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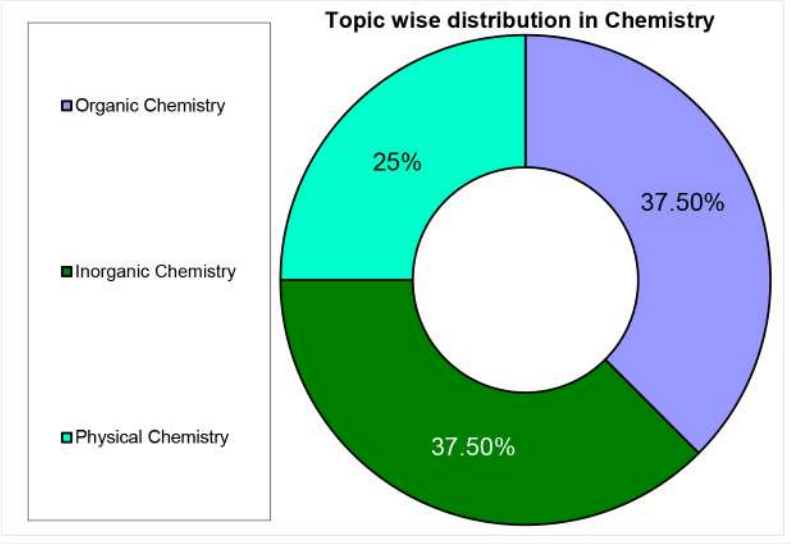
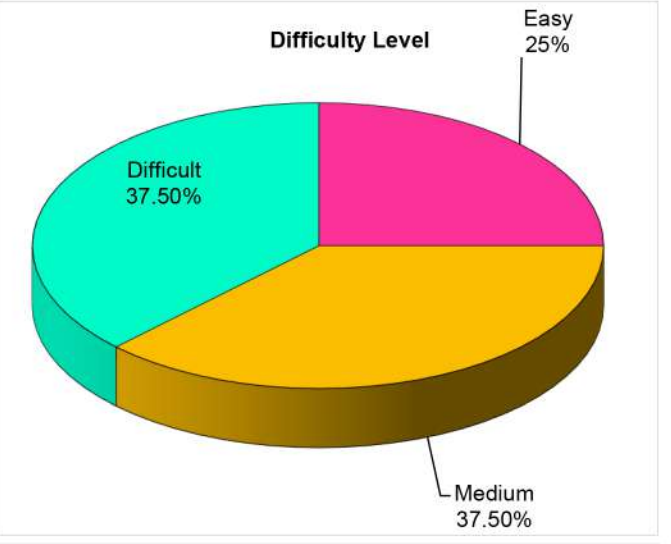
STUDY CENTRE, PALA

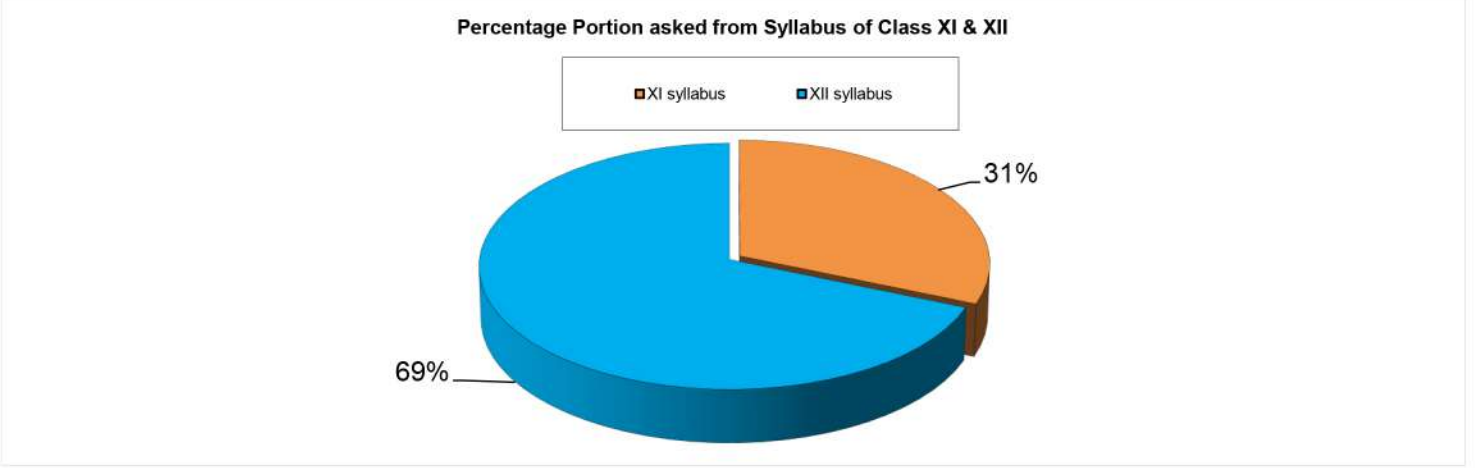
ANALYSIS OF JEE ADVANCED 2025 - CHEMISTRY PAPER-1

Topics	Easy	Medium	Difficult	Total	*Percentage*
Organic Chemistry	0	2	4	6	37.50%
Inorganic Chemistry	4	1	1	6	37.50%
Physical Chemistry	0	3	1	4	25.00%
Total	**4**	**6**	**6**	**16**	100.00%

XII syllabus	11	XI syllabus	5







SECTION 1 (Maximum Marks: 12)

- This section contains **FOUR (04)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated **according to the following marking scheme**:

Full Marks : $+3$ If **ONLY** the correct option is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : -1 In all other cases.

Q.1 The heating of NH_4NO_2 at 60–70 °C and NH_4NO_3 at 200–250 °C is associated with the formation of nitrogen containing compounds **X** and **Y**, respectively. **X** and **Y**, respectively, are

(A)	N_2 and N_2O
(B)	NH_3 and NO_2
(C)	NO and N_2O
(D)	N_2 and NH_3

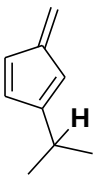
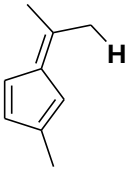
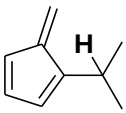
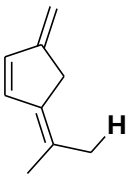
Q.2 The correct order of the wavelength maxima of the absorption band in the ultraviolet-visible region for the given complexes is

(A)	$[Co(CN)_6]^{3-} < [Co(NH_3)_6]^{3+} < [Co(NH_3)_5(H_2O)]^{3+} < [Co(NH_3)_5(Cl)]^{2+}$
(B)	$[Co(NH_3)_5(Cl)]^{2+} < [Co(NH_3)_5(H_2O)]^{3+} < [Co(NH_3)_6]^{3+} < [Co(CN)_6]^{3-}$
(C)	$[Co(CN)_6]^{3-} < [Co(NH_3)_5(Cl)]^{2+} < [Co(NH_3)_5(H_2O)]^{3+} < [Co(NH_3)_6]^{3+}$
(D)	$[Co(NH_3)_6]^{3+} < [Co(CN)_6]^{3-} < [Co(NH_3)_5(Cl)]^{2+} < [Co(NH_3)_5(H_2O)]^{3+}$

Q.3 One of the products formed from the reaction of permanganate ion with iodide ion in neutral aqueous medium is

(A)	I_2	(B)	IO_3^-	(C)	IO_4^-	(D)	IO_2^-

Q.4 Consider the depicted hydrogen (**H**) in the hydrocarbons given below. The most acidic hydrogen (**H**) is

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

SECTION 2 (Maximum Marks: 12)

- This section contains **THREE (03)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated **according to the following marking scheme**:

  Full Marks : $+4$ **ONLY** if (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;
  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, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then
  choosing ONLY (A), (B) and (D) will get $+4$ marks;
  choosing ONLY (A) and (B) will get $+2$ marks;
  choosing ONLY (A) and (D) will get $+2$ marks;
  choosing ONLY (B) and (D) will get $+2$ marks;
  choosing ONLY (A) will get +1 mark;
  choosing ONLY (B) will get +1 mark;
  choosing ONLY (D) will get +1 mark;
  choosing no option (i.e. the question is unanswered) will get 0 marks; and
  choosing any other combination of options will get -2 marks.

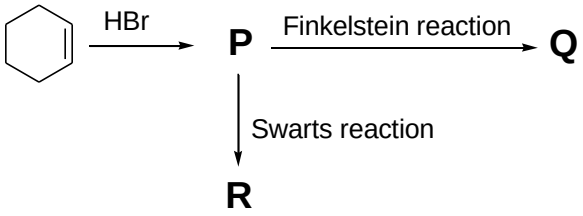
Q.5 Regarding the molecular orbital (MO) energy levels for homonuclear diatomic molecules, the **INCORRECT** statement(s) is(are)

(A)	Bond order of Ne_2 is zero.
(B)	The highest occupied molecular orbital (HOMO) of F_2 is σ-type.
(C)	Bond energy of O_2^+ is smaller than the bond energy of O_2.
(D)	Bond length of Li_2 is larger than the bond length of B_2.

Q.6 The pair(s) of diamagnetic ions is(are)

(A)	La^{3+}, Ce^{4+}
(B)	Yb^{2+}, Lu^{3+}
(C)	La^{2+}, Ce^{3+}
(D)	Yb^{3+}, Lu^{2+}

Q.7 For the reaction sequence given below, the correct statement(s) is(are)



(In the options, X is any atom other than carbon and hydrogen, and it is different in **P**, **Q** and **R**)

(A)	C–X bond length in **P**, **Q** and **R** follows the order **Q** > **R** > **P**.
(B)	C–X bond enthalpy in **P**, **Q** and **R** follows the order **R** > **P** > **Q**.
(C)	Relative reactivity toward S_N2 reaction in **P**, **Q** and **R** follows the order **P** > **R** > **Q**.
(D)	pK_a value of the conjugate acids of the leaving groups in **P**, **Q** and **R** follows the order **R** > **Q** > **P**.

SECTION 3 (Maximum Marks: 24)

- This section contains **SIX (06)** questions.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated **according to the following marking scheme**:
  Full Marks : $+4$ If ONLY the correct numerical value is entered in the designated place;
  Zero Marks : 0 In all other cases.

Q.8 In an electrochemical cell, dichromate ions in aqueous acidic medium are reduced to Cr^{3+}. The current (in amperes) that flows through the cell for 48.25 minutes to produce 1 mole of Cr^{3+} is _____.

Use: 1 Faraday $= 96500$ C mol^{-1}

Q.9 At 25 ℃, the concentration of H^+ ions in 1.00×10^{-3} M aqueous solution of a weak monobasic acid having acid dissociation constant (K_a) of 4.00×10^{-11} is $\boldsymbol{X} \times 10^{-7}$ M. The value of $\boldsymbol{X}$ is _____.

Use: Ionic product of water (K_w) $= 1.00 \times 10^{-14}$ at 25 ℃

Q.10 Molar volume (V_m) of a van der Waals gas can be calculated by expressing the van der Waals equation as a cubic equation with V_m as the variable. The ratio (in mol dm^{-3}) of the coefficient of V_m^2 to the coefficient of V_m for a gas having van der Waals constants $a = 6.0$ dm^6 atm mol^{-2} and $b = 0.060$ dm^3 mol^{-1} at 300 K and 300 atm is _____.

Use: Universal gas constant (R) $= 0.082$ dm^3 atm mol^{-1} K^{-1}

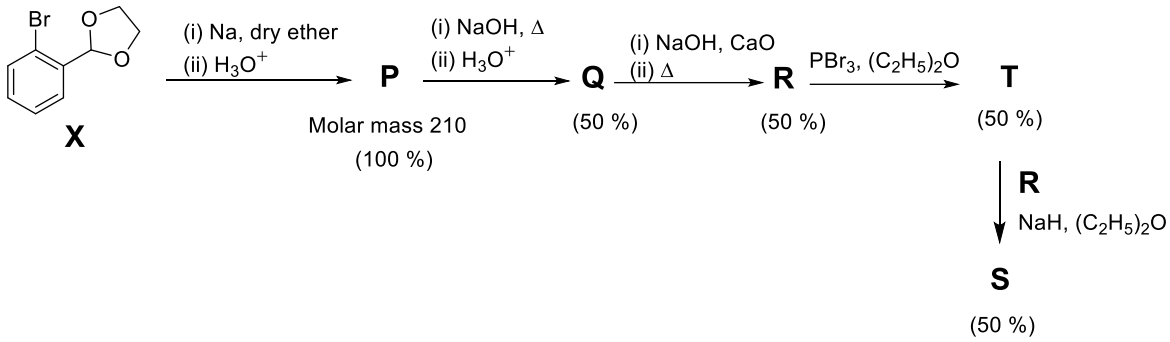
Q.11 Considering ideal gas behavior, the expansion work done (in kJ) when 144 g of water is electrolyzed completely under constant pressure at 300 K is _____.

Use: Universal gas constant (R) $= 8.3$ J K^{-1} mol^{-1}; Atomic mass (in amu): H = 1, O = 16

Q.12 The monomer (**X**) involved in the synthesis of Nylon 6,6 gives positive carbylamine test. If 10 moles of **X** are analyzed using Dumas method, the amount (in grams) of nitrogen gas evolved is _____.

Use: Atomic mass of N (in amu) = 14

Q.13 The reaction sequence given below is carried out with 16 moles of **X**. The yield of the major product in each step is given below the product in parentheses. The amount (in grams) of **S** produced is_____.



Use: Atomic mass (in amu): H = 1, C = 12, O = 16, Br = 80

SECTION 4 (Maximum Marks: 12)

- This section contains **THREE (03)** Matching List Sets.
- Each set has **ONE** Multiple Choice Question.
- Each set has **TWO** lists: **List-I** and **List-II**.
- **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated **according to the following marking scheme**:
  Full Marks : $+4$ **ONLY** if the option corresponding to the correct combination is chosen;
  Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
  Negative Marks : -1 In all other cases.

Q.14 The correct match of the group reagents in **List-I** for precipitating the metal ion given in **List-II** from solutions, is

List-I	**List-II**
(P) Passing H_2S in the presence of NH_4OH	(1) Cu^{2+}
(Q) $(NH_4)_2CO_3$ in the presence of NH_4OH	(2) Al^{3+}
(R) NH_4OH in the presence of NH_4Cl	(3) Mn^{2+}
(S) Passing H_2S in the presence of dilute HCl	(4) Ba^{2+}
	(5) Mg^{2+}

(A)	$P \rightarrow 3; Q \rightarrow 4; R \rightarrow 2; S \rightarrow 1$
(B)	$P \rightarrow 4; Q \rightarrow 2; R \rightarrow 3; S \rightarrow 1$
(C)	$P \rightarrow 3; Q \rightarrow 4; R \rightarrow 1; S \rightarrow 5$
(D)	$P \rightarrow 5; Q \rightarrow 3; R \rightarrow 2; S \rightarrow 4$

Q.15 The major products obtained from the reactions in **List-II** are the reactants for the named reactions mentioned in **List-I**. Match each entry in **List-I** with the appropriate entry in **List-II** and choose the correct option.

List-I

(P) Stephen reaction

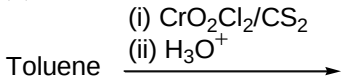
(Q) Sandmeyer reaction

(R) Hoffmann bromamide degradation reaction

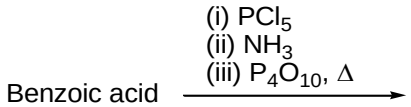
(S) Cannizzaro reaction

List-II

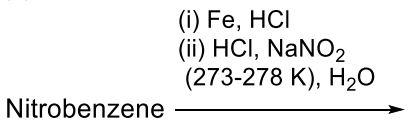
(1)



(2)



(3)



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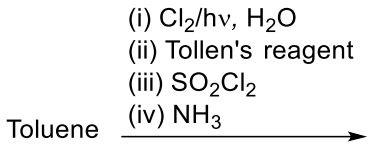
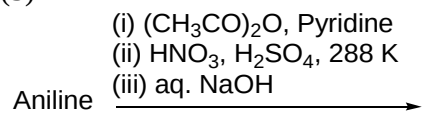


(5)

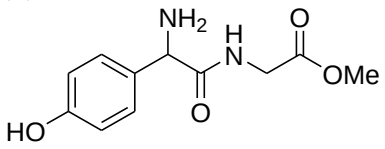


(A)	P → 2; Q → 4; R → 1; S → 3
(B)	P → 2; Q → 3; R → 4; S → 1
(C)	P → 5; Q → 3; R → 4; S → 2
(D)	P → 5; Q → 4; R → 2; S → 1

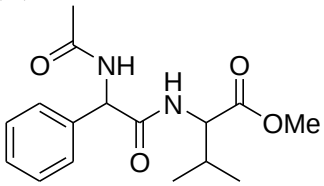
Q.16 Match the compounds in **List-I** with the appropriate observations in **List-II** and choose the correct option.

List-I

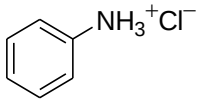
(P)



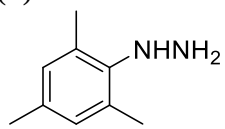
(Q)



(R)



(S)



List-II

(1) Reaction with phenyl diazonium salt gives yellow dye.

(2) Reaction with ninhydrin gives purple color and it also reacts with $FeCl_3$ to give violet color.

(3) Reaction with glucose will give corresponding hydrazone.

(4) Lassiagne extract of the compound treated with dilute HCl followed by addition of aqueous $FeCl_3$ gives blood red color.

(5) After complete hydrolysis, it will give ninhydrin test and it **DOES NOT** give positive phthalein dye test.

(A)	P → 1; Q → 5; R → 4; S → 2
(B)	P → 2; Q → 5; R → 1; S → 3
(C)	P → 5; Q → 2; R → 1; S → 4
(D)	P → 2; Q → 1; R → 5; S → 3

END OF THE QUESTION PAPER

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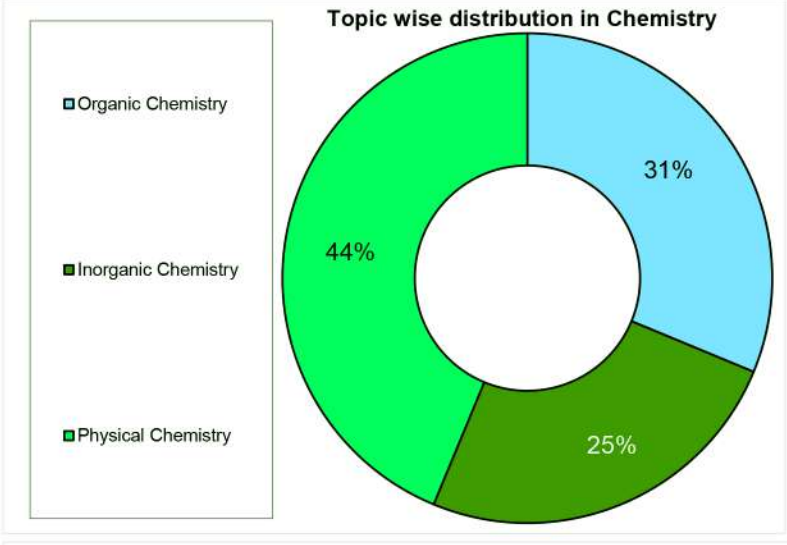
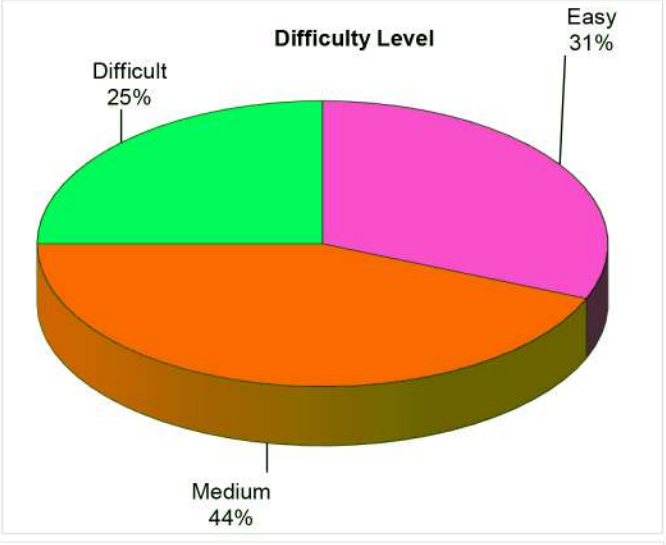
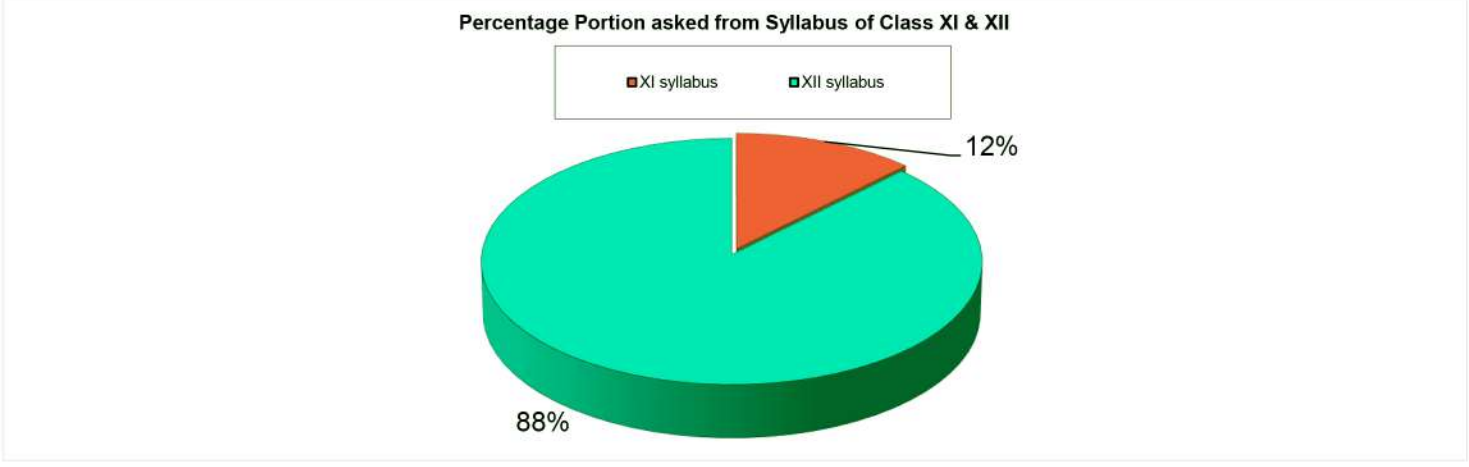
ANALYSIS OF JEE ADVANCED 2025 - CHEMISTRY PAPER-2

Topics	Easy	Medium	Difficult	*Total*	*Percentage*
Organic Chemistry	0	4	1	*5*	31.25%
Inorganic Chemistry	4	0	0	*4*	25.00%
Physical Chemistry	1	3	3	*7*	43.75%
Total	***5***	***7***	***4***	***16***	100.00%

XII syllabus	14	XI syllabus	2







SECTION 1 (Maximum Marks: 12)

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Negative Marks : -1 In all other cases.

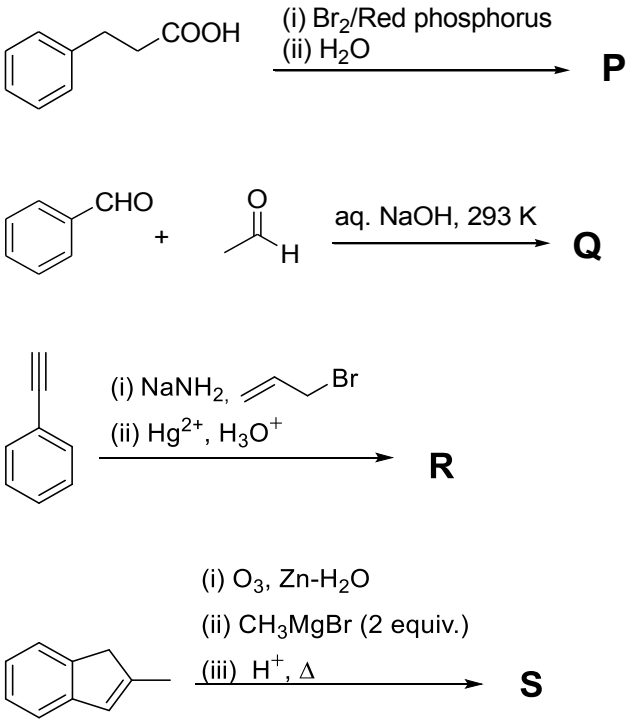
Q.1 During sodium nitroprusside test of sulphide ion in an aqueous solution, one of the ligands coordinated to the metal ion is converted to

(A)	NOS^-	(B)	SCN^-	(C)	SNO^-	(D)	NCS^-

Q.2 The complete hydrolysis of ICl, ClF_3 and BrF_5, respectively, gives

(A)	IO^-, ClO_2^- and BrO_3^-
(B)	IO_3^-, ClO_2^- and BrO_3^-
(C)	IO^-, ClO^- and BrO_2^-
(D)	IO_3^-, ClO_4^- and BrO_2^-

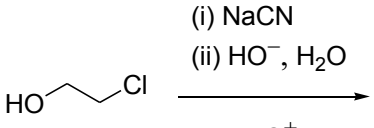
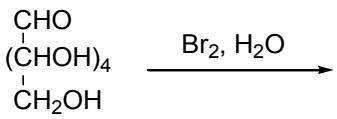
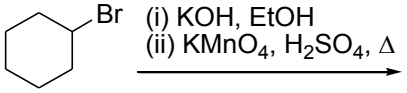
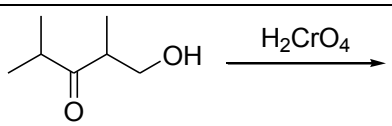
Q.3 Monocyclic compounds **P**, **Q**, **R** and **S** are the major products formed in the reaction sequences given below.



The product having the highest number of unsaturated carbon atom(s) is

(A)	**P**	(B)	**Q**
(C)	**R**	(D)	**S**

Q.4 The correct reaction/reaction sequence that would produce a dicarboxylic acid as the major product is

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

SECTION 2 (Maximum Marks: 16)

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- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated **according to the following marking scheme**:

  Full Marks : $+4$ **ONLY** if (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;
  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, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then
  choosing ONLY (A), (B) and (D) will get $+4$ marks;
  choosing ONLY (A) and (B) will get $+2$ marks;
  choosing ONLY (A) and (D) will get $+2$ marks;
  choosing ONLY (B) and (D) will get $+2$ marks;
  choosing ONLY (A) will get +1 mark;
  choosing ONLY (B) will get +1 mark;
  choosing ONLY (D) will get +1 mark;
  choosing no option (i.e. the question is unanswered) will get 0 marks; and
  choosing any other combination of options will get -2 marks.

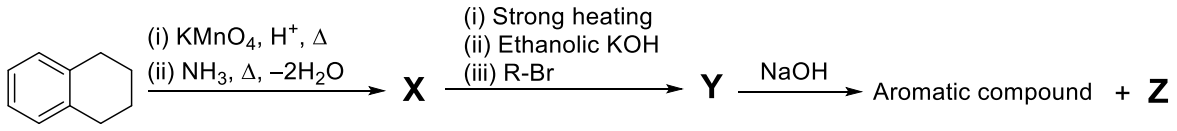
Q.5 The correct statement(s) about intermolecular forces is(are)

(A)	The potential energy between two point charges approaches zero more rapidly than the potential energy between a point dipole and a point charge as the distance between them approaches infinity.
(B)	The average potential energy of two rotating polar molecules that are separated by a distance r has $1/r^3$ dependence.
(C)	The dipole-induced dipole average interaction energy is independent of temperature.
(D)	Nonpolar molecules attract one another even though neither has a permanent dipole moment.

Q.6 The compound(s) with P–H bond(s) is(are)

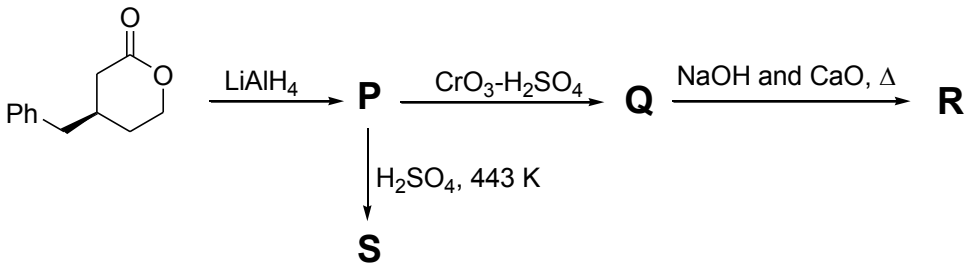
(A)	H_3PO_4
(B)	H_3PO_3
(C)	$H_4P_2O_7$
(D)	H_3PO_2

Q.7 For the reaction sequence given below, the correct statement(s) is(are)



(A)	Both **X** and **Y** are oxygen containing compounds.
(B)	**Y** on heating with $CHCl_3$/KOH forms isocyanide.
(C)	**Z** reacts with Hinsberg's reagent.
(D)	**Z** is an aromatic primary amine.

Q.8 For the reaction sequence given below, the correct statement(s) is(are)



(A)	**P** is optically active.
(B)	**S** gives Bayer's test.
(C)	**Q** gives effervescence with aq. $NaHCO_3$.
(D)	**R** is an alkyne.

SECTION 3 (Maximum Marks: 32)

- This section contains **EIGHT (08)** questions.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated **according to the following marking scheme**:
  Full Marks : $+4$ If ONLY the correct numerical value is entered in the designated place;
  Zero Marks : 0 In all other cases.

Q.9 The density (in $\mathrm{g\,cm^{-3}}$) of the metal which forms a cubic close packed (ccp) lattice with an axial distance (edge length) equal to 400 pm is _____.

Use: Atomic mass of metal $= 105.6$ amu and Avogadro's constant $= 6 \times 10^{23}\ \mathrm{mol^{-1}}$

Q.10 The solubility of barium iodate in an aqueous solution prepared by mixing 200 mL of 0.010 M barium nitrate with 100 mL of 0.10 M sodium iodate is $\boldsymbol{X} \times 10^{-6}$ mol $\mathrm{dm^{-3}}$. The value of $\boldsymbol{X}$ is _____.

Use: Solubility product constant (K_{sp}) of barium iodate $= 1.58 \times 10^{-9}$

Q.11 Adsorption of phenol from its aqueous solution on to fly ash obeys Freundlich isotherm. At a given temperature, from 10 mg $\mathrm{g^{-1}}$ and 16 mg $\mathrm{g^{-1}}$ aqueous phenol solutions, the concentrations of adsorbed phenol are measured to be 4 mg $\mathrm{g^{-1}}$ and 10 mg $\mathrm{g^{-1}}$, respectively. At this temperature, the concentration (in mg $\mathrm{g^{-1}}$) of adsorbed phenol from 20 mg $\mathrm{g^{-1}}$ aqueous solution of phenol will be _____.

Use: $\log_{10} 2 = 0.3$

Q.12 Consider a reaction $A + R \longrightarrow Product$. The rate of this reaction is measured to be $k[A][R]$. At the start of the reaction, the concentration of R, $[R]_0$, is 10-times the concentration of A, $[A]_0$. The reaction can be considered to be a pseudo first order reaction with assumption that $k[R] = k'$ is constant. Due to this assumption, the relative error (in %) in the rate when this reaction is 40 % complete, is _____.
[k and k' represent corresponding rate constants]

Q.13 At 300 K, an ideal dilute solution of a macromolecule exerts osmotic pressure that is expressed in terms of the height (h) of the solution (density $= 1.00$ g cm^{-3}) where h is equal to 2.00 cm. If the concentration of the dilute solution of the macromolecule is 2.00 g dm^{-3}, the molar mass of the macromolecule is calculated to be $\boldsymbol{X} \times 10^4$ g mol^{-1}. The value of $\boldsymbol{X}$ is _____.

Use: Universal gas constant (R) $= 8.3$ J K^{-1} mol^{-1} and acceleration due to gravity (g) $= 10$ m s^{-2}

Q.14 An electrochemical cell is fueled by the combustion of butane at 1 bar and 298 K. Its cell potential is $\frac{\boldsymbol{X}}{F} \times 10^3$ volts, where F is the Faraday constant. The value of $\boldsymbol{X}$ is _____.

Use: Standard Gibbs energies of formation at 298 K are: $\Delta_f G^o_{CO_2} = -394$ kJ mol^{-1}; $\Delta_f G^o_{water} = -237$ kJ mol^{-1}; $\Delta_f G^o_{butane} = -18$ kJ mol^{-1}

Q.15 The sum of the spin only magnetic moment values (in B.M.) of $[Mn(Br)_6]^{3-}$ and $[Mn(CN)_6]^{3-}$ is _____.

Q.16 A linear octasaccharide (molar mass $= 1024$ g mol^{-1}) on complete hydrolysis produces three monosaccharides: ribose, 2-deoxyribose and glucose. The amount of 2-deoxyribose formed is 58.26 % (w/w) of the total amount of the monosaccharides produced in the hydrolyzed products. The number of ribose unit(s) present in one molecule of octasaccharide is _____.

Use: Molar mass (in g mol^{-1}): ribose $= 150$, 2-deoxyribose $= 134$, glucose $= 180$;
Atomic mass (in amu): H = 1, O = 16

END OF THE QUESTION PAPER