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**BEWARE OF NEGATIVE MARKING**

## PART-1 : PHYSICS

### SECTION-1 : (Maximum Marks: 28)

- This section contains **SEVEN** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:
  - Full Marks* : +4 If only (all) the correct option(s) is (are) chosen.
  - Partial Marks* : +3 If all the four options are correct but **ONLY** three options are chosen.
  - Partial Marks* : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.
  - Partial Marks* : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.
  - Zero Marks* : 0 If none of the options is chosen (i.e. the question is unanswered).
  - Negative Marks* : -2 In all other cases.
- **For Example** : If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in -2 marks.

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1. Choose the **CORRECT** statement(s) :
- (A) The electric potential at a point on the axis of an electric dipole depends on the distance  $r$  of the point from the dipole as  $\frac{1}{r^3}$ .
- (B) Electric dipole moment is a vector quantity.
- (C) When a test charge is brought from infinity along the perpendicular bisector of the electric dipole the work done is zero.
- (D) An electric dipole kept in a uniform electric field may experience torque.

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**Space for Rough Work**

2. Consider a capacitor of capacitance  $10\mu\text{F}$  connected to a battery. The space between the parallel plates is filled slowly with dielectric of dielectric constant 5. Choose the **CORRECT** option(s) :
- (A) If the capacitor was connected to a battery throughout the process electric field before and after insertion of dielectric remains same.
- (B) If the capacitor was disconnected from the battery & then dielectric was inserted, electric field before & after the insertion of dielectric remains same.
- (C) Break down potential of capacitor increases after insertion of dielectric.
- (D) Capacitance of the capacitor increases.
3. Two toy cars with different masses originally at rest are pushed apart by an ideal spring and released. Which of the following statement(s) are **TRUE**?
- (A) Both toy cars will acquire equal but opposite momenta.
- (B) Both toy cars will acquire equal kinetic energy.
- (C) The more massive toy car will acquire less speed.
- (D) The smaller toy car will experience an acceleration of greater magnitude.
4. Which of the following statement(s) are **TRUE** about a stationary wave ?
- (A) No particle will move with same amplitude.
- (B) All particles between two successive nodes reach their extreme position together in phase.
- (C) Displacement and velocity nodes co-exist.
- (D) Velocity nodes and pressure nodes co-exist.

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**Space for Rough Work**



**SECTION-2 : (Maximum Marks : 18)**

- This section contains **SIX** questions of matching type.
- This section contains **Two** tables (each having 3 columns and 4 rows)
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- 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.
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*Full Marks* : +3 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

**Answer Q.1, Q.2 and Q.3 by appropriately matching the information given in the three columns of the following table.**

In a standard YDSE set up, a slab of thickness  $t$  & refractive index  $\mu$  is placed in front of the upper slit. Other symbols have usual meaning.

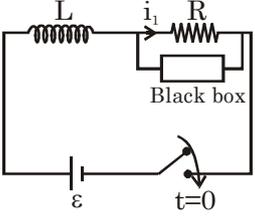
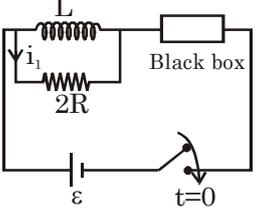
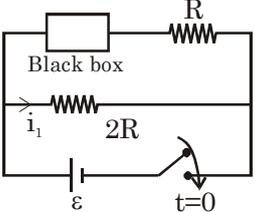
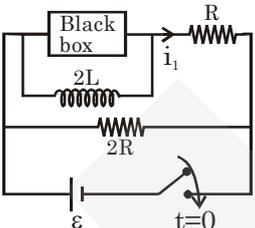
Column-1	Column-2	Column-3
(I) $\frac{D}{d} = 10^{+3}$	(i) $t = 1\mu\text{m}$ $\mu = 1.6$	(P) $\lambda = 400\text{ nm}$
(II) $\frac{D}{d} = 2 \times 10^{+3}$	(ii) $t = 1.5\mu\text{m}$ $\mu = 1.3$	(Q) $\lambda = 500\text{ nm}$
(III) $\frac{D}{d} = 5 \times 10^{+4}$	(iii) $t = 2\mu\text{m}$ $\mu = 1.6$	(R) $\lambda = 600\text{ nm}$
(IV) $\frac{D}{d} = 4 \times 10^{+3}$	(iv) $t = 2.5\mu\text{m}$ $\mu = 1.4$	(S) $\lambda = 700\text{ nm}$

1. In which of the following cases, the central maxima shifts by 1mm ?  
 (A) (II) (i) (P)      (B) (III) (ii) (R)      (C) (IV) (iii) (Q)      (D) (I) (iv) (S)
2. In which of the following cases, the central maxima shifts by 2 fringe width ?  
 (A) (I) (i) (P)      (B) (II) (ii) (Q)      (C) (III) (iii) (R)      (D) (IV) (iv) (S)
3. If the intensity at central maxima is  $I_0$ , in which of the following cases intensity at the centre of the screen is zero ?  
 (A) (I) (i) (P)      (B) (II) (ii) (Q)      (C) (III) (iii) (R)      (D) (IV) (iv) (S)

**Space for Rough Work**

Answer Q.4, Q.5 and Q.6 by appropriately matching the information given in the three columns of the following table.

Column-1 gives various circuit diagram with a black box which can contain either inductor or resistor. Column-2 lists time constant for the various circuit while column-3 lists the value of current ( $i_1$ ) at either  $t = 0$  or  $t \rightarrow \infty$ . Initially before switching on inductor does not carry any energy.

Column-1	Column-2	Column-3
<p>(I) </p>	<p>(i) <math>\frac{L}{2R}</math></p>	<p>(P) <math>i_1 = 0</math> at <math>t = 0</math></p>
<p>(II) </p>	<p>(ii) <math>\frac{2L}{3R}</math></p>	<p>(Q) <math>i_1 = \frac{\epsilon}{R}</math> at <math>t \rightarrow \infty</math></p>
<p>(III) </p>	<p>(iii) <math>\frac{3L}{R}</math></p>	<p>(R) <math>i_1 = \frac{\epsilon}{2R}</math> at <math>t = 0</math></p>
<p>(IV) </p>	<p>(iv) <math>\frac{3L}{2R}</math></p>	<p>(S) <math>i_1 = \frac{\epsilon}{3R}</math> at <math>t = 0</math></p>

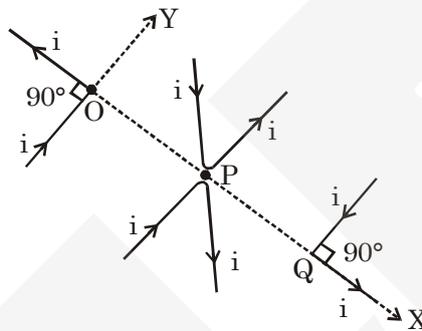
4. If the black box consists of  $\frac{R}{2R}$ , then correct matching will be :  
 (A) (I) (iv) (Q)      (B) (II) (i) (P)      (C) (I) (iv) (R)      (D) (IV) (iii) (P)
5. If the black box consists of  $\frac{R}{R}$ , then correct matching will be :  
 (A) (I) (ii) (P)      (B) (IV) (i) (Q)      (C) (II) (iv) (S)      (D) (II) (iii) (R)
6. If the black box consists of \_\_\_\_\_ (connecting wire), then correct matching will be :  
 (A) (II) (iii) (Q)      (B) (II) (i) (R)      (C) (II) (i) (P)      (D) (II) (ii) (Q)

Space for Rough Work

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- This section contains **FIVE** questions.
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1. Figure shows infinitely long bent wires in the plane of paper and each carrying a current 'i' with 'O' as origin and x and y axis as shown, co-ordinates of points P & Q are (2m, 0) and (6m, 0) respectively. Magnetic induction at P is given by  $\frac{\alpha\mu_0 i}{32\pi}$ . Fill the value of  $\alpha$  in OMR sheet.



2. X-ray are incident normally on a crystal of lattice constant 0.6nm. The first order reflection on diffraction from the crystal occurs at an angle of  $30^\circ$ . The wavelength of the X-ray used is  $\alpha$  nm. Fill  $10\alpha$  in OMR sheet.

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**Space for Rough Work**

3. A galvanometer having a coil resistance of 100 ohm gives a full scale deflection when a current of one milliampere is passed through it. The resistance which can convert this galvanometer into a meter giving a full scale deflection for a current of 10 amperes is connected in parallel. When this modified galvanometer is connected across the terminals of a battery it measures a current of 4A. The current drops to 1A when a resistance of 1.5 ohm is connected in series with the modified galvanometer. Find the emf (in volt) of the battery.
4. Geiger counter reading of a radioactive sample is initially 6800 counts per min. The same sample gives a reading of 425 counts per min 10 hrs later. The sample's half life of  $\alpha$  hr. Fill  $2\alpha$  in OMR sheet.
5. The diameter of a wire of length 100 cm is measured with the help of a screw gauge. The main scale reading is 1 mm and circular scale reading is 25. Pitch of the screw gauge is 1 mm and the total number of divisions on the circular scale is 100. This wire is used in an experiment of determination of Young's modulus of a wire by Searle's method. The following data are available: elongation in the wire  $l = 0.256$  cm under the tension of 50 N, least count for measuring normal length of wire is 0.01 cm and for elongation in the wire is 0.001 cm. Find the maximum percentage error in the calculating value of Young's modulus ( $Y$ ), assuming that the force is measured very accurately.

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**Space for Rough Work**

## PART-2 : CHEMISTRY

### SECTION-1 : (Maximum Marks: 28)

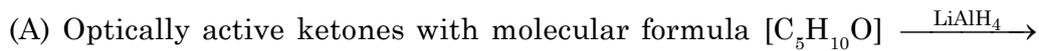
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1. At 300 K , a 0.5 mole sample of air (80% by mol of  $N_2$  & 20% by mol of  $O_2$ ) is put in 10 litre cylinder piston system in which 5 litre water is already present, then -
- $k_H$  for  $N_2 = 10^5$  atm  
 $k_H$  for  $O_2 = 4 \times 10^4$  atm
- (A)  $X_{N_2}$  in  $H_2O$  will be  $1.9704 \times 10^{-5}$   
(B)  $X_{O_2}$  in  $H_2O$  will be  $1.2315 \times 10^{-5}$   
(C) On increasing temperature value of Henry's constant increases  
(D) In  $H_2O$ ,  $N_2(g)$  is more soluble as compare to  $O_2(g)$  at same pressure

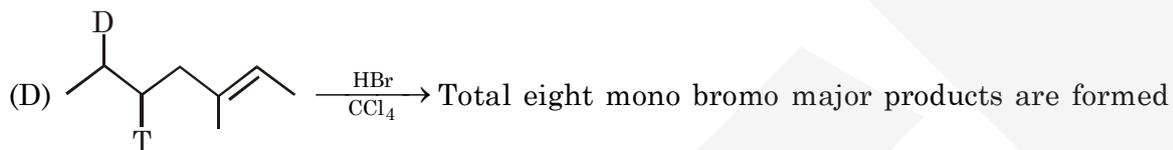
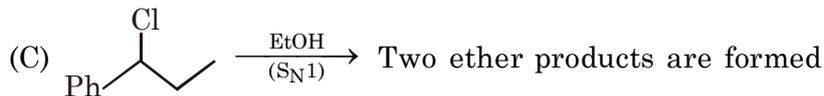
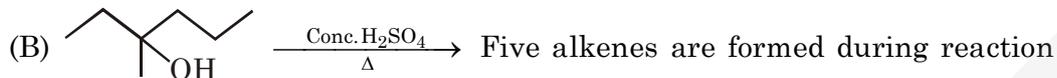
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Space for Rough Work

2. Identify correct match for total number of products?



Total six alcohol products are formed



3. Which of the following processes is/are involved in the extraction of Cu from sulphide ores of copper containing iron sulphide.

(A) FeS is more readily converted to the oxide than  $Cu_2S$

(B) Liq. Matte is placed in converter for carbon reduction

(C)  $Cu_2S$  is partially converted to  $Cu_2O$  by air blasting and then to metallic copper

(D) Silica is added to combine with FeO

4.  $E_{A^+/A}^\circ = 0.5V$  ;  $E_{B^+/B}^\circ = 0.2V$

$E_{C^+/C}^\circ = -0.3V$  ;  $E_{D^+/D}^\circ = -0.1V$

Based on above data select correct statement under standard condition -

(A) Best oxidising agent is  $A^+$

(B) Best reducing agent is D

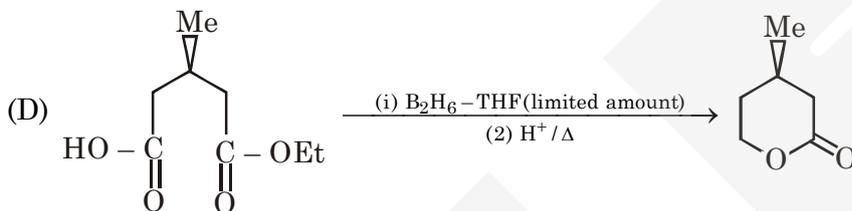
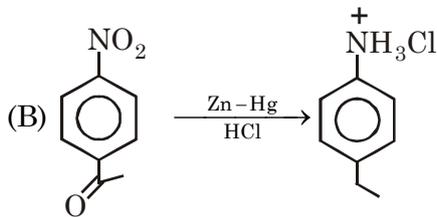
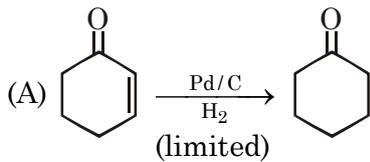
(C) C can displace D from it's solution

(D) In galvanic cell obtained by electrodes A & B current flow from B to A in external circuit

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Space for Rough Work

5. Identify reactions correctly matched with their major product?



6. Select **CORRECT** statement(s).

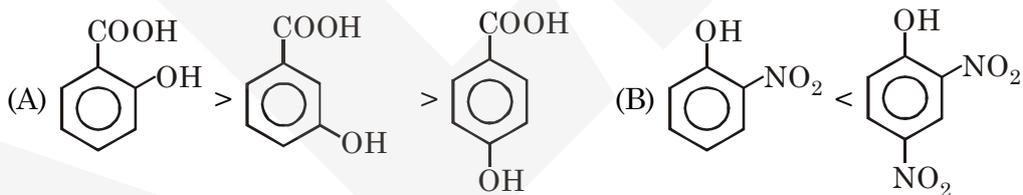
(A)  $H_2$  &  $D_2$  have same internuclear distance

(B)  $H_2$  &  $H_3^+$  have same number of electrons

(C)  $H_3O^+$  &  $H_3^+$  have same number of  $2c-2e^-$  bonds

(D)  $NaHCO_3(s)$  &  $KHCO_3(s)$  have same arrangement of hydrogen bonded  $HCO_3^-$  ions.

7. Identify correct order(s) of acidic strength?



(C)  $HF < HCl < HBr < HI$

(D)  $HOCl < HClO_2 < HClO_3 < HClO_4$

Space for Rough Work

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**Answer Q.1, Q.2 and Q.3 by appropriately matching the information given in the three columns of the following table.**

$$\Delta H_{\text{atomisation}}^0 [\text{C}_2\text{H}_6(\text{g})] = 2810 \text{ kJ/mol} ; \Delta H_{\text{atomisation}}^0 [\text{C}_2\text{H}_4(\text{g})] = 2255 \text{ kJ/mol}$$

$$\Delta H_{\text{f}}^0 [\text{C}_2\text{H}_4(\text{g})] = 25 \text{ kJ/mol} ; \Delta H_{\text{B.E.}}^0 [\text{H}-\text{H}] = 430 \text{ kJ/mol}$$

**Suppose : Bond enthalpy of same bond in different molecule will be equal.**

Column-1	Column-2	Column-3
(A) Enthalpy of hydrogenation of $\text{C}_2\text{H}_4(\text{g})$	(P) $\Delta H^0$ will be positive	(I) $\Delta H^0 > \Delta U^0$
(B) Enthalpy of formation of $\text{C}_2\text{H}_6(\text{g})$	(Q) $\Delta H^0 = -225$	(II) $\Delta H^0 < \Delta U^0$
(C) Enthalpy of hydrogenation of $\text{C}_6\text{H}_6(\text{g})$ (R.E. of $\text{C}_6\text{H}_6(\text{g})$ is 150 kJ/mol)	(R) $\Delta H^0 = -125$	(III) $\Delta S^0 < 0$
(D) $\text{C}_4\text{H}_{10}(\text{g}) \rightarrow \text{C}_2\text{H}_6(\text{g}) + \text{C}_2\text{H}_4(\text{g})$	(S) $\Delta H^0 = -100$	(IV) $\Delta G^0 < 0$ , at very low temperature

1. Which of the following option correctly match  
 (A) A - R - II                      (B) A - P - I                      (C) A - Q - I                      (D) A - S - II
2. Which of the following option correctly match  
 (A) B - P - III                      (B) B - Q - III                      (C) B - R - III                      (D) B - S - III
3. Which of the following option incorrectly match  
 (A) D - P - I                      (B) D - R - I                      (C) C - Q - III                      (D) C - S - IV

**Space for Rough Work**

Answer Q.4, Q.5 and Q.6 by appropriately matching the information given in the three columns of the following table.

Column - 1 Geometry at bold atom O/N	Column - 2 Observed on bold atom	Column - 3 Also observed on bold atom
(I) Bent	(i) $\text{H}_3\text{SiNCO}$	(P) $\text{P}_4\text{O}_6$
(II) Pyramidal	(ii) $\text{O}_3$	(Q) $[\text{M}(\text{H}_2\text{O})_6]^{+n}$
(III) Tetrahedral	(iii) $\text{NOF}_3$	(R) $[\text{NO}_2]^+ [\text{NO}_3]^-$
(IV) Linear	(iv) $\text{H}_3\text{O}^+$	(S) $[\text{Be}_4\text{O}(\text{CH}_3\text{COO})_6]$

4. Select **CORRECT** matching.

(A) (I) (ii) (R)                      (B) (II) (i) (R)                      (C) (III) (iii) (Q)                      (D) (IV) (i) (R)

5. Select **INCORRECT** matching.

(A) (III), (iii) (S)                      (B) (I), (ii) (P)                      (C) (II), (iv) (Q)                      (D) None

6. Select **CORRECT** for anion of (R).

(A) Geometry is same as N of (i)                      (B) Hybridisation of same as N of (iii)

(C) Bond angle is same as O of (ii)                      (D) Hybridisation is same as O of (ii)

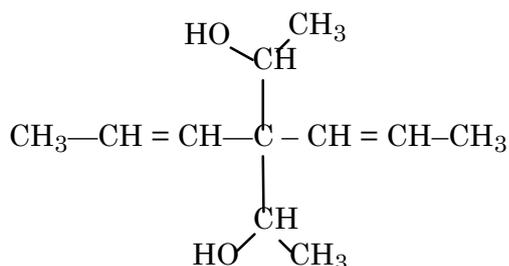
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**Space for Rough Work**

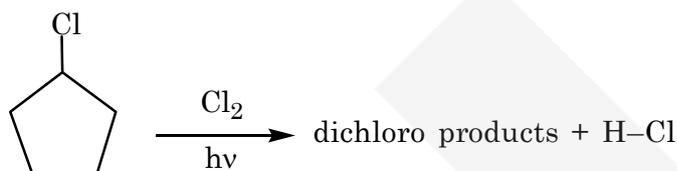
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1. Total number of stereoisomers for following structure is 'X' Then identify the value of (X - 5) is.



2. Identify total number of theoretically possible dichloro products formed in following reaction -



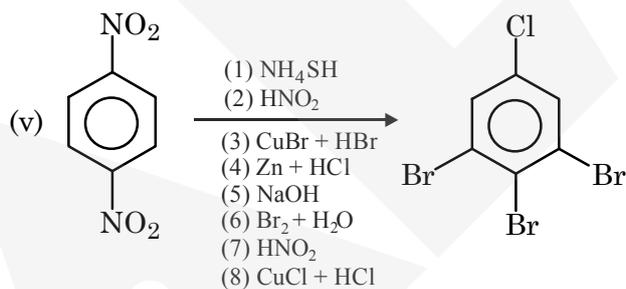
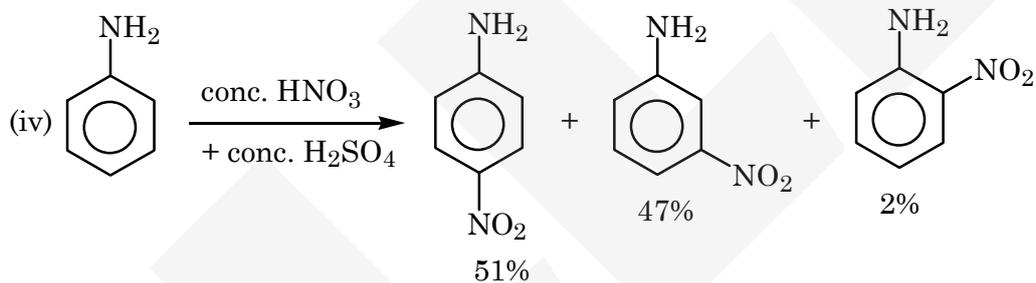
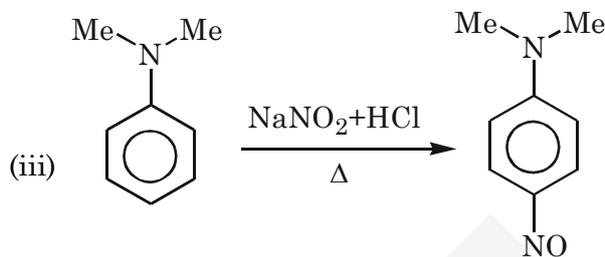
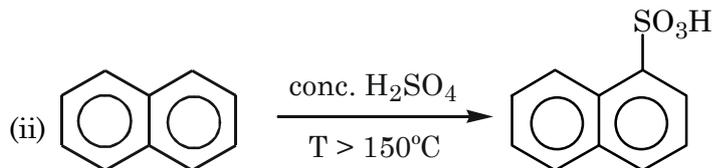
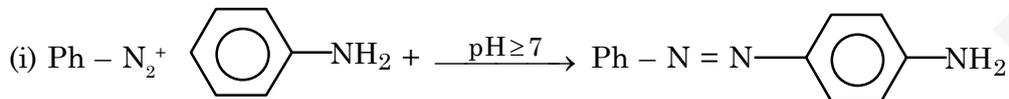
3. Find the number of paramagnetic compound(s) with octahedral anion.



**Space for Rough Work**

4. Ionic solid AB(s) (M.wt. = 50) crystallise in NaCl(s) type structure if edge length of unit cell is  $\frac{1}{3} \times 10^{-7}$  cm then calculate density of AB(s) in gm/ml if it contain  $\frac{100}{3}\%$  schottky defect  $[N_A = 6 \times 10^{23}]$

5. Identify reactions correctly matched with their major products -



Space for Rough Work

**PART-3 : MATHEMATICS**
**SECTION-1 : (Maximum Marks: 28)**

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1. If A is non-singular matrix of order 'n' such that  $3ABA^{-1} + A = 2A^{-1}BA$ , then which of the following is/are true (where  $P^{-1}$  denotes inverse of matrix P and  $|P|$  denotes determinant value of matrix P) -
    - (A)  $|ABA^{-1} - A^{-1}BA| \neq 0$
    - (B)  $|A + B| = 0$
    - (C)  $|ABA^{-1} - A^{-1}BA| = 0$
    - (D)  $|A + B| \neq 0$
  2. Normals are drawn from the point P(15,12) to the parabola  $y^2 = 4x$ . If the feet of the normals form a  $\Delta ABC$ , then which of the following is/are true.
    - (A) Centroid of  $\Delta ABC$  is  $\left(\frac{26}{3}, 0\right)$
    - (B) Centroid of  $\Delta ABC$  is  $\left(\frac{22}{3}, 0\right)$
    - (C) Area of triangle formed by tangents to the parabola at A, B and C is 35 sq. units
    - (D) Area of triangle formed by tangents to the parabola at A, B and C is 140 sq. units
  3. Let  $z_1$  lies on  $|z| = 1$  and  $z_2$  lies on  $|z| = 2$ , then which of the following is/are true -
    - (A) maximum value of  $|z_1 + z_2|$  is 3
    - (B) minimum value of  $|2z_1 - z_2|$  is 0
    - (C) maximum value of  $|2z_1 + z_2|$  is 4
    - (D) minimum value of  $|2z_1 - 3z_2|$  is 5

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**Space for Rough Work**



**SECTION-2 : (Maximum Marks : 18)**

- This section contains **SIX** questions of matching type.
- This section contains **Two** tables (each having 3 columns and 4 rows)
- Based on each table, there are **THREE** questions
- 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* : +3 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

**Answer Q.1, Q.2 and Q.3 by appropriately matching the information given in the three columns of the following table.**

Consider  $f(x) = xe^{-x}$ ,  $g(x) = xe^x$ ,  $p(x) = x^3 - 3x$  and  $q(x) = x^4 - 2x^2 + 3$

Column-1 contain information about different functions.

Column-2 and Column-3 contain information about various aspects of  $h(x)$ .

Column-1	Column-2	Column-3
(I) $h(x) = f(x)$	(i) $h(x)$ is increasing in $x \in (0, 1)$	(P) $h(x) = 2$ has 2 solution.
(II) $h(x) = g(x)$	(ii) $h(x)$ is decreasing in $x \in (0, 1)$	(Q) $h(x) = 0$ has 3 solutions.
(III) $h(x) = p(x)$	(iii) $h'(x)$ is increasing in $x \in (-\infty, -2)$	(R) $h''(x) < 0$ for $x \in (-\infty, -3)$ .
(IV) $h(x) = q(x)$	(iv) $h'(x)$ is decreasing in $x \in (-\infty, -2)$	(S) $h(x)$ has a negative point of minima.

1. Which of the following option is the only **CORRECT** combination ?  
 (A) (I) (iv) (Q)      (B) (IV) (iii) (R)      (C) (II) (iv) (Q)      (D) (I) (iv) (R)
2. Which of the following option is the only **INCORRECT** combination ?  
 (A) (II) (i) (R)      (B) (III) (ii) (P)      (C) (II) (ii) (R)      (D) (III) (iv) (R)
3. Which of the following option is the only **CORRECT** combination ?  
 (A) (IV) (i) (S)      (B) (IV) (iii) (P)      (C) (II) (iv) (Q)      (D) (III) (ii) (S)

**Space for Rough Work**

Answer Q.4, Q.5 and Q.6 by appropriately matching the information given in the three columns of the following table.

Column-1 contain the hyperbola with the given conditions.

Column-2 contain the eccentricity of the hyperbola.

Column-3 contain the information about tangents to the hyperbola.

Column 1	Column 2	Column 3
(I) The distance of one focus of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ from its directrix is 5 and 3	(i) $\sqrt{17}$	(P) There exist infinite points on the plane from which perpendicular tangents can be drawn to hyperbola.
(II) Equation of hyperbola is $x = \frac{e^t + e^{-t}}{2}$ and $y = \frac{e^t - e^{-t}}{3}$ , $t \in \mathbb{R}$ .	(ii) $\sqrt{\frac{3}{2}}$	(Q) There exist no point on the plane from which perpendicular tangents can be drawn to hyperbola.
(III) Tangent to hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ at point $\left(\frac{2a}{\sqrt{3}}, \frac{b}{\sqrt{3}}\right)$ form a triangle of area $3a^2$ square units with the co-ordinate axes.	(iii) $\frac{\sqrt{13}}{3}$	(R) There exist a tangent to hyperbola having slope 1.
(IV) The normal at the point (6,3) on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ intersect the x-axis at (9, 0).	(iv) 2	(S) There exist a tangent to hyperbola having slope 2.
4. Which of the following option is the only <b>CORRECT</b> combination ?	(A) (I) (iv) (R)      (B) (II) (iii) (Q)      (C) (III) (i) (Q)      (D) (IV) (ii) (Q)	
5. Which of the following option is the only <b>INCORRECT</b> combination ?	(A) (I) (iv) (P)      (B) (II) (iii) (P)      (C) (IV) (ii) (R)      (D) (III) (i) (Q)	
6. Which of the following option is the only <b>INCORRECT</b> combination ?	(A) (I) (iv) (S)      (B) (II) (iii) (S)      (C) (IV) (ii) (P)      (D) (III) (i) (S)	

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**Space for Rough Work**

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**SECTION-3 : (Maximum Marks : 15)**

- This section contains **FIVE** questions.
  - The answer to each question is a **SINGLE DIGIT INTEGER** ranging from 0 to 9, both inclusive.
  - For each question, darken the bubble corresponding to the correct integer in the ORS.
  - For each question, marks will be awarded in one of the following categories :  
*Full Marks* : +3 If only the bubble corresponding to the correct answer is darkened.  
*Zero Marks* : 0 In all other cases.
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1. Consider the number  $N = 10!$ . If the number of positive divisors of  $N$  is  $\lambda$ , then  $\frac{\lambda}{30}$  equals
  2. Let  $L_1, L_2$  and  $L_3$  be the length of tangents drawn from a point  $P$  to the circles  $x^2 + y^2 = 4$ ,  $x^2 + y^2 - 4x = 0$  and  $x^2 + y^2 - 4y = 0$  respectively. If  $L_1^4 = L_2^2 L_3^2 + 16$ , then locus of  $P$  are the curves  $C_1$  (a straight line) and  $C_2$  (a circle). Let the circumcentre of the triangle formed by  $C_1$  and other two lines which are inclined at an angle of  $45^\circ$  with  $C_1$  and is tangent to  $C_2$  is  $(\alpha, \beta)$ , then  $(\alpha + 2\beta)$  equals
  3. Given  $a, b \in \{0, 1, 2, \dots, 6\}$ . Consider the system of equations
$$\begin{aligned}x + y + z &= 4, \\2x + y + 3z &= 6, \\x + 2y + az &= b\end{aligned}$$
If the number of ordered pairs  $(a, b)$  so that the system of equations has unique solution is  $\lambda$ , then  $\frac{\lambda}{7}$  equals
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**Space for Rough Work**

4. Let the function  $g(x)$  where  $g : \mathbb{R} \rightarrow \mathbb{R}$ , continuous in  $[0, \infty)$  and positive in  $(0, \infty)$  satisfying the condition  $g(1) = 1$  and  $\frac{1}{2} \int_0^x g^2(t) dt = \frac{1}{x} \left( \int_0^x g(t) dt \right)^2$  then the value of  $(g(4))^{\sqrt{2}-1}$  is
5. Let  $S_n = \sum_{r=1}^n r \cdot 2^{\frac{r}{2}(1+(-1)^r)} \cdot 3^{\frac{r}{2}(1-(-1)^r)}$ . If  $S_{20} = \alpha \cdot 3^{21} + \beta \cdot 2^{22} + \frac{391}{288}$ , then the value of  $\left[ \frac{32\alpha - 9\beta}{4} \right]$  is  
(where  $[.]$  denotes the greatest integer function)

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**Space for Rough Work**