Brilliant STUDY CENTRE PALA

QUESTION BOOKLET CODE **A**

IIT/AIIMS SCREENING CUM SCHOLARSHIP TEST

SAMPLE QUESTION PAPER

IMPORTANT INSTRUCTIONS

Please read the instructions carefully

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 hours** duration.
   This question booklet contains 90 questions. The **Maximum Mark is 240**
5. There are three sections. Physics, Chemistry & Mathematics having 20 questions each. Each section consists of two parts. **In Part 1** (15 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/ two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VARIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 60 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate	Roll Number
I have read all the instructions and shall abide by them _ _ _ _ _ _ _ _ _ _ _ _ **Signature of the Candidate**	**I have verified all the information filled by the candidate** _ _ _ _ _ _ _ _ _ _ _ _ **Signature of the Invigilator**

PART I

This part contains 15 questions each

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

PART II

This part contains 5 questions each

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

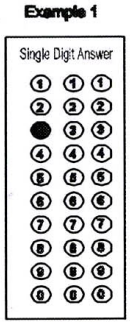
Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **No negative mark for incorrect answer**

CORRECT METHOD FOR MARKING PART - II QUESTIONS

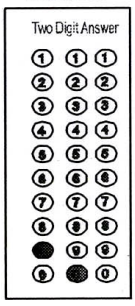
If Single Digit Answer

If answer is 3



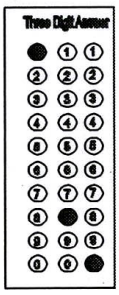
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



PHYSICS -PART I

1. The distance travelled by a freely falling body in one second, two second, three second etc are in the ratio

   A) 1 : 1 : 1 B) 1 : 2 : 3 C) 1 : 3 : 5 D) 1 : 4 : 9

2. A bullet of mass 10g moving with velocity 100m/s strikes a mud wall and comes to rest after penetrating through 5m. The force offered by the mud wall is

   A) 10N B) 20N C) 25N D) 40N

3. Unit of G is

   A) Nm^2kg^{-2} B) $Nmkg^{-2}$ C) Nkg^2m^{-2} D) $Nkg^{-2}m^{-2}$

4. If initially the distance between two bodies is r and their masses be M_1 and M_2 then the force of gravitation be F. If this distance is increased to two times then the force would become

   A) $\frac{F}{2}$ B) $\frac{F}{4}$ C) 2F D) 4F

5. Sound wave of wavelength λ travels from a medium in which their speed is V into a medium in which their speed is 4V. The wavelength of the sound in the second medium is

   A) λ B) 2λ C) 3λ D) 4λ

6. A particle is taken to a height R above the earth's surface where R is the radius of the earth. The acceleration due to gravity there is

   A) 19.6 m/s^2 B) 2.45 m/s^2 C) 9.8 m/s^2 D) 4.9 m/s^2

7. A body floats with $1/3^{rd}$ of its volume outside water and $3/4^{th}$ of its volume outside liquid. Then the density of the liquid is

   A) $\frac{3}{8} g/cm^3$ B) $\frac{8}{3} g/cm^3$ C) $\frac{9}{4} g/cm^3$ D) $\frac{4}{9} g/cm^3$

8. Two bodies of mass 1kg and 4kg possess equal momentum .The ratio of KE is

   A) 4 : 1 B) 1 : 4 C) 2 : 1 D) 1 : 2

9. A 2 cm long object is placed $\perp$ r to the principal axis of a concave mirror the distance of the object from the mirror is 30cm and its image is formed. 60 cm from the mirror on the same side of the mirror as the object the hight of the image?

   A) 4cm B) 40cm C) 4m D) none

10. If the light travelling at 3×10^5 km/s reaches the earth in 8.3 minutes the distance of sun from the earth is

    A) 150 million km B) 15 million km C) 300 million km D) 200 million km

11. The water flows through three holes made at different heights of a vessel. The pressure is maximum at

    A) the top most hole B) the middle hole C) the lowermost hole D) is same at all hole

12. One coulomb is equal to

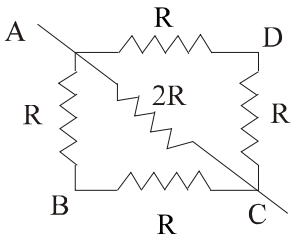
A) 6.35×10^{19} electrons B) 6.25×10^{18} electrons

C) 6.25×10^{19} electrons D) $6 \times 25 \times 10^{18}$ electrons

13. In the air the path of lightning goes up to a temperature of about.

A) 300°C B) 3, 000°C C) 300, 000°C D) 30,000°C

14. Find the effective resistance between point A and C



A) 3/2R B) 6R C) 3R D) 2/3R

15. An electron has a circular path of radius 0.01m in a perpendicular magnetic induction 10^{-3}T find the speed of electron

A) 1.76×10^{6}m/s B) 1.76×10^{-6}m/s C) 1.76m/s D) none

PHYSICS - PART II

16. Calculate the resistance of an electric bulb which allows a 10A current when connected to a 220 V power source

17. The power of lens having focal length 20cm is

18. How much force is resuired to lift a mass of 100 g

19. A bus starts from town A and reaches town B with speed 40km/h. It returns to town A with speed 60km/h. The average velocity of the bus is

20. The minimum distance between the source of sound and the obstracle for an echo to take place is (speed of sound is 340m/s)

CHEMISTRY - PART I

21. The non-metal having a shiny surface is

A) Sulphur B) Phosphorous C) Iodine D) Carbon

22. Which one of the following metal oxide is amphoteric in nature?

A) CaO B) MgO C) FeO D) ZnO

23. Dry ice is

A) solid NH_3 B) solid SO_2 C) solid CO_2 D) solid N_2

24. The metal which do not react with water

A) Ca B) Na C) Ni D) K

25. Striking tip of match box is made up of

A) P_4S_3 B) P_4 C) $MgPO_4$ D) $CaPO_4$

26. Chemical formula of phosphoric acid

A) H_3PO_3 B) H_3PO_4 C) H_2PO_4 D) None of these

27. When calcium dissolves in water, a milky appearance is obtained. This milky appearance is due to the formation of

A) CaO B) $Ca(OH)_2$ C) $CaCl_2$ D) $CaPO_4$

28. The substance which shows sublimation

A) NaOH B) NaCl C) I_2 D) $Ca(OH)_2$

29. Separation of cream from milk is done by

A) Sedimentation B) Centrifugation C) Distillation D) Evaporation

30. Which is called baking soda ?

A) NaOH B) Na_2CO_3 C) $NaHCO_3$ D) $NaNO_3$

31. Rust is chemicaly

A) $Fe_3O_4 . 4NH_3$ B) $Fe_3O_4 . xH_2O$ C) $Fe_2O_3 . xH_2O$ D) $FeCl_3 . xH_2O$

32. In neutralization reaction

A) Heat is absorbed B) Heat is evolved

C) Oxidation take place D) None of these

33. When Zn react with con. H_2SO_4, the gas evolved is

A) O_2 B) H_2 C) SO_2 D) NO_2

34. Which of the following is a mineral acid

A) H_2CO_2 B) $H_4C_2O_2$ C) $H_6C_7O_2$ D) H_2CO_3

35. Match the substances in column (I) with the type of substances in column (II) and colour of substances in column (III) and select the correct match from choices given

Column I (Substances)	Column -II type of substance	Column-III Colour
(1) air	(i) element	(a) colourless
(2) Chlorine	(ii)compound	(b) brown
(3) rust	(iii) mixture	(c) greenish yellow

A) (1)-(ii), (a) 2-(i),(b) 3-(ii) (c)
B) (1)-(iii),(a) 2-(i)(c) 3-(ii) (b)
C) (1)-(iii) (c) 2-(i),(a) 3-(ii)(b)
D) (1)-(i) (c) 2-(iii)(a) 3-(ii) (b)

CHEMISTRY - PART II

36. The amount of glucose required to prepare 250gm of 4.8% solution of glucose by mass

37. Atomicity of S is.....

38. 1 mole of a compound containing 1 mole of carbon atoms and 2 moles of oxygen atoms. The molecular weight of the compound is .....

39. pH of 1M hydrochloric acid is.....

40. In alnico the % of Fe is .....

MATHEMATICS - PART I

41. The difference between the compound interest and the simple interest for 2 years at 8% per annum on a certain sum of money is 120. Find the sum?

A) 18,750/-
B) 18,700/-
C) 18,850/-
D) 18,050/-

42. A carton is in the shape of a cuboid of measure 200 cm × 100 cm × 50 cm. A box is in the shape of a cube of measure 5 cm × 5 cm × 5 cm. Then how many boxes can be stored in the carton?

A) 4,000
B) 8,000
C) 2,000
D) 1,000

43. The salary of an officer has been increased by 50%. By what percent the new salary must be reduced to restore the original salary?

A) $44\frac{1}{2}\%$
B) $33\frac{1}{3}\%$
C) $22\frac{1}{3}\%$
D) $11\frac{1}{3}\%$

44. Find the cost of erecting a fence around a square field whose area is 9 hectares if fencing costs 3.50/- per metre.

A) 4200/-
B) 4300/-
C) 4400/-
D) 4500/-

45. The diagonals of a rhombus are 8cm and 6cm, then the length of each side of the rhombus is equal to

A) 3 cm B) 4cm C) 5cm D) None of these

46. In a cyclic quadrilateral, the difference between two opposite angles is 58, the measure of opposite angles are

A) 158, 22 B) 129, 51 C) 109, 71 D) 119, 61

47. The mean of 100 observations is 60. If one of the observation 50 is replaced by 120, the resulting mean will be

A) 50.5 B) 51 C) 51.5 D) 60.7

48. If $x^2 - 3x - 4$ divides p(x) completely then the corresponding factors are

A) $(x - 4), (x + 1)$ B) $(x - 4), (x - 1)$ C) $(x + 4), (x - 1)$ D) $(x + 4), (x + 1)$

49. If –5 is the remainder when $3x^2 + mx - 2$ is divided by $x + 2$, then m is

A) 5 B) $\frac{15}{2}$ C) –5 D) –24

50. The coefficient of x^2 in $(px^2 + 4x + r) \times (4x^2 - 3qx - 5)$ is

A) $-5p - 12q + 4r$ B) $4p + 5q$ C) $12q - 5p$ D) $16q - 3qr$

51. If in a fraction 1 less from two times of the numerator (x) and 1 add in denominator (y) then new fraction will be

A) $\frac{2x-1}{y+1}$ B) $\frac{2(x+1)}{y+1}$ C) $2\left(\frac{x-1}{y+1}\right)$ D) $2\left(\frac{x}{y}\right)$

52. The sum of the squares of two consecutive positive integers is 545; then the integers are

A) 19,15 B) 16,17 C) 26,17 D) 6,17

53. If $(x + 1)$ is a factor of $x^2 - 3ax + 3a - 7$ then the value of 'a' is

A) 1 B) –1 C) 0 D) –2

54. Which term of the arithmetic progression 8,14,20,26..... will be 72 more than its 41st term

A) 43rd B) 53rd C) 63rd D) 68th

55. If the circumference of a circle increases from 4π to 8π, then its area is

A) quadrupled B) tripled C) doubled D) halved

MATHEMATICS - PART II

56. The value of $\sqrt[3]{\frac{0.027}{0.008}} \div \sqrt{\frac{0.09}{0.04}} - 1$

57. The difference between a two digit number and the number obtained by interchaging the digit is 27. What is the difference between the two digits of the number?

58. The difference between two numbers is 5 and difference in their squares is 65. The larger number is

59. In ΔABC, $\angle A : \angle B : \angle C = 2 : 3 : 5$, angle at B is

60. How many balls, each of radius 1cm, can be made from a solid sphere of lead of radius 8cm

IIT / AIIMS - 2023 SCREENING CUM SCHOLARSHIP TEST

SAMPLE QUESTION ANSWER KEY

FN_{20C}/C/[P]	PHYSICS + CHEMISTRY + MATHS + KEY

PHYSICS

1. D
2. A
3. A
4. B
5. D
6. B
7. B
8. A
9. A
10. A
11. C
12. C
13. D
14. D
15. A
16. 22
17. 5
18. 1
19. 0
20. 17

CHEMISTRY

21. C
22. D
23. C
24. C
25. A
26. B
27. B
28. C
29. B

30. C
31. C
32. B
33. C
34. D
35. B air-mixture-colourless chlorine-element-greenish yellow rust-compound-Brown
36. 12
37. 8
38. 44
39. 0
40. 60

MATHEMATICS

41. A
42. B
43. B
44. A
45. D
46. D
47. D
48. A
49. B
50. A
51. A
52. A
53. A
54. A
55. D
56. 0
57. 6
58. 11
59. 54
60. 512

Brilliant STUDY CENTRE PALA

IIT/AIIMS 2020 – SCREENING CUM SCHOLARSHIP EXAM

QUESTION BOOKLET CODE

A

Date: 05th April 2018

IMPORTANT INSTRUCTIONS

Please read the instructions carefully

1. This booklet is your Question Paper. Do not break the seals of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of 2 ½ hours duration.

   This question booklet contains 90 questions. The Maximum Marks are 360
4. There are three sections in the question paper. Section I - Physics, Section II - Chemistry, Section III - Mathematics having 30 questions each.
5. For each question, four answers are suggested and given against (A), (B), (C) and (D) of which, **only one** will be the **Most Appropriate Answer**. Mark the bubble containing the letter corresponding to the 'Most Appropriate Answer' in the answer sheet, by using either **Blue or Black ball - point pen only**
6. Each correct answer will be awarded **FOUR** marks.
7. **ONE** mark will be deducted for each incorrect answer.
8. More than one answer marked against a question will be deemed as incorrect answer and will be negatively marked.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. Return both the **Question paper and Answer sheet** to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VARIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate	Roll Number
I have read all the instructions and shall abide by them _ _ _ _ _ _ _ _ _ _ _ _ **Signature of the Candidate**	**I have verified all the information filled by the candidate** _ _ _ _ _ _ _ _ _ _ _ _ **Signature of the Invigilator**

SECTION I - PHYSICS

1. A box of mass 20 kg is pushed along a rough floor with a velocity 2 m/s and then let go. The box moves 5m on the floor before coming to rest. What must be the frictional force acting on the box?

   A) 4N B) 2N C) 20 N D) 8N

2. Two objects, one 4 times as massive as the other, are approaching each other under their mutual gravitational attraction. When the separation between the objects is 100 km, the acceleration of the lighter object is 1 m/s^2. When the separation between them is 25 km, the acceleration of the heavier object is

   A) 1 m/s^2 B) 2 m/s^2 C) 8 m/s^2 D) 4 m/s^2

3. A force of 10 N is applied on an object of mass 1 kg of 2s, which was initially at rest. What is the work done on the object by the force?

   A) 200 J B) 20 J C) 16 J D) 180 J

4. Stethescope of doctors for finding quality, strength and frequency of human heart beat is based on the principle of

   A) SONAR B) Reverberation C) Multiple reflection D) Echo

SPACE FOR ROUGH WORK

5. A ray of light is incident in medium 1 on a surface that separates medium 1 from medium 2. Let v_1 and v_2 represent the velocity of light in medium 1 and medium 2 respectively. Also let n_{12} and n_{21} represent the refractive indes of medium 1 with respect to medium 2 and refractive index of medium 2 with respect to medium 1, respectively. If i and r denote the angle of incidence and angle of refraction, then

A) $\frac{\sin i}{\sin r} = n_{21} = \frac{v_1}{v_2}$ B) $\frac{\sin i}{\sin r} = n_{21} = \frac{v_2}{v_1}$ C) $\frac{\sin i}{\sin r} = n_{12} = \frac{v_1}{v_2}$ D) $\frac{\sin i}{\sin r} = n_{12} = \frac{v_2}{v_1}$

6. A convex lens has a focal length of 0.5 m. It has to be combined with a second lens, so that the combination has a power of 1.5 dioptre. Which of the following could be the second lens?

A) A concave lens of focal length 2m

B) Another convex lens of focal length 0.5 m

C) A concave lens of focal length 0.5 m

D) A convex lens of focal length 2m

7. Consider two conducing plates A and B, between which the potential difference is 5V, plate A being at a higher potential. A proton and an electron are released at plates A and B respectively. The two particles then move towards the opposite plates - the proton to plate B and the electron to plate A. Which one will have a larger velocity when they reach their respective destination plates?

A) Both will have the same velocity

B) The electron will have the larger velocity

C) The proton will have the larger velocity

D) None will be able to reach the destination point

SPACE FOR ROUGH WORK

8. Which one of the following statements best describes the nature of the field lines due to a bar magnet?

A) Field lines start form the north pole and end on the south pole. Any number of field lines can pass through a point

B) Field lines start from the north pole and end on the south pole. Only one field line passes through a point

C) Field lines are continuous lines passing inside and outside the magnet. Only one field line passes through a point

D) Field lines are continuous lines passing inside and outside the magnet. Any number of field lines can pass through a point

9. A star produces its energy through the process of

A) Nuclear fusion

B) Chemical reaction

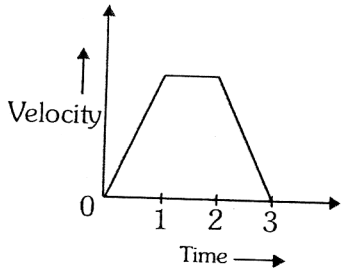
C) Nuclear fission

D) Gravitational attraction between different parts of the star

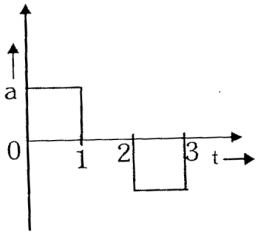
---

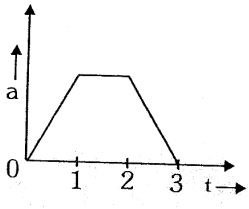
SPACE FOR ROUGH WORK

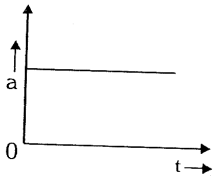
10. The velocity time graph of an object moving along a straight line is shown below

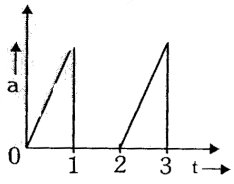


Which one of the following graphs represents the acceleration (a) - time (t) graph for the above motion?

A) 

B) 

C) 

D) 

SPACE FOR ROUGH WORK

11. To read a poster on a wall, a person with defective vision needs to stand at a distance of 0.4m from the poster. A person with normal vision can read the poster from a distance of 2.0 m. Which one of the following lens may be used to correct the defective vision?

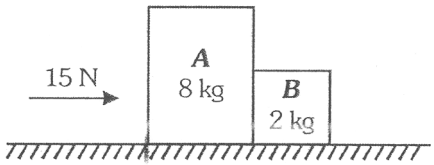
A) A concave lens of 0.5 D

B) A concave lens of 1.0 D

C) A concave lens of 2.0 D

D) A convex lens of 2.0 D

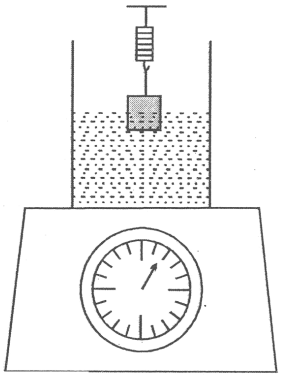
12. Two blocks A and B of masses 8kg and 2 kg respectively, lie on a horizontal frictionless surface as shown in the figure. They are pushed by a horizontally applied force of 15 N. The force excerted by B on A is



A) 1.5 N B) 3.0 N C) 4.5 N D) 6.0 N

SPACE FOR ROUGH WORK

13. A beaker half-filled with water is put on a platform balance which is then set to zero. A 800 g mass is immersed partially in water using a spring balance as shown in the figure. If the spring balance reads 300g, what will be the reading on the platform balance?



A) 200 g B) 300 g C) 500 g D) 800 g

14. An object falls a distance H in 50 s when dropped on the surface of the earth. How long would it take for the same object to fall through the same distance on the surface of a planet whose mass and radius are twice that of the arth? (neglect air resistance)

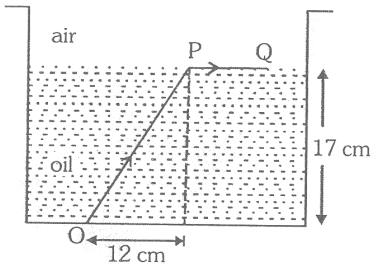
A) 35.4 g B) 50.0 s C) 70.7 s D) 100.0 s

SPACE FOR ROUGH WORK

15. A source produces sound waves under water. Waves travel through water and then into air. Which of the following statements about the frequency (f) and wavelength (λ) is correct as sound passes from water to air?

A) f remains unchanged but λ decreases
B) f remains unchanged but λ increases
C) λ remains unchanged but f decreases
D) λ remains unchanged but f increases

16. A vessel is filled with oil as shown in the diagram. A ray of light from point O at the bottom of vessel is inciden on the oil-air intergace at point p and grazes the surface along PQ. The refractive index of the oil is close to



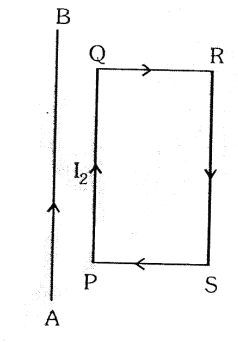
A) 1.41
B) 1.50
C) 1.63
D) 1.73

17. A charged particle placed in an electric field falls from rest through a distance d in time t. If the charge on the particle is doubled, the time of fall through the same distance will be

A) 2t
B) t
C) $\frac{t}{\sqrt{2}}$
D) $\frac{t}{2}$

SPACE FOR ROUGH WORK

18. AB is a long wire carrying a current I_1, and PQRS is rectangular loop carrying current I_2 (as shown in the figure).



Which among the following statements are correct?

a) Arm PQ will get attracted to wire AB, and the arm RS will get repelled from wire AB

b) Arm PQ will get repelled from wire AB and arm RS attracted to wire AB

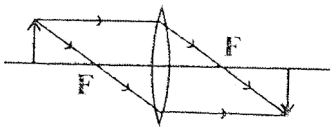
c) Forces on the arms PQ and RS will be unequal and opposite

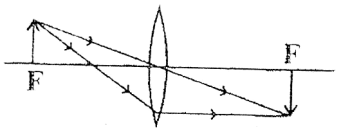
d) Forces on the arms QR and SP will be zero

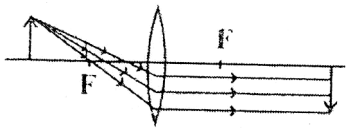
A) only (a) B) (b) and (c) C) (a) and (c) D) (b) and (d)

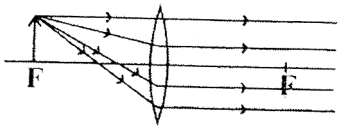
SPACE FOR ROUGH WORK

19. Which of the following ray diagram is correct?

A) 

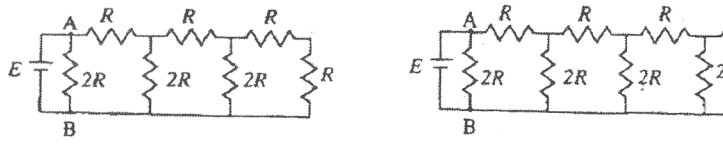
B) 

C) 

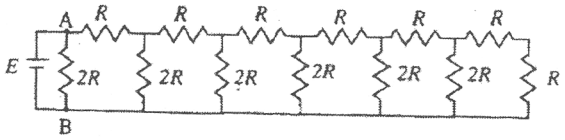
D) 

SPACE FOR ROUGH WORK

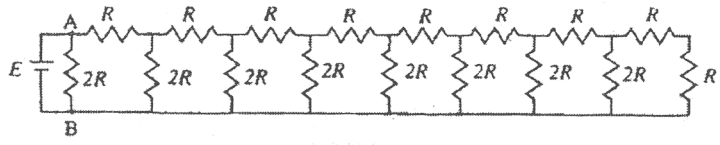
20. Three different circuits (I, II and III) are constructed using identical batteries and resistors of R and 2R ohm. What can be said about current I in arm AB of each circuit?



(I)



(II)



(III)

A) $I_{II} < I_1 < I_{III}$

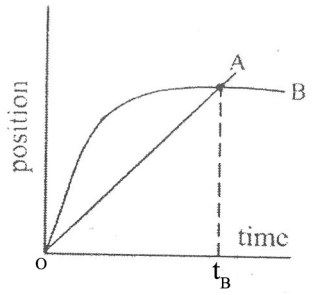
B) $I_1 < I_{II} < I_{III}$

C) $I_1 = I_{II} = I_{III}$

D) $I_1 > I_{II} = I_{III}$

SPACE FOR ROUGH WORK

21. The graph shows position as a function of time for two trains A and B running on parallel tracks. For times greater than t = 0, which of the following statement is true?



A) At time t_B, both trains have the same velocity

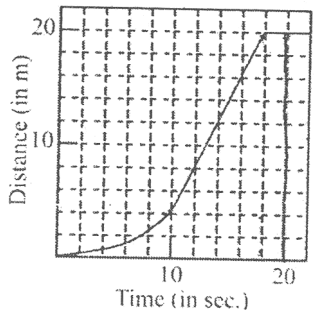
B) Both trains speed up all the time

C) Both trains may have the same velocity at some time earlier than t_B

D) Graph indicates that both trains have the same acceleration at a given time

SPACE FOR ROUGH WORK

22. The figure shown below depicts the distance travelled by a body as a function of time



The average speed and maximum speed between 0 and 20 s are:

A) 1 m/s, 2.0 m/s respectively

B) 1 m/s, 1.6 m/s respectively

C) 2.0 m/s, 2.6 m/s respectively

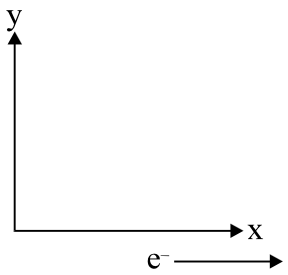
D) 1.3 m/s, 2.0 m/s respectively

23. A hypothetical planet has density ρ, radius R and surface gravitational acceleration g. If the radius of the planet were doubled, but the planetary density stayed the same, the acceleration due to gravity at the planet's surface would be

A) 4g B) 2g C) g D) g/2

SPACE FOR ROUGH WORK

24. An electron moving with uniform velocity in x direction enters a region of uniform magnetic field along y direction. Which of the following physical quantity (ies) is (are) non-zero and remain constant?



I) Velocity of the electron

II) Magnitude of the momentum of the electron

III) Force on the electron

IV) The kinetic energy of electron

A) Only I and II B) Only III and IV C) All four D) Only II and IV

25. In a neon gas discharge tube, every second 4.8×10^{18} Ne^{+} ions move towards the right through a cross-section of the tube, while 'n' electrons move to the left in the same time. If the current in the tube is 1.12 amperes towards the right, 'n' is equal to (given e = 1.6×10^{-19} coulomb)

A) 1.8×10^{18} B) 2.2×10^{18} C) 2.4×10^{19} D) 2.8×10^{19}

SPACE FOR ROUGH WORK

26. Four situations are given below

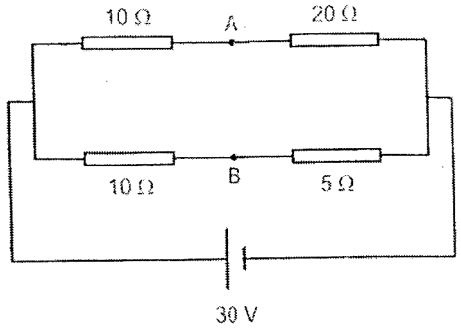
I) An infinitely long wire carrying current II) A rectangular loop carrying current

III) A solenoid of finite length carrying current IV) A circular loop carrying current

In which of the above cases will the magnetic field produced be like that of a bar magnet?

A) I B) I and III C) Only III D) Only IV

27. In the circuit diagram shown below, V_A and V_B are the potentials at points A and B respectively. Then, $V_A - V_B$ is



A) –10 V B) –20 V C) 0 V D) 10 V

SPACE FOR ROUGH WORK

28. When a charged particle passes through an electric field, which among the following properties change?

I) Mass II) Charge III) Velocity IV) Momentum

A) II & III B) Only III C) III and IV D) I, III & IV

29. A ball of mass m is thrown from a height h with a speed v. For what initial direction of the ball will its speed on hitting the ground be maximum?

A) Horizontally

B) Vertically downwards

C) At an angle of 45° from the vertical in the downward direction

D) Speed does not depend on the direction in which the ball is thrown

30. A beaker is filled with two non-mixing liquids. The lower liquid has density twice that of the upper one. A cylinder of height h floats with one-fourth of its height submerged in the lower liquid and half of its height submerged in the upper liquid. Another beaker is filled with the denser of the two liquids alone. If the same cylinder is kept in the second beaker, the height of the submerged position would be

A) h B) $\frac{3h}{4}$ C) $\frac{h}{2}$ D) $\frac{h}{4}$

SPACE FOR ROUGH WORK

SECTION 2 - CHEMISTRY

31. Four substances were thoroughly mixed with water separately to obtain mixtures A, B, C and D. Some of their properties are given below:

I) Path of a beam of light passing through it was visible in A, B and D but invisible in C

II) On leaving undisturbed, the particles of the substance settle down in A but not in B, C and D

III) The solute-particles are visible to naked eye in A but invisible in B, C and D.

Which of the following is correct about A, B, C and D?

A) A, B and D are colloids, C is a solution

B) A is a suspension, B and D are colloids, C is a solution

C) A is colloid, B, C and D are solutions

D) A is a suspension. B, C and D are colloids

32. Magnesium ribbon is rubbed with sand paper before making it to burn. The reason of rubbing the ribbon is to

A) remove moisture condensed over the surface of ribbon

B) generate heat due to exothermic reaction

C) remove the magnesium oxide formed over the surface of magnesium

D) mix silicon from and paper (silicon dioxide with magnesium for lowering ignition temperature of the ribbon)

SPACE FOR ROUGH WORK

33. An element X reacts with dilute H_2SO_4 as well as with NaOH to produce salt and $H_2(g)$. Hence, it may be concluded that

I) X is an electropositive elements

II) Oxide of X is basic in nature

III) Oxide of X is basic in nature

IV) X is an electronegative element

A) I, II, III B) IV, I, III C) III, IV, I D) II, III, IV

34. An element X has electronic configuration 2, 8, 1 and another element Y has electronic configuration 2, 8, 7. They form a compound Z. The property that is not exhibited by Z is

A) it has high melting point

B) it is a good conductor of electricity in its pure solid state

C) it breaks into pieces when beaten with hammer

D) it is soluble in water

35. The compound containing both ionic and covalent bond is

A) $AlBr_3$ B) CaO C) $MgCl_2$ D) NH_4Cl

SPACE FOR ROUGH WORK

36. Somebody wanted to calculate the number of moles of oxygen atoms comprising of 9.033×10^{23} number of its atoms. The person further thought to calculate its mass and to find the number of moles of hydrogen atoms required to combine completely with this amount of oxygen to form water. The number of moles of oxygen atoms, their mass (in grams) and the number of moles of hydrogen atoms are

A) 1.5, 3 and 24 respectively

B) 15, 18 and 3 respectively

C) 0.15, 27.3 respectively

D) 1.5, 24 and 3 respectively

37. Two identical beakers labelled as (X) and (Y) contain 100 cm^3 of water each at 20°C. To the water in the beaker (X) 100 g of water at 0°C was added and stirred to mix thoroughly. To the beaker (Y) 100 g of ice at 0°C was added and stirred till it melted into water. The water in the beaker (Y) will be

A) hotter than water in beaker X

B) colder than water in beaker X

C) heavier than water in beaker X

D) lighter than water in beaker X

SPACE FOR ROUGH WORK

38. At 283 K a saturated solution of solid X can be prepared by dissolving 21.0 g of it in 100 g of water. The maximum amount of X which can be dissolved in 100 g of water at 313 K is 62.0 g. An attempt is made to dissolved 50.0 g of X in 100g of water at 313 K

A) All the 50.0 g of X will dissolve at 313 K

B) At 313 K 29.0 g of X will remain undissolved

C) Solubility of X decrease with increase of temperature

D) On cooling the solution of X from 313 K to 283 K more than 21.0 g of X will crystallize out. Which of the above statements are correct?

A) A and B B) A and D C) B and C D) A, C and D

39. Two elements A and B contain 13 and 8 proton respectively. If the number of neutrons in them happen to be 14 and 8 respectively, the formula unit mass for the compound between A and B unit would be

A) 43 B) 75 C) 102 D) 112

40. The reaction of burning carbon in oxygen is represented by the equation

$$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} + \text{Heat} + \text{Light}$$

When 9.0 g of solid carbon is burnt in 16.0 g of oxygen gas, 22.0 g of carbon dioxide is produced. The mass of carbon dioxide gas formed on burning of 3.0 g of carbon in 32.0 g of oxygen would be (Note : Atomic mass of C = 12.0 u, O = 16.0 u)

A) 6.60 g B) 7.33 g C) 8.25 g D) 11.00 g

SPACE FOR ROUGH WORK

41. An atom of an element (X) has its K, L and M shells filled with some electrons. It reacts with sodium metal to form a compound NaX. The number of electrons in the M shell of the atom (X) will be

A) Eight B) Seven C) Two D) One

42. Oxygen gas reacts with hydrogen to produce water. The reaction is represented by the equation

$$O_{2(g)} + H_{2(g)} \longrightarrow H_2O_{(g)}$$

The above reaction is an example of

a) oxidation of hydrogen

b) reduction of oxygen

c) reduction of hydrogen

d) redox reaction

A) a, b and c

B) b, c and d

C) a, c and d

D) a, b and d

SPACE FOR ROUGH WORK

43. Match the items of column-I with the items of column-II

Column-I	**Column-II**
a) $NH_4OH + CH_3COOH \longrightarrow CH_3COONH_4 + H_2O$	i) Thermal decomposition
b) $2AgBr \longrightarrow 2Ag + Br_2$	ii) Thermit reaction
c) $ZnCO_3 \longrightarrow ZnO + CO_2$	iii) Photochemical reaction
d) $2Al + Fe_2O_3 \longrightarrow 2Fe + Al_2O_3$	iv) Neutralization reaction

A) d $\rightarrow$ ii; c $\rightarrow$ iv; b $\rightarrow$ i; a $\rightarrow$ iii B) c $\rightarrow$ i; a $\rightarrow$ ii; d $\rightarrow$ iii; b $\rightarrow$ iv

C) b $\rightarrow$ ii; d $\rightarrow$ i; a $\rightarrow$ iii; c $\rightarrow$ iv D) a $\rightarrow$ iv; b $\rightarrow$ iii; c $\rightarrow$ i; d $\rightarrow$ ii

44. Metals like sodium, potassium, calcium and magnesium are extracted by electrolysis of their chlorides in molten state. These metals are not extracted by reducing of their oxides with carbon because

a) reduction with carbon is very expensive

b) carbon readily makes alloy with these metals

c) carbon has less affiity for oxygen than these metals

d) carbon is weaker reducing agent than these metals

A) a and b B) b and c C) c and d D) d and a

SPACE FOR ROUGH WORK

45. A hydrocarbon has a molecular formula as C_6H_{12}. It does not react with hydrogen to give C_6H_{14} nor does it react with chlorine to give $C_6H_{12}Cl_2$. The hydrocarbon C_6H_{12} is

a) A saturated hydrocarbon b) An unsaturated hydrocarbon

c) An open chain hydrocarbon d) A cyclo-alkane

A) a and b B) c and d C) d and b D) a and d

46. An organic compound is a clear liquid having a molecular formula C_4H_8O. It has an open chain structure. Without any carbon-carbon double bond. The compound can be

a) an alcohol b) an ester c) an aldehyde d) a ketone

A) a and b B) c and d C) b and d D) d and a

47. An element with atomic number 17 is placed in the group 17 of the long form periodic table. Element with atomic number 9 is placed above and with atomic number 35 is placed below it. Element with atomic number 16 is placed left and with atomic number 18 is placed right to it. Which of the following statements are correct?

a) Valency of the element with atomic number 18 is zero

b) Elements of the element with atomic number 18 is zero

c) Valency of elements with atomic number 9, 17 and 35 is one

d) Element with atomic number 17 is more electronegative than element with atomic numbers 16 and 35

A) a, b and c B) a, c and d C) b, c and d D) a, b and d

SPACE FOR ROUGH WORK

48. A drop each of two non-corrosive and non-irritating liquids A and B at a temperature of 22°C are placed on the skin. Liquid A gives a more cooling sensation than liquid B. Which of the following can be said about the liquids A and B?

A) Liquid A has higher boiling point than that of liquid B

B) Liquid A has higher latent heat of vaporisation than that of liquid B

C) Liquid A has lower latent heat of vaporisation than that of liquid B

D) The boiling points of liquid A and B are equal

49. There is a mixture of three solid compounds A, B and C. Out of these compounds A and C are soluble in water and compound C is sublimable also. In what sequence the following techniques can be used for their effective separation?

I) Filtration II) Sublimation

III) Crystallisation from water extract IV) Dissolution in water

A) II, I, IV, III B) IV, I, II, III C) I, II, III, IV D) II, IV, I, III

50. Which of the following is a suitable example for illustrating the law of conservation of mass? (Atomic mass of O = 16; H = 1)

A) 18g of water is formed by the combination of 16g oxygen with 2g of hydrogen

B) 18g of water in liquid state is obtained by heating 18g of ice

C) 18g of water is completely converted into vapour state on heating

D) 18g of water freezes at 4°C to give same mass of ice

SPACE FOR ROUGH WORK

51. A metal carbonate X on treatment with a mineral acid liberates a gas which when passed through aqueous solution of a substance Y gives back X. The substance Y on reaction with the gas obtained at anode during electrolysis of brine gives a compound Z which can decolorise coloured fabrics. The compounds X, Y and Z respectively are

A) $CaCO_3$, $Ca(OH)_2$, $CaOCl_2$ B) $Ca(OH)_2$, CaO, $CaOCl_2$

C) $CaCO_3$, $CaOCl_2$, $Ca(OH)_2$ D) $Ca(OH)_2$, $CaCO_3$, $CaOCl_2$

52. A salt can be between produced by reaction

a) A weak acid and weak base b) Metal oxide and water

c) Metal and mineral acid d) Metal oxide and a mineral acid

A) a, b and c B) b, c and d C) c, d and a D) d, a and b

53. A silvery white metal X reacts with water at room temperature to produce a water soluble compound Y and a colourless gas Z. The reactions is highly exothermic and the Z catches fire immediately during the reaction. The solution of Y in water on reacting with stoichiometric amount of dilute solution of hydrochloric acid gives a solution of pH = 7.0 The compounds X, Y and Z respectively are:

A) Al, $Al(OH)_3$ and H_2 B) Ag, AgOH and H_2

C) K, KCl and H_2 D) Na, NaOH and H_2

SPACE FOR ROUGH WORK

54. A compound X is obtained by the reaction of alkaline $KMnO_3$ with another compound Y followed by acidification. Compound X also reacts with compound Y in presence of few drops of H_2SO_4 to form a sweet smelling compound Z. The compound X, Y and Z are respectively.

A) Ethanol, Ethene, Ethanoic acid
B) Ethanoic acid, Ethanol, Ethylethanoate
C) Ethanoic Acid, Ethanal, Ethene
D) Ethanol, Ethanoic Acid, Sodium Ethanoate

55. An element X (atomic number 12) reacts with another element Y (Atomic number 17) to form a compound Z. Which of the following statements are true regarding this compound?

I) Molecular formula of Z is XY_2
II) It is soluble in water
III) X and Y are joined by sharing of electrons
IV) It would conduct electricity in the molten state

A) II and III
B) I and III
C) I, III and IV
D) II and IV

56. The metal (M) forms an oxide, M_2O_3. The formula of its nitride will be

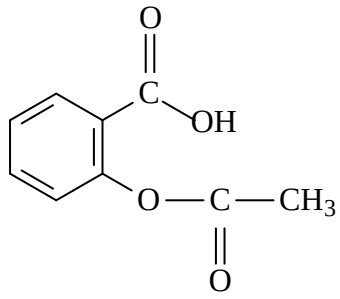
A) M_2N_3
B) MN
C) M_2N
D) M_3N_2

57. Which one of the following statement is incorrect about graphite and diamond?

A) Graphite is smooth and slippery
B) Diamond is good conductor of heat
C) Graphite is a good conductor of electricity
D) Physical and chemical properties of graphite and diamond are different

SPACE FOR ROUGH WORK

58. The functional groups present in the following compound are:-



A) Alcohol, ketone and ester

B) Ester and carboxylic acid

C) Carboxylic acid and ketone

D) Ester and alcohol

SPACE FOR ROUGH WORK

59. A part of the modern periodic table is presented below in which the alphabets represent the smbols of elements.

Table

Group → / Period ↓	1	2	14	15	16	17
2				M	Q	
3	A	J			R	
4	E		L			T
5	G					X

Consult the above part of the periodic table to predict which of the following is a covalent compound

A) RQ_2

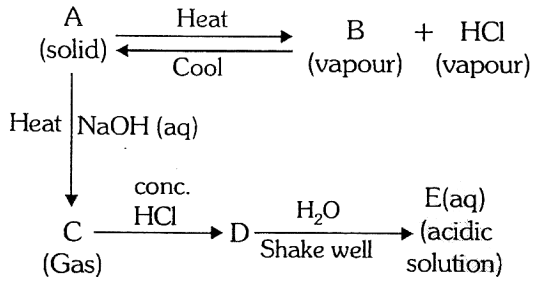
B) AT

C) JQ

D) JX_2

SPACE FOR ROUGH WORK

60. The schematic diagram is given below



Which of the following is an incorrect statement?

A) A and E are chemically same

B) A and D are chemically same

C) D and E are chemically same

D) C and E are chemically same

SECTION 3 - MATHEMATICS

61. On dividing a natural number by 13, the remainder is 3 and on dividing the same number by 21, the remainder is 11. If the number lies between 500 and 600, then the remainder on dividing the number by 19 is

A) 4 B) 6 C) 9 D) 13

SPACE FOR ROUGH WORK

62. If S_1, S_2, S_3 ....., S_r are the sums of first n terms of r arithmetic progressions whose first terms are 1, 2, 3..... and whose common differences are 1, 3, 5, ... respectively, then the value of $S_1 + S_2 + S_3 + ... + S_r$ is

A) $\frac{(nr-1)(nr+1)}{2}$ B) $\frac{(nr+1)nr}{2}$ C) $\frac{(nr-1)nr}{2}$ D) $\frac{n(nr+1)}{2}$

63. If cosec x – sinx = a and secx – cosx = b, then

A) $\left(a^2b\right)^{\frac{2}{3}} + \left(ab^2\right)^{\frac{2}{3}} = 1$ B) $\left(ab^2\right)^{\frac{2}{3}} + \left(a^2b^2\right)^{\frac{2}{3}} = 1$

C) $a^2 + b^2 = 1$ D) $b^2 - a^2 = 1$

64. If Anish is moving along the boundary of a triangular field of sides 35m, 53m and 66 m and you are moving along the boundary of a circular field whose area is double the area of the triangular field, then the radius of the circular field is: (Take $\pi = \frac{22}{7}$)

A) $14\sqrt{3}$ m B) $3\sqrt{14}$ m C) $28\sqrt{3}$ m D) $7\sqrt{3}$ m

SPACE FOR ROUGH WORK

65. Two circles with centres P and R touch each other externally at O. A line passing through O cuts the circles at T and S respectively. Then,

A) PT and RS are of equal length
B) PT and RS are perpendicular to each other
C) PT and RS are intersecting
D) PT and RS are parallel

66. If in a triangle ABC, D is the mid point of side BC, $\angle ADB = 45°$ and $\angle ACD = 30°$, then $\angle BAD$ and $\angle ABC$ are respectively equal to

A) 15°, 105°
B) 30°, 105°
C) 30°, 100°
D) 60°, 100°

67. The centre of the circle passing through the points (6, –6), (3, –7) and (3, 3) is

A) (3, 2)
B) (–3, –2)
C) (3, –2)
D) (–3, 2)

68. The mean of three positive numbers is 10 more than the smallest of the numbers and 15 less than the largest of the three. If the median of the three numbers is 5, then the mean of squares of the numbers is

A) $108\frac{2}{3}$
B) $116\frac{2}{3}$
C) $208\frac{1}{3}$
D) $216\frac{2}{3}$

69. ABC is a triangle in which AB = 4 cm, BC = 5 cm, and AC = 6cm. A circle is drawn to touch side BC at P, side AB extended at Q and side AC extended at R. Then, AQ equals

A) 7.0 cm
B) 7.5 cm
C) 6.5 cm
D) 15.0 cm

SPACE FOR ROUGH WORK

70. Three dice are thrown simultaneously. The probability of getting a total of at least 5 of the numbers appearing on their tops is

A) $\frac{5}{54}$ B) $\frac{7}{54}$ C) $\frac{49}{54}$ D) $\frac{53}{54}$

71. ABCD is a square with side a. With centres A, B, C and D four circles are drawn such that each circle touches externally two of the remaining three circles. Let δ be the area of the region in the interior of the square and exterior of the circles. Then the maximum value of δ is

A) $a^2(1-\pi)$ B) $a^2\left(\frac{4-\pi}{4}\right)$ C) $a^2(\pi-1)$ D) $\frac{\pi a^2}{4}$

72. The value of tan 1° tan 2° tan 3° ..... tan 89° is

A) 0 B) 1 C) 2 D) 4

73. Which of the following statements holds always?

A) Every rectangle is a square B) Every paralellogram is a trapezium

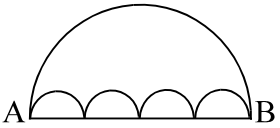
C) Every rhombus is a square D) Every parallelogram is a rectangle

74. Which of the following polygons are uniquely determined when all the sides are give?

A) Quadrilateral B) Triangle C) Pentagon D) Hexagon

SPACE FOR ROUGH WORK

75. All the arcs in the following diagram are semi-cricles. This diagram shows two paths connecting A to B. Path I is the single large semi-circle and Path II consists of the chain of small semi-circles.



A) Path I is longer than Path II

B) Path I of the same length of Path II

C) Path I is shorter than Path II

D) Path I is of the same length as path II. Only if the number of semi circles is not more than 4

76. One integer is chosen out of 1, 2, 3 ....., 100. What is the probability that it is neither divisible by 4 nor by 6

A) 0.59 B) 0.67 C) 0.41 D) 0.33

77. A solid metal sphere of surface area S_1 is melted and recast into a number of smaller spheres. S_2 is the sum of the surface areas of all the smaller spheres. Then

A) $S_1 > S_2$ B) $S_2 > S_1$

C) $S_1 = S_2$ D) $S_1 = S_2$ only if all the smaller spheres of equal radii

SPACE FOR ROUGH WORK

78. Which of the following is an irrational number?

A) $\sqrt{41616}$

B) 23.232323

C) $\frac{\left(1+\sqrt{3}\right)^3-\left(1-\sqrt{3}\right)^3}{\sqrt{3}}$

D) 23.10100100010000 .....

79. Median of a data number which has number of observations below and above it. The median set is a an equal below and of the data

1, 9, 4, 3, 7, 6, 8, 8, 12, 15 is

A) 7.5

B) 7

C) 8

D) Any number between 7 and 8

80. Suppose you walk from home to the bus stand at 4 km/h and immediately return at x km/h. If the average speed is 6 km/h then x is

A) 8 km/h

B) 10 km/h

C) 12 km/h

D) Cannot be determined unless the distance from home to bus stand is known

SPACE FOR ROUGH WORK

81. If θ is an acute angle such that $\tan\theta = \frac{2}{3}$, then evaluate $\left(\frac{1+\tan\theta}{\sin\theta+\cos\theta}\right)\left(\frac{1-\cot\theta}{\sec\theta+\operatorname{cosec}\theta}\right)$

A) $-\frac{1}{5}$

B) $\frac{-4}{\sqrt{13}}$

C) $\frac{1}{5}$

D) $\frac{4}{\sqrt{13}}$

82. The value of the expression $\frac{1}{\sqrt{11-2\sqrt{30}}}-\frac{3}{\sqrt{7-2\sqrt{10}}}-\frac{4}{\sqrt{8+4\sqrt{3}}}$ after simplification is

A) $\sqrt{30}$

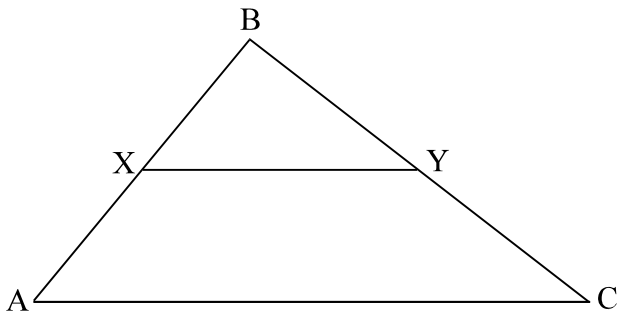
B) $2\sqrt{10}$

C) 1

D) 0

SPACE FOR ROUGH WORK

83. In ΔABC, $\overline{XY}$ is parallel to $\overline{AC}$ and divides the triangle into the two parts of equal area. Then the $\frac{AX}{AB}$ equals



A) $\frac{\sqrt{2}+1}{2}$ B) $\frac{2-\sqrt{2}}{2}$ C) $\frac{2+\sqrt{2}}{2}$ D) $\frac{\sqrt{2}-1}{2}$

84. In how many ways can a given square be cut into two congruent trapeziums?

A) Exactly 4 B) Exactly 8 C) Exactly 12 D) More than 12

SPACE FOR ROUGH WORK

85. The number of integers n (<20) for which $n^2 - 3n + 3$ is a perfect square is

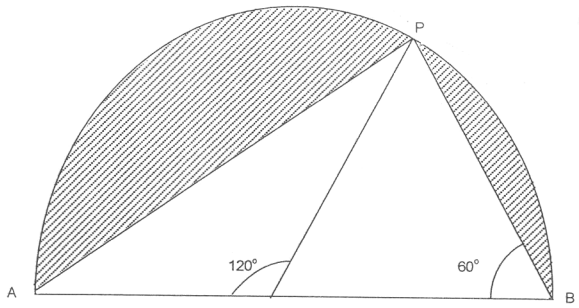
A) 0 B) 1 C) 2 D) 3

86. For positive x and y, the LCM is 225 and HCF is 15. There

A) is exactly one such pair B) are exactly two such pairs

C) are exactly three such pairs D) are exactly four such pairs

87. In the figure, a semi-circle with centre O is drawn on AB. The ratio of the larger shaded area to the smaller shaded area is



A) $\frac{4\pi - 2\sqrt{3}}{2\pi - 2\sqrt{3}}$ B) $\frac{4\pi - 3\sqrt{3}}{3\pi - 3\sqrt{3}}$ C) $\frac{4\pi - 3\sqrt{3}}{2\pi - 3\sqrt{3}}$ D) $\frac{3\pi - 2\sqrt{3}}{2\pi - 2\sqrt{3}}$

SPACE FOR ROUGH WORK

88. Which of the numbers can be expressed as the sum of squares of two positive integers, as well three positive integers?

A) 75 B) 192

C) 250 D) 100

89. If the line segments joining the midpoints of the consecutive side of a quadrilateral ABCD form a rectangle then $\square ABCD$ must be

A) Rhombus B) Square

C) Kite D) All of the above

90. The sides of a triangle are of lengths 20, 21 and 29 units. The sum of the lengths of altitudes will be

A) $\frac{1609}{29}$ units B) 49 units

C) $\frac{1609}{21}$ units D) 70 units

SPACE FOR ROUGH WORK

Name .....

Batch..... Roll No. .....

Brilliant STUDY CENTRE
PALA

VERSION
A

05- 04- 2018

IIT/AIIMS 2020 SCREENING & SCHOLARSHIP EXAM

Batch :IIT/AIIMS

LT_{18A}/TP/MOD/[A]

Answer key

Section-1 : PHYSICS

1.	D
2.	D
3.	A
4.	C
5.	A
6.	A
7.	B
8.	C
9.	A
10.	A
11.	C
12.	B
13.	C
14.	C
15.	A
16.	D
17.	C
18.	C
19.	A
20.	C
21.	C
22.	A
23.	B
24.	D
25.	B
26.	C
27.	D
28.	C
29.	D
30.	C

Section-1I : Chemistry

31.	B
32.	C
33.	A
34.	B
35.	D
36.	D
37.	B
38.	B
39.	C
40.	D
41.	B
42.	D
43.	D
44.	C
45.	D
46.	B
47.	B
48.	C
49.	D
50.	A
51.	A
52.	C
53.	D
54.	B
55.	D
56.	B
57.	D
58.	B
59.	A
60.	D

Section-1II : Mathematics

61.	A
62.	B
63.	A
64.	A
65.	D
66.	B
67.	C
68.	D
69.	B
70.	D
71.	B
72.	B
73.	B
74.	B
75.	B
76.	B
77.	B
78.	D
79.	D
80.	C
81.	A
82.	D
83.	B
84.	D
85.	C
86.	B
87.	C
88.	C
89.	A
90.	A

Brilliant STUDY CENTRE PALA

QUESTION BOOKLET CODE
A

IIT/AIIMS - 2022 SCREENING CUM SCHOLARSHIP

Date : 27th December 2019

IMPORTANT INSTRUCTIONS

Please read the instructions carefully

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.
   This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/ two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VARIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate	Roll Number
I have read all the instructions and shall abide by them _ _ _ _ _ _ _ _ _ _ _ Signature of the Candidate	I have verified all the information filled by the candidate _ _ _ _ _ _ _ _ _ _ _ Signature of the Invigilator

SECTION I

PHYSICS

PART I

This part contains 25 questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

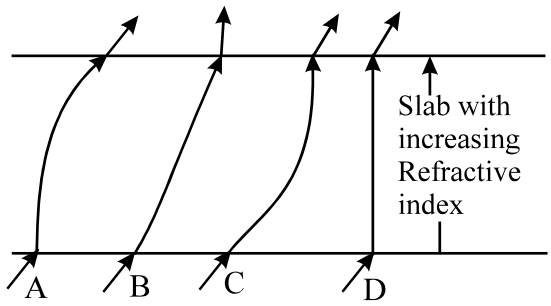
SPACE FOR ROUGH WORK

1. A body is moving with constant acceleration from A to B in a straight line. C is the mid-point of AB. If u and v are the speeds at A and B respectively. The speed at C is

A) $\frac{u+v}{2}$ B) $\frac{v-u}{2}$

C) $\sqrt{\frac{u^2+v^2}{2}}$ D) $\sqrt{\frac{v^2-u^2}{2}}$

2. A ray of light enters a slab of material with increasing refractive index. Four possibilities of the trajectory of the ray are shown below

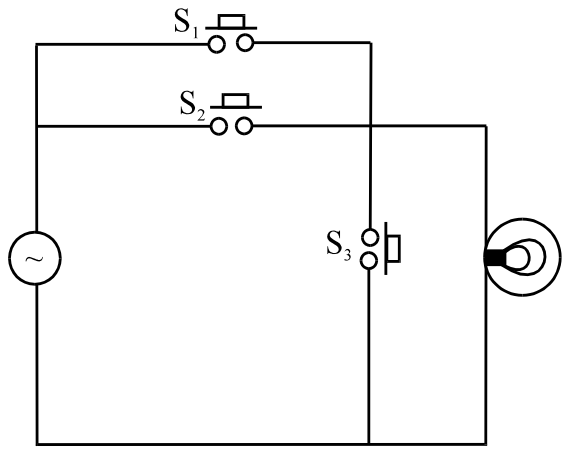


The correct choice is :

A) A B) B C) C D) D

SPACE FOR ROUGH WORK

3. Consider the circuit below. The bulb will light up if :



A) S_1, S_2 and S_3 are all closed

B) S_1 is closed but S_2 and S_3 are open

C) S_2 and S_3 are closed but S_1 is open

D) S_1 and S_3 are closed but S_2 is open

4. An electric heater consists of a nichrome coil and runs under 220 V, consuming 1 kW power. Part of its coil burned out and it was reconnected after cutting off the burnt portion. The power it will consume now is :

A) more than 1 kW

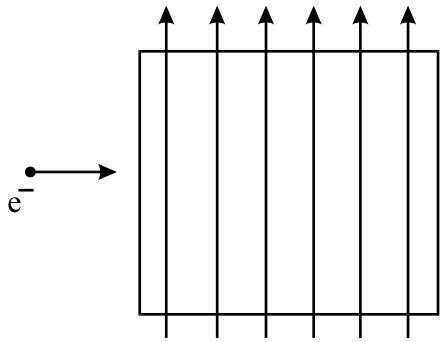
B) less than 1 kW, but not zero

C) 1 kW

D) 0 kW

SPACE FOR ROUGH WORK

5. An electron enters a chamber in which a uniform magnetic field is present as shown



An electric field of appropriate magnitude is also applied so that the electron travels undeviated without any change in its speed through the chamber. We are ignoring gravity. Then, the direction of the electric field is

A) opposite to the direction of the magnetic field

B) opposite to the direction of the electron's motion

C) normal to the plane of the paper and coming out of the plane of the paper

D) normal to the plane of the paper and into the plane of the paper

SPACE FOR ROUGH WORK

6. The distance between a town and a factory is 30 km. A man started to walk from the factory to the town at 6.30 am. While a cyclist left the town for the factory at 6.40 am riding at a speed of 18 km hr^{-1}, the man met the cyclist after walking 6 km. Find at what time they met?

A) 7.30 am B) 8.00 am

C) 8.10 am D) 8.30 am

7. Tripling the speed of a motor car multiples the distance needed for stopping it : (brakeing force is same)

A) By 3 times B) By 5 times

C) By 6 times D) By 9 times

8. A small lead shot is embedded in a big lump of ice floating in a jar of water. The level of water in the jar is noted. When all the ice melts down, the level of water in the jar would :

A) Go down B) Be raised

C) Remain unchanged D) None of the above

9. If a body is positively charged, then it has

A) excess of electrons B) excess of neutrons

C) deficiency of electrons D) deficiency of protons

SPACE FOR ROUGH WORK

10. Whenever the magnetic flux linked with a coil changes, an induced e.m.f. is produced in the circuit. The e.m.f. lasts

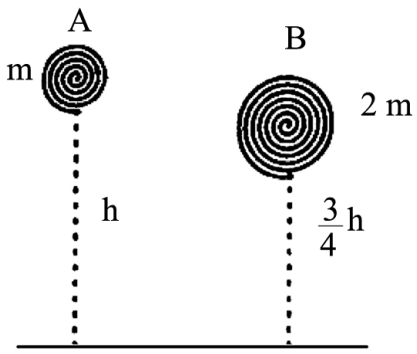
A) for a short time B) for a long time

C) for ever D) so long as the change in flux takes place

11. If work, force and time are represented by A, B and C respectively then the term $\left(\frac{A}{BC}\right)$ will represent

A) Displacement B) Velocity C) Acceleration D) Momentum

12. Ratio of potential energies of body A and body B will be



A) $\frac{U_A}{U_B}=\frac{2}{3}$ B) $\frac{U_A}{U_B}=\frac{3}{2}$ C) $\frac{U_A}{U_B}=\frac{1}{3}$ D) $\frac{U_A}{U_B}=\frac{3}{4}$

SPACE FOR ROUGH WORK

13. Identify the following colours in the ascending order of their frequencies

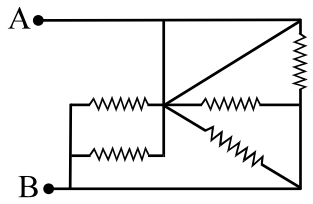
A) Red, blue, yellow, green

B) Blue, green, yellow, red

C) Red, green, yellow, blue

D) Red, yellow, green, blue

14. The circuit shown has 5 resistors of equal resistance R. Calculate equivalent resistances across point A and B



A) $\frac{11R}{12}$ B) $\frac{13R}{12}$ C) $\frac{R}{5}$ D) $\frac{15R}{6}$

15. Which one of the following alternating current is supplied in our house hold circuits

A) 110 V and 50 Hz

B) 220 V and 60 Hz

C) 110 V and 60 Hz

D) 220 V and 50 Hz

SPACE FOR ROUGH WORK

16. A parachutist with total weight 75 kg drops vertically onto a sandy ground with a speed of 2 ms^{-1} and comes to a halt over a distance of 0.25 m. The average force from the ground on her is close to :

A) 600 N B) 1200 N C) 1350 N D) 1950 N

17. Newton's second law gives a measure of :

A) Velocity B) Force

C) Kinetic energy D) Potential energy

18. If the velocity of an object is doubled, its kinetic energy is :

A) doubled B) tripled

C) increase 4 times D) increase 8 times

19. Sound frequencies greater than 20 kHz is called

A) Audible B) Ultrasonic

C) Infrasonic D) None of these

20. Which of the following acts as a circuit protection device

A) Conductor B) Inductor

C) Switch D) Fuse

SPACE FOR ROUGH WORK

21. A point object is placed at a distance of 10 cm and its real image is formed at a distance of 20 cm from a concave mirror. When the object is moved by 0.1 cm towards the mirror, then the image will be moved by about

A) 0.4 cm away from the mirror
B) 0.4 cm towards the mirror
C) 0.8 cm away from the mirror
D) 0.8 cm towards the mirror

22. When a piece of aluminium wire of finite length is drawn through a series of dies to reduce its diameter to half its original value, its resistance will become

A) 4 times
B) 8 times
C) 2 times
D) 16 times

23. Which of the following statements is false?

Action and reaction pair

A) acts on two different objects
B) do not have equal magnitude
C) have opposite directions
D) have resultant zero

SPACE FOR ROUGH WORK

24. You are riding on your bicycle with inflated tyres. Your friend asks for a lift and sits on the carrier behind you :

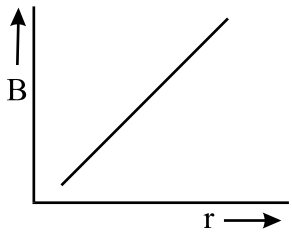
A) The air pressure in the tyres increases

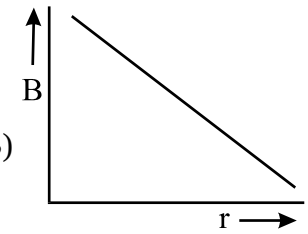
B) The air pressure in the tyres decreases

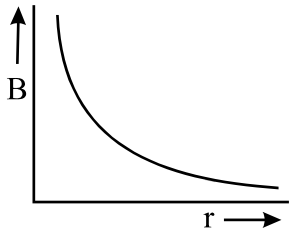
C) The air pressure in the tyres remains the same

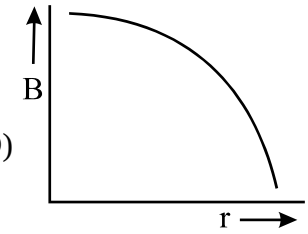
D) Nothing in the system changes except the reaction of the ground

25. Which of the following graphs, shows the variation of magnetic induction B with distance r from a long wire carrying a current

A) 

B) 

C) 

D) 

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 26-30

The answer to each question is a **NUMBER ranging from 0 to 999, both inclusive**

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

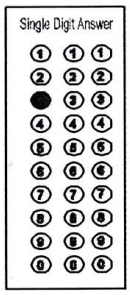
Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

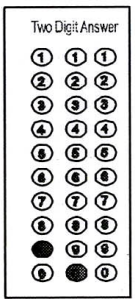
Example 1



If Two Digit Answer

If answer is 90

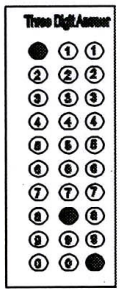
Example 2



If Three Digit Answer

If answer is 180

Example 3



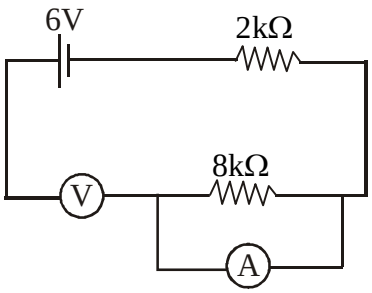
SPACE FOR ROUGH WORK

26. Consider two spherical planets of same average density. Planet 2 is 8 times as massive as planet 1. The ratio of the acceleration due to gravity on the second planet to that on the first is

27. The wavelength of a sound wave whose frequency is 220 Hz and speed is 440 m/s in a given medium is ..... metre

28. A 10 N force is applied on a body produces an acceleration of 1 m/s^2. The mass of the body is ..... kg

29. In the circuit shown below, a student performing Ohm's law experiment accidently puts the voltmeter and the ammeter as shown in the circuit below; the reading in the voltmeter will be ..... V (nearest integer)



30. The mass of a body is 10 kg on the moon. Its mass on the earth will be ..... kg

SPACE FOR ROUGH WORK

SECTION II
CHEMISTRY

PART I

This part contains 25 questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct7

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : –1 In all other cases

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

31. The transition element among the following is

A) Sulphur B) Radium

C) Iron D) Lead

32. Name of the newly discovered element with atomic number 114 is

A) Livermorium B) Flerovium

C) Roentgenium D) Meitnerium

33. Which oxide among the following exhibit both acidic and basic character?

A) CO_2 B) CaO

C) ZnO D) NO

34. The salt among the following that is used in the manufacture of glass is

A) NaCl B) $Na_2CO_3.10H_2O$

C) $CuSO_4.5H_2O$ D) $Al_2(SO_4)_3$

SPACE FOR ROUGH WORK

35. Match the compound in Column (I) with melting point in Column (II) and boiling point in Column (III) and select the correct match from options provided

Column I (compound)	**Column II (melting point)**	**Column III (boiling point)**
(a) acetic acid	(i) 90 K	(p) 351 K
(b) ethanol	(ii) 290 K	(q) 111 K
(c) methane	(iii) 156 K	(r) 391 K

A) (a) - (ii), (r); b - (iii), p; c - (i), q

B) (a) - (ii), (r); b - (i), q; c - (iii), p

C) (a) - (ii), (q); b - (i), p; c - (iii), r

D) (a) - (ii), (p); b - (ii), r; c - (i), q

36. How many moles of aluminium ions are present in 0.051 g aluminium oxide?

(atomic mass : Al = 27 u, O = 16 u)

A) 0.051

B) 0.102

C) 0.001

D) 0.0005

37. Atomic mass of Helium is 4 u. How many moles of Helium atoms are there in 52 g Helium?

A) 52

B) 13

C) $4 \times 6.022 \times 10^{23}$

D) $13 \times 6.022 \times 10^{23}$

SPACE FOR ROUGH WORK

38. Dry ice is

A) ice below 0^0C

B) Solid CO_2

C) Solid H_2O_2

D) ice dried between folds of filter paper

39. Match the category of elements in Column (II) with the elements Column (II) and the type of elements in Column (III) and select the correct match from choices given

Column I (category)	**Column II (elements)**	**Column III (type of the elements)**
(a) Dobereiner's triads	(i) Kr, Xe, Rn	(p) inert gases
(b) p-block elements	(ii) Cu, Ag, Au	(q) alkali metals
(c) transition elements	(iii) Li, Na, K	(r) coinage elements

A) (a) - (iii), (q); b - (i), p; c - (ii), r

B) (a) - (ii), (r); b - (iii), q; c - (ii), r

C) (a) - (iii), (q); b - (ii), r; c - (i), p

D) (a) - (i), (p); b - (ii), r; c - (iii), q

SPACE FOR ROUGH WORK

40. Which among the following is not considered to be a state of matter by scientists?

A) Gas B) Plasma

C) Bose-Einstein Condensate D) Colloid

41. In the extraction of iron 'slag is removed from top to leave molten iron at bottom of the furnace' is based on the principle that/of

A) a sublimable volatile component changes directly from solid to gaseous state on heating

B) separation of components of a mixture that boil at different temperatures without decomposition

C) separation of pure solid in the form of crystals from a solution

D) immiscible liquids separate out in layers depending on their densities

42. Ozone depletion is mainly due to the release of which substance among the following into atmosphere?

A) CO_2 B) CFC C) CH_4 D) CO

43. The amount of heat energy released during the combustion of unit mass of a fuel is called its calorific value. Which fuel among the following has highest calorific value?

A) methane B) methanol

C) hydrogen D) carbon monoxide

SPACE FOR ROUGH WORK

44. For standard state of a substance the temperature is taken to be 298 K. Which among the following is this temperature expressed in ^0F

A) 77^0F B) 102.6^0F C) 45^0F D) 57^0F

45. Match the substance in Column (I) with their composition in Column (II) and type of the substances in Column (III). Select the correct match from the provided options

Column I (substance)	**Column II (composition)**	**Column III (type of substances)**
(a) baking soda	(i) NaOH	(p) base
(b) soda ash	(ii) $NaHCO_3$	(q) acid salt
(c) caustic soda	(iii) Na_2CO_3	(r) normal salt

A) (a) - (ii), (p); b - (iii), q; c - (i), r B) (a) - (ii), (q); b - (i), p; c - (iii), r

C) (a) - (i), (p); b - (ii), q; c - (iii), r D) (a) - (ii), (q); b - (iii), r; c - (i), p

46. Which compound among the following do not belong to the same homologous series as the others?

A) C_4H_8 B) C_2H_6 C) CH_4 D) C_5H_{12}

SPACE FOR ROUGH WORK

47. The correct set of co-efficients for the following balanced equation is

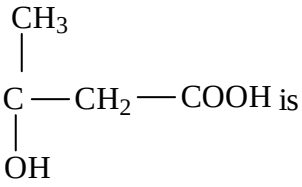
$$CxHy_{(g)} + pO_{2(g)} \longrightarrow qCO_{2(g)} + rH_2O_{(\ell)}$$

	p	q	r
A	$\left(x + \frac{y}{4}\right)$	$\left(\frac{x}{2}\right)$	y
B	$\left(x + \frac{y}{2}\right)$	2x	$\left(\frac{y}{2}\right)$
C	$\left(\frac{x + y}{2}\right)$	x	y
D	$\left(x + \frac{y}{4}\right)$	x	$\left(\frac{y}{2}\right)$

48. Which among the following sets of atomic numbers corresponds to elements of the same group?

A) 11, 19, 27, 5 B) 12, 20, 4, 38 C) 9, 16, 35, 3 D) 24, 47, 42, 55

SPACE FOR ROUGH WORK

49. IUPAC name of the compound  is

A) 3-ethyl-2-methylbutanoic acid

B) 3-hydroxy-3-methylbutanoic acid

C) 2-hydroxy-2-methylbutane

D) 3,3-diethyl butane

50. Which among the following are the elements present in stainless steel?

A) Fe, C and Ni

B) Fe, Cr and Cu

C) Fe, Cr and Ni

D) Fe, Ni and Cu

51. Hydrogen gas is not liberated when

A) Zinc react with aqueous NaOH

B) Zinc react with aqueous HCl

C) Magnesium react with aqueous H_2SO_4

D) Copper react with aqueous HNO_3

SPACE FOR ROUGH WORK

52. Match the metals in Column (I) with the name of the minerals in Column (II) and type of the minerals in Column (III) and select the correct match from choices given

Column I (metal)	**Column II (mineral)**	**Column III (type of the mineral)**
(a) Al	(i) Calamine	(p) Sulphate
(b) Ca	(ii) Chinaclay	(q) Carbonate
(c) Zn	(iii) Gypsum	(r) Silicate

A) (a) - (iii), (r); b - (i), p; c - (ii), q

B) (a) - (ii), (q); b - (iii), r; c - (i), p

C) (a) - (i), (r); b - (iii), p; c - (ii), q

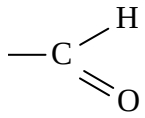
D) (a) - (ii), (r); b - (iii), p; c - (i), q

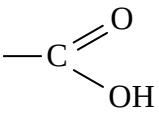
53. The phenomenon of change of a liquid into vapours at any temperature below its boiling point is called

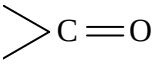
A) Sublimation B) Condensation C) Evaporation D) Flocculation

54. The functional group of alcohols is

A) –OH

B) 

C) 

D) 

55. pH of which substance among the following is the least under identical conditions?

A) Vinegar B) Lime water C) Water D) Milk

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 56-60

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

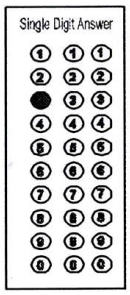
Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

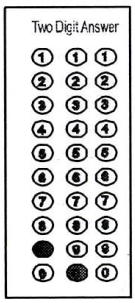
Example 1



If Two Digit Answer

If answer is 90

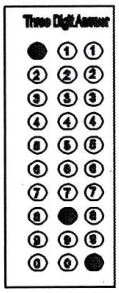
Example 2



If Three Digit Answer

If answer is 180

Example 3



SPACE FOR ROUGH WORK

56. How many atoms are there in a molecule of the element Argon?

57. 15 g of a compound $C_xH_{12}O_y$ contain 1 g hydrogen. What is the molar mass of organic compound? (atomic mass of H = 1 u)

58. What is the percentage of carbon in acetic acid? (at mass of C = 12 u, H = 1 u, O = 16 u)

59. 2g hydrogen (at. mass = 1 u) and 80 gram bromine (at. mass = 80 u) react to form hydrogen bromide. What is the maximum number of grams of hydrogen bromide that can be formed?

60. A diamond ring weighing 4g contain 1 carat diamond placed on 24 carat gold. What is the percentage of gold in the diamond ring?

SPACE FOR ROUGH WORK

SECTION III
MATHEMATICS

PART I

This part contains 25 questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

61. If $\frac{9x}{y}+\frac{25y}{x}=30$ then $x:y$ is

A) 5 : 3 B) 3 : 5

C) 3 : 4 D) 4: 3

62. The number of isosceles triangles can be drawn, in which at least one angle is 4 times any one of the another angle, is

A) 1 B) 2

C) 4 D) More than 4

63. In ΔABC, D is a point on the line segment BC such that AD = BD = CD. Then the measure of $\angle BAC$ is

A) 60 B) 45

C) 90 D) 120

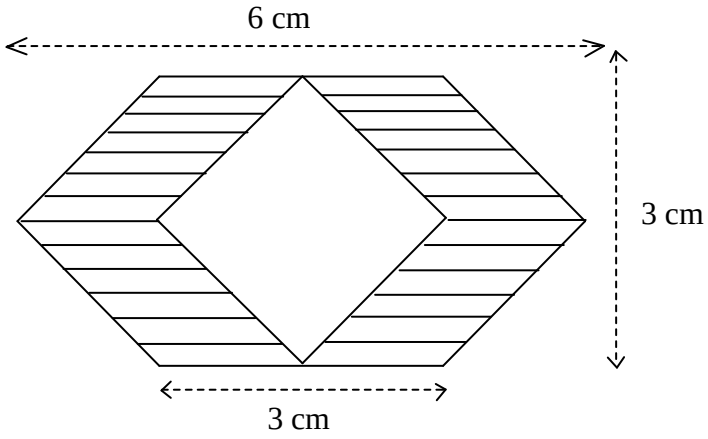
64. In a 360 m race Arun can beat Varun by 90 m. Tharun can beat Varun by 36 m. On the same day and same condition with same track of 480 m race Arun can beat Tharun by _____

A) 60 m B) 70 m

C) 80 m D) 90 m

SPACE FOR ROUGH WORK

65. The area of shaded region



A) $4\sqrt{2}$ cm^2

B) $3\sqrt{2}$ cm^2

C) 6 cm^2

D) 9 cm^2

66. What is the greatest positive integer 'm' which makes $m^3 + 100$ is divisible by $m + 10$

A) 890

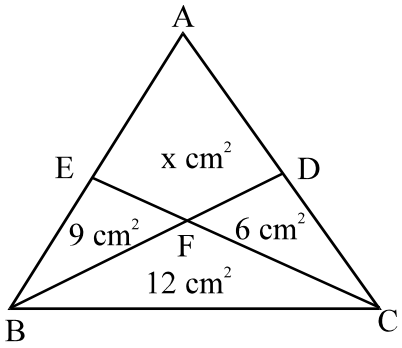
B) 990

C) 790

D) 690

SPACE FOR ROUGH WORK

67. ΔABC is subdivided into four regions with areas are marked as in the figure. Then the value of x as the area of AEFD is



A) $\frac{103}{5}$ B) $\frac{107}{5}$ C) $\frac{113}{5}$ D) $\frac{117}{5}$

68. If $a^2 + a + 1 = 0$ then $a^2 + \frac{1}{a^2}$ is

A) a positive integer B) a negative integer

C) a positive rational but not integer D) a negative rational but not integer

69. a, b, c, d are real numbers such that $a - 2016 = b + 2017 = c - 2018 = d + 2019$. Then which among the following is correct

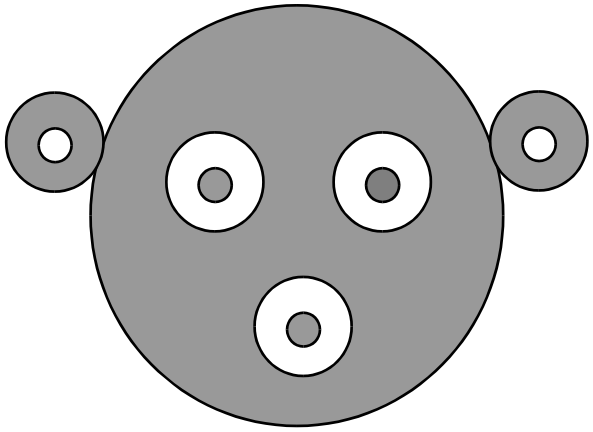
A) $d < b < a < c$ B) $d < a < b < c$ C) $c < b < a < d$ D) $b < a < d < c$

SPACE FOR ROUGH WORK

70. One Sunday Raju observed that 20 lotus were in a pond. Next day he noticed that lotus were doubled to 40. On third day it became 80 lotus. He continuously noticed and observed that the pond was full of lotus by 20 days. Then on which day he observed only $1/4^{th}$ of the entire pond had filled by lotus

A) Wednesday B) Monday C) Thursday D) Friday

71. If diameter of 3 circles are in the ratio 4 : 2 : 1. Perimeter of smallest circle is 8π cm. Then the area of shaded region is



A) 196π B) 208π C) 216π D) 220π

72. 20% of 50% is what percent of 25% of 40% is

A) 80% B) 60% C) 90% D) 100%

SPACE FOR ROUGH WORK

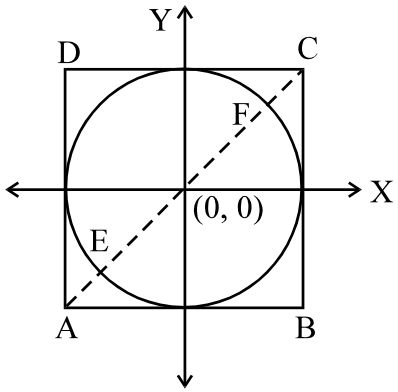
73. $x - 2$ is a factor of p (x) where p (x) is given by $x^3 - x^2 + ax + b$. When p(x) is divided by $x - 3$, the remainder is 10. Then $a + b$ is

A) 1 B) 0 C) –1 D) 2

74. In a right triangle smaller sides are in the ratio 1 : 2 and one acute angle is θ then $\sin\theta + \cos\theta$ is

A) $\frac{1}{\sqrt{5}}$ B) $\frac{2}{\sqrt{5}}$ C) $\frac{3}{\sqrt{5}}$ D) $\frac{4}{\sqrt{5}}$

75. A circle of radius 1 unit is inscribed in a square ABCD. If center of the circle is (0, 0) and diagonal AC of square intersect the circle at E,F. Then co-ordinate of F is



A) $\left(\frac{1}{2},\frac{1}{2}\right)$ B) $\left(\frac{1}{\sqrt{2}},\frac{1}{\sqrt{2}}\right)$ C) $\left(\sqrt{2},\sqrt{2}\right)$ D) $\left(\frac{2}{3},\frac{2}{3}\right)$

SPACE FOR ROUGH WORK

76. The value of (1 – 101) (2 – 100) (3 – 99) ..... (99 – 3) (100 – 2) (101 – 1) is

A) less than 0 B) greater than 0 but less than 100

C) more than 100 D) none of these

77. Area enclosed by two concentric circles with radius 5 and 6 is

A) 11π B) 20π C) 36π D) 25π

78. Find the smallest number by which 980 be mutiplied so that the product is a perfect square

A) 2 B) 7 C) 5 D) 3

79. Find the smallest number by which 375 must be divided to obtain a perfect cube

A) 2 B) 3 C) 5 D) 4

80. Which of the following equation has two equal real roots.

A) $x^2 - 14x - 9 = 0$ B) $9x^2 - 6x + 7 = 0$ C) $16x^2 - 8x + 1 = 0$ D) $9x^2 - 12x + 16 = 0$

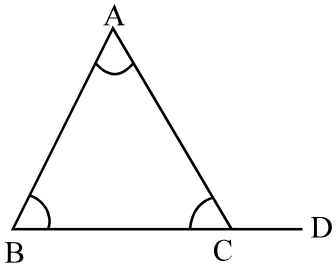
81. The relation between mean, median and mode is :

A) Mode = 3 Median + 2 Mean B) Mode = 3 Mean + 2 Median

C) 3 Median = 2 Mean + Mode D) 3 Median = 2 Mean - Mode

SPACE FOR ROUGH WORK

82. In the given figure BC is produced to D and $\angle BAC = 40^o$ and $\angle ABC = 70^o$. Find the value of $\angle ACD$:



A) 30^o B) 40^o C) 70^o D) 110^o

83. Find the value of $\frac{-4}{5} \times \frac{3}{7} \times \frac{15}{16} \times \left(\frac{-14}{9}\right)$

A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{1}{5}$ D) $\frac{1}{6}$

84. Area of the square inscribed in a circle of radius 10 is

A) 100 B) 200 C) 300 D) 314

85. The length of the ladder making an angle of 45^0 with the ground and whose foot is 7m away from the wall is

A) 14 m B) $14\sqrt{2}$m C) $\frac{7\sqrt{2}}{2}$m D) $7\sqrt{2}$m

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 86-90

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

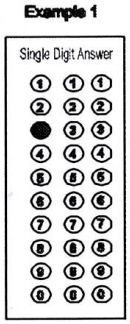
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

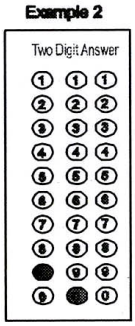
If Single Digit Answer

If answer is 3



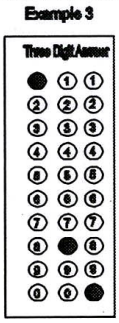
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

86. Given ordered pairs are in a sequence as follows (2, 12) (9, 9) (16, 6) (23, 3) ..... then sum of the entries in the 10^{th} ordered pair is

87. Number of digits in $8^{15}.\ 5^{40}$ is

88. Find 'm' so that $(-3)^{m+1} \times (-3)^5 = (-3)^7$

89. The discriminant of the quadratic equation $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$ is :

90. The next term of the sequence 9, 16, 27, 42, ... is :

SPACE FOR ROUGH WORK

Name .....

Batch..... Roll No. .....

Brilliant STUDY CENTRE
PALA

VERSION A

27 - 12 - 2019 **PHYSICS + CHEMISTRY - MATHEMATICS - KEY**

PHYSICS		CHEMISTRY		MATHEMATICS	
1.	C	31.	C	61.	A
2.	C	32.	B	62.	B
3.	B	33.	C	63.	C
4.	A	34.	B	64.	C
5.	D	35.	A	65.	D
6.	B	36.	C	66.	A
7.	D	37.	B	67.	D
8.	A	38.	B	68.	B
9.	C	39.	A	69.	A
10.	D	40.	D	70.	A
11.	B	41.	D	71.	B
12.	A	42.	B	72.	D
13.	D	43.	C	73.	B
14.	C	44.	A	74.	C
15.	D	45.	D	75.	B
16.	C	46.	A	76.	D
17.	B	47.	D	77.	A
18.	C	48.	B	78.	C
19.	B	49.	B	79.	B
20.	D	50.	C	80.	C
21.	A	51.	D	81.	C
22.	A	52.	D	82.	D
23.	B	53.	C	83.	A
24.	A	54.	A	84.	B
25.	C	55.	A	85.	D
26.	2	56.	1	86.	50
27.	2	57.	180	87.	42
28.	10	58.	40	88.	1
29.	6	59.	81	89.	64
30.	10	60.	95	90.	61

Brilliant STUDY CENTRE PALA

QUESTION BOOKLET CODE **A**

IIT/AIIMS - 2022 SCREENING CUM SCHOLARSHIP TEST

Date : 29th September 2019

IMPORTANT INSTRUCTIONS

Please read the instructions carefully

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.
   This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/ two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VARIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate	Roll Number
I have read all the instructions and shall abide by them _ _ _ _ _ _ _ _ _ _ _ **Signature of the Candidate**	**I have verified all the information filled by the candidate** _ _ _ _ _ _ _ _ _ _ _ **Signature of the Invigilator**

SECTION I
PHYSICS

PART I

This part contains 25 questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

1. A car moving at 160 km/h when passes the mark A, driver applies brake and reduces its speed uniformly to 40 km/h at mark C. The marks are spaced at equal distances along the road as shown below. At which part of the track the car has instantaneous speed of 100 km/h. Neglect the size of the car

A) At mark B

B) Between mark A and mark B

C) Between mark B and mark C

D) Insufficient information to decide

2. A car moves with uniform acceleration along a straight line PQR. Its speed at P and R are 5 m/s and 25 m/s respectively. If PQ : QR = 1 : 2; the ratio of the times taken by car to travel distance PQ and QR is :

A) 1 : 2 B) 2 : 1 C) 1 : 3 D) 1: 1

3. A boy sitting on the topmost berth in the compartment of a train which is just going to stop on a railway station, drops an apple aiming at the open hand of his brother situated vertically below his hands at a distance of about 2 m. The apple will fall

A) In the hand of his brother

B) Slightly away from the hands of his brother in the direction of motion of the train

C) Slightly away from the hands of his brother in the direction opposite to the direction of motion of the train

D) None of the above

SPACE FOR ROUGH WORK

4. A body is under the action of two equal and opposite forces, each of 3 N. The body is displaced by 3 m. The work done is :

A) +9 J B) Zero C) –9 J D) 18 J

5. The tidal wave in the sea are primarily due to gravitational effect of

A) earth on the sea B) sun on the earth C) earth on the moon D) moon on the earth

6. A polythene piece, rubbed with wool, is found to have a negative charge of 4×10^{-7} C. The number of electrons transferred is :

A) 2.5×10^{12} from wool to polythene

B) 2.5×10^{12} from polythene to wool

C) 1.5×10^{12} from wool to polythene

D) 1.5×10^{12} from polythene to wool

7. A magnetic field :

A) Always exerts force on a charged particle

B) Exerts force, if the charged particle is moving across the magnetic field lines

C) Never exerts a force on a charged particle

D) Exerts a force, if the charged particle is moving along the magnetic field lines

SPACE FOR ROUGH WORK

8. The word "KVPY" is written on a board and viewed through different lens such that board is at a distance beyond the focal length of the lens

(i) **(ii)**

Ignoring magnification effects, consider the following statements

I. Image (i) has been viewed from the planar side of a plano-concave lens and image (ii) from the planar side of a plano-convex lens

II. Image (ii) has been viewed from the concave side of a plano-concave lens and image (ii) from the convex side of a plano-convex lens

III. Image (i) has been viewed from the concave side of a plano-concave lens and image (ii) from the planar side of a plano-convex lens

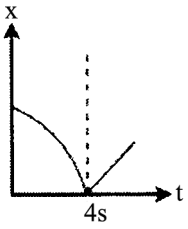
IV. Image (i) has been viewed from the planar side of a plano-concave lens and image (ii) from the convex side of a plano-convex lens

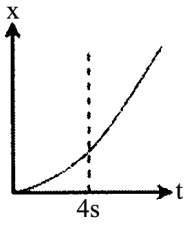
Which of the above statements are correct?

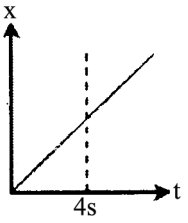
A) Only III B) Only IV C) Only III and IV D) All four

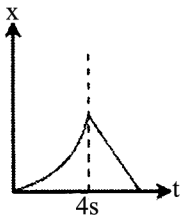
SPACE FOR ROUGH WORK

9. An object at rest at the origin begins to move in the +x direction with a uniform acceleration of 1 m/s^2 for 4s and then it continues moving with a uniform velocity of 4 m/s in the same direction. The x-t graph for object's motion will be -

A) 

B) 

C) 

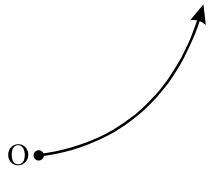
D) 

10. The unit of frequency of the sound is :

A) Hertz B) Metre C) Metre/second D) Second

SPACE FOR ROUGH WORK

11. A charged particle initially at rest at O, when released follows a trajectory as shown. Such a trajectory is possible in the presence of



A) Electric field of constant magnitude and varying direction

B) Magnetic field of constant magnitude and varying direction

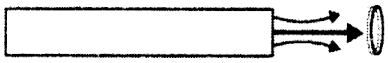
C) Electric field of constant magnitude and constant direction

D) Electric and magnetic fields of constant magnitudes and constant directions which are parallel to each other

12. The figure shows a bar magnet and a metallic coil. Consider four situations

I. Moving the magnet away from the coil II. Moving the coil towards the magnet

III. Rotating the coil about the vertical diameter IV. Rotating the coil about its axis



An emf in the coil will be generated for the following situations

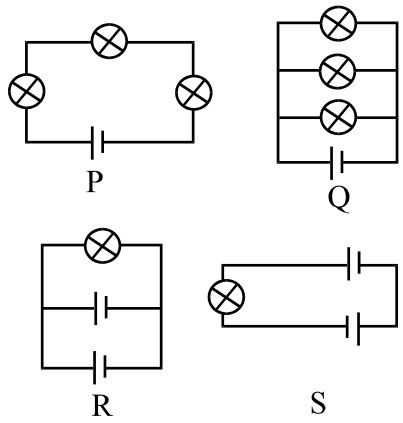
A) I and II only B) I, II and IV only C) I, II and III only D) I, II, III and IV

SPACE FOR ROUGH WORK

13. A clay ball of mass m and speed v strikes another metal ball of same mass m, which is at rest. They stick together after collision. The kinetic energy of the system after collision is :

A) $\frac{m\upsilon^2}{2}$ B) $\frac{m\upsilon^2}{4}$ C) $2m\upsilon^2$ D) $m\upsilon^2$

14. Following figures show different combinations of identical bulb(s) connected to identical battery(ies). Which option is correct regarding the total power dissipated in the circuit

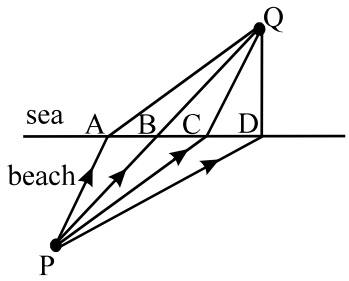


A) P < Q < R < S B) P < Q < R = S

C) R < Q < P < S D) P < R < Q < S

SPACE FOR ROUGH WORK

15. A girl standing at point P on a beach wishes to reach a point Q in the sea as quickly as possible. She can run at 6 km h^{-1} on the beach and swim at 4 km h^{-1} in the sea. She should take the path



A) PAQ B) PBQ C) PCQ D) PDQ

16. A 750 W motor drives a pump which lifts 300 litres of water per minute to a height of 6 meters. The efficiency of the motor is nearly (take acceleration due to gravity to be 10 m/s^2)

A) 30% B) 40% C) 50% D) 20%

17. Sound travels 1.5 times faster in nickel than in bronze; which is of same density. This is because

A) nickel has greater elasticity

B) bronze is more elastic

C) nickel is less elastic

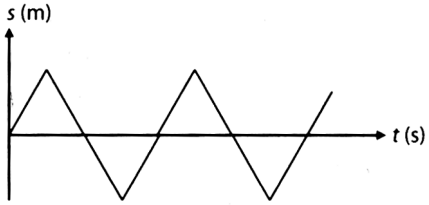
D) bronze is less ductile

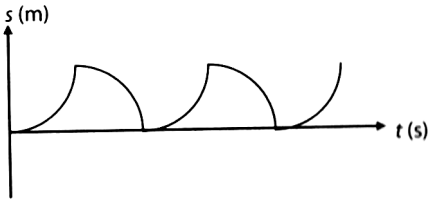
SPACE FOR ROUGH WORK

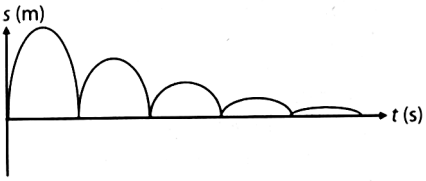
18. A block of ice is floating in a liquid of specific gravity 1.2 in a beaker. When the ice melts completely, the level of liquid _____

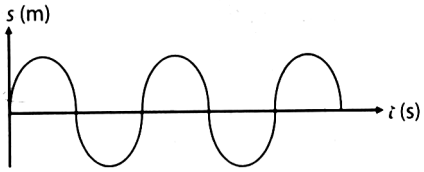
A) rises
B) goes down
C) remains same
D) first rises and then goes down

19. The displacement-time graph of a ball bouncing on the ground and eventually coming to rest looks like

A) 

B) 

C) 

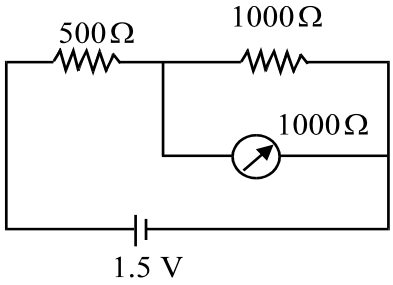
D) 

20. If a new unit of length is chosen such that the distance travelled by light in vacuum in one second is unity, then the distance between the sun and the earth in terms of the new unit if light takes 8 min and 20 s to cover this distance _____

A) 500 new unit
B) 50 new unit
C) 5000 new unit
D) 5 new unit

SPACE FOR ROUGH WORK

21. Two resistances $500\,\Omega$ and $1000\,\Omega$ are connected in series with a battery of 1.5 V. The voltage across the $1000\,\Omega$ resistance is measured by a voltmeter having a resistance of $1000\,\Omega$. The reading in the voltmeter would be _____



A) 1.5 V B) 1 V C) 0.75 V D) 0.5 V

22. If 6 coulomb of charge flows through a conductor in 3 seconds, find the strength of electric current

A) 18 A B) 0.5 A C) 2 A D) 3 A

23. A moving charge will produce :

A) no field B) an electric field C) a magnetic field D) both B and C

24. An automobile travelling with speed of 60 km/h can brake to stop with in a distance of 20 m. If the car is going twice as fast i.e. 120 km/h, the stopping distance will be :

A) 20 m B) 40 m C) 60 m D) 80 m

25. How many dynes are equal to 1 N?

A) 10^6 B) 10^4 C) 10^5 D) 10^3

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 26-30

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

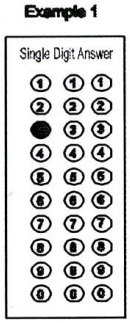
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

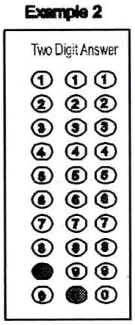
If Single Digit Answer

If answer is 3



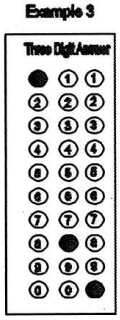
If Two Digit Answer

If answer is 90



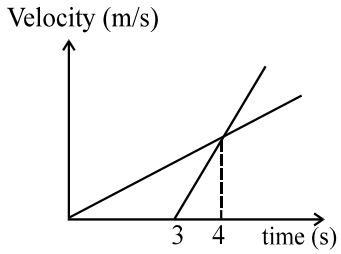
If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

26. A material particle is chasing the other one and both of them are moving on the same straight line. Their motion after they pass a particular point is recorded and the data obtained is shown by velocity - time graph of the particles. How long after the start will the chase end?



27. Three unequal resistors in parallel are equivalent to a resistance of 1 ohm. If two of them are in the ratio 1 : 2 and if no resistance value is fractional, the largest value of the three resistances in ohm is :

28. A force of 50 N is applied normally on a table of area 2 m^2. Then the pressure exerted on the table top is: (in Nm^{-2})

29. The net force acting on a body of mass 1 kg moving with a uniform velocity of 5 ms^{-1} is : (answer in N)

30. 0.035 kg = _____ gm

SPACE FOR ROUGH WORK

SECTION II
CHEMISTRY

PART I

This part contains 25 questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct7

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

31. Which among the following is a compound?

A) Ozone B) Fullerene C) Freon D) Graphene

32. The formula of a metal chloride is MCl_4 the formula of the metal phosphate is

A) MPO_4 B) $M_2(PO_4)_3$ C) $M_4(PO_4)_3$ D) $M_3(PO_4)_4$

33. The SI unit of amount of substance is

A) Kilogram B) Cubic metre C) Mole D) Gram

34. In which among the following cases a chemical reaction do not occur?

A) Water is added to quick lime

B) Baking soda is added to vinegar

C) Sugar is added to salt solution

D) White phosphorus glows in the dark

35. When an aqueous solution of Barium chloride is added to ammonium sulphate solution a white precipitate of Barium sulphate is formed. This reaction is an example of

A) Simple combination reaction B) Double displacement reaction

C) Redox reaction D) Neutralisation reaction

SPACE FOR ROUGH WORK

36. The correct set of co-efficients, p, q and r for the following, balanced equation is

$$C_nH_{2n+2} + pO_2 \longrightarrow qCO_2 + rH_2O$$

	p	**q**	**r**
A	(3n+1)	n	(n+1)
B	$\left(\frac{3n+1}{2}\right)$	$\left(\frac{n}{2}\right)$	(n+1)
C	(3n + 1)	n	$\left(\frac{n+1}{2}\right)$
D	$\left(\frac{3n+1}{2}\right)$	n	(n+1)

37. Aqueous solutions of which among the following do not conduct electricity?

A) Cane sugar B) Vinegar C) Caustic soda D) Common salt

38. The acid present in lemon is

A) Sulphuric acid B) Benzoic acid C) Hydrochloric acid D) Citric acid

SPACE FOR ROUGH WORK

39. In aqueous solution which among the following act as a weak acid?

A) H_2CO_3 B) HNO_3 C) H_2SO_4 D) HBr

40. Which among the following is correct regarding aqueous solution of a base?

A) The solution contains H^+ ion as well as OH^- ion

B) The solution contains OH^- ions only

C) The solution contains H^+ ions only

D) The nature of the base decide whether there are H^+ ions or OH^- ions in solution

41. A metal exist as its carbonate ore on the crust of earth. The carbonate ore is concentrated by suitable method and is converted to metal oxide. The process by which concentrated carbonate ore is converted to metal oxide is

A) Roasting B) Calcination C) Carbon reduction D) Electrolysis of molten ore

42. 'After concentrating the ore the metal can be obtained by just heating it in air'. This is applicable to which ore among the following?

A) Al_2O_3 B) Cu_2S C) Fe_2O_3 D) ZnS

43. Silver articles become black after some time, when exposed to air. This is because of formation of

A) Silver carbonate B) Silver oxide C) Silver sulphide D) Silver nitrate

SPACE FOR ROUGH WORK

44. Which among the following combination is incorrect?

A) Amalgam - alloy where one of the metal is mercury

B) Brass - alloy of copper and zinc

C) Bronze - alloy of copper and tin

D) Solder - alloy of tin and zinc

45. Among the following atomic radius is the least for

A) Carbon B) Oxygen C) Nitrogen D) Lithium

46. Which element among the following is not classified as a metalloid?

A) Carbon B) Silicon C) Germanium D) Arsenic

47. $CaCO_3$ dissolves in water in presence of

A) O_2 B) CO_2 C) CO D) NaOH

48. The fuel used in cryogenic rocket-engine CE-20 that was used in Chandrayan-2 mission is

A) hydrogen peroxide and hyrazine B) kerosine mixed with TNT

C) liquid oxygen and liquid hydrogen D) liquid helium and solid CO_2

SPACE FOR ROUGH WORK

49. A crystalline substance (X) is water soluble. Aqueous solution of (X) produced a precipitate with Barium nitrate. On adding a drop of methyl orange the aqueous solution of (X) developes yellow colour. The substance (X) could be

A) $(NH_4)_2SO_4$ B) $CaCl_2$ C) K_3PO_4 D) $NaNO_3$

50. No coloured gas is evolved or no colour change is observed when

A) hydrated copper sulphate is heated strongly

B) aqueous solutions of potassium iodide and lead nitrate are mixed together

C) lead nitrate is heated strongly

D) potassium nitrate is heated strongly

51. Which among the following is not formed when $FeSO_4$ is heated strongly

A) FeO B) Fe_2O_3 C) SO_2 D) SO_3

52. Which among the following is not a balanced equation?

A) $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$

B) $P_4 + 3NaOH + 2H_2O \longrightarrow 3NaH_2PO_2 + PH_3$

C) $4FeS_2 + 11O_2 \longrightarrow 2Fe_2O_3 + 8SO_2$

D) $4Zn + 10HNO_3 \longrightarrow 4Zn(NO_3)_2 + 5H_2O + N_2O$

SPACE FOR ROUGH WORK

53. Which among the following is incorrect?

A) H_2S burns in air to form H_2O and SO_2

B) $BaCO_3$ on heating decomposes to BaO and CO_2

C) CaO can combine with CO_2 to form $CaCO_3$

D) $BaSO_4$ combines with H_2O to form $Ba(OH)_2$ and H_2SO_4

54. Match the non metals in Column-I with the colour of non metals in Column-II and their physical state at 273 K and 1 atm. Pressure in Column (III) and select the correct match from choices given

Column - I (Non metals)	**Column-II (Colour)**	**Column-III (Physical state at STP)**
a) Cl_2	p) violet	I) liquid
b) Br_2	q) greenish yellow	II) Solid
c) I_2	r) red brown	III) Gas

A) a-q,-III b - r, II c-p, I

B) a - r, I b - p, II c - q, III

C) a - p, III b - q, II c - r, I

D) a - q, III b - r, I c - p, II

SPACE FOR ROUGH WORK

55. Match the salts in Column-I with nature of their aqeuous solutions in Column-II and behaviour of the salts towards acid/alkali in Column-III and select the correct match from choices given

Column - I (Salts)	**Column-II (Nature of aqueous solution)**	**Column-III (Behaviour towards acid/alkali)**
a) NaCl	p) acidic	I) Pungent smell with aqueous NaOH
b) NH_4Cl	q) basic	II) No pungent smell with aqueous NaOH or dil.H_2SO_4
c) CH_3COONa	r) neutral	III) Pungent smell with dil.H_2SO_4

A) a - r, II b - p, I c - q, III

B) a - r, I b - p, III c - q, II

C) a - p, I b - q, II c - r, III

D) a - r, III b - q, II c - p, I

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 56-60

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

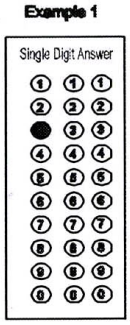
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

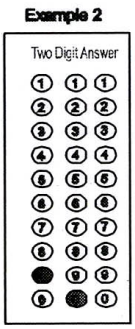
If Single Digit Answer

If answer is 3



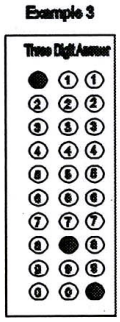
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

56. How many grams of mass decrease is observed when 1 mole gypsum is carefully converted into 1 mole plaster of paris

57. One mole acetic acid weighs 60.2 g. How many grams does 10^{23} molecules of acetic acid weigh (take avogadro constant rounded off to two decimal places for calculation)

58. Give the number of atoms present in a molecule of sulphuric acid

59. What is the atomic number of carbon.

60. What is the percentage of oxygen in NaOH? (Given at. mass of Na = 23 u, O = 16 u, H = 1u)

SPACE FOR ROUGH WORK

SECTION III
MATHEMATICS

PART I

This part contains 25 questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

61. If $x + y + z = 10$; $x^2 + y^2 + z^2 = 20$ and $x^3 + y^3 + z^3 = 40$ then xyz is :

A) 80 B) 100 C) 70 D) 90

62. LCM of $\frac{7}{15}$ and $\frac{3}{25}$ is :

A) $\frac{7}{25}$ B) $\frac{21}{25}$ C) $\frac{21}{5}$ D) $\frac{21}{125}$

63. If $p(x) = x^3 - 3x^2 + 5x - 2$ then which among the following is true :

A) $p(0) > p(1)$ B) $p(1) < p(2)$

C) $p(3) < p(2)$ D) $p(1) > p(3)$

64. The digit in the unit place of $3^{73} + 7^{37}$ is :

A) 0 B) 2 C) 4 D) 6

SPACE FOR ROUGH WORK

65. $\frac{\sin^4\theta - \cos^4\theta}{\sin\theta - \cos\theta} =$

A) $\sin^3\theta - \cos^3\theta$ B) $\sin^2\theta - \cos^2\theta$ C) $\sin^3\theta + \cos^3\theta$ D) $\sin\theta + \cos\theta$

66. If $\frac{1^2 + 2^2 + ... + n^2}{1 + 2 + ... + n} = 17$, then the sum $\sum_{k=1}^{n}(2k-1)$ is :

A) 576 B) 676 C) 625 D) 900

67. If 'n!' is read as 'n' factorial and defined as product of first 'n' natural numbers 1,2, 3,..... n. That is n! = 1. 2. 3. 4.....(n - 1).n, then the last digit of the sum 1! + 2! + 3! + ...+11!, is :

A) 1 B) 4 C) 3 D) 6

68. In a mathematics class Raju was requested to add square of first 10 natural numbers and Rani was requested to add cubes of first 10 natural numbers. After the calculation made by Raju and Rani, Ravi was requested to find the sum of the values obtained by Raju and Rani, Rahim was asked to subtract the sum obtained by Rani from the sum obtained by Raju. Finally Roshan was requested to calculate the sum of the values obtained by Ravi and Rahim. Then what was the sum obtained by Roshan?

A) 550 B) 660 C) 770 D) 880

SPACE FOR ROUGH WORK

69. A superfast train takes 3 hours less than a slow train for a journey of 1200 km. If the speed of slow train is 20 km/hr less than the fast train, then the speed of slow train is :

A) 100 B) 70 C) 90 D) 80

70. Let x and y be two numbers, which leave remainders 4 and 5 respectively after dividing them by '7'. Then what is the remainder when we divide $2x^2 + 3y^2$ by 7?

A) 1 B) 2 C) 3 D) 4

71. If $p(x) = \dfrac{\frac{1}{x^{2017}} - \frac{1}{x^{2019}}}{\frac{1}{x^{2018}} - \frac{1}{x^{2020}}}$ then :

A) $p(3) < 3$ B) $p(3) > 3$ C) $p(3) = 0$ D) $p(3) = 3$

72. If x, y, z are real numbers such that, $x^2 + 2y - 7 = 0$, $y^2 + 4z + 7 = 0$, $z^2 + 6x + 14 = 0$ then the value of $x^2 + y^2 + z^2$ is :

A) 21 B) 17 C) 14 D) 29

SPACE FOR ROUGH WORK

73. If $x + y + z = 0$ then the square of the value of $\frac{(x+y)^2}{xy} + \frac{(y+z)^2}{yz} + \frac{(z+x)^2}{zx}$ is of :

A) 3 B) 1 C) 9 D) 81

74. If $P(x, y) = 2x^2 + 3y^2$; $Q(x, y) = 4x - 18y - 39$, where x and y are real numbers, then the minimum value of $P(x, y) - Q(x, y)$ is :

A) 8 B) 10 C) 15 D) 19

75. If $1 + 2 + 3 + ...+ x = 190$ then the value of $(x + 1)(x + 2)$ is :

A) 420 B) 480 C) 540 D) 560

76. If $x > 0; x + \frac{1}{x^2} = \frac{9}{2}$, and $x^2 + \frac{1}{x} = \frac{9}{4}$ then value of $x^3 + \frac{1}{x} =$

A) $\frac{9}{8}$ B) $\frac{19}{8}$ C) $\frac{19}{9}$ D) $\frac{17}{8}$

SPACE FOR ROUGH WORK

77. A circle centered at O touches all the sides of ΔABC, whose perimeter is 24cm, externally . If A be the farthest vertex of the triangle from the centre O of the circle and at a distance of 13 cm. Then the area of circle is :

A) $25\pi cm^2$ B) $36\pi cm^2$ C) $16\pi cm^2$ D) $49\pi cm^2$

78. A (0, 0), B(0, 6) and C(8,0) are vertices of a triangle. Then the diameter of circumcircle of ΔABC is :

A) 8 B) 9 C) 10 D) 12

79. HCF of $x^3 - 1$ and $x^2 + x - 2$ is :

A) 1 B) x - 1 C) x - 2 D) x + 1

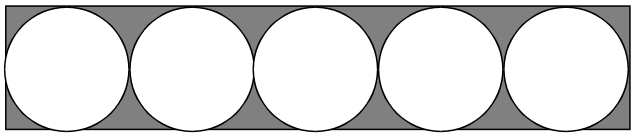
80. Difference between mean and median of the following data is :

9, 16, 10, 16, 13, 15, 17, 12, 18

A) 1 B) 2 C) 0 D) -1

SPACE FOR ROUGH WORK

81. Five circles are inscribed in a rectangle as in the figure. The width of the rectangle is 8 cm. Thenthe area of shaded region is :



A) $60(4-\pi)cm^2$ B) $60(6-\pi)cm^2$

C) $80(6-\pi)cm^2$ D) $80(4-\pi)cm^2$

82. If the polynomial $2x^3 + ax^2 + 3x - 5$ and $x^3 + x^2 - 4x + a$ leave the same reminder when divided by $x - 2$ then the value of a is :

A) $\frac{13}{3}$ B) $\frac{-13}{3}$ C) $\frac{3}{13}$ D) $\frac{-3}{13}$

83. Find the angle between the minute hand of clock and hour hand when the time is 8 : 20 am

A) 90^o B) 120^o C) 100^o D) 110^o

SPACE FOR ROUGH WORK

84. If the sum of interior angles of a convex polygon is 1980^{o} then its number of sides are :

A) 10 B) 11 C) 12 D) 13

85. The point on the y-axis which is equidistant from A(-5, -2) and B(3, 2) is :

A) (-4, 0) B) (-2, 0) C) (0, -3) D) (1, -4)

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 86-90

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

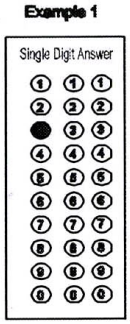
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

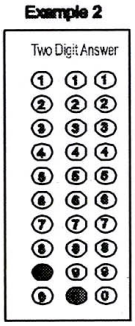
If Single Digit Answer

If answer is 3



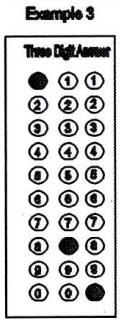
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

86. The mean of first n natural numbers is $\frac{5n}{9}$, find n :

87. Varun and Arun make a plan to submit a school project of '7 -segment display' for numbers with match box sticks. Only 30 sticks are available for the project. Varun plan to make a display of two numbers - smallest and largest prime numbers between 50 and 100 - and remaining sticks are given to Arun. Arun decides to make a single two digit perfect square number by using all sticks given by Varun. For more clarity he wrote all possible two digit perfect square number which can be formed by remaining all sticks. Seeing this Varun add that all possible numbers written by Arun. Then what is the sum got by Varun?

88. Smallest two digit prime number is :

89. If N is a two digit perfect square number. Find N so that sum of their two digits becomes maximum :

90. The diameter of circle is 20cm. Find the radius of the circle in mm?

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

29 - 09 - 2019

Brilliant STUDY CENTRE
PALA

CODE

A

IIT - AIIMS SCREENING CUM SCHOLARSHIP EXAM - KEY

PHYSICS

1.	C
2.	D
3.	B
4.	B
5.	D
6.	A
7.	B
8.	CANCELLED
9.	B
10.	A
11.	A
12.	C
13.	B
14.	D
15.	C
16.	B
17.	A
18.	A
19.	C
20.	A
21.	C
22.	C
23.	D
24.	D
25.	C
26.	6
27.	6
28.	25
29.	0
30.	35

CHEMISTRY

31.	C
32.	D
33.	C
34.	C
35.	B
36.	D
37.	A
38.	D
39.	A
40.	A
41.	B
42.	B
43.	C
44.	D
45.	B
46.	A
47.	B
48.	C
49.	C
50.	D
51.	A
52.	B
53.	D
54.	D
55.	A
56.	27
57.	10
58.	7
59.	6
60.	40

MATHEMATICS

61.	A
62.	C
63.	B
64.	A
65.	D
66.	C
67.	C
68.	C
69.	D
70.	B
71.	D
72.	C
73.	C
74.	B
75.	A
76.	D
77.	A
78.	C
79.	B
80.	A
81.	D
82.	B
83.	CANCELLED
84.	D
85.	CANCELLED
86.	9
87.	36
88.	11
89.	49
90.	100

Brilliant STUDY CENTRE PALA

QUESTION BOOKLET CODE
A

IIT/AIIMS - 2021 SCREENING CUM SCHOLARSHIP EXAM

Date : 30th September 2018

IMPORTANT INSTRUCTIONS

Please read the instructions carefully

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.
   This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/ two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VARIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate	Roll Number
I have read all the instructions and shall abide by them _ _ _ _ _ _ _ _ _ _ _ **Signature of the Candidate**	**I have verified all the information filled by the candidate** _ _ _ _ _ _ _ _ _ _ _ **Signature of the Invigilator**

SECTION I
PHYSICS

PART I

This part contains 25 questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

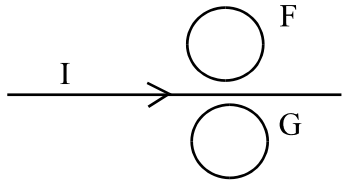
Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

1. Two conducting circular loops F and G are kept in a plane on either side of a straight current carrying wire as shown in the figure below



If the current in the wire decreases in magnitude, the induced current in the loops will be

A) Clockwise in F and clockwise in G
B) Anti-clockwise in F and clockwise in G
C) Clockwise in F and anti-clockwise in G
D) Anti-clockwise in F and anti-clockwise in G

2. A body falling from rest describes distance S_1, S_2 and S_3 in the first, second and third seconds of its fall. Then the ratio of $S_1 : S_2 : S_3$ is :

A) 1 : 3 : 5
B) 1 : 1 : 1
C) 1: 2 : 3
D) 1 : 4 : 9

3. A comb run through ones dry hair attracts small bits of paper. This is due to :

A) comb is a good conductor

B) Paper is a good conductor

C) The atoms in the paper gets polarised by the charged comb

D) The comb possesses magnetic properties

SPACE FOR ROUGH WORK

4. Ice is floating on water in a beaker when ice completely melts then level of water in beaker :

A) Increases

B) Decreases

C) Remains the same

D) First increases then decreases

5. An apple falls from a tree because of gravitation between the earth and apple. If F_1 is the magnitude of force exerted by the earth on the apple and F_2 is the magnitude of force exerted by apple on earth, then :

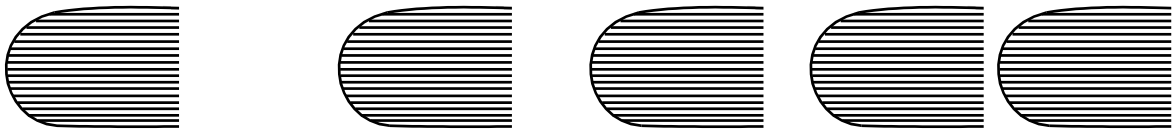
A) F_1 is very much greater than F_2

B) F_2 is very much greater than F_1

C) F_1 is only a little greater than F_2

D) F_1 and F_2 are equal

6. A vehicle is moving on a road. Ink drops are falling, one at a time, on the road from the vehicle. After the vehicle has moved away, what one observes is shown (qualitatively) in the figure given below. From the figure we can conclude about the vehicle to be moving



A) From left to right with increasing speed

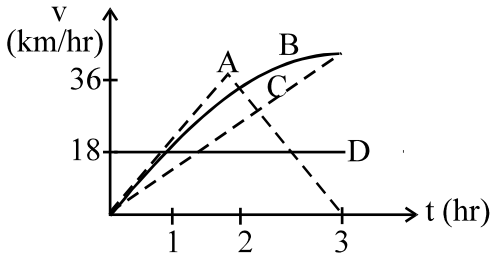
B) From right to left with uniform speed

C) From right to left with decreasing speed

D) From left to right with decreasing speed

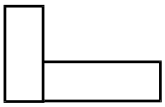
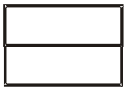
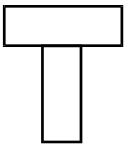
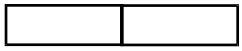
SPACE FOR ROUGH WORK

7. Velocity time graph of four athletes for three seconds as given below. Who has travelled maximum distance?



A) A B) B C) C D) D

8. You are given two identical steel pieces and only one of those is magnetized. In all the following arrangements, there is attraction between them. Which of the following arrangements helps us in identifying the magnet?

A)  B)  C)  D) 

9. The S.I unit of pressure is

A) Nm^2 B) N/m^2 C) m^2/N D) N/m

SPACE FOR ROUGH WORK

10. The frequency of a source of sound is 50 Hz. How many times does it vibrate in 1 minute

A) 50 B) 300 C) 3000 D) 30000

11. A student was asked to draw a ray diagram for formation of image by a convex lens for the following positions of the object :

a) Between F and 2F b) At F .

c) At 2 F d) Between F and optical centre

The position for which virtual image can be formed among these is

A) b B) a C) c D) d

12. Which one of the following expressions has the same units as power?

A) Force × distance B) Work × time C) Force × acceleration D) Force × velocity

13. Suppose you are given three resistances of values 2, 4, 6 ohms. Which of the following value is not possible to get by arranging resistances in various combinations?

A) Less than 2 B) Equal to 4.4 C) Equal to 7.33 D) Equal to 6.75

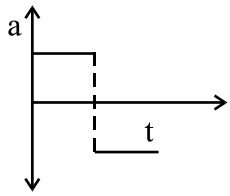
SPACE FOR ROUGH WORK

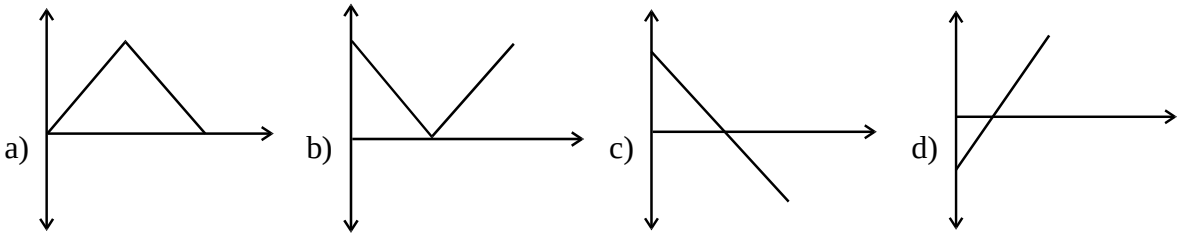
14. The coil of the heater is cut into two equal halves and only one of them is used in the heater. The ratio of the heat produced by the original coil to the halved coil is

A) 2 : 1 B) 1 : 2 C) 4 : 1 D) 1 : 4

15. Which of the given velocity time graphs matches the given acceleration time graph .

(Time is plotted along the horizontal axis in all cases)

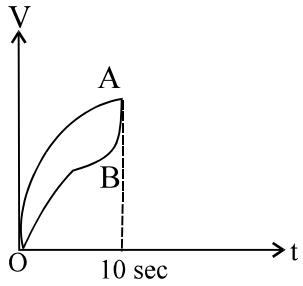




A) a B) b C) c D) d

SPACE FOR ROUGH WORK

16. A graph given, shows the variation of velocity and time of two bodies A and B. Choose an alternative for their average velocities



A) Average velocities of both are same since they have same initial and final velocities

B) Average velocities of both are same since both cover equal distance in equal interval of time

C) Average velocity of A is greater than that of B since it covers more distance than B in 10 sec

D) Nothing can be said since their accelerations are not given

17. A flat mirror creates a virtual image of your face which of the following optical elements in combination with the flat mirror can form a real image?

A) convex lens B) concave lens C) concave mirror D) convex mirror

SPACE FOR ROUGH WORK

18. When a ray of white light enters a prism, it begins to spread out in rainbow coloures (figure 1). An inverted prism is brought close to this prism as shown in the figure 2. Both the prisms are made of same material. If a ray of white light is incident on surface A and "d" is made zero then output from surface "B" will be

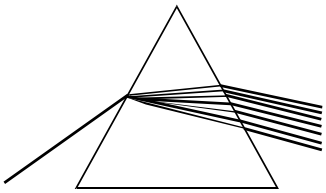
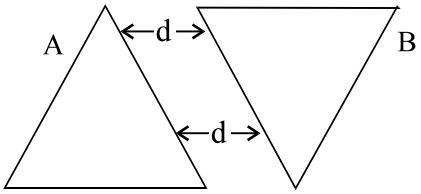


fig.1



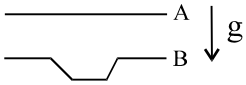
A) White light

B) Rainbow coloures which are converging

C) Rainbow colours which are spreading out

D) no light comes out from surface B

19. There are two tracks A and B as shown in the figure. The direction of gravity is also shown in the figure



If two similar balls begin to move at same uniform velocity at the same time which of the two balls will reach the end of the track faster?

A) Ball on track A

B) Ball on track B

C) They will reach on the same time

D) Cannot decide by the date given

20. Current I is equal to (Q - charge, t - time)

A) $Q \times t$

B) Q/t^2

C) $Q \times t^2$

D) Q/t

SPACE FOR ROUGH WORK

21. Two bodies with kinetic energies in the ratio 2 : 3 are moving with equal momentum. The ratio of their masses

A) 1 : 3 B) 1 : 2 C) 3 : 2 D) 2 : 3

22. Figure 1 show a metallic disc with a hole at its centre. Which one of the figures from 2 to 5 schematically shows how the disc will appear after it is uniformly heated?

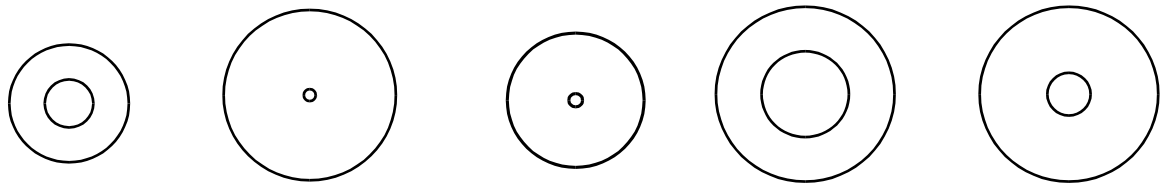


Figure 1 Figure 2 Figure 3 Figure 4 Figure 5

A) Figure 2 B) Figure 3 C) Figure 4 D) Figure 5

23. Unit of velocity is

A) m/s B) m × s C) m/s^2 D) $m \times s^2$

24. An object with an initial velocity V_0 speeds up with an acceleration a, travelling a distance L_1, then it slows down with a deceleration a, and stops after travelling an additional distance L_2. If $\frac{L_2}{L_1} = k,$ then what is the maximum velocity of the object during its travel?

A) $\frac{k-1}{k+1} v_0$ B) $\sqrt{\frac{k}{k-1}}\ v_0$ C) $\frac{k}{k-1} v_0$ D) $\sqrt{\frac{k+1}{k}}\ v_0$

25. A boy and a cart are moving in the same direction, with the boy going twice as fast as the cart. When he gets into the cart, the speed of the cart increases by 20%. Find the ratio of mass of cart to mass of boy

A) 5 B) 4 C) 3 D) 2

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 26-30

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

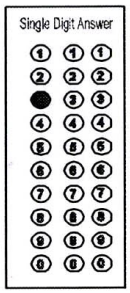
Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

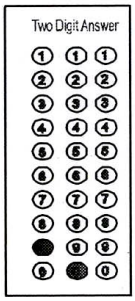
Example 1



If Two Digit Answer

If answer is 90

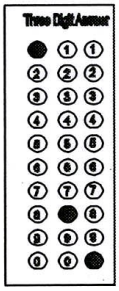
Example 2



If Three Digit Answer

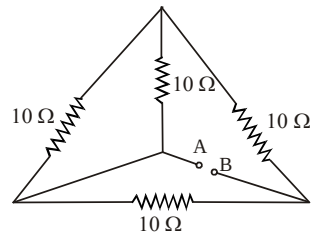
If answer is 180

Example 3



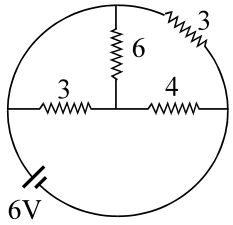
SPACE FOR ROUGH WORK

26. Calculate equivalent resistance between points A and B in the following circuit (in ohms)

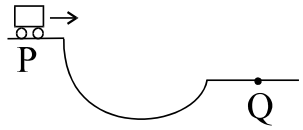


27. A body of mass 2 kg is moving on a smooth floor in straight line with a uniform velocity of 10 m/s. Resultant force acting on the body is (in N)

28. In the circuit shown, the total current supplied by the battery is (in Ampere)



29. A trolley runs from point P to Q along a track, as shown in the figure. At point Q, its potential energy is 50 kJ less than at point P. At point P, the trolley has kinetic energy 5 kJ. Between P and Q, the work done against friction is 10 kJ. What is the kinetic energy at point Q? (in kJ)



30. A ball is dropped from the top of a tower of height 100 m. Simultaneously, another ball was thrown upward from the bottom of the tower with a speed of 50 m/s ($g = 10\ m/s^2$). These two balls would cross each other after a time (in second)

SPACE FOR ROUGH WORK

SECTION II
CHEMISTRY

PART I

This part contains 25 questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct7

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

31. A student is given four sample of solids W, X, Y and Z, all of which have metallic lusture. The results of her investigations are written a tabular form not matched correctly. Select the correct match sequence for W, X, Y and Z.

Property	**Solid**
a) W is a good electrical conductor. X, Y, Z are poor electrical conductors.	P) I_2
b) When the solids are hit with a hammer W, flattens out, X shatters into many pieces, Y is smashed into powder and Z is not affected	Q) SiO_2
c) When the solids are heated with a Bunsen burner, Y melts with some sublimation, but X, W, Z do not meet	R) PbS
d) In treatment with 6M HNO_3 X dissolves, there is no effect on W or Z	S) Au

A) (W - P), (Y - S), (X - R), (Z - Q)

B) (W - S), (Y - P), (X - R), (Z - Q)

C) (W - S), (Y - P), (X - Q), (Z - R)

D) (W - S), (Y - Q), (X - P), (Z - R)

32. Which one of the following oxides gives pink colour with phenolphthalein indicator in aqueous solution

A) N_2O B) NO C) BaO D) CO_2

33. What are the gases formed, when lead nitrate on heating

A) N_2O and NO_2 B) NO_2 and H_2 C) NO_2 and NO D) NO_2 and O_2

SPACE FOR ROUGH WORK

34. Alumino thermite process is used for welding the railway tracks. This process is highly exothermic displacement reaction. Thermite composition is

A) $\underset{(2:1:3)}{Fe_2O_3 : Al : C}$ B) $\underset{(1:3)}{Fe_2O_3 : Al}$ C) $\underset{(2:1)}{Fe_2O_3 : Al}$ D) $\underset{(3:1)}{Fe_2O_3 : Al}$

35. Pure gold known as 24 carat gold. It is very soft. In order to make jewellery, it mix with silver or copper. In India 22 carat Au is used for making ornaments. What is the percentage of Au present in 18 carat Au?

A) 91.6% B) 50.6% C) 75% D) 88.8%

36. Among the following is not an oxide ore of metal

A) Copper pyrites B) Cuprite C) Bauxite D) Magnetite

37. To protect decay, one is advised to brush the teeth regularly. The ingredient of the paste which checks the tooth decay is

A) Acidic B) Basic C) Neutral D) Corrosive

38. A metal 'X' has high melting point, good conductor of electricity, and is most malleable. Then the metal 'X' is

A) Cu B) Au C) Fe D) Pt

39. By which property are gases and liquids different from solid?

A) Volume B) Mass C) Conductivity D) Fluidity

SPACE FOR ROUGH WORK

40. Structure of nuclei of three atoms A, B and C are given below.

A has 90 protons and 146 neutrons

B has 92 protons and 146 neutrons

C has 90 protons and 148 neutrons

Based on the above data, which of these atoms are isotopes and which are isobars?

A) A and C are isotopes B and C are isobars B) A and B are isotopes A and C are isobars

C) B and C are isobars A and B are isotopes D) A and C are isotopes A and B are isobars

41. How much time it would take to distribute one Avogadro's number of wheat grains, if 10^{10} grains are distributed each second

A) 1.9×10^{2} years B) 1.9×10^{10} years C) 1.9×10^{8} years D) 1.9×10^{6} years

42. The number of atoms present in 0.1 mole of P_4 (atomic mass 31) are

A) 2.4×10^{24} atoms B) Same as in 0.05 mol of S_8

C) 6×10^{22} atoms D) Same as in 3.1 g of phosphorous

43. A compound contain three elements A, B and C. If the oxidation number of A = +2, B = +5 and C = –2, the possible formula of the compound is

A) $A_3(B_4C)_2$ B) $A_3(BC_4)_2$ C) $A_4(B_4C_4)_2$ D) ABC_2

SPACE FOR ROUGH WORK

44. Select the anhydrous of acids from the following

A) NH_3 B) BaO C) NO_2 D) CaO

45. A Brown and bright element 'x' when heated in presence of air turns into black substance 'y'. If hydrogen gas is passed over this heating material again 'x' is obtained 'x' and 'y' are

A) Cu and CuO B) S and SO_2 C) C and CO_2 D) Na and NaH

46. Somebody wanted to calculate the number of moles of oxygen atoms comprising of 9.033×10^{23} number of its atoms. The person further thought to calculate its mass and to find the number of moles of hydrogen atoms required to combined completely with this amount of oxygen to form water. The number of moles of oxygen atoms, their mass (in grams) and the number of moles of hydrogen atoms are

A) 1.5, 3 and 24 respectively B) 15, 18 and 3 respectively

C) 0.15, 27, 3 respectively D) 1.5, 24 and 3 respectively

47. Some rocket engines use a mixture of hydrazine, N_2H_4 and hydrogen peroxide, H_2O_2 as the propellant. The reaction is given by the following equation $N_2H_{4(\ell)} + 2H_2O_{2(\ell)} \longrightarrow N_{2(g)} + 4H_2O_{(g)}$. How much of the excess reactant, remains unchanged?When 0.850 mol of N_2H_4 is mixed with 17g of H_2O_2?

A) 16g of N_2H_4 B) 0.25 mol H_2O_2 C) 19.2 g of N_2H_4 D) 8.5 g of H_2O_2

SPACE FOR ROUGH WORK

48. An element X reacts with dilute. H_2SO_4 as well as with NaOH to produce salt and $H_2(g)$. Hence, it may be concluded that-

I. X is an electropositive element

II. oxide of X is basic in nature

III. oxide of X is acidic in nature

IV. X is an electronegative element

A) I, II, III are correct B) IV, I, II are correct C) III, IV, I are correct D) II, III, IV are correct

49. A substance A react with another substance B to produce the product C and a gas D. If a mixture of the gas D and ammonia is passed through an aqueous solution of C, baking soda is formed. The substances A and B are

A) HCl and NaOH B) HCl and Na_2CO_3 C) Na and HCl D) Na_2CO_3 and H_2O

50. An element with atomic number 17 is placed in the group 17 of the long form periodic table. Element with atomic number 9 is placed above and with atomic number 35 is placed below it. Element with atomic number 16 is placed left and with atomic number 18 is placed right to it. Which of the following statements are correct?

a) Valency of the element with atomic number 18 is zero

b) Elements with same valency will have atomic number 16, 17 and 18

c) Valency of elements with atomic number 9, 17 and 35 is one

d) Element with atomic number 17 is more electronegative than element with atomic numbers 16 and 35

A) a, b and c B) b, c and d C) a, c and d D) a, b and d

SPACE FOR ROUGH WORK

51. What is the mass of oxygen required to react completely with 15g of H_2 gas to form water?

A) 140 g B) 115 g C) 107.5 g D) 120 g

52. Which of the following is a liquid metal?

A) Bromine B) Mercury C) Iodine D) Argon

53. King of chemical is :

A) HCl B) HNO_3 C) H_2SO_4 D) NaOH

54. The transition of substance directly from the solid to the gas phase. Without passing through the intermediate liquid phase is called

A) Sublimation B) Freezing C) Vapourisation D) Boiling

55. A chemical equation is balanced in accordance with the law of:

A) conservation of mass B) multiple proportion

C) constant proportion D) reciprocal proportion

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 56-60

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

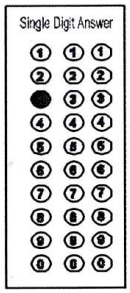
Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

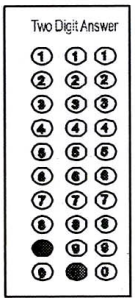
Example 1



If Two Digit Answer

If answer is 90

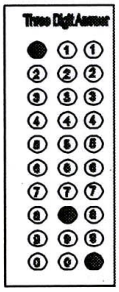
Example 2



If Three Digit Answer

If answer is 180

Example 3



SPACE FOR ROUGH WORK

56. The ion of an element has 3 positive charge, 27 mass-number and 14 neutrons. What is the number of electrons in this ion?

57. $A + 2B + 3C \longrightarrow AB_2C_3$. Reaction of 6g of A, 6×10^{23} atom of B, 0.036 mol of C yields 4.8 g of compound AB_2C_3. If the atomic mass A and C are 60 and 80 respectively. The atomic mass of B is

58. Find the number of gram molecules of oxygen in 6×10^{24} molecules of CO

59. Formula of a metallic oxide is M_2O_3. Upon reduction with hydrogen the metallic oxide gives pure metal and water. 0.112 gm metal is produced by 6mg of hydrogen after complete reduction. Atomic mass of the metal is

60. Two elements A and B contain 13 and 8 proton respectively. If the number of neutrons in them happen to be 14 and 8 respectively, the formula unit mass for the compound between A and B unit would be

SPACE FOR ROUGH WORK

SECTION III
MATHEMATICS

PART I

This part contains 25 questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

61. If x, y and z are distinct real numbers such that x:(y+z)=y:(z+x), then

A) x, y, z are all positive

B) xy+yz+zx+1=0

C) x+y+z=0

D) x, y, z are all negative

62. If x and y are any two real numbers with opposite signs, which of the following is the greatest

A) $\left(|x|-|y|\right)^2$ B) $\left|x^2-y^2\right|$ C) x^2+y^2 D) $(x-y)^2$

63. The sides of a quadrilateral are all positive integers and three of them are 30, 80 and 90 units. How many possible values are there for the fourth side_____

A) 120 B) 199 C) 125 D) 190

64. The number of distinct prime divisors of the number $512^3-253^3-259^3$ is

A) 5 B) 6 C) 7 D) 9

65. Let a sequence have 1000 zeroes. Instep 1, to every position in the sequence we add 2. Instep 2, to every even position in the sequence we add 2. Instep 3, to every position which is a multiple of 3 we add 2. This is continues up to 1000th step. After 1000th step, what will be the value in the 600th position

A) 48 B) 24 C) 64 D) 124

66. The least number that is divisible by all the numbers from 1 to 10 both inclusive is _____

A) 1820 B) 2320 C) 3520 D) 2520

SPACE FOR ROUGH WORK

67. Which one of the following is pure quadratic

A) $3x^2+2x$ B) $3x^2+2x+4$ C) $ax^2+bx+c,\ abc \neq 0$ D) x^2+1

68. If x and y are co-ordinates of the vertices of a triangle and more over they are rational numbers, then the triangle can't be a/an

A) Right angled triangle B) Isosceles triangle

C) Isosceles and right angled triangle D) Equilateral triangle

69. The ratio of the length of a side of an equilateral triangle and its height is

A) $1:\sqrt{3}$ B) $\sqrt{3}:2$ C) $2:\sqrt{3}$ D) 2:1

70. If $x = \frac{1}{1+\sqrt{3}}$ then the value of $4x^2+4x+2$ is

A) 3 B) 5 C) 6 D) 4

71. The average marks scored by Aswin in certain number of test is 84. He scored 100 marks in the next test. His new average score of all those tests is 86, then the total number of tests he appeared, is

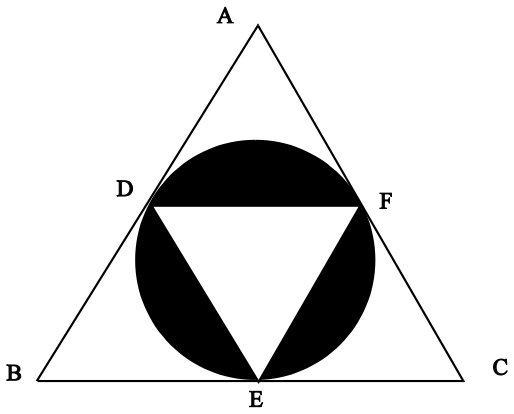
A) 8 B) 7 C) 5 D) 10

SPACE FOR ROUGH WORK

72. The number of solution of the equation $\sqrt{x} = x - 2$ is

A) 2 B) 1 C) 0 D) 4

73. In the given figure, ABC is an equilateral triangle whose side is $2\sqrt{3}\text{cm}$. A circle is drawn which passes through the midpoints D, E and F of its sides. The area of the shaded region is



A) $\frac{1}{4}(4\pi - 3\sqrt{3})$ B) $\frac{1}{4}(\pi - 3\sqrt{3})$ C) $\frac{1}{4}(2\pi - \sqrt{3})$ D) $\frac{1}{4}(3\pi - \sqrt{3})$

74. If a cylinder of radius 3cm and height 10cm is melted and recast into the shape of small spheres of diameter 1cm, then the number of spheres so formed is

A) 35 B) 270 C) 540 D) 1080

SPACE FOR ROUGH WORK

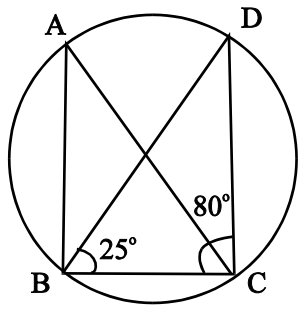
75. The angle of elevation of the top of a building from the foot of the tower is 30^o and the angle of elevation of the top of the tower from the foot of the building is 60^o. If the tower is 30m high, then the height of the building is

A) 30m B) 20m C) 15m D) 10m

76. If the heights and radii of a cone and a hemisphere are same then the ratio of their volumes is

A) 1:2 B) 2:3 C) 1:3 D) 1:1

77. In the given figure, $\angle DBC = 25^o$ and $\angle DCB = 80^o$ then $\angle BAC$ is equal to



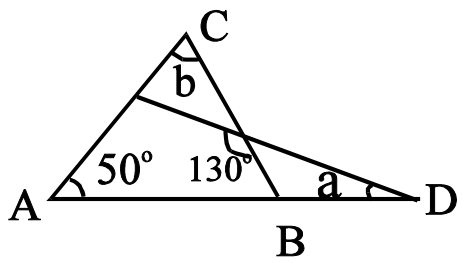
A) 90^o B) 85^o C) 75^o D) 25^o

78. The difference between the simple and compound interest on Rs 12500 for 3 years at 4% is

A) Rs. 60.50 B) Rs. 60.80 C) Rs. 60.00 D) Rs. 60.30

SPACE FOR ROUGH WORK

79. In the diagram, the value of a+b =



A) 70^o B) 90^o C) 100^o D) 80^o

80. The radii of two circles are 9cm and 12cm. The circumference of a circle whose area is equal to sum of the areas of the given two circles is

A) 15cm B) 15πcm C) 225cm D) 30πcm

81. In an examination A got 25% mark more than B, B got 10% less than C and C got 25% more than D. If D got 320 marks out of 500, the marks obtained by A was

A) 400 B) 405 C) 450 D) 360

SPACE FOR ROUGH WORK

82. If $x-a$ is a factor of $x^3-3x^2a+2a^2x+b$ then value of b is

A) 2 B) 0 C) 3 D) 1

83. The point which is equidistant from the points (0, 0) (0, 8) and (4, 6) is

A) $\left(\frac{1}{2},-4\right)$ B) $\left(-\frac{1}{2},4\right)$ C) $\left(\frac{1}{2},4\right)$ D) $\left(-\frac{1}{2},-4\right)$

84. If $\frac{a}{b}=\frac{b}{c}$, the value of $\frac{1}{b-c}+\frac{1}{b-a}$ is

A) $\frac{1}{b}$ B) $\frac{1}{a}$ C) $\frac{1}{ab}$ D) $\frac{1}{c}$

85. The value of $\sqrt{\frac{\left(\sqrt{12}-\sqrt{8}\right)\left(\sqrt{3}+\sqrt{2}\right)}{5+\sqrt{24}}}$ is

A) $\sqrt{6}-2$ B) $2-\sqrt{6}$ C) $2+\sqrt{6}$ D) Both A and B

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 86-90

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

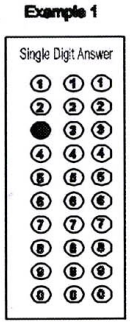
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

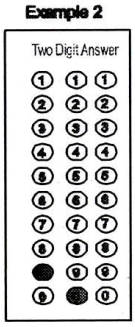
If Single Digit Answer

If answer is 3



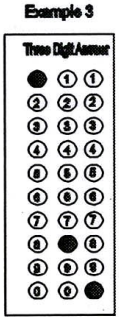
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

86. Five real numbers a_1, a_2, a_3, a_4, a_5 are such that

$\sqrt{a_1-1}+2\sqrt{a_2-4}+3\sqrt{a_3-9}+4\sqrt{a_4-16}+5\sqrt{a_5-25}=\frac{a_1+a_2+a_3+a_4+a_5}{2}$. The value of

$a_1+a_2+a_3+a_4+a_5$ is

87. How many ordered pairs of (x, y) integers satisfy $\frac{x}{15}=\frac{36}{y}$

88. A certain school has 2000 students. Every student reads 5 newspapers and every newspaper is read by 25 students. Then the number of newspaper is

89. There are 4 lines in a plane no two of which are parallel. The maximum number of points in which they can intersect is

90. The median of 10, 14, 11, 9, 8, 12, 6 is

SPACE FOR ROUGH WORK

Name .....

Batch..... Roll No. .....

Brilliant STUDY CENTRE
PALA

VERSION
A

30 - 09 - 2018 **PHYSICS + CHEMISTRY - MATHEMATICS - KEY**

PHYSICS

1. B
2. A
3. C
4. C
5. D
6. D
7. B
8. C
9. B
10. C
11. D
12. D
13. D
14. A
15. A
16. C
17. A
18. A
19. B
20. D
21. C
22. C
23. A
24. B
25. B
26. 6
27. 0
28. 3
29. 45
30. 2

CHEMISTRY

31. B
32. C
33. D
34. D
35. C
36. A
37. B
38. B
39. D
40. A
41. D
42. B
43. B
44. C
45. A
46. D
47. C
48. A
49. B
50. C
51. D
52. B
53. C
54. A
55. A
56. 10
57. 50
58. 5
59. 56
60. 102

MATHEMATICS

61. C
62. D
63. B
64. B
65. A
66. D
67. D
68. D
69. C
70. D
71. A
72. B
73. A
74. C
75. D
76. A
77. C
78. B
79. D
80. D
81. C
82. B
83. C
84. A
85. A
86. 110
87. 48
88. 400
89. 6
90. 10

Brilliant STUDY CENTRE PALA

QUESTION BOOKLET CODE
A

IIT/AIIMS - 2021 SCREENING CUM SCHOLARSHIP EXAM

Date : 30th December 2018

IMPORTANT INSTRUCTIONS

Please read the instructions carefully

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.
   This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/ two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover the Answer sheet to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VARIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate	Roll Number
I have read all the instructions and shall abide by them **Signature of the Candidate**	**I have verified all the information filled by the candidate** **Signature of the Invigilator**

SECTION I
PHYSICS

PART I

This part contains 25 questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

1. Which statement is correct among the following for gravitational acceleration (g) due to earth?

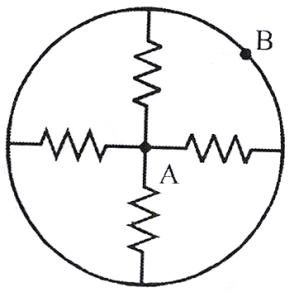
A) The value of g is equal at poles and equatorial circle

B) The value of g is more at poles than at equatorial circle

C) The value of g is more at equatorial circle than at poles

D) None of these

2. What is the equivalent resistance of the network between points A and B? (each resistance is of value r)



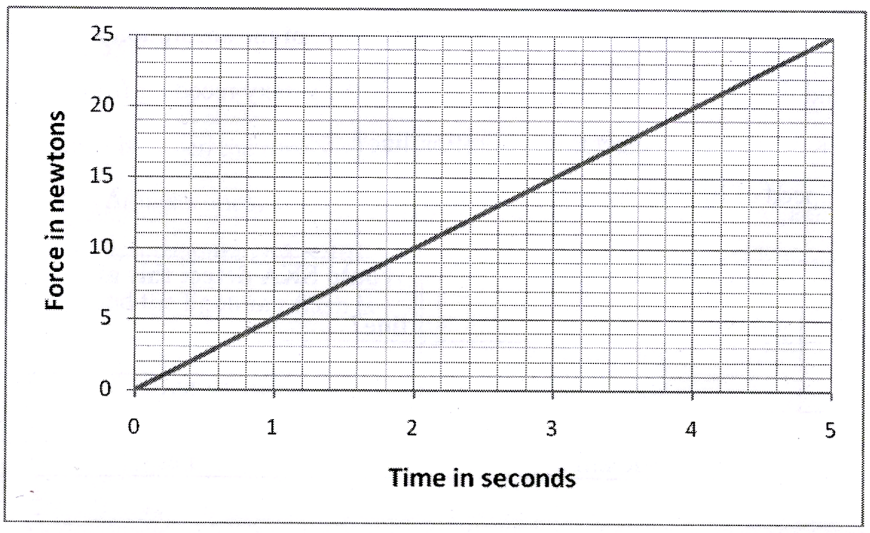
A) $\frac{r}{2}$ B) 4r C) $\frac{r}{4}$ D) Zero

SPACE FOR ROUGH WORK

3. The velocity of sound wave in a given medium is V when its frequency is v. The velocity, when frequency changes to 5v is

A) 5 V B) V/5 C) 25 V D) V

4. A variable force is exerted on a body of constant mass. The body, initially at rest, moves in a straight line. The following graph shows how the force varies with time. All frictional forces are ignored



If the velocity of the object is 7.0 ms^{-1} after 2.0 s, the velocity after 3.4 s will be approximately

A) 20.2 ms^{-1} B) 17.0 ms^{-1} C) 11.9 ms^{-1} D) 28.9 ms^{-1}

SPACE FOR ROUGH WORK

5. A bird is in a wire cage hanging from a spring balance. The reading of the balance is taken when the bird flying about in the cage, and when the bird is at rest in the cage. The first reading will be

A) Less than the second

B) Greater than the second

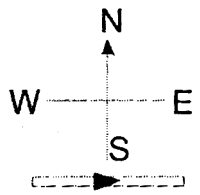
C) Much greater than the second

D) Same as the second

6. A beam of alpha particles moving towards east is deflected towards south by magnetic field. The direction of magnetic field is

A) Towards south B) Towards east C) Downward D) Upward

7. A constant current I flows in a horizontal wire in the plane of the paper from West to East as shown in the figure. The direction of magnetic field at a point will be South to North



A) Directly above the wire

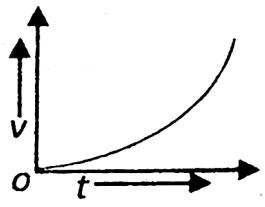
B) Directly below the wire

C) At a point located in the plane of the paper, on the north side the wire

D) At a point located in the plane of the paper, on the south side of the wire

SPACE FOR ROUGH WORK

8. The velocity-time graph of moving body is shown in the figure



Which of the following statement is true?

A) The acceleration is constant and positive

B) The acceleration is constant and negative

C) The acceleration is increasing and positive

D) The acceleration is decreasing and negative

9. A packet of weight W was allowed to fall freely in a water tank with acceleration 'a' (<g). The magnitude of resistance force offered by water is

A) $w\frac{g}{a}$ B) $w\frac{a}{g}$ C) $w\left(1-\frac{a}{g}\right)$ D) $w\left(1+\frac{a}{g}\right)$

10. A heater coil is cut in to two equal parts and only one part is now used in the heater instead of the original one. Heat generated by one half of the coil would be how much in comparison to that of the full length coil?

A) 4 times B) 2 times C) Half D) $\frac{1}{4}^{th}$

SPACE FOR ROUGH WORK

11. A convex spherical mirror is considered as a suitable rear view mirror for automobiles, because

A) It always produces virtual, erect and diminished images

B) It always produces real, erect and magnified images

C) It always produces real, inverted and diminished images

D) It always produces virtual, inverted and magnified images

12. Had Newton and Einstein shaken their hands, which fundamental force they would have exerted on each other (During shaking their hands)?

A) Frictional B) Electromagnetic C) Gravitational D) Mechanical

13. Three identical electric bulbs are connected parallel to each other. On connecting their combination across a source of emf having stabilized voltage and negligible resistance, all bulbs glow with full brightness. Suddenly a bulb fuses. The other bulbs will blow

A) Brighter B) Dimmer

C) With same initial intensity D) Zero, as those will also fuse

14. In dispersive materials

A) The angle of refraction for a light ray depends on the wavelength of light

B) The angle of refraction for a light ray does not depend on the wavelength of light

C) The angle of reflection from the surface of the material does not depend on the wavelength of light

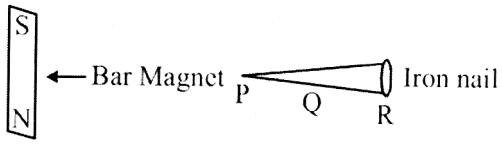
D) Both A & C hold true

SPACE FOR ROUGH WORK

15. Knowing that mass of the moon is M/81, find distance of a point from moon where gravitational field due to earth and moon cancel each other. Given that distance between earth and moon = 60R, Radius of Earth=R, Mass of Earth = M

A) 2 R B) 6 R C) 4 R D) 8 R

16. A bar magnet is used to pick up an Iron nail



At which part P, Q and R is the easiest for the magnet to pick up the iron nail?

A) At P

B) At Q

C) At R

D) It makes no difference at any part

17. An athlete completes one round of a circular track of radius R in 40 seconds. The displacement at the end of 2 minutes 20 seconds will be

A) Zero B) 2R C) πR D) $7\pi R$

SPACE FOR ROUGH WORK

18. Magnetic field due to current through a ....., is similar to magnetic field produced by a bar magnet

A) Circular loop of conducting wire

B) Rectangular loop of conducting wire

C) Solenoid

D) Thick copper wire

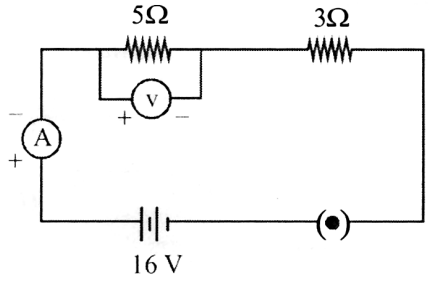
19. Choose the wrong statement related to refraction of light

A) Twinkling of stars

B) Oval shape of sun in morning and evening

C) Object in water appears bigger in size

D) Red light undergoes dispersion, while passing through prism

20. 

In the above electrical circuit, the readings shown by the ammeter and voltmeter are :

A) 2A, 10 V B) 3.2 A, 16 V C) 2A, 16 V D) 3.2 A, 10 V

SPACE FOR ROUGH WORK

21. A stone is dropped from the top of a tower 490 m high into a pond of water at the base of the tower. The splash is heard after (Given g = 9.8 m/s^2, speed of sound = 350 m/s)

A) 11.4 sec B) 10 sec C) 22.8 sec D) 20 sec

22. If an object is moving with constant velocity, then the motion is

A) Non-uniform speed B) Uniform acceleration C) Uniform motion D) Non-uniform motion

23. The process of re-emission of absorbed light in all directions with different intensities by the atom or molecule is called

A) Scattering of light B) Dispersion of light C) Reflection of light D) Refraction of light

24. In which case of a moving body force is not needed?

A) To increase the speed of the body

B) To decrease the momentum of the body

C) To change the direction of motion

D) To keep the body in uniform velocity

25. The ratio of electric field intensity at distance 5 cm to that at 10 cm from a point charge 5Q in air is

A) 2 : 1 B) 1 : 2 C) 1 : 4 D) 4 : 1

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 26-30

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

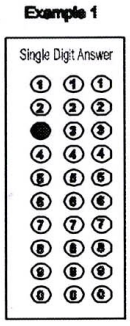
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

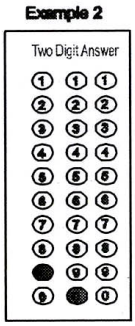
If Single Digit Answer

If answer is 3



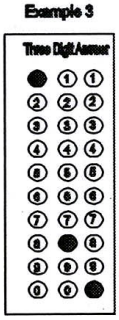
If Two Digit Answer

If answer is 90



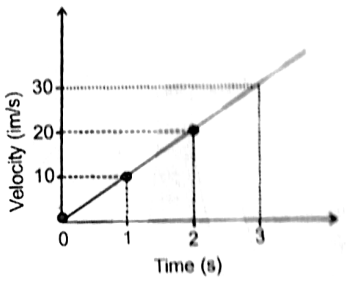
If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

26. Velocity-time graph of a body moving with uniform acceleration is shown in the diagram. The distance travelled by the body in 3 seconds is (answer in m)



27. If x calories of heat are supplied to 15 g of water, its temperature rises from 20^0C to 24^0C. If specific heat for water is 1 cal $g^{-1}\,{}^0C^{-1}$, then the value of x is

28. Determine the potential difference between ends of a wire of resistance 5Ω is 720 C charge passes through it per minute (in V)

29. A Diwali rocket is ejecting 0.05 Kg of gases per second at a velocity of 400 m/s. What is the accelerating force on the rocket? (answer in Newton)

30. A car travels from Chennai to Bengaluru with a speed of 60 km/hr and returns back along the same path with a speed of 40 km/hr. The average speed of the car is given by : (answer in km/hr)

SPACE FOR ROUGH WORK

SECTION II
CHEMISTRY

PART I

This part contains 25 questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct7

For each question, darken the bubble corresponding to the correct option in the ORS

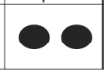
For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

31. The oxide among the following that react with both dil. HCl and aqueous NaOH is

A) ZnO B) CO_2 C) SiO_2 D) CaO

32. Oxygen gas is not liberated on heating

A) K_2CO_3 B) $KMnO_4$ C) $NaNO_3$ D) $KClO_3$

33. Magnesium has three natural isotopes. The isotopic masses and relative abundance are given below

isotopic mass	23.98 u	24.98 u	25.98 u
relative abundance	78.46%	10.08%	11.46%

The average atomic mass of natural magnesium is

A) 24.31 u B) 24.68 u C) 24.29 u D) 24.48 u

34. A colourless crystalline solid 'B' dissolved easily in water. On addition of dilute HCl to the aqueous solution of 'B', no change was observed. When NaOH was added to the aqueous solution of 'B', a white ppt was obtained that dissolved in excess, giving a colourless solution. 'B' is :

A) $MgSO_4$ B) $Pb(NO_3)_2$ C) $AgNO_3$ D) $ZnSO_4$

SPACE FOR ROUGH WORK

35. The formula of ammonia is NH_3 and that of Magnesium chloride $MgCl_2$. The formula of Magnesium nitride is

A) MgN_2 B) Mg_2N_3 C) Mg_3N_2 D) $Mg(NO_3)_2$

36. A student adds 5.85 gm of NaCl to 1 litre of water (the pH of which was measured to be 7.0) in a flask (X) to make a 0.1 M solution. He transfers 500 ml into another flask (Y). He covers the flask (Y) with tissue paper and the original flask (X) with a watch glass and goes to watch a movie. When he returns to the lab the next morning, he checks the pH of both the solutions using a perfectly calibrated pH meter. Which of the following is correct?

A) X has pH =7 and Y has pH > 7

B) X has pH < 7 and Y has pH = 7

C) X has pH = 7 and Y has pH < 7

D) Both X and Y have pH = 7

37. Heavy water is

A) Water containing heavy metal salts dissolved in it

B) Water at 4^0 C, the temperature of maximum density for water

C) Deuterium oxide

D) Water saturated with oxygen gas

SPACE FOR ROUGH WORK

38. The amount of energy released during the combustion of unit mass of fuel is called

A) efficiency B) calorific value C) octane number D) packing fraction

39. The substance formed on passing chlorine gas through slaked lime is

A) Soda lime B) Bleaching powder C) Chloral D) quick lime

40. Which among the following is not a monobasic acid ?

A) Hydrochloric acid B) Nitric acid C) Acetic acid D) Carbonic acid

41. If the nucleus of hydrogen atom in a sphere of radius 1 cm. The distance at which the electron in the atom is moving round the nucleus is

A) 10 cm B) 100 cm C) 100 m D) 1000 m

42. Ammonia gas is formed when ammonium chloride react with

A) Conc. H_2SO_4 B) $Ca(OH)_2$ C) $NaNO_2$ D) dil. HCl

43. International mole day is

A) 23rd October 6.02 am to 6.02 pm

B) 22nd April 6 am to 6 pm

C) 5th June 12 am to 12 pm

D) 30th January 11 am to 11 pm

SPACE FOR ROUGH WORK

44. The beach sands of Kerala is a source of minerals like monazite. Monazite is the source of Thorium. Monazite also contain Neodymium and Cerium. The metals Thorium, Neodymium and Cerium belong to which block of modern long form of periodic table ?

A) s - block B) p - block C) d - block D) f - block

45. Food containers made of iron are coated with tin and not with zinc because

A) Zinc has higher m.p compared to Sn

B) Zinc is costly compared to Sn

C) tin is more reactive compared to Zn

D) Zinc is more reactive compared to Sn

46. The metal among the following that react with steam but not with cold water or hot water is

A) Sodium B) Calcium C) Magnesium D) Iron

47. The coloured compound among the following is

A) $CaSO_4 \cdot 2H_2O$ B) $(CaSO_4)_2 \cdot H_2O$

C) $Na_2CO_3 \cdot 10H_2O$ D) $CuSO_4 \cdot 5H_2O$

SPACE FOR ROUGH WORK

48. Baking soda is

A) $Na_2CO_3 \cdot 10H_2O$ B) NaOH C) $NaHCO_3$ D) $(NH_4)_2CO_3$

49. Stinging hair of nettle leaves inject which compound to human body when touched ?

A) Methanoic acid B) Ethanoic acid

C) Oxalic acid D) Citric acid

50. Acidity in stomach is got rid of by using antacids. The substance among the following that can be used as antacid is

A) lemon juice B) Vinegar

C) Milk of magnesia D) aerated soft drinks

51. Rain is called acid rain when the pH of rain water is

A) less than 5.6 B) more than 6.5 C) more than 7 D) less than zero

52. On passing CO_2, lime water is turned milky due to formation of

A) $Ca(OH)_2$ B) $Ca(HCO_3)_2$ C) $CaCO_3$ D) CaO

SPACE FOR ROUGH WORK

53. The correct set of co-efficients for the balanced equation is

$$p\ Al(s) + q\ Fe_3O_4(s) \rightarrow r\ Al_2O_3 + s\ Fe(s)$$

A) p = 3	q = 4	r = 2	s = 4
B) p = 8	q = 3	r = 4	s = 9
C) p = 8	q = 4	r = 3	s = 9
D) p = 6	q = 2	r = 3	s = 6

54. Aqua regia is

A) a mixture of conc. H_2SO_4 & HNO_3 in 1 : 1 ratio

B) a mixture of conc. HNO_3 & HCl in the ratio 1 : 3

C) a mixture of conc. HCl & H_2SO_4 in the ratio 1 : 2

D) conc. H_2SO_4 containing SO_3 dissolved in it

55. Anodising is the process of

A) coating iron with Zinc

B) coating Copper with tin

C) forming oxide layer over aluminium

D) forming carbide layer over steel

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 56-60

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

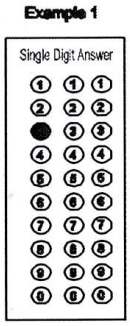
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

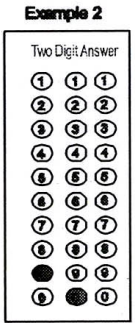
If Single Digit Answer

If answer is 3



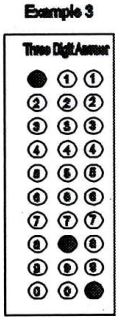
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

56. Considering the first 100 elements, how many are gaseous elements at one atmospheric pressure and 25^0 C temperature ?

57. A gold ornament is Hallmarked 750. The purity of gold used to make the ornament expressed in carats is .....

58. 2 g H_2 gas and 35.5 g Cl_2 gas react in presence of sunlight to form HCl gas. How many moles of HCl gas is formed ?

59. An element with mass number 81 contains 31.7% more neutrons than protons. Give the atomic number of the element

60. Till today how many elements are officially named and accepted by IUPAC officially?

SPACE FOR ROUGH WORK

SECTION III
MATHEMATICS

PART I

This part contains 25 questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

61. If n is a perfect square then the next perfect square greater than n is

A) $n^2 + 1$ B) $n^2 + n$ C) $n + 2\sqrt{n} + 1$ D) $2n + 1$

62. If the polynomial $2x^3 + ax^2 + 3x - 5$ and $x^3 + x^2 - 4x + a$ leave the same reminder when divided by $x - 2$ then the value of a is

A) $\frac{13}{3}$ B) $\frac{-13}{3}$ C) $\frac{3}{13}$ D) $\frac{-3}{13}$

63. In a quadratic equation $ax^2 + bx + c = 0$, if both roots are (+) ve then

A) a and b are same sign c is opposite sign

B) a, b, c are (+) ve

C) a, b, c are (-v) ve

D) a and c are same sign b is opposite sign

64. A factor of $x^3 - 6x^2 - 6x + 1$ is

A) $2x + 1$ B) $x - 1$ C) $x - 2$ D) $x + 1$

SPACE FOR ROUGH WORK

65. The equations $2x - 3y + 5 = 0$ and $6y - 4x = 10$ when solved have

A) no solution

B) only one solution

C) only two solutions

D) an infinite number of solution

66. Find the common difference of an A.P. where first term is 100 and the sum of whose first 6 terms is 5 times. The sum of the next 6 terms

A) 10 B) –5 C) 6 D) –10

67. Find the angle between the minute hand of clock and hour hand when the time is 7 : 20

A) 90° B) 105° C) 100° D) 110°

68. The length of the shadow of a pole is $\sqrt{3}$ times the length of the pole, then angle of elevation of the sun is

A) 30° B) 60° C) 90° D) 45°

SPACE FOR ROUGH WORK

69. If $\sin\theta + \cos\theta = 1$ then $\sin\theta \cos\theta$ =

A) $\frac{1+\sqrt{2}}{1+\sqrt{3}}$ B) $\frac{1}{\sqrt{3}-1}$ C) 1 D) 0

70. If the points (0, 4), (4, 0) and (6, 2P) are collinear then the value of P is

A) –1 B) 7 C) 6 D) 4

71. If the sum of interior angles of a convex polygon is 1620° then its number of sides are

A) 10 B) 11 C) 12 D) 13

72. The number of triangles with any three of the lengths 1, 4, 6, 8 are

A) 4 B) 2 C) 1 D) 0

73. In a circle a 16 unit long chord is at a distance 6 units away from the centre, find the distance of a 12 unit long chord from the centre is

A) 5 B) 6 C) 7 D) 8

SPACE FOR ROUGH WORK

74. The circumference of the circumcircle of the triangle formed by x-axis, y-axis and the graph of $3x + 4y = 12$ is

A) 3π B) 4π C) 5π D) 6π

75. The mean of first n natural numbers is $\frac{5n}{9}$, find n

A) 5 B) 4 C) 9 D) 10

76. The arithmetic mean of the set of observations $1^2, 2^2, 3^2 \ldots\ldots n^2$ is

A) $\frac{n(n+1)}{6}$ B) $\frac{(n+1)(2n+1)}{6}$ C) $\frac{(n-1)(2n+1)}{6}$ D) $\frac{(n+1)(2n-1)}{6}$

77. The mean of first n odd natural numbers is $\frac{n^2}{81}$ find n

A) 9 B) 81 C) 27 D) 36

78. If a solid sphere of radius 10 cm is moulded into 8 spherical solid balls of equal radius then the surface area of each ball is

A) 100π B) 75π C) 60π D) 50π

SPACE FOR ROUGH WORK

79. If the centre of the circle is (5, 4) and touch the y-axis then its radius is

A) 4 B) 5 C) 9 D) 1

80. The point on the y-axis which is equidistant from A (–5, –2) and B (3, 2) is

A) (–4, 0) B) (–2, 0) C) (0, –2) D) (0, –4)

81. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, then the value of a is

A) –1 B) –5 C) 1 D) 5

82. A vertical pole of height 10 metres stands at one corner of a rectangular field. The angle of elevation of its top from the farthest corner is 30°, while that from another corner is 60°. The area (in m^2) of rectangular field is

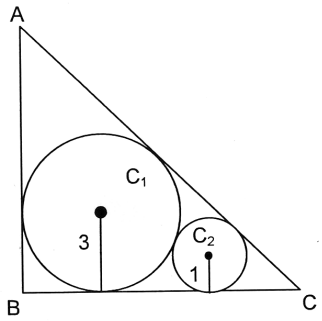
A) $\frac{200\sqrt{2}}{3}$ B) $\frac{400}{\sqrt{3}}$ C) $\frac{200\sqrt{2}}{\sqrt{3}}$ D) $\frac{400\sqrt{2}}{\sqrt{3}}$

83. A circle is inscribed in a square and the square is circumscribed by another circle. What is the ratio of the areas of the inner circle to the outer circle?

A) 1 : 2 B) 1 : $\sqrt{2}$ C) $\sqrt{2}$: 4 D) 1 : $\sqrt{3}$

SPACE FOR ROUGH WORK

84. In the adjoining figure, ABC is a triangle in which $\angle B = 90°$ and its incircle C_1 has radius 3. A circle C_2 of radius 1 touches sides AC, BC and the circle C_1. Then length AB is equal to



A) $3+6\sqrt{3}$ B) $10+3\sqrt{2}$ C) $10+2\sqrt{3}$ D) $9+3\sqrt{3}$

85. If the vertices of an equilateral triangle have integral co-ordinates, then

A) such a triangle is not possible

B) the area of the triangle is irrational

C) the area of the triangle is an integer

D) the area of the triangle is rational but not an integer

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 86-90

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

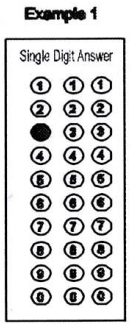
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

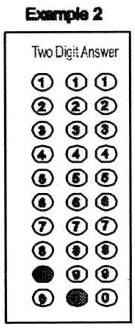
If Single Digit Answer

If answer is 3



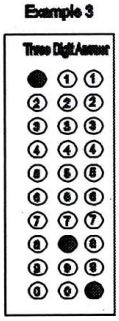
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

86. If $56^2 - 49^2 = 7P$ then P =

87. If the system of the equation $2x + ky = 7,\ 2kx + 3ky = 20$ has no solution then the value of k is

88. The first term of an AP is 5, the last term is 45 and the sum is 400, then the fourth term of an AP is

89. The shortest distance of the point (2, 3) from the X axis is

90. A thin wire is bent into the form of a circle of radius 7 cm, if a square is made out of the wire then the side of the square would be

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

Name .....

Batch..... Roll No. .....

Brilliant STUDY CENTRE
PALA

VERSION
A

30 - 12 - 2018 **PHYSICS + CHEMISTRY - MATHEMATICS - KEY**

PHYSICS		CHEMISTRY		MATHEMATICS	
1.	B	31.	A	61.	C
2.	C	32.	A	62.	B
3.	D	33.	A	63.	D
4.	A	34.	D	64.	D
5.	A	35.	C	65.	D
6.	D	36.	C	66.	D
7.	B	37.	C	67.	C
8.	C	38.	B	68.	A
9.	C	39.	B	69.	D
10.	B	40.	D	70.	A
11.	A	41.	D	71.	B
12.	B	42.	B	72.	C
13.	C	43.	A	73.	D
14.	D	44.	D	74.	C
15.	B	45.	D	75.	C
16.	C	46.	D	76.	B
17.	B	47.	D	77.	B
18.	C	48.	C	78.	A
19.	D	49.	A	79.	B
20.	A	50.	C	80.	C
21.	A	51.	A	81.	B
22.	C	52.	C	82.	A
23.	A	53.	B	83.	A
24.	D	54.	B	84.	D
25.	D	55.	C	85.	A
26.	45	56.	11	86.	105
27.	60	57.	18	87.	3
28.	60	58.	1	88.	13
29.	20	59.	35	89.	3
30.	48	60.	118	90.	11

Brilliant STUDY CENTRE PALA

QUESTION BOOKLET CODE **A**

IIT/AIIMS - 2021 SCREENING CUM SCHOLARSHIP EXAM

Date : 31st MARCH 2019

IMPORTANT INSTRUCTIONS

Please read the instructions carefully

1. This booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilators
2. Please fill in the items such as name, roll number and signature of the candidate in the columns given below.
3. The test is of **2 ½ hours** duration.
   This question booklet contains 90 questions. The **Maximum Mark is 360**
5. There are three sections. Physics, Chemistry & Mathematics having 30 questions each. Each section consists of two parts. **In Part 1** (25 questions) each question has four options (A), (B), (C) and (D). **Only one** of these four options is correct. Each correct answer will be awarded **FOUR** marks. **ONE** mark will be deducted for each incorrect answer.
6. **In Part 2** (5 questions) each question has an answer which is a number with one/ two/three digits. Each correct answer will be awarded **FOUR** marks. **NO NEGATIVE** mark for incorrect answer.
7. Mark the bubble corresponding to the Answer in the Optical Response Sheet (ORS) by using either **Blue or Black ball - point pen only**
8. More than one answer marked against a question will be deemed as incorrect answer.
9. No negative mark for unattended Question.
10. Question paper booklet code is printed on the right hand top of this booklet
11. The paper CODE is printed on the right part of the ORS. Ensure that the code is identical and same as that on the question paper booklet. If not, contact the invigilator for change.
12. Handover both **Question Paper and the Answer Sheet** to the invigilator at the end of the examination

IMMEDIATELY AFTER OPENING THIS QUESTION BOOKLET, THE CANDIDATE SHOULD VARIFY WHETHER THE QUESTION BOOKLET ISSUED CONTAINS ALL THE 90 QUESTIONS. IF NOT, REQUEST FOR REPLACEMENT

Name of the Candidate	Roll Number
I have read all the instructions and shall abide by them _ _ _ _ _ _ _ _ _ _ _ **Signature of the Candidate**	**I have verified all the information filled by the candidate** _ _ _ _ _ _ _ _ _ _ _ **Signature of the Invigilator**

SECTION I
PHYSICS

PART I

This part contains 25 questions

Question No. 1-25

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

1. A boy sitting on the top most berth in the compartment of a train which is just going to stop on the railway station, drops an apple aiming at the open hand of his brother situated vertically below his hands at a distance of about 2m. The apple will fall:

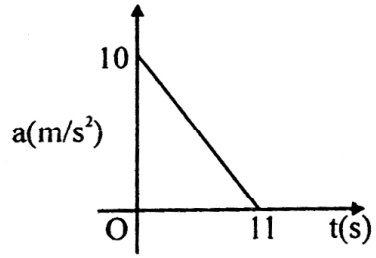
A) Slightly away from the hand of his brother in the direction of the motion of the train.

B) In the hand of his brother.

C) Slightly away from the hands of his brother in the direction opposite to the direction of the motion of the train.

D) None of these

2. A body starts from rest at time t = 0, the acceleration time graph is shown in figure. The maximum velocity attained by the body will be:



A) 1110 m/s

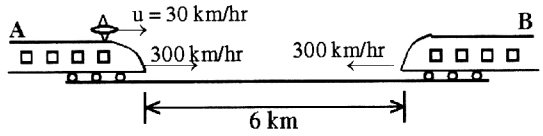
B) 55 m/s

C) 650 m/s

D) 550 m/s

SPACE FOR ROUGH WORK

3. A bird is sitting on train A moving towards East with a velocity 300 km/hr. Another train B of same speed is moving in West direction on the same track. When the trains are 6 km apart, the bird starts flying with a velocity 30 km/hr with respect to ground towards B. After touching B, it returns back to A and continue repeating this process until the trains collide. In this process, the total distance travelled by the bird is:



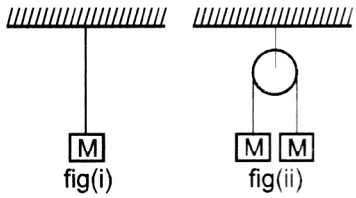
A) 100 m B) 200 m C) 300 m D) 6 km

4. A constant force acts on a body of mass m at rest for t seconds and then ceases to act. In next t seconds the body travels a distance x, magnitude of force is

A) $\frac{mx}{t^2}$ B) $\frac{mx}{t}$

C) mxt D) mxt^2

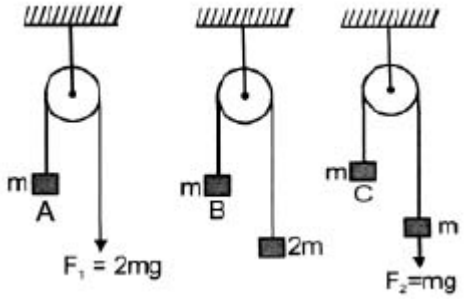
5. The elongation of wire of length L is I, in the case of figure (i). The same wire elongation in case of figure (ii) will be (pulley is light)



A) 2 I B) 4 I C) I D) I/2

SPACE FOR ROUGH WORK

6. In the figure, the blocks A, B, C of mass m each have accelerations a_1, a_2 and a_3 respectively. "F_1" and "F_2" are external forces of magnitude 2 mg and mg respectively.



A) $a_1 > a_3 > a_2$ B) $a_1 = a_2 = a_3$ C) $a_1 > a_2 > a_3$ D) $a_1 > a_2$, $a_2 = a_3$

7. A cyclist comes to a skidding stop in 10m. During this process, the force on the cycle due to the road is 200 N and is directly opposed to the motion. (a) How much work does the road do on the cycle? (b) How much work does the cycle do on the road?

A) –2000 J, 2000 J B) –2000 J, 1000 J by each tyre

C) 0 J, 2000 J D) –2000 J, 0 J

8. If the mass of sun were ten times smaller and gravitational constant G were ten times larger in magnitudes

A) the acceleration due to gravity on earth will not change

B) walking on ground would become more difficult

C) raindrops will fall much faster

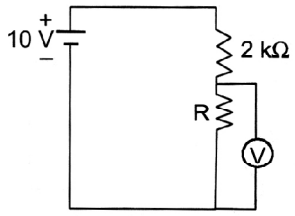
D) airplanes will have to travel much faster

SPACE FOR ROUGH WORK

9. If a charge q is placed at the centre of the line joining two equal charges Q such that the system is in equilibrium then the value of q is:

A) Q/2 B) –Q/2 C) Q/4 D) –Q/4

10. In the given circuit voltmeter shows a reading of 4V, then the power developed across R resistance will be

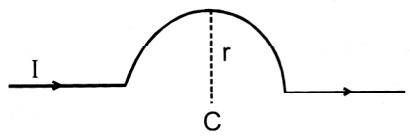


A) 15 mW B) 14 mW C) 12 mW D) 10 mW

11. A uniform wire when connected directly across a 220 V line produces heat H per second. If the wire is divided into n-parts and all parts are connected in parallel across a 220 V line, the heat produced per second will be

A) H/n B) H/n^2 C) n^2H D) nH

12. A wire carries a current I amperes shown in figure. The semicircle has a radius r. The magnetic field at the centre C will be:

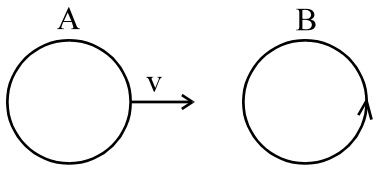


A) zero B) $\frac{\pi I}{r}\times 10^{-7}$ Newton/ampere-metre

C) $\frac{\pi I}{r}$ Newton/ampere-metre D) $\frac{\pi I}{r}$ gauss

SPACE FOR ROUGH WORK

13. There are two coils A and B as shown in figure. A current starts flowing in B as shown, when A is moved towards B and stops. When A stops moving the current in A is counter clockwise. B is kept stationary when A moves. We can infer that



A) there is a constant current in the clockwise direction in A.

B) there is a varying current in A

C) there is no current in A

D) there is a constant current in the counter clockwise direction in A

14. The focal length of a concave mirror in air is f. If it is immersed in water $\left(n = \frac{4}{3}\right)$, then the focal length will be

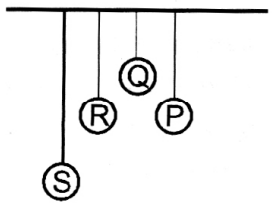
A) f B) $\frac{4}{3}f$ C) $\frac{3}{4}f$ D) 4f

15. The speeds of sound in air and sea-water are given to be 340 m/s and 1440 m/s. respectively. A ship sends a strong signal straight down and detects its echo after 1.5 secs. The depth of sea at that point is:

A) 2.16 km B) 0.255 km C) 0.51 km D) 1.08 km

SPACE FOR ROUGH WORK

16. Four pendulums P, Q, R & S are suspended from same elastic supports as shown in figure. Out of these P and R are of the same length. Q is smaller than P and S is longest. If the pendulum bob P is displaced to give small vibration.



A) amplitude of vibration for S is maximum

B) amplitude of vibration for all is same

C) amplitude of vibration for Q is maximum

D) amplitude of vibration for R is maximum

17. A sound wave of wavelength 90 cm in glass is refracted in to air. If the speed of sound in glass is 5400 m/s, the wavelength of the wave in air (speed of sound in air = 330 m/s)

A) 55 cm B) 5.5 cm C) 55 m D) 5.5 m

18. A star produces its energy through the process of

A) Nuclear fusion

B) Chemical reaction

C) Nuclear fission

D) Gravitational attraction between different parts of the star

SPACE FOR ROUGH WORK

19. Which of the following can produce a magnetic field?

A) Electric charges rest

B) Electric charges in motion

C) Only by permanent magnets

D) Electric charges whether at rest or in motion

20. A wire is lying horizontally in the north-south direction and there is a horizontal magnetic field pointing towards the east. Some positive charges in the wire move towards north and an equal number of negative charges move towards south. The direction of force on the wire will be

A) East

B) Down, into the page

C) Up, out of the page

D) West

21. When a charged particle passes through an electric field, which among the following properties change?

I. Mass

II. Charge

III. Velocity

IV. Momentum

A) II and III B) Only III C) III and IV D) I, III and IV

22. The diameter of a wire is reduced to one fifth of its original value by stretching it. If its initial resistance is R, what would be its resistance after reduction of the diameter?

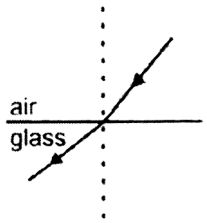
A) $\frac{R}{625}$ B) 625R C) 25R D) $\frac{R}{25}$

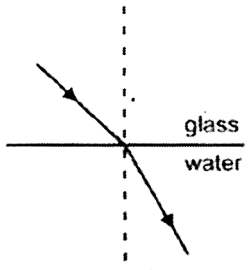
SPACE FOR ROUGH WORK

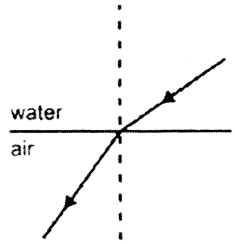
23. If sum of velocities of light in two media is 3.25×10^8 m/s and their difference is 0.75×10^8 m/s, find the refractive index of the second medium with respect to one:

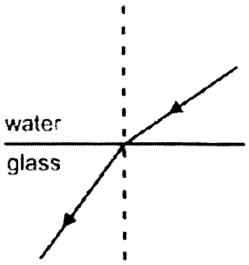
A) 1.25 B) 1.6 C) 1.5 D) 1.3

24. Which of the following ray diagrams, show the correct refraction of ray light

A)


B)


C)


D)


25. The energy consumed in 10 hours by 4 devices each of power 500 W:

A) 20 Joule B) 20 Watt C) 20 kwh D) 5 kwh

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 26-30

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

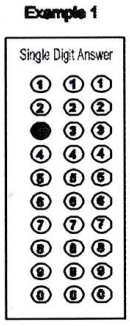
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

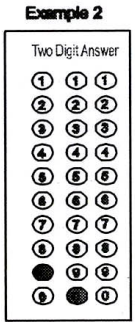
If Single Digit Answer

If answer is 3



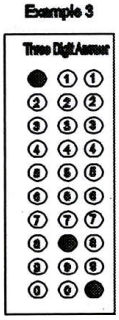
If Two Digit Answer

If answer is 90



If Three Digit Answer

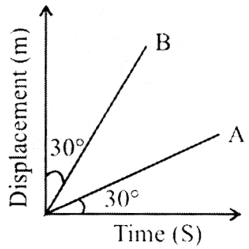
If answer is 180



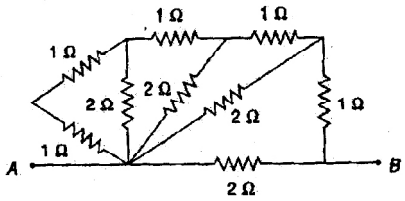
SPACE FOR ROUGH WORK

26. A body covers half the distance with a speed of 20 m/s and the other half with 30 m/s. The average speed of the body during the whole journey is (answer in m/s)

27. The displacement-time graph for two particles are shown in the figure. The ratio of velocity of B to velocity of A is

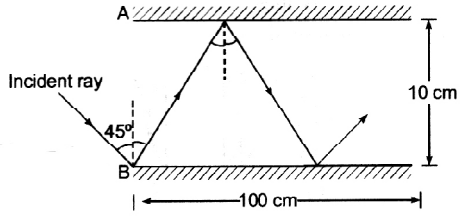


28. What is the resistance between A and B in the following circuit (answer in Ω)



29. An object weights 10 N in air. When immersed fully in water, it weights only 8N. The weight of the liquid displaced by the object will be: (answer in N)

30. Two parallel plane mirrors A and B are placed at a separation 10 cm as shown in figure. A ray incident on the corner of mirror B at an angle of incidence 45°. Find the number of times this ray is reflected from mirror A



SPACE FOR ROUGH WORK

SECTION II
CHEMISTRY

PART I

This part contains 25 questions

Question No. 31-55

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct7

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

31. The metal (M) forms an oxide, M_2O_3. The formula of its nitride will be

A) MN B) M_2N_3 C) M_2N D) M_3N_2

32. Simple distillation can be used to separate

A) A mixture of ether (boiling point 35^0C) and toluene (boiling point 110^0C)

B) A mixture of benzene (boiling point 80^0C) and toluene (boiling point 110^0C)

C) A mixture of ethanol (boiling point 78^0C) and water (boiling point 100^0C)

D) None of these

33. An element X (atomic number 12) reacts with another element Y (atomic number 17) to form a compound Z. Which of the following statements are true regarding this compound?

I. Molecular formula of Z is XY_2

II. It is soluble in water

III. X and Y are joined by sharing of electrons

IV. It would conduct electricity in the molten state

A) I, II and IV B) I and III C) II and III D) I and IV

34. ^{35}Cl and ^{37}Cl are the two isotopes of chlorine, in the ratio 3 : 1 respectively. If the isotope ratio is reversed the average atomic mass of chlorine will be :

A) 35.0 u B) 35.5 u C) 36.0 u D) 36.5 u

SPACE FOR ROUGH WORK

35. The solubility of a substance S in water is 28.6% (mass by volume) at 50^0C. When 50 mL of its saturated solution at 50^0C is cooled to 40^0C, 2.4 g of solid S separates out. The solubility of S in water at 40^0C (mass by volume) is :

A) 2.4% B) 11.9% C) 26.2% D) 23.8%

36. Foam of soap always appears white as

A) It contains large hydrogen chains

B) It absorbs red portion of the visible light

C) It reflects light of all wavelengths

D) It has one hydrophobic end, which is insoluble in water

37. Aluminium carbonate reacts with dilute nitric acid to form aluminium nitrate, water and carbon dioxide. The reaction can be written as $Al_2(CO_3)_3 + xHNO_3 \rightarrow yAl(NO_3)_3 + zCO_2 + 3H_2O$

The stoichiometric constants x, y and z are

A) 6, 2, 4 B) 6, 2, 3 C) 2, 4, 6 D) 4, 2, 3

38. The reaction between carbon and oxygen can be represented as

$C_{(s)} + O_{2(g)} + !! \longrightarrow CO_{2(g)} + \text{heat}$

In which of the following type(s), the above reaction can be classified?

I. Combustion reaction II. Displacement reaction

III. Endothermic reaction IV. Combination reaction

A) I and III B) I, III and IV C) I and IV D) I only

SPACE FOR ROUGH WORK

39. Gypsum is heated to about 373 K in large steel pots with mechanical stirrers to get plast of paris. The formula of plaster of paris is :

A) $CaSO_4.2H_2O$ B) $CaSO_4.\ 1\frac{1}{2}H_2O$ C) $CaSO_4.H_2O$ D) $CaSO_4.\frac{1}{2}H_2O$

40. Dilute hydrochloride acid is added to sodium bicarbonate. The gas liberated in

A) CO_2 B) CO C) Cl_2 D) H_2

41. Nonmetallic oxides are usually acidic in nature. Which among the following non metallic oxide is neutral?

A) CO_2 B) SO_2 C) H_2O D) P_2O_5

42. The chemical formula of 'Rock salt' is-

A) Na_2CO_3 B) NaCl C) $NaHCO_3$ D) KCl

43. On passing CO_2 in excess in aqueous solution of sodium carbonate the substance obtained is :

A) NaOH B) $NaHCO_3$ C) $Na_2CO_3.10H_2O$ D) $Na_2CO_3.H_2O$

44. A substance A reacts with another substance B to produce the product C and a gas D. If a mixture of the gas D and ammonia is passed through an aqueous solution of C, baking soda is formed. The substances A and B are :

A) HCl and NaOH B) HCl and Na_2CO_3 C) Na and HCl D) Na_2CO_3 and H_2O

45. The tumeric solution will turn red by an aqueous solution of

A) Potassium acetate B) Copper sulphate C) Sodium sulphate D) Ferric chloride

---

SPACE FOR ROUGH WORK

46. Brass contains:

A) Cu and Sn B) Cu and Ni C) Cu and Zn D) Mg and Al

47. Iron ore is :

A) Bauxite B) Dolomite C) Haematite D) Calamine

48. The metals which liberate hydrogen gas with dilute hydrochloric acid as well as caustic soda solution are

A) Na and K B) Zn and Al C) Fe and Mn D) Cu and Ag

49. The metal used to recover copper from an aqueous solution of copper sulphate is

A) Na B) Ag C) Hg D) Fe

50. Which of the following is true about the two statements?

Statement I : Reactivity of aluminium decreases when it is dipped in nitric acid

Statement II : A protective layer of aluminium nitrate is formed when aluminium is dipped in nitric acid

A) I is correct but II is incorrect

B) I is incorrect but II is correct

C) Both statements are correct and II is also the correct explanation of I

D) Both the statements are correct but II is not correct explanation of I

SPACE FOR ROUGH WORK

51. Metals like sodium potassium, calcium and magnesium are extracted by electrolysis of their chlorides in molten state. These metals are not extracted by reduction of their oxides with carbon because

1) Reduction with carbon is very expensive

2) Carbon readily makes alloys with these metals

3) Carbon has less affinity for oxygen

4) Carbon is a weaker reducing agent than these metals

A) 1 and 2 B) 2 and 3

C) 3 and 4 D) 4 and 1

52. A metal occurs in nature as its ore X which on heating in air converts to Y. Y reacts with unreacted X to give the metal. The metal is :

A) Hg B) Cu

C) Zn D) Fe

53. Correct order of first ionisation potential of B, C, Al, Si is

A) $B < Al < Si < C$

B) $B < Si < Al < C$

C) $Al < B < Si < C$

D) $Al < Si < B < C$

SPACE FOR ROUGH WORK

54. The given table shows the position of six elements P, Q, R, S, T and U in the periodic table. Using the table identify the incorrect statement.

Group → / Period ↓	1	2	3-12	13	14	15	16	17	18
2		*P*					*Q*		*R*
3		*S*				*T*			*U*

A) Element S present in group 2 is a metal and it exhibits a valency of 2.

B) The element T present in group 15 is a non-metal and it exhibits a valency of 3.

C) Element S has bigger atomic radius than element T.

D) Elements R and U are known as halogens

55. An element X has 7 electrons in its L shell. What is true about the element X?

I. It belongs to period 9 of modern periodic table

II. Its atom contains 9 protons

III. It has a valency of 7

IV. Its atoms can accept an electron to acquire noble gas configuration

A) I and II B) II and III C) III and IV D) II and IV

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 56-60

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

Zero Marks : 0 If none of the bubbles is darkened

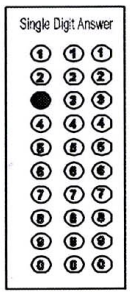
Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

If Single Digit Answer

If answer is 3

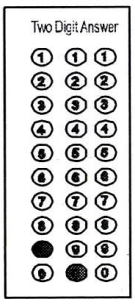
Example 1



If Two Digit Answer

If answer is 90

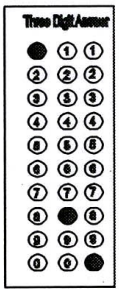
Example 2



If Three Digit Answer

If answer is 180

Example 3



SPACE FOR ROUGH WORK

56. An element with atomic number 17 is placed in the group 17 of the long form periodic table. Element with atomic number 9 is placed above and with atomic number 35 is placed below it. Element with atomic number 16 is placed left and with atomic number 18 is placed right to it. How many of the following statements are correct

i. Valency of the element with atomic number 18 is zero

ii. Elements with same valency will have atomic number 16, 17 and 18

iii. Valency of elements with atomic number 9, 17 and 35 is one

iv. Element with atomic number 17 is more electronegative that element with atomic numbers 16 and 35

57. The atomic number of an element X is 19. Give the number of electrons in its cation X^+

58. The reaction of burning of carbon in oxygen is represented by the equation :

$$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)} + \text{Heat} + \text{Light}$$

When 9.0 g of solid carbon is burnt in 16.0 g of oxygen gas, 22.0 g of carbon dioxide is produced. The mass of carbon dioxide gas formed on burning of 3.0 g of carbon in 32.0 g of oxygen would be (Note : atomic mass of = 12.0 u, O = 16.0 u)

59. pH of pure water at 298 K is .....

60. A scientist weighs out exactly 1.8 kg of glucose for an experiment. The molecular formula of glucose is $C_6H_{12}O_6$ and atomic masses of carbon, hydrogen and oxygen are 12u, 1u and 16u respectively. How many moles of glucose did the scientist weigh out?

SPACE FOR ROUGH WORK

SECTION III
MATHEMATICS

PART I

This part contains 25 questions

Question No. 61-85

Each question has FOUR options [A], [B], [C] and [D]. ONLY ONE of these four options is correct

For each question, darken the bubble corresponding to the correct option in the ORS

For each question, marks will be awarded in one of the following categories

Full Marks : **+4 If only the bubble corresponding to the correct option is darkened**

Zero Marks : **0 If none of the bubbles is darkened**

Negative Marks : **–1 In all other cases**

CORRECT METHOD FOR MARKING PART - I QUESTIONS

Correct method of marking	Wrong methods of marking							
	Tick mark	X mark	Dot mark	Scratch mark	Partial Mark	Line Mark	Outside Mark	Multiple Mark
								

SPACE FOR ROUGH WORK

61. Two dice are rolled simultaneously. The probability that face 4 comes up at least once

A) $\frac{11}{36}$ B) $\frac{1}{3}$ C) $10/36$ D) $2/3$

62. If x is 80% of y, then what percent of 2x is y?

A) 40% B) 80% C) $66\frac{2}{3}\%$ D) $62\frac{1}{2}\%$

63. The pair of linear equations $2kx + 5y = 7, 6x - 5y = 11$ has a unique solution if

A) $k \neq -3$ B) $k \neq 6$ C) $k \neq 5$ D) $k \neq -5$

64. The median of 5,7,4,6,8,10 is.....

A) 7 B) 6 C) 6.5 D) 7.5

65. A shopkeeper fixes the marked price of an item 35% above its cost price. The percentage of discount allowed so that he attains a profit of 8% is;

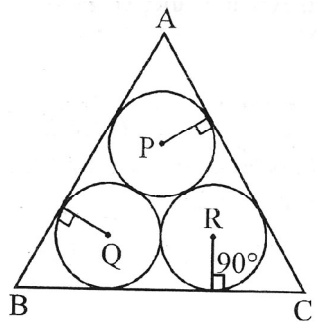
A) 20% B) 27% C) 31% D) 43%

66. An equilateral triangle and a regular hexagon have equal perimeters. If the area of the triangle is $12dm^2$, then the difference of their areas (in dm^2)is

A) 2 B) 4 C) 6 D) 8

SPACE FOR ROUGH WORK

67. Three circles each of radius r units are drawn inside an equilateral triangle of side a units, such that each circle touches the other two and two sides of the triangle as shown in the figure, (P, Q and R are the centres of the three circles). Then relation between r and a is

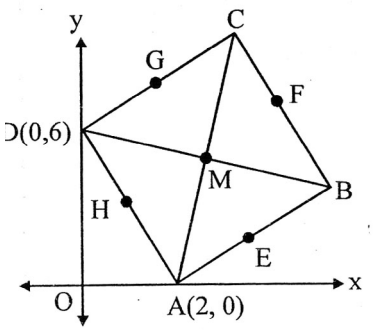


A) $a = 2\left(\sqrt{3}+1\right)r$ B) $a = \left(\sqrt{3}+1\right)r$ C) $a = \left(\sqrt{3}+2\right)r$ D) $a = \left(2\sqrt{3}+1\right)r$

68. If the centroid of the triangle formed by the points (a,b), (b,c) and (c,a) is at the origin, then $a^3 + b^3 + c^3 =$

A) abc B) a+b+c C) 3abc D) 0

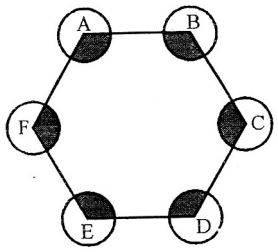
69. In the following diagram ABCD is a square and E,F,G and H are mid-points of the sides. Then which among the following is not true



A) point E(5,1) B) point G is (3,7) C) point F is (7,6) D) point M is (4, 4)

SPACE FOR ROUGH WORK

70. ABCDEF is any hexagon with different vertices A, B,C,D,E and F as the centres of circles with same radius r are drawn. The area of the shaded portion is



A) πr^2 B) $2\pi r^2$ C) $3\pi r^2$ D) $4\pi r^2$

71. A cuboidal metal block of dimensions 20cm ×16cm×12cm weighs 6kg. Find the weight of block of the same metal of size 10cm×8cm×8cm

A) 3kg B) 8kg C) 7kg D) 1kg

72. If the common difference of an AP is -5, then the value of $a_{20} - a_{15}$ = ...

A) -5 B) 5 C) 25 D) -25

73. An open box is made from a square lamina of side 12cm, by cutting equal squares at the corners and folding up the remaining flaps. The volume of this box cannot be

A) 20 c.c B) 100 c.c C) 108 c.c D) 130 c.c

74. Find the distance between –5 and 8 on the number line?

A) –13 B) –3 C) 13 D) 3

SPACE FOR ROUGH WORK

75. If $\sec A + \tan A = p$, then the value of $\sin A$ is

A) $\frac{1-2p}{1+p^2}$ B) $\frac{p^2-1}{p^2+1}$ C) $\frac{1+p^2}{2\left(1-p^2\right)}$ D) $\frac{p^2+1}{p^2-1}$

76. If $\tan\theta = 4$, then $\left(\frac{\tan\theta}{\frac{\sin^3\theta}{\cos\theta}+\sin\theta\cos\theta}\right)$ is equal to

A) 0 B) $2\sqrt{2}$ C) $\sqrt{2}$ D) 1

77. If $\tan\theta = m/n$ then what is the value of $\frac{m\sin\theta - n\cos\theta}{m\sin\theta + n\cos\theta}$?

A) $\frac{m^2+n^2}{m^2-n^2}$ B) $\frac{m^2-n^2}{m^2+n^2}$ C) $\frac{m-n}{m+n}$ D) None of these

78. What is the value of $\frac{\cos\theta}{\sin\left(90°-\theta\right)} + \frac{\sin\theta}{\cos\left(90°-\theta\right)}$?

A) –1 B) 2 C) 1 D) 0

79. $\tan^2\theta - \sin^2\theta = K\tan^2\theta\sin^2\theta$, then the value of K is

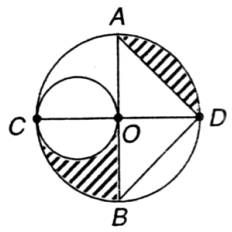
A) 1 B) 2 C) $\frac{1}{2}$ D) $-\frac{1}{2}$

SPACE FOR ROUGH WORK

80. $\sin^2 5^o + \sin^2 10^o + ... + \sin^2 85^o + \sin^2 90^o =$

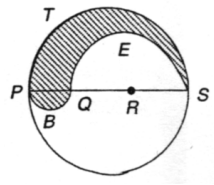
A) $7\frac{1}{2}$ B) $8\frac{1}{2}$ C) $9\frac{1}{2}$ D) $10\frac{1}{2}$

81. In the figure, AB and CD are two diameters of a circle (with centre at O) perpendicular to each other and OC is the diameter of the smaller circle. If OC = 20cm, find the area of the shaded region.



A) $50(4\pi + 3)$ B) $50(4\pi - 3)$ C) $50(3\pi + 4)$ D) $50(3\pi - 4)$

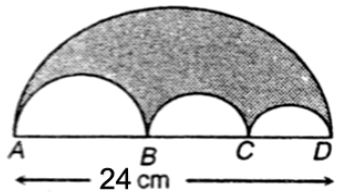
82. PQRS is a diameter of a circle of radius 3 cm. The lengths PQ, QR and RS are equal. Semi-circles are drawn with PQ and QS as diameters, as shown in the given figure. Find area of the shaded region



A) 3π B) 4π C) $\frac{7}{2}\pi$ D) $\frac{9}{2}\pi$

SPACE FOR ROUGH WORK

83. In the figure provided, are shown four semi-circles are shown with AD = 24cm and AB:BC:CD = 3:2:1. Determine the perimeter of the shaded region is



A) 60π B) 24π

C) 64π D) 84π

84. If a, b, c be the 4^{th}, 7^{th} and 10^{th} term of an AP respectively then the sum of the roots of the equation $ax^2-2bx + c = 0$

A) $-\frac{b}{a}$ B) $-\frac{2}{a}$

C) $\frac{c+a}{a}$ D) Can not be determined

85. The number of integral solution of the equation $7\left(y+\frac{1}{y}\right)-2\left(y^2+\frac{1}{y^2}\right)=9$

A) 0 B) 1 C) 2 D) 3

SPACE FOR ROUGH WORK

PART II

This part contains 5 questions

Question No. 86-90

The answer to each question is a NUMBER ranging from 0 to 999, both inclusive

For each question, darken the bubble corresponding to the correct integer/s in the ORS

Full Marks : +4 If only the bubble corresponding to the correct option is darkened

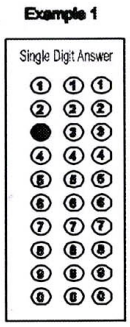
Zero Marks : 0 If none of the bubbles is darkened

Negative Marks : No negative mark for incorrect answer

CORRECT METHOD FOR MARKING PART - II QUESTIONS

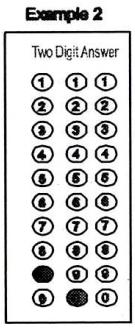
If Single Digit Answer

If answer is 3



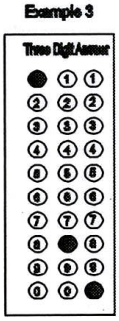
If Two Digit Answer

If answer is 90



If Three Digit Answer

If answer is 180



SPACE FOR ROUGH WORK

86. If 40 persons consume 240kg of rice in 15 days, in how many days will 30 persons consume 48 kg of rice

87. If α and β are the roots of $x^2 - 7x + 1 = 0$, then the value of $\frac{1}{(\alpha - 7)^2} + \frac{1}{(\beta - 7)^2} =$

88. The sum of first 9 terms of $\frac{1^2}{1} + \frac{1^3 + 2^3}{1+3} + \frac{1^3 + 2^3 + 3^3}{1+3+5} + \ldots\ldots\ldots$ is

89. Sanjana travels 660 km. partly by train and partly by car. If she covers 300km by train and the rest by car, it takes 13.5 hours. But, if she travels 360 km by train and the rest by car, she takes 30minutes longer. Find the time taken by Sanjana if she travels 660km by car. (in hours)

90. The mode of 3,5,7,3,4,2,2,3,5 is .....

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

Name .....

Batch..... Roll No. .....

Brilliant STUDY CENTRE
PALA

VERSION
A

31 - 03 2019 **PHYSICS + CHEMISTRY - MATHEMATICS - KEY**

PHYSICS		CHEMISTRY		MATHEMATICS	
1.	A	31.	A	61.	A
2.	B	32.	A	62.	D
3.	C	33.	A	63.	A
4.	A	34.	D	64.	C
5.	C	35.	D	65.	A
6.	A	36.	C	66.	C
7.	D	37.	B	67.	A
8.	A	38.	C	68.	C
9.	D	39.	D	69.	C
10.	C	40.	A	70.	B
11.	C	41.	C	71.	D
12.	B	42.	B	72.	D
13.	D	43.	B	73.	D
14.	A	44.	B	74.	C
15.	D	45.	A	75.	B
16.	D	46.	C	76.	D
17.	B	47.	C	77.	B
18.	A	48.	B	78.	B
19.	B	49.	D	79.	A
20.	B	50.	A	80.	C
21.	C	51.	C	81.	D
22.	D	52.	B	82.	A
23.	B	53.	D	83.	B
24.	D	54.	D	84.	C
25.	C	55.	D	85.	B
26.	24	56.	3	86.	4
27.	3	57.	18	87.	47
28.	1	58.	11	88.	96
29.	2	59.	7	89.	11
30.	5	60.	10	90.	3