	Time Allowed :2 Hour 30 mins	Maximum Marks:125	Total Questions :125	
General Instructions				
Read the following instructions very carefully and strictly follow them:				
1.	1. This question paper contains total 125 questions divided into four parts :			
2.	2. Part I : Physics Q. No - 1 to 35			
3.	3. Part II : Chemistry Q. No - 36 to 70			
4.	4. Part III : Mathematics Q. No - 71 to 110			
5.	5. Part IV : Aptitude Test Q. No - 111 to 120			
6.	6. Part V : English Q. No - 121 to 125			
7.	. All questions are multiple choice questions with four options, only one of them is correct.			
8.	3. For each correct response, the candidate will get 1 mark.			
9.	There is no negative marking for the wrong answer.			
10.	10. The test is of $2\frac{1}{2}$ hours duration.			

## Part I: Physics

1. The force between two point charges q1 and q2 placed in a vacuum at r cm apart is F. The Force between them when placed in a medium having dielectric K = 5 at r/5 cm apart will be: (a) F 25 (b) 5F (c) F 5 1(d) 25F

2. A parallel plate capacitor has 1  $\mu$ F capacitance. One of its two plates is given a +2 $\mu$ C charge, and the other plate is given, +4 $\mu$ C charge. The potential difference developed across the capacitor is (a) 3 V (b) 1 V (c) 5 V (d) 2 V

3. A body of mass M at rest explodes into three pieces in the ratio of masses 1:1:2. Two smaller pieces fly off perpendicular to each other with velocities of 30 m/s and 40 m/s, respectively. The velocity of the third piece will be: (a) 15 m/s (b) 25 m/s (c) 35 m/s (d) 50 m/s

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4. Two objects, A and B, are placed at 15 cm and 25 cm from the pole in front of a concave mirror having a radius of curvature 40 cm. The distance between images formed by the mirror is (a) 60 cm, (b) 40 cm, (c) 160 cm (d) 100 cm

5. A heavy box of mass 50 kg is moving on a horizontal surface. If the coefficient of kinetic friction between the box and the horizontal surface is 0.3, then the force of kinetic friction is (a) 14.7 N (b) 147 N (c) 1.47 N (d) 1470 N

6. When unpolarized light is incident at an angle of  $60^{\circ}$  on a transparent medium from air, the reflected ray is completely polarized. The angle of refraction in the medium is (a)  $30^{\circ}$  (b)  $60^{\circ}$  (c)  $90^{\circ}$  (d)  $45^{\circ}$ 

7. A long straight wire of circular cross section (radius a) is carrying a steady current I. The current I is uniformly distributed across this cross 7 section. The magnetic field is: (a) Zero in the region r < a and inversely preparticulated to r in the region r > a.

(a) Zero in the region r < a and inversely proportional to r in the region r > a

(b) Inversely proportional to r in the region r < a and uniform throughout in the region r > a(c) Directly proportional to r in the region r < a and inversely proportional to r in the region r > a

(d) Uniform in the region r < a and inversely proportional to distance r from the axis, in the region r > a

8. A sinusoidal voltage of amplitude 25 V and frequency 50 Hz is applied to a half-wave rectifier using a P-N junction diode. No filter is used, and the load resistor is 1000 $\Omega$ . The forward resistance Rf of the ideal diode is 10 $\Omega$ . The percentage rectifier efficiency is: (A) 40% (B) 20% (C) 30% (D) 15%

9. A flask contains a monoatomic and a diatomic gas in the ratio of 4 : 1 by mass at a temperature of 300K. The ratio of average kinetic energy per molecule of the two gases is: (A) 1 : 1 (B) 2 : 1 (C) 4 : 1 (D) 1 : 4

10. Water falls from a 40 m high dam at the rate of 9×104 kg per hour. Fifty percent of gravitational potential energy can be converted into electrical energy. The number of 100W lamps that can be lit is: (A) 25 (B) 50 (C) 100 (D) 18

11. A sinusoidal voltage of amplitude 25 V and frequency 50 Hz is applied to a half-wave rectifier using a P-N junction diode. No filter is used, and the load resistor is 1000 $\Omega$ . The forward resistance Rf of the ideal diode is 10 $\Omega$ . The percentage rectifier efficiency is: (A) 40% (B) 20% (C) 30% (D) 15%

12. In a Rutherford scattering experiment, when a projectile of charge Z1 and mass M1 approaches a target nucleus of charge Z2 and mass M2, the distance of closest approach is r0. The energy of the projectile is: (A) Directly proportional to Z1Z2 (B) Inversely proportional to Z1 (C) Directly proportional to mass M1 (D) Directly proportional to M1 × M2

Part 2 Chemistry

- 1. Polarizability of halide ions increases in the order:  $12(A) F \langle I \langle Br \langle CI (B) CI \langle Br \langle I \langle F (C) I \langle Br \langle CI \langle F (D) F \langle CI \langle Br \langle I \langle F (C) F \langle CI \langle F (C) F \langle CI \langle F \langle F \langle C \langle F \langle F \langle C \langle F \langle$
- 2. The statement that is not correct for the periodic classification of elements is: (A) The properties of elements are periodic functions of their atomic numbers. (B) Non-metallic elements are less in number than metallic elements. (C) For transition elements, the 3d-orbitals are filled with electrons after 3p-orbitals and before 4s-orbitals. (D) The first ionisation enthalpies of elements generally increase with the increase in atomic number as we go along a period.
- 3. Which of the following statements is false? (A) Cannizzaro reaction is given by aldehydes in the presence of alkali. (B) Aldol condensation is given by aldehydes in the presence of alkali. (C) Aldol condensation is given by aldehydes and ketones in the presence of acids. (D) None of the above.
- Which of the following compounds does not show Lassaigne's test for nitrogen? (A) Urea
   (B) Hydrazine (C) Phenylhydrazine (D) Azobenzene
- 5. A first-order reaction is half completed in 45 minutes. How long does it need for 99.9% of the reaction to be completed? (A) 5 hours (B) 7.5 hours (C) 10 hours 17(D) 20 hours
- 6. The element not showing a variable oxidation state is (a) Bromine (b) Iodine (c) Chlorine (d) Fluorine
- 7. The oxidation number of H in NaH, CaH2, and LiH, respectively, is (a) +1, +1,-1 (b)-1, +1, +1 (c) +1, +1, +1 (d)-1,-1,-1
- Phenol does not undergo nucleophilic substitution reaction easily due to (a) the acidic nature of phenol (b) the partial double bond character of C OH bond (c) the partial double bond character of the C C bond (d) the instability of the phenoxide ion
- 9. Which of the following exhibits Frenkel defects? (A) Sodium chloride (B) Silver bromide (C) Graphite (D) Diamond
- In a reaction, the threshold energy is equal to: (A) Activation energy + normal energy of reactants (B) Activation energy- normal energy of reactants (C) Normal energy of reactants- activation energy (D) Average kinetic energy of molecules of reactants

## Part III: Mathematics

 The number of students who take both the subjects mathematics and chemistry is 30.This represents 10% of the enrolment in mathematics and 12% of the enrolment in chemistry. How many students take at least one of these two subjects? [(a)] 520 490 560 480

- A and Bare independent events of a random experiment if and only if: (a) P(A|B)= P(A∩B) (b) P(A|B) = P(B|A) (c) P(A|B)= P(A|Bc) (d) P(A|B) = P(A|Bc)
- 3. The equation of a common tangent to the parabolas  $y = x^2$  and  $y = (x-2)^2$  is: (a) y = 4(x-2) (b) y = 4(x-1) (c) y = 4(x+1) (d) y = 4(x+2)
- 4. The number of different permutations of all the letters of the word "PERMUTATION" such that any two consecutive letters in the arrangement are neither both vowels nor both identical is: (a) 63 ×6!×5! (b) 57 ×5!×5! 28(c) 33 ×6! ×5! (d) 7 ×7!×5!
- 5. The circle touching the y axis at a distance 4 units from the origin and cutting off an intercept 6 from the x-axis is: (A) x2 +y2 ±10x-8y+16 = 0 (B) x2 +y2 ±5x-8y+16 = 0 (C) x2 +y2 ±5x-2y-8 = 0 29(D) x2 +y2 ±2x-y-12 = 0
- The probability that a card drawn from a pack of 52 cards will be a diamond or a king is (A) 1/52 (B) 2/13 (C) 4/13 (D) 1/13
- 7. The domain of the function is: (A)  $-3 \le x \le 3$  (B) -3 < x < 3 (C)  $-9 \le x \le 9$  (D) -9 < x < 9
- In △ABC, the mid-point of the sides AB, BC and CA are respectively (1,0,0),(0,m,0) and (0,0,n). (A) 8 (B) 16 (C) 9 (D) 25
- The mean and variance of a random variable X having a binomial distribution are 4 and 2, respectively. Find P(X = 1). (A) 1/4 (B) 1/32 (C) 1/16 (D) <sup>1</sup>/<sub>8</sub>

10.

Part 4: Aptitude Test

DIRECTIONS: These questions are to be answered based on the pie chart given below showing how a person's monthly salary is distributed over different expense heads.

1. For a person whose monthly salary is Rs 6,000 p.m., how many items are there on which he has to spend more than Rs 1,000 p.m.? (A) 1 (B) 2 (C) 3 (D) 4

2. If NATION is coded as 467234 and EARN is coded as 1654, then ATTENTION should be coded as: (A) 432769561 (B) 956143654 (C) 766412743 (D) 677147234

3. A man is facing west. He runs 45° in the clockwise direction and then another 180° in the same direction, and then 270° in the anticlockwise direction. Which direction is he facing now?
(a) South (b) North-West (c) West (d) South-West

4. In this question, there are three statements followed by conclusions numbered I and II. You have to take the given statements to be true even if they seem to be at variance from commonly known facts and then decide which of the given conclusions logically follow from the three statements.

Statements: • All books are ledgers. • All pens are keys. • Some pens are books.

Conclusions: • I. Some ledgers are keys. • II. Some keys are books. (a) if only conclusion I follows (b) if only conclusion II follows (c) if neither I nor II follows (d) if both I and II follow

5. What is the approximate percentage increase in the production of Monopoly from 1993 to 1995? (A) 10 (B) 20 (C) 30 (D) 25

6. For which toy category has there been a continuous increase in production over the years?(A) Ludo (B) Chess (C) Monopoly (D) Carrom

7. What is the percentage drop in the production of Ludo from 1992 to 1994? (A) 30 (B) 50 (C) 20 (D) 10

8. Ram moves from a point X to 20 metres towards North. Then he moves 40 metres towards West. Then he moves 20 metres North. Then he moves 40 metres towards East and then 10 metres towards right and he reaches a point Y. Find the distance and direction of Y from X? 36(A) 30 metres, North (B) 40 metres, North (C) 30 metres, South (D) 40 metres, South

9. Statements: I. Some cats are dogs. II. No dog is a toy. Conclusions: I. Some dogs are cats. II. Some toys are cats. III. Some cats are not toys. IV. All toys are cats. (A) Only Conclusions I and either II or III. (B) Only Conclusions II and III follow. (C) Only Conclusions I and II follow. (D) Only Conclusion I follows.

10. Among five persons D,E,F,G,H, each having different heights, who is the second tallest? Statements: I. D is taller than only G and E. F is not the tallest. II. H is taller than F. G is taller than E but shorter than D. (A) If the data in Statement I alone are sufficient to answer the question, while the data in Statement II alone are not sufficient. (B) If the data in Statement II alone are sufficient to answer the question, while the data in Statement I alone are not sufficient. (C) If the data in Statement I alone or in Statement II alone are sufficient to answer the question. (D) If the data in both the Statements I and II together are not sufficient. (E) If the data in both the Statements I and II together are not sufficient.

Part V: English

1. Read the passage carefully and choose the best answer to each question out of the four alternatives.

"People very often complain that poverty is a great evil and that it is not possible to be happy unless one has a lot of money. This is not necessarily true. Even a poor man, living in a small hut with none of the comforts and luxuries of life, may be quite contented with his lot and achieve a measure of happiness. On the other hand, a very rich man, living in a palace and enjoying everything that money can buy, may still be miserable if, for example, he does not enjoy good health or his only son has taken to evil ways. Apart from this, he may have a lot of business worries which keep him on tenterhooks most of the time. There is a limit to what money can buy, and there are many things that are necessary for a man's happiness that money cannot procure. Real happiness is a matter of the right attitude and the capacity of being contented with whatever you have is the most important ingredient of this attitude."

i. The phrase "on tenterhooks" means: (a) in a state of thoughtfulness (b) in a state of anxiety (c) in a state of sadness (d) in a state of forgetfulness

ii. It is true that: (a) money alone can give happiness (b) money always gives happiness (c) money seldom gives happiness (d) money alone cannot give happiness

iii. A rich man's life may become miserable if he: (a) has an evil son, bad health, and business worries; (b) does not enjoy good health; (c) has business worries (d) has business worries and his only son has taken to evil ways

iv. Which of the following is the most appropriate title for the passage? (a) Poverty, a great evil
(b) The key to happiness (c) Contentment, the key to happiness (d) Money and contentment
v. Which of the following statements is true? (a) Only a poor but contented man can be happy
(b) A poor but contented man can never be happy (c) A poor but contented man can be happy
(d) A poor but contented man is always happy

- 2. If someone else's opinion makes us angry, it means that (A) we are subconsciously aware of having no good reason for becoming angry (B) there may be good reasons for his opinion but we are not consciously aware of them (C) our own opinion is not based on good reason and we know this subconsciously (D) we are not consciously aware of any reason for our own opinion
- 3. The writer says if someone maintains that two and two are five, you feel pity because you (A) have sympathy (B) don't agree with him (C) want to help the person (D) feel sorry for his ignorance
- 4. The second sentence in the passage (A) builds up the argument of the first sentence by restating it from the opposite point of view (B) makes the main point which has only been introduced by the first sentence (C) simply adds a further point to the argument already stated in the first sentence (D) illustrates the point made in the first sentence