



[PAPER-I]

SET-A

IPEC EXPLOSIVE MIND TEST

SAMPLE PAPER

CLASS-XI

(For XI to XII Moving Students)

Time : 3 Hrs.

Maximum Marks : 142

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

INSTRUCTIONS

1. The booklet is your Question Paper. Do not break the seal of this booklet before being instructed to do so by the invigilator.
2. Blank spaces and blank pages are provided in the question paper for your rough work. No additional sheets will be provided for rough work.
3. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers and electronic gadgets are **NOT** allowed inside the examination hall.
4. The answer sheet, a machine-readable Optical Response Sheet (**ORS**), is provided separately.
5. On breaking the seal of the booklet check that it contains **8** pages and all the **40** questions.
6. A candidate has to write his / her answers in the ORS sheet by darkening the appropriate bubble with the help of **Black ball point pen** as the correct answer of the question attempted.
7. **Question Paper Format :**
This question paper consists of **3 Parts. Part-I: Mathematics, Part-II: Physics and Part-III: Chemistry.**

Part - I (Maths)	Section - I (2 Comprehensions in 10 single correct type questions)
	Section - II (10 single correct type questions)
Part - II (Physics)	Section - I (2 Comprehensions in 4 single correct type questions)
	Section - II (6 single correct type questions)
Part - III (Chemistry)	Section - I (2 Comprehensions in 4 single correct type questions)
	Section - II (6 single correct type questions)
8. **Marking Scheme :**
Please see the marking scheme as mentioned in all comprehensions.

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PART - I (MATHS)

SECTION - I

[COMPREHENSION TYPE]

This section contains 2 Comprehension (10 Single Correct Type Questions). Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

All Question carries +3 marks for correct answer and No Negative marks for wrong answer

Comprehension#1

Let $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$ be three points such that $AC = AB$ and $\angle CAB = \theta$.

Let $z_1 = x_1 + iy_1, z_2 = x_2 + iy_2$ and $z_3 = x_3 + iy_3$,

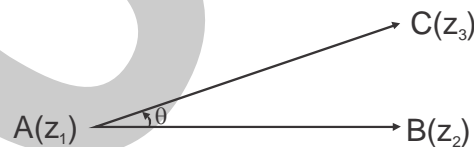
where $i = \sqrt{-1}$. Therefore, $\overline{AB} = z_2 - z_1, \overline{AC} = z_3 - z_1$

Then, \overline{AC} will be obtained by rotating \overline{AB} through an angle θ in anticlockwise sense and therefore

$$\overline{AC} = \overline{AB} e^{i\theta}$$

or
$$(z_3 - z_1) = (z_2 - z_1) e^{i\theta}$$

or
$$\left(\frac{z_3 - z_1}{z_2 - z_1} \right) = e^{i\theta}$$



- The line joining the points $A(1,0)$ and $B(1+\sqrt{3},1)$ is rotated about A by an angle θ . If B goes to $C(2, \sqrt{3})$, then the angle θ is
 (A) 15° (B) 30° (C) 45° (D) 90°
- The extremities of the diagonal of a square are $(1,1), (-2,-1)$, then the equation of the other diagonal is
 (A) $8x + 3y + 4 = 0$ (B) $8x - 3y + 4 = 0$ (C) $6x + 4y + 3 = 0$ (D) $6x - 4y + 3 = 0$

(Space for rough work)



3. The point $(4,1)$ undergoes the following three transformations successively
- Reflection about the line $y = x - 2$
 - Translation by one unit along y-axis in the positive direction
 - Rotation through an angle $\pi/4$ about the origin in the anticlockwise direction.
- Then the final coordinates of the point are
- (A) $(1,4)$ (B) $(3,2)$ (C) $(3,3)$ (D) None of these
4. A point $(2,2)$ undergoes reflection in the x-axis and then the coordinate are rotated through an angle of $\pi/4$ in anticlockwise direction. The final position of the point in the new coordinate system is
- (A) $(0,2\sqrt{2})$ (B) $(0,-2\sqrt{2})$ (C) $(2\sqrt{2},0)$ (D) $(-2\sqrt{2},0)$
5. The line joining the points $A(3,0)$ and $B(5,2)$ is rotated about A in the anticlockwise direction through an angle of 15° , If B goes to C in the new position now the line joining A and C is rotated about A in the anticlockwise direction through an angle of 45° of C goes to D in the new position , then the coordinates of D are
- (A) $(4-\sqrt{3},\sqrt{3}-1)$ (B) $(4+\sqrt{3},\sqrt{3}-1)$ (C) $(4-\sqrt{3},\sqrt{3}+1)$ (D) $(4+\sqrt{3},\sqrt{3}+1)$

Comprehension#2

The sum of the squares of three distinct real numbers which are in strictly increasing GP is S^2 . If their sum of αS .

6. α^2 lies in
- (A) $\left(\frac{1}{3},1\right)$ (B) $(1,2)$ (C) $\left(\frac{1}{3},3\right)$ (D) $\left(\frac{1}{3},1\right) \cup (1,3)$
7. If $\alpha^2 = 2$, then the value of $[r]$ is (where $[.]$ denotes the greatest integer function and r is common ratio of GP)
- (A) 0 (B) 1 (C) 2 (D) 3

(Space for rough work)



8. If $r = 2$, then the value of (α^2) is (where $(.)$ denotes the least integer function and r is common ratio of GP)
 (A) 0 (B) 1 (C) 2 (D) 3
9. If $S = 10\sqrt{3}$, then the greatest value of the middle term is
 (A) 5 (B) $5\sqrt{3}$ (C) 10 (D) $10\sqrt{3}$
10. If we drop the condition that the GP is strictly increasing and take $r^2 = 1$, (where r is common ratio of GP) then the value of α is
 (A) 0 (B) ± 1 (C) ± 2 (D) $\pm\sqrt{3}$

SECTION - II

[SINGLE CORRECT TYPE]

This section contains 10 Single Correct Type Questions). Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

All Question carries +4 marks for correct answer and -1 marks for wrong answer

11. If $|z - 3 + 2i| \leq 4$, (where $i = \sqrt{-1}$) then the difference of greatest and least value of $|z|$ is
 (A) $2\sqrt{11}$ (B) $3\sqrt{11}$ (C) $2\sqrt{13}$ (D) $3\sqrt{13}$
12. The equation $(x-3)^9 + (x-3^2)^9 + (x-3^3)^9 + \dots + (x-3^9)^9 = 0$ has
 (A) all the roots are real (B) one real and 8 imaginary roots
 (C) real roots namely $x = 3, 3^2, \dots, 3^9$ (D) five real and 4 imaginary roots
13. The sum to infinity of the series, $1 + 2\left(1 + \frac{1}{n}\right) + 3\left(1 - \frac{1}{n}\right)^2 + \dots$ is
 (A) n^2 (B) $n(n+1)$ (C) $n\left(1 + \frac{1}{n}\right)^2$ (D) None of these
14. The exponent of 3 in $100!$ is
 (A) 12 (B) 24 (C) 48 (D) 96

(Space for rough work)



15. The largest term in the expansion of $(2 + 3x)^{25}$, where $x = 2$, is its
 (A) 13th term (B) 19th term (C) 20th term (D) 26th term
16. If the area of triangle formed by the points $(2a, b)$, $(a + b, 2b + a)$ and $(2b, 2a)$ be λ , then the area of the triangle whose vertices are $(a + b, a - b)$, $(3b - a, b + 3a)$ and $(3a - b, 3b - a)$ will be
 (A) $\frac{3}{2}\lambda$ (B) 3λ (C) 4λ (D) None of these
17. The two circles $x^2 + y^2 + ax = 0$ and $x^2 + y^2 = c^2$ touch each other, if
 (A) $a + c = 0$ (B) $a - c = 0$ (C) $a^2 = c^2$ (D) None of these
18. The locus of the points of trisection of the double ordinates of the parabola $y^2 = 4ax$ is
 (A) $y^2 = ax$ (B) $9y^2 = 4ax$ (C) $9y^2 = ax$ (D) $y^2 = 9ax$
19. Let P be a variable point on the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ with foci at S and S', If A be the area of triangle PSS', then the maximum value of A is
 (A) 24 sq unit (B) 12 sq unit (C) 36 sq unit (D) None of these
20. If the eccentricity of the hyperbola $x^2 - y^2 \sec^2 \alpha = 5$ is $\sqrt{3}$ times the eccentricity of the ellipse $x^2 \sec^2 \alpha + y^2 = 25$, then a value of α is
 (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

(Space for rough work)

PART - II (Physics)

SECTION - I

[COMPREHENSION TYPE]

This section contains 2 Comprehension (4 Single Correct Type Questions). Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

All Question carries +3 marks for correct answer and No Negative marks for wrong answer

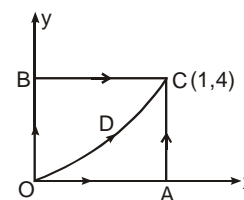
Comprehension#1

The velocity 'v' of a particle moving along straight line is given in terms of time t as $v = 3(t^2 - t)$ where t is in seconds and v is in m/s.

21. The distance travelled by particle from $t = 0$ to $t = 2$ seconds is :
 (A) 2 m (B) 3 m (C) 4 m (D) 6 m
22. The displacement of particle from $t = 0$ to $t = 2$ seconds is
 (A) 1 m (B) 2 m (C) 3 m (D) 4 m

Comprehension#2

A particle is moved along the different paths OAC, OBC & ODC as shown in the fig. Path ODC is a parabola, $y = 4x^2$. Find the work done by a force $\vec{F} = xy \hat{i} + x^2y \hat{j}$ on the particle along these paths.



23. Workdone in moving From O to C along ODC
 (A) $\frac{11}{3}$ J (B) $\frac{19}{10}$ J (C) $\frac{1}{3}$ J (D) $\frac{19}{3}$ J
24. Workdone in moving From O to C along OAC
 (A) 10 J (B) 8 J (C) 6 J (D) 18 J

SECTION - II

[SINGLE CORRECT TYPE]

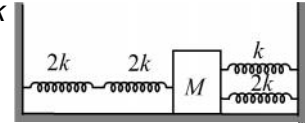
This section contains 6 Single Correct Type Questions). Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

All Question carries +4 marks for correct answer and -1 marks for wrong answer

25. A position dependent force $F = 7 - 2x + 3x^2$ N acts on a small body of mass 2 kg and displaces it from $x = 0$ to $x = 5$ m. The work done in joule is
 (A) 70 J (B) 270 J (C) 35 J (D) 135 J

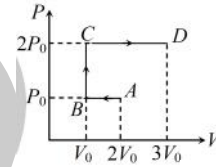
(Space for rough work)

26. Four massless springs whose force constants are $2k$, $2k$, k and $2k$ respectively are attached to a mass M kept on a frictionless plane (as shown in figure). If the mass M is displaced in the horizontal direction, then the frequency of the system



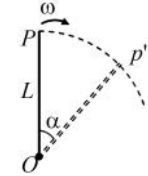
- (A) $\frac{1}{2\pi} \sqrt{\frac{k}{4M}}$ (B) $\frac{1}{2\pi} \sqrt{\frac{4k}{M}}$ (C) $\frac{1}{2\pi} \sqrt{\frac{k}{7M}}$ (D) $\frac{1}{2\pi} \sqrt{\frac{7k}{M}}$

27. P-V diagram of an ideal gas is as shown in figure. Work done by the gas in the process ABCD is



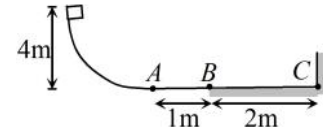
- (A) $4P_0V_0$ (B) $2P_0V_0$
(C) $3P_0V_0$ (D) P_0V_0

25. A rod of uniform mass and of length L can freely rotate in a vertical plane about an axis passing through O . The angular velocity of the rod when it falls from position P and P' through an angle α is



- (A) $\sqrt{\frac{6g}{5L}} \sin \alpha$ (B) $\sqrt{\frac{6g}{L}} \sin \frac{\alpha}{2}$ (C) $\sqrt{\frac{6g}{L}} \cos \frac{\alpha}{2}$ (D) $\sqrt{\frac{6g}{L}} \sin \alpha$

29. A block of mass $m = 0.1$ kg is released from a height of 4 m on a curved smooth surface. On the horizontal surface, path AB is smooth and path BC offers coefficient of friction $\mu = 0.1$. If the impact of block with the vertical wall at C be perfectly elastic, the total distance covered by the block on the horizontal surface before coming to rest will be: (take $g = 10$ m/s²)



- (A) 29 m (B) 49 m (C) 59 m (D) 109 m

30. A projectile's time of flight T is related to the horizontal range R by the equation $gT^2 = 2R$. The angle of projection in degrees is

- (A) 30° (B) 45° (C) 60° (D) 90°

(Space for rough work)

PART - III (CHEMISTRY)

SECTION - I

[COMPREHENSION TYPE]

This section contains 2 Comprehension (4 Single Correct Type Questions). Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

All Question carries +3 marks for correct answer and No Negative marks for wrong answer

Comprehension#1

A german physicist gave a principle about the uncertainties in simultaneous measurement of position and momentum of small particles. According to that physicist.

It is impossible to measure simultaneously the position and momentum of small particle with absolute accuracy or certainty. If an attempt is made to measure any one of these two quantities with higher accuracy, the other becomes less accurate. The product of the uncertainty in position (Δx) and uncertainty IN momentum (Δp) is always constant and is equal to or greater than $h/4\pi$, where h is Planck's constant

$$\text{i.e. } (\Delta x)(\Delta p) \geq \frac{h}{4\pi}$$

31. Uncertainty in position is twice the uncertainty in momentum, uncertainty in velocity is

(A) $\sqrt{\frac{h}{\pi}}$ (B) $\frac{1}{2m}\sqrt{\frac{h}{\pi}}$ (C) $\frac{1}{2m}\sqrt{h}$ (D) $\frac{1}{2\sqrt{2}m}\sqrt{\frac{h}{\pi}}$

32. The uncertainty in position of an electron ($m = 9.1 \times 10^{-28}$ gm) moving with a velocity 3×10^4 cm/s accurate upto 0.001% will be

(A) 3.84 cm (B) 1.92 cm (C) 7.68 cm (D) 5.76 cm

Comprehension#2

The essential conditions for liquefaction of gases were discovered by Andrews in 1869 as a result of his study of pressure-volume-temperature relationship for CO_2 . It was found that above a certain temperature, it was impossible to liquefy a gas whatever the pressure was applied. The temperature below which the gas can be liquefied by the application of pressure alone is called critical temperature (T_c). The pressure required to liquefy a gas at this temperature is called the critical pressure (P_c). The volume occupied by one mole of the substance at the critical temperature and pressure is critical volume. Critical constant are related with van der Waal's constant as follows:

33. The relationship between P_c, V_c and T_c is

(A) $P_c V_c = RT_c$ (B) $P_c V_c = 3RT_c$ (C) $P_c V_c = \frac{3}{5}RT_c$ (D) $P_c V_c = \frac{3}{8}RT_c$

(Space for rough work)



34.	Gases	A	B	C	D
	P_c (Atm)	2.2	14	35	45
	t_c (kelvin)	5.1	33	127	140

Which of the above gases cannot be liquefied at 100 K and 50 atm?

- (A) D only (B) A only (C) A and B (D) C and D

SECTION - II

[SINGLE CORRECT TYPE]

This section contains 6 Single Correct Type Questions. Each question has four choices (A), (B), (C) and (D) out of which ONLY ONE is correct.

All Question carries +4 marks for correct answer and -1 marks for wrong answer

35. An indicator is a weak acid and pH range of its colour is 3 to 5. If the neutral points of the indicator lies in the centre of the hydrogen ion concentration corresponding to given pH range then pH at the equivalence points is :
- (A) 3.3 (B) 4.0 (C) 7.0 (D) 5.0.
36. AB, A_2 and B_2 are diatomic molecules. If the bond enthalpies of A_2 , AB & B_2 are in the ratio 1:1:0.5 and enthalpy of formation of AB from A_2 and B_2 - 100 kJ/mol⁻¹. What is the bond enthalpy of A_2 ?
- (A) 400 kJ/mol (B) 200 kJ/mol (C) 100 kJ/mol (D) 300 kJ/mol
37. A solution of 200 ml of 1 M KOH is added to 200 ml of 1 M HCl and the mixture is well shaken. The rise in temperature is T_1 , The experiment is repeated by using 100 ml of each solution and increase in Temperature T_2 is noted. Which of the following is correct.
- (A) $T_1 = T_2$ (B) T_2 is twice as large as T_1
 (C) T_1 is twice as large as T_2 (D) T_1 is four times as large as T_2
38. Assuming the nucleus and an atom to be spherical, the radius of the nucleus o mass number A is given by $1.25 \times 10^{-13} \times A^{1/3}$ cm. The atomic radius of atom is 1 \AA . If the mass number is 64, the fraction of the atomic volume that is occupied by the nucleus is:
- (A) 1.25×10^{-13} (B) 2.50×10^{-13} (C) 5×10^{-5} (D) None
39. Devitrification of glass is a process for which change in entropy (S)
- (A) -ve (B) + ve
 (C) 0 (D) S value depend on the nature of the glass
40. The potential energy of the electron present in the ground state of Li^{2+} ion is represented by:
- (A) $+\frac{3e^2}{4fV_0r}$ (B) $-\frac{3e}{4fV_0r}$ (C) $-\frac{3e^2}{4fV_0r^2}$ (D) $-\frac{3e^2}{4fV_0r}$

(Space for rough work)