

Date: 00st October 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 the Answer sheet to the invigilator at the end of the examination

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

Name of the Candidate

I have read all the instructions and shall abide by them

Signature of the Candidate

Roll Number

I have verified all the information filled by the candidate

Signature of the Invigilator

SECTION I - PHYSICS

PART A : (Objective type Multiple choice question) - MCQ TYPE

1. Column I has four physical quantities. Column II has four units. Match entries in column I with entries in column II

Column I

A) Acceleration

B) Density

C) Specific heat capacity

D) Force

A) A-q, B-p, C-r, D-s

C) A-q, B-q, C-r, D-s

Column II

p) Kg ms^{-2}

q) ms^{-2}

r) Kg m^{-3}

s) $\text{J kg}^{-1} \text{ }^\circ\text{C}^{-1}$

B) A-q, B-s, C-r, D-p

D) A-q, B-r, C-s, D-p

2. A particle covers half of the circle of radius r . Then the displacement and distance of particle are respectively

A) $2\pi r, 0$

B) $2r, \pi r$

C) $\frac{\pi r}{2}, 2r$

D) $0, \pi r$

3. If v - t graph is a straight line inclined to time axis then

A) $a = 0$

B) $a \geq 0$

C) $a = \text{constant} \neq 0$

D) $a \neq \text{constant} \neq 0$

4. An object is situated at a distance of $f/2$ from a convex lens of focal length f . Distance of image will be

A) $\left(+\frac{f}{2}\right)$

B) $\left(+\frac{f}{3}\right)$

C) $\left(+\frac{f}{4}\right)$

D) $-f$

5. The resistivity of wire depends on

A) length

B) area of cross section

C) material

D) all the above three factors

6. Two point masses each equal to 1 kg attract one another with a force of 10^{-10}N . The distance between the two point masses is

A) 8cm

B) 80cm

C) 0.8cm

D) 0.08 cm

7. Choose the correct statements from following

a) Mechanical wave needs medium for their propagation

b) Sound cannot travel through vacuum

c) Mechanical waves transport energy from one place to another

d) sound waves are nonmechanical waves

A) a,c,d

B) a,b,c

C) b,c,d

D) a,b,c,d

8. An ice cream has a marked value of 700 Kcal. How many kilowatt hour of energy will it deliver to the body as it is digested

A) 0.81 Kwh

B) 0.90 Kwh

C) 1.11 Kwh

D) 70.71 Kwh

9. An electric kettle takes 4A current at 220V. How much time will it take to boil 1 kg of water from temperature 20°C . The temperature of boiling water is 100°C

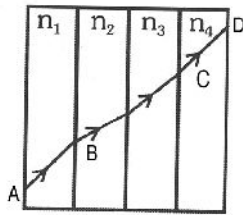
A) 12.6 min

B) 4.2 min

C) 6.3 min

D) 8.4 min

20. A ray of light passes through 4 transparent media with refractive index n_1, n_2, n_3, n_4 as shown in the figure. The surface of all the medias are parallel. If the emergent ray CD is parallel to the incident ray AB, we must have

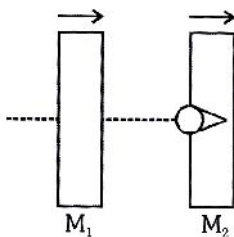


- A) $n_1 = n_2$ B) $n_2 = n_3$ C) $n_3 = n_4$ D) $n_4 = n_1$

PART - B- NUMERICAL TYPE

(Each questions has an answer which is number one/two/three digits)

21. An electric lamp is marked 60W 230V. The cost of a 1 kwh of energy is Rs.1.25. The cost of using this lamp 8 hrs a day for 30 days
22. A block of wood weighs 4N in air and 3N when immersed in a liquid. The buoyant force in newton is
23. Ultrasonic signal sent from sonar returns to it after reflection from a rock after a lapse of 1 sec. If the velocity of ultrasound in water is 1600 ms^{-1} , the depth of rock in water is (Ans. in metre)
24. Power of a water pump is 2kW. If $g = 10 \text{ m/s}^2$ the amount of water it can raise in one minute to a height of 10m (Ans. in litre)
25. A bullet moving with velocity 200 cm/s penetrates a wooden block and comes to rest after traversing 4cm inside it. What velocity is needed for travelling a distance at 9cm in same block (Ans. in cm/s)
26. One car moving on a straight road covers one third of distance with 20 km/hr and rest with 60 km/hr. The average speed is in km/hr
27. The energy required to accelerate a car from 10 m/s to 20 m/s how many times the energy required to accelerate the car from rest to 10 m/s
28. A 20g bullet pierces through a plate of mass $M_1 = 1 \text{ kg}$ and then comes to rest inside a second plate of mass $M_2 = 2.98 \text{ kg}$ as shown in the figure. It is found that the two plates initially at rest and now move with equal velocities. Find the percentage loss in the initial velocity of the bullet when it is between M_1 and M_2 , (Neglect any loss of material of the plates due to the action of bullet)

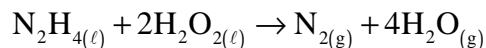


29. 6Ω and 12Ω resistors are connected in parallel. This combination is connected to series with a 10V battery and 6Ω resistor. What is the potential difference between the terminals of the 12Ω resistance ?
30. Train A of length 120 m moving with a velocity 20m/sec is about to cross another train B of length 130m, moving towards it from opposite direction with a speed of 30m/sec. then find the time duration during which the trains would cross each other (Ans. in sec)

SECTION-II : CHEMISTRY

PART A : (Objective type Multiple choice question) - MCO TYPE

31. 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



How much of the excess reactant, remains unchanged ? when 0.750 mol of N_2H_4 is mixed with 17g of H_2O_2 ?

- A) 16g N_2H_4 B) 0.25 mol H_2O_2 C) 0.25 mol N_2H_4 D) 8.5 g H_2O_2
32. Which one of the following combinations is false ?
- | Solution type | Particle size |
|---------------------------------|----------------------------|
| A) Colloidal solution | 10^{-5} to 10^{-7} cm |
| B) True solution | 10^{-7} to 10^{-8} cm |
| C) Suspension | 10^{-9} to 10^{-12} cm |
| D) All are correct combinations | |
33. An atom has 2K, 8L and 5M electrons. Choose the correct statement(s) regarding it
- a) Trivalent anion of this atom will have 12 protons in its nucleus
b) Trivalent cation of this atom will have six p-electrons in it
c) This atoms form an amphoteric oxide of formula X_2O_3
d) One of its allotrope is tetra atomic (X_4)

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

34. Chlorine (Cl) and oxygen form four different binary compounds. Analysis gives the following results

Compound	Mass of O combined with 1.0gCl
A	0.226 g
B	0.909 g
C	1.354 g
D	1.579 g

Compound A has a formula that is some multiple of Cl_2O , then which of the following is incorrectly said ?

- A) Compound B is Cl_2O_5 (or Cl_4O_{10} , or Cl_6O_{15} , and so forth)
B) Compound C is Cl_2O_6 (or ClO_3 , or Cl_3O_9 , and so forth)
C) Compound D is Cl_2O_7 (or a multiple thereof)
D) The above data show that the law of multiple proportions holds for these compounds
35. Water is a
- A) protophobic solvent B) protophilic solvent
C) aprotic solvent D) amphiprotic solvent
36. Select from the following acids, the correct order of their increasing acidity
- A) $HF < NH_3 < CH_4 < H_2O$ B) $H_2O < NH_3 < CH_4 < HF$
C) $CH_4 < H_2O < NH_3 < HF$ D) $CH_4 < NH_3 < H_2O < HF$

37. All of the following processes involve a separation of either a mixture into its components, or a compound into elements. For each, decide whether a physical process or a chemical reaction is required
- Sodium metal is obtained from the substance Sodium chloride
 - Iron filings are separated from sand by using a magnet
 - Sugar crystals are separated from sugar syrup by evaporation of water
 - Fine crystals of Silver chloride are separated from a suspension of the crystals in water
 - Copper is produced when Zinc metal is placed in a solution of Copper (II) sulphate, a compound

Physical processes

Chemical processes

A) a,b,c

d,e

B) a,d

b,c,e

C) b,c,d

a,e

D) e

a,b,e,d

38. The purity of a substance can be gauged by the following, except
- its melting point
 - its boiling point
 - Chromatography
 - Physical appearance
39. You are presented with three bottles A,B,C each containing a different liquid. Bottles are labelled as follows
- Bottle A : Ionic compound - Boiling point 30°C
- Bottle B : molecular compound - Boiling point 29.2°C
- Bottle C : molecular compound - Boiling point 67.1°C
- Choose the correct statement
- The compound most likely to be incorrectly identified is bottle A
 - The substance in bottle B has strongest intermolecular attractions
 - The substance in bottle C is highly volatile
 - A pure aqueous solution of compound in bottle B is a good conductor of electricity among the three
40. Who introduced pH scale
- Sorenson
 - Stoney
 - Soret
 - Sea borg
41. Carbogen is the mixture which is used for artificial respiration. The composition of the mixture is
- a mixture of O₂ and 5-10% N₂
 - a mixture of O₂ and 5-10% CO₂
 - a mixture of O₂ and 5-10% CO
 - a mixture of O₂ and 5-10% O₃
42. The nonmetal having metallic lustre is
- iodine
 - phosphorus
 - sulphur
 - all of these
43. Metal having highest oxidation state is
- Manganese
 - Iron
 - Osmium
 - Platinum
44. Galena is the ore of
- Pb
 - Hg
 - Fe
 - Cu
45. Among the following pairs, which contain both neutral oxides
- SiO₂, CO
 - NO, N₂O
 - NO, SO₃
 - N₂O, SO₂
46. 4.4g CO₂ and 2.24L of H₂ gas at STP are mixed in a container. The total number of molecules present in the container will be
- 1.2044×10^{23}
 - 6.022×10^{23}
 - 2 mole
 - 6.022×10^{24}

47. Which organic compound first synthesised in the laboratory ?
 A) Alcohol B) Ether C) Ester D) Urea
48. 1 L each of N_2 gas, ozone gas CH_4 gas at STP contains the ratio of number of atoms respectively
 A) 1:1:1 B) 2:3:5 C) 1:2:5 D) 2:5:3
49. Ethylene is isoelectronic with
 A) chlorine B) oxygen C) nitrogen gas D) CO_2
50. Among the following which one is aldehyde functional group
- A) $R - \overset{\overset{O}{\parallel}}{C} - OH$ B) $R - \overset{\overset{O}{\parallel}}{C} - H$ C) $R - \overset{\overset{O}{\parallel}}{C} - OR$ D) $R - \overset{\overset{O}{\parallel}}{C} - R$

PART - B : NUMERICAL TYPE

(Each questions has an answer which is number one/two/three digits)

51. The weight of iron which will be converted in Fe_3O_4 by the action of 18g steam on it will be:
 52. What is the mass of oxygen required to react completely with 15g of H_2 gas to form water?
 53. Atomic number of Rubidium
 54. Number of valence electrons present in group 1 elements
 55. Find the atomic mass of Se in the Dobereiner's triad S, Se, Te. Atomic masses of S and Te are 32 and 128 respectively.
 56. The atomicity of sulphur is
 57. How much water is should be added to 32 ml acetone to make its concentration 20%
 58. How much water should be added to 20 grams of salt to obtain 20% salt solution?
 59. Number of transuranium elements from the following
 Fm, Ce, Pa, Pm, Pu, Am, Bk, U
 60. Molecular mass of H_2SO_4 is

SECTION-III: MATHEMATICS

PART A : (Objective type Multiple choice question) - MCQ TYPE

61. $\sqrt{x} = x - 2$ then x =
 A) 1 B) 1,4 C) 4, 2 D) 4
62. The last digit of $(253)^{1002}$ is
 A) 4 B) 3 C) 9 D) 2
63. A circle of radius 3 makes a complete roll on a line segment AB then AB is
 A) 4π B) 6π C) 7π D) 5π
64. If $a + \frac{1}{a} = \sqrt{3}$ then $a^3 + \frac{1}{a^3} =$
 A) 0 B) 1 C) 2 D) 3
65. Which rational expression should be added to $\frac{x-x^2+2}{x(x^2-1)}$ to get $\frac{x+1}{x^2-1}$
 A) $\frac{2}{x}$ B) $\frac{x}{2}$ C) $2x$ D) x^2

78. In what ratio is the line segment joining the point $(-2,-3)$ and $(3,7)$ divided by the y axis
 A) 3:2 B) 2:3 C) 4:5 D) 5:4
79. The midpoints of the sides of a triangle are $(3,4)$ $(4,1)$ and $(2,0)$. Which of the following does not denote the coordinates of its vertices
 A) $(5,3)$ B) $(1,3)$ C) $(5,5)$ D) $(3,-3)$
80. In a single throw of a die what is the probability of getting a number greater than 4
 A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{2}{3}$ D) $\frac{1}{3}$

PART - B : NUMERICAL TYPE

(Each questions has an answer which is number one/two/three digits)

81. The greatest number of four digits which when divided by 3, 5, 7, 9 leaves the remainders 1, 3, 5, 7 respectively is -----
82. In the given figure, AB is the diameter of a circle with O and and AT is a tangent. If $\angle AOQ = 58^\circ$, then the value of $\angle ATQ$ is -----
83. A man standing on the bank of the river observes the angle subtended by a tree on the opposite bank is 60° , when he retiers 36m from the bank he finds the angle to be 30° . Find the breadth of the river
84. A path 7 meters wide surrounds outside a circular lawn 252m in diameter. Find the area of the path
85. The three cotermious edges of a rectangular solid and 36cm, 75cm and 80cm respectively. Find the edge of a cube which will be of the same capacity
86. If the numbers $3k+4$, $7k+1$ and $12k-5$ are in A.P then the value of k is
87. How many terms of the A.P $9,17,25,\dots$ must be taken to give the sum 636
88. The distance of the chord of length 16cm from the centre of the circle of diameter 20cm is
89. The distance between two parallel chords of lengths 8cm and 6cm in a circle of diameter 10cm if the chords are on the same side of the centre is
90. The distance between the point $(2,3)$ and its image with respect to the X axis is

Section-1 : PHYSICS

1. D
2. B
3. C
4. D
5. C
6. B
7. B
8. A
9. C
10. B
11. D
12. C
13. A
14. B
15. C
16. A
17. D
18. C
19. A
20. D
21. Rs. 18
22. 1
23. 800 m
24. 1200 lit
25. 300 cm/s
26. 36
27. 3
28. 25
29. 4
30. 5

Section-II : Chemistry

31. A
32. C
33. D
34. A
35. D
36. D
37. C
38. D
39. A
40. A
41. B
42. A
43. C
44. A
45. B
46. A
47. D
48. B
49. B
50. B
51. 42
52. 120
53. 37
54. 1
55. 80
56. 8
57. 128
58. 80
59. 4
60. 98

Section-III : Mathematics

61. D
62. C
63. B
64. A
65. A
66. B
67. D
68. C
69. C
70. B
71. A
72. A
73. C
74. C
75. D
76. A
77. C
78. B
79. A
80. D
81. 9763
82. 61
83. 18
84. 5698
85. 60
86. 3
87. 12
88. 6
89. 1
90. 6