Date: 22 November, 2026

31

Aakash
Medical | IIT-JEE | Foundations

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Answers & Solutions

Time : 120 Minute **Max. Marks : 216**

for

Association of Chemistry Teachers
National Standard Examination in
CHEMISTRY (NSEC)-2026

INSTRUCTIONS TO CANDIDATES

(1) There are 60 questions in this paper. Attempt all the 60 Questions.

(2) Question paper has two parts. In **Part A-1** (Q. No. 1 to 48) each question has four alternatives, out of which **only one** is correct. Choose the correct alternative and fill the appropriate bubble, as shown.

Q. No. 12 (a) ● (c) (d)

In **Part A-2** (Q. No. 49 to 60) each question has four alternatives, out of which **any number of alternative (s)** (1, 2, 3 or 4) may be correct. You have to choose ALL correct alternative(s) and fill the appropriate bubble(s), as shown.

Q. No. 52 (a) ● (c) ●

(3) For **Part A-1**, each correct answer carries **3 marks** whereas 1 mark will be deducted for each wrong answer. In **Part A-2**, you get **6 marks** if all the correct alternatives are marked and no incorrect. No negative marks in this part.

Olympiads Results

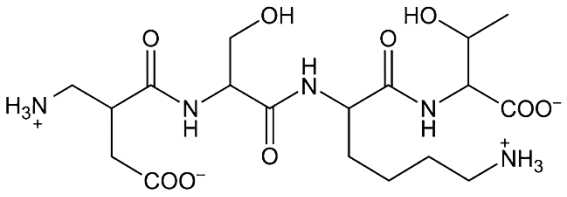
777 Classroom Students Aakashians Qualified	134 Classroom Students Aakashians Qualified	378 Classroom Students Aakashians Qualified	26 Classroom Students Aakashians Qualified	2072 Classroom Students Aakashians Qualified
in IOQM 2025	in RMO 2025-26	in NSEs 2025-26	for OCSCs/IMOTC /APMO 2025-26	in NSO (Level-1) 2025-26

Attempt All Sixty Questions

A - 1

ONLY ONE OUT OF FOUR OPTIONS IS CORRECT. BUBBLE THE CORRECT OPTION

1. The correct sequence of amino acids in the following given tetrapeptide is



(a) Asp, Lys, Ser, Thr
(b) Ser, Lys, Thr, Asp
(c) Asp, Ser, Lys, Thr
(d) Ser, Thr, Lys, Asp

Answer (c)

Sol. Asp, Ser, Lys, Thr

2. Mn^{2+} reacts with sodium bismuthate in acidic medium to a dark-coloured diamagnetic compound (A) which on heating at 513K gives another dark-coloured paramagnetic compound (B). Also, compound (A) reacts with thiosulphate ions to form a brown coloured, water insoluble compound (C). Identify compounds (A), (B) and (C)

(a) Compound A = $KMnO_4$, B = K_2MnO_4 and C = MnO_2
(b) Compound A = K_2MnO_4, B = $KMnO_4$ and C = Mn_2O_3
(c) Compound A = Mn_2O_3, B = K_2MnO_4 and C = Mn_3O_4
(d) Compound A = $KMnO_4$, B = Mn_3O_4 and C = MnO_2

Answer (a)

Sol. $\underset{\text{Purple Diamagnetic}}{KMnO_4} \longrightarrow \underset{\text{Paramagnetic}}{K_2MnO_4} \longrightarrow \underset{\text{Brown}}{MnO_2}$

3. The rate law for the gas phase reaction between 'A' and 'B' is given as rate = $k[A]^2[B]$. If in another experiment, [A] is reduced to one-third of its previous value, what change must be made to [B] so that the reaction rate becomes one-third of its initial value?

(a) Decrease B to one-third of its original value
(b) Keep B unchanged
(c) Increase B to 3 times its original value
(d) Increase B by a factor of 9

Answer (c)

Sol. $r1 = [A]^2[B]$

Where [A] reduced to $\frac{[A]}{3}$

$$\frac{r'}{r} = \left(\frac{1}{3}\right)^2 \frac{[B]'}{[B]}$$

$$r' = \frac{r}{3}$$

$[B]' = 3[B]$

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$$\frac{r}{r'} = \left(\frac{A_1}{A_{1/3}}\right)^2 \left(\frac{B}{B'}\right)$$

$B' = 3B$

4. Bis(benzoylacetonato)beryllium(II) exists in two isomeric forms. Which of the following statement is correct?

(a) It is a square planar complex with a plane of symmetry.

(b) It is a tetrahedral complex with no plane of symmetry and the two forms are not superimposable on each other.

(c) It is a tetrahedral complex with a plane of symmetry and two forms are not superimposable on each other.

(d) It is an octahedral complex with a plane of symmetry.

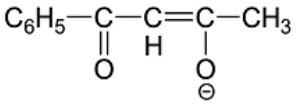
Answer (b)

Sol. Be(II): $1s^2 2s^0 2p^0$

sp^3 → Tetrahedral complex

Benzoylacetonato → bidentate ligand

$M(AB)_2$



5. The ease of hydrolysis of borazine compared to benzene is mainly due to the:

(a) stronger π-bonding in borazine

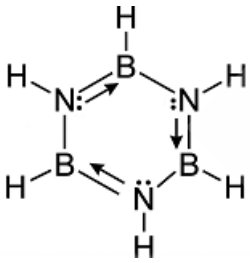
(b) polar B-N bonds

(c) higher symmetry of borazine

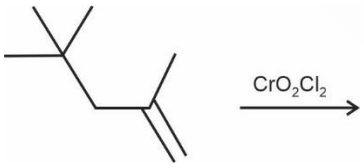
(d) absence of lone pair of electrons

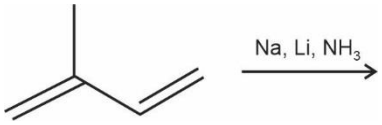
Answer (b)

Sol. Borazine has polar B–N bonds.

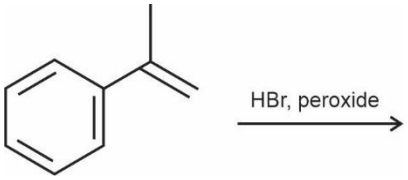


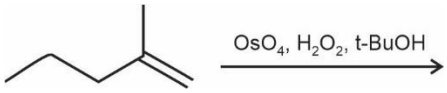
6. Examine the reaction/s **I**, **II**, **III** and **IV** given below.

I. 

II. 

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2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

III. 

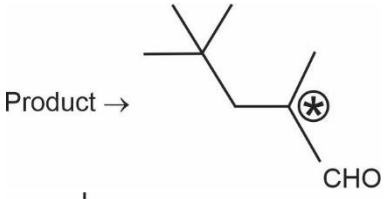
IV. 

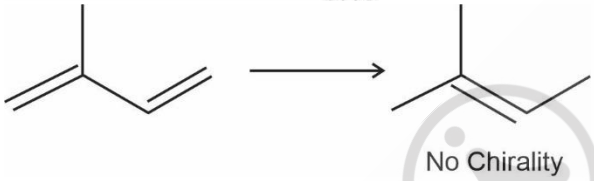
The reaction(s) that will produce chiral product(s) is/are:

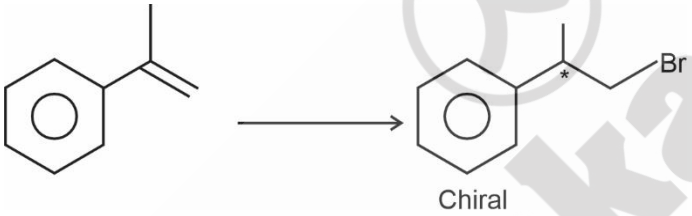
(a) I & III (b) II & III

(c) I & IV (d) Only IV

Answer (a)

Sol. I. 

II. 

III. 

7. The correct option of intensive and extensive properties among the following are

	Property	I	II	III	IV
i	EMF	Intensive	Extensive	Intensive	Intensive
ii	ΔU	Extensive	Extensive	Extensive	Extensive
iii	Viscosity	Intensive	Intensive	Extensive	Extensive
iv	Specific surface area	Intensive	Extensive	Intensive	Extensive

(a) II (b) III

(c) I (d) IV

Answer (c)

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8. A mixture of compounds A and B is present in a test tube. Fumes are seen when exposed to moist air. When a rod dipped in ammonium hydroxide is brought near the mouth of this test tube, the intensity of the fumes increases. On the addition of concentrated sulphuric acid, brown fumes are obtained which intensifies on the addition of copper turnings. A solution of the mixture in an HCl medium gives a black precipitate on passing H_2S, which does not dissolve in yellow ammonium sulphide. When the acid solution is diluted to a large extent, a white turbidity is obtained which disappears on the addition of a few drops of HCl. The acidic solution obtained after removing the black precipitate gives a white precipitate on the addition of ammonium hydroxide. The precipitate is soluble in NaOH. Identify the cations and anions in solution.

(a) Hg^{2+}, Cr^{3+}, NO_3^-, Br^- (b) Mn^{2+}, Fe^{3+}, NO_2^-, Cl^-

(c) Cr^{3+}, Cu^{2+}, Br^-, Cl^- (d) Bi^{3+}, Al^{3+}, NO_3^-, Cl^-

Answer (d)

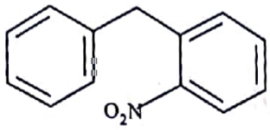
Sol. $\left.\begin{matrix}(1)\ \text{Fume / air}\\(2)\ \text{Fumes / } NH_4OH\end{matrix}\right]Cl^-$ salt $\xrightarrow{\text{Moist air}} HCl \xrightarrow{NH_3} NH_4Cl$

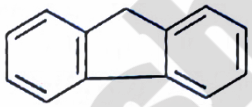
$H_2SO_4 \longrightarrow NO_2\,(\text{brown fumes}) + (NO_3^-\ \text{confirmed})$

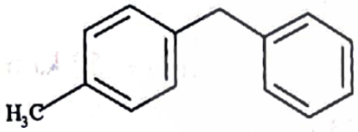
$H_2S + HCl \xrightarrow{+\text{mixture}} \text{Black ppt,}$

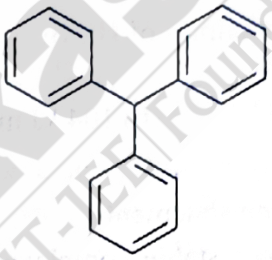
$BiCl_3 + H_2O \longrightarrow \text{BiOCl white} \xrightarrow{HCl} Bi^{3+}\ \text{confirmed}$

9. Compounds **I, II, III** and **IV.** On treating with a base, the compound that will give most stable carbanion is:

(a) 

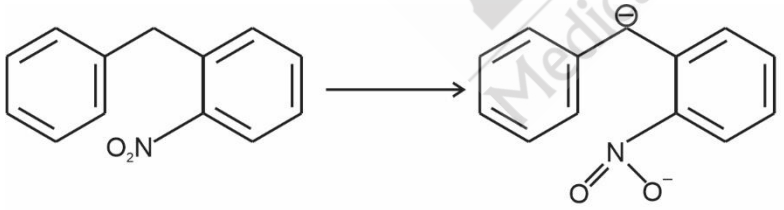
(b) 

(c) 

(d) 

Answer (b)

Sol.



two benzene ring
delocalising -ve charge.

Olympiads Results

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2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26



aromatic ring.

10. An aqueous solution of ferrous alum and chrome alum is heated with excess sodium peroxide. The products obtained are

(a) Green precipitate and colourless supernatant

(b) Brown precipitate and yellow supernatant

(c) Brown precipitate and colourless supernatant

(d) Green precipitate and yellow supernatant

Answer (b)

Sol. $2Na_2O_2 + 2H_2O \rightarrow 4NaOH + O_2$

$2Fe^{2+} + Na_2O_2 + 4OH^- + 2H_2O \rightarrow \underset{\text{brown}}{2Fe(OH)_3 \downarrow} + 2Na^+$

Cr^{3+}

$2Cr^{3+} + 3Na_2O_2 + 4OH^- \rightarrow \underset{\text{yellow solution}}{2CrO_4^{2-}} + 6Na^+ + 2H_2O$

11. Rank the following oxides in order of decreasing acidity in aqueous medium: Ga_2O_3, Al_2O_3, In_2O_3, Tl_2O, and B_2O_3.

(a) $Tl_2O > In_2O_3 > Ga_2O_3 > Al_2O_3 > B_2O_3$ (b) $Tl_2O > B_2O_3 > Al_2O_3 > In_2O_3 > Ga_2O_3$

(c) $Ga_2O_3 > In_2O_3 > Al_2O_3 > B_2O_3 > Tl_2O$ (d) $B_2O_3 > Al_2O_3 > Ga_2O_3 > In_2O_3 > Tl_2O$

Answer (d)

Sol. Down the group, metallic character increases.

B_2O_3 is acidic.

Al_2O_3 and Ga_2O_3 is amphoteric.

In_2O_3 and Tl_2O is basic.

Correct order of acidic strength in aqueous medium:

$B_2O_3 > Al_2O_3 > Ga_2O_3 > In_2O_3 > Tl_2O$

12. Which of the following is correct for the physisorption of N_2 on activated carbon at 77 K

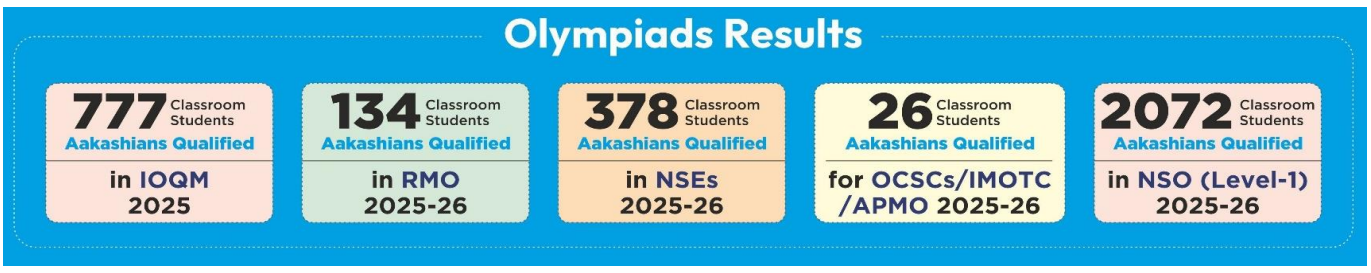
(a) $\Delta H = 0$; $\Delta S < 0$ (b) $\Delta H < 0$; $\Delta S < 0$

(c) $\Delta H > 0$; $\Delta S < 0$ (d) $\Delta H = 0$; $\Delta S = 0$

Answer (b)

Sol. In physisorption of N_2 on activated charcoal, some amount of energy is released, so $\Delta H < 0$, and disorderness decreases, so $\Delta S < 0$.

Correct answer: $\Delta H < 0$; $\Delta S < 0$



13. Consider the following statements regarding group 14 and 15 elements:

(i) Sn^{2+} is more stable than Sn^{4+} due to the inert pair effect

(ii) PbO_2 is a strong oxidizing agent, whereas SnO_2 is not

(iii) BiH_3 is less stable than NH_3 due to decreasing E–H bond strength down the group

(iv) Acidic character of oxides increases down group 14 due to increasing metallic character

Which of the above statements are correct?

(a) i and ii only (b) ii and iii only

(c) i, ii and iii only (d) i, iii and iv only

Answer (b)

Sol. (i) Sn^{4+} is more stable than Sn^{2+}; inert pair effect dominates in Pb.

(ii) Pb^{4+} is a strong oxidising agent due to inert pair effect; Pb^{2+} is more stable.

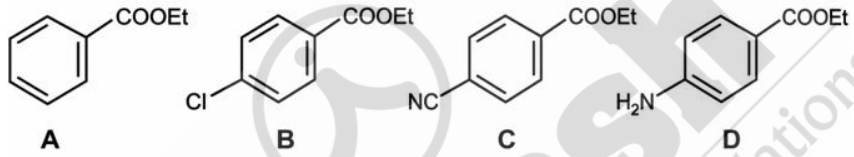
(iii) Thermal stability decreases down the group in group 15 hydrides, as the E–H bond weakens.

(iv) Metallic character increases down the group, so acidic character decreases.

(ii) and (iii) are only correct.

14. Base catalyzed hydrolysis of esters is an irreversible reaction that involves nucleophilic addition followed by elimination of the alkoxide anion to give a carboxylic acid on acidic workup of the reaction.

The following esters; **A, B, C** and **D** are subjected to alkaline hydrolysis



The highest and the lowest rate of hydrolysis of the above esters respectively are:

(a) A and D (b) B and D

(c) C and D (d) B and C

Answer (c)

Sol. Alkaline hydrolysis undergo through nucleophilic addition on the electrophilic carbon of ester.

The rate of alkaline hydrolysis:

$\propto$ EWG

$$\propto \frac{1}{\text{EDG}}$$

In (c), the rate is highest and in (d), the rate is lowest.

15. Which of the following pair of complex ions has the longest and the shortest C–C bond, respectively?

(a) $K[Pt(Cl)_3(\pi\text{-}F_2C{=}CF_2)]$ and $K[Pt(Cl)_3(\pi\text{-}H_2C{=}CH_2)]$

(b) $K[Pt(Cl)_3(\pi\text{-}(CH_3)_2C{=}C(CH_3)_2)]$ and $K[Pt(Cl)_3(\pi\text{-}F_2C{=}CF_2)]$

(c) $K[Pt(Cl)_3(\pi\text{-}Cl_2C{=}CCl_2)]$ and $K[Pt(Cl)_3(\pi\text{-}F_2C{=}CF_2)]$

(d) $K[Pt(Cl)_3(\pi\text{-}(NC)_2C{=}C(CN)_2)]$ and $K[Pt(Cl)_3(\pi\text{-}(CH_3)_2C{=}C(CH_3)_2)]$

Answer (d)

Olympiads Results

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2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. The C–C bond length depends on metal to ligand π-back bonding.

EWG increases the π-acceptor tendency of alkene; stronger back bonding transfers electron density into π^* orbital which weakens and lengthens the C–C bond.

In option (d), due to presence of –CN group in alkene back bonding is more, and the C–C bond length is more, and due to the presence of $-CH_3$ group in alkene π-acceptor tendency is less so bond length is shortest.

16. Bond dissociation enthalpies of H_2, Br_2 and HBr are 436, 192 and 366 kJ mol^{-1} respectively. Enthalpy of formation of HBr is

(a) -104 kJ mol^{-1} (b) 104 kJ mol^{-1}

(c) 52 kJ mol^{-1} (d) -52 kJ mol^{-1}

Answer (d)

Sol. $\frac{1}{2}H_2 + \frac{1}{2}Br_2 \rightarrow HBr$

$$\Delta H_f^\circ = \Sigma(BE)_{Reactant} - \Sigma(BE)_{Product}$$

$$\Delta H_f^\circ = \frac{1}{2} \times 436 + \frac{1}{2} \times 192 - 366$$

$$\Delta H_f^\circ = 218 + 96 - 366$$

$$= -52 \text{ kJ/mol}$$

17. Consider the following statements:

A. Fe^{3+} forms more stable complexes than La^{3+} with any given σ-donating ligand due to higher charge density.

B. Lanthanoid ions generally form complexes with lower coordination numbers than transition metal ions.

C. The stability of complexes of 5d elements is generally greater than their 3d analogues partly due to lanthanoid contraction.

D. EDTA is a tetradentate ligand and forms stable complexes with many transition metals and other cations

Identify the correct statements:

(a) A and C only (b) A and B only

(c) B only (d) C and D only

Answer (a)

Sol. (A) Due to smaller size and higher charge density of Fe^{3+} favours strong interaction with σ-donor ligands compared with La^{3+}.

(B) Lanthanoid ions form high coordination number compounds (8–12).

(C) 5d complexes are generally more stable than 3d complexes partly due to lanthanoid contraction.

(D) EDTA is a hexadentate ligand.

(A) and (C) are correct.

Olympiads Results
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2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

18. 0.9 % (w/v) of saline is isotonic with human blood. For a certain application the osmotic pressure of the same saline solution is required to be decreased by 25 %. The osmotic pressure of 1.5 L of saline solution prepared for this purpose is close to

(a) 5.96 bar (b) 7.94 bar

(c) 8.94 bar (d) 2.67 bar

Answer (a)

Sol. C of NaCl $= \dfrac{0.9 \times 1000}{58.5 \times 100}$

$= 0.1538$ M

i of NaCl $= 2$

As body temperature is 37°C

$\pi = iCRT$

$\pi = 2 \times 0.1538 \times 0.08314 \times 310$

$= 7.94$ bar

Osmotic pressure decreases by 25%

So

$\pi_{new} = 0.75 \times 7.94$ bar

$= 5.96$ bar

19. Examine the reaction series **I, II, III** and **IV**.

I. Chlorobenzene $\xrightarrow[(ii)HCl]{(i)NaOH,10\,atm,573-623K}$ P1 $\xrightarrow{(i)\ Zn,\Delta}$ P2 $\xrightarrow{\text{molar amount } Cl_2,Fe}$ P3

II. 1 – cyclohexylpropan – 2 – ol $\xrightarrow{red\,P,Br_2}$ A1 $\xrightarrow{excess\,NH_3}$ A2 $\xrightarrow[(ii)\ Ethanol]{(i)\ NaNO_2,HCl,5°C}$ A3

III. Ethylbenzene $\xrightarrow[(ii)H_3O^+,\Delta]{(i)\ KMnO_4,KOH}$ Q1 $\xrightarrow{NaOH,CaO,\Delta}$ Q2 $\xrightarrow{\text{molar } C_2H_5Cl,\ anhy.\ AlCl_3}$ Q3

IV. 2 – Butanone $\xrightarrow[(ii)HCl]{(i)\ CH_3MgBr,ether}$ R1 $\xrightarrow{20\%H_2SO_4,373K}$ R2 $\xrightarrow[(ii)\ Zn,H_2O,\Delta]{(i)O_3,CCl_4}$ R3

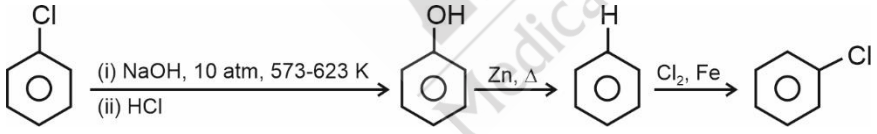
The series of reactions amongst the above that regenerates the starting compound at the end will be:

(a) I and II (b) I and III

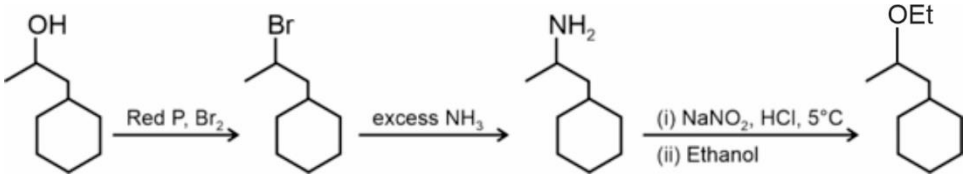
(c) III and IV (d) I, II, III and IV

Answer (b)

Sol. I.

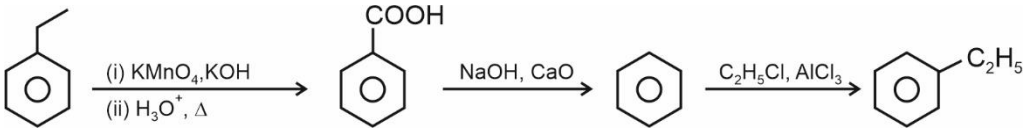


II.

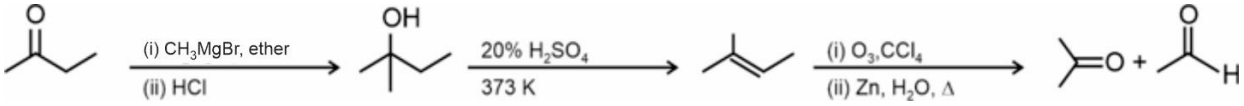


Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

III.



IV.



20. Identify the incorrect statement(s)

A. Complete hydrolysis of XeF_4 and XeF_6 gives XeO_3.

B. XeO_3 reacts with aqueous alkali to form hydrogen xenate ion, $HXeO_4^-$, which slowly disproportionate to give Xe and perxenate ion, XeO_6^{4-}.

C. The perxenate solutions are yellow in colour and are strong reducing agents.

D. XeF_4 and XeF_6 are square planar (dsp^2) and distorted octahedral (sp^3d^2) in shape, respectively.

Choose the option:

(a) A only

(b) A and B

(c) C and D

(d) B, C and D

Answer (c)

Sol. (A) $6XeF_4 + 12H_2O \rightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$

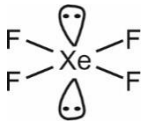
$XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$

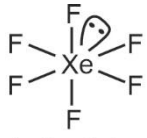
(B) $XeO_3 + OH^- \rightarrow HXeO_4^-$

This slowly disproportionates:

$2HXeO_4^- + 2OH^- \rightarrow XeO_6^{4-} + Xe + O_2 + 2H_2O$

(C) Perxenate solutions are not strong reducing agents; perxenate is a strong oxidising agent. **Incorrect**

(D) $XeF_4 \Rightarrow$  sp^3d^2

$XeF_6 \Rightarrow$  sp^3d^3 **Incorrect**

distorted octahedral

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

21. In Dumas method of estimation of nitrogen, 0.35 g of an organic compound gave 55 mL of nitrogen collected at 300 K temperature and 715 mm pressure. The percentage composition of nitrogen in the compound is:

(Aqueous tension at 300 K = 15 mm)

(a) 15.45% (b) 16.45%

(c) 17.45% (d) 14.45%

Answer (b)

Sol. $n_{N_2} = \frac{PV}{RT}$

$$\frac{700 \times 0.055}{760 \times 0.0821 \times 300}$$

$n_{N_2} = 0.0021$ mol

Mass of N_2 = 0.058 g

% of N = $\frac{0.058}{0.35} \times 100 = 16.5\%$

22. Identify the incorrect statement among the following:

(a) Among halogens, F_2 does not undergo disproportionation reactions

(b) The correct order of stability is: HOCl > HOBr > HOI > HOF

(c) The correct order of acidity is: $HOClO_3 > HOClO_2 > HOClO > HOCl$

(d) The interhalogens AB_n undergo hydrolysis giving halide ions derived from the larger halogen and a hypohalite (when AB), halite (when AB_3), halate (when ABs) and perhalate (when AB_7) anion derived from the smaller halogen. (A = larger halogen, B = Smaller halogen)

Answer (d)

Sol. Order of acidity depend on stability of conjugate base

B is more electronegative (smaller halogen)

23. Acetylene (C_2H_2) gas is generated when water is added to CaC_2 (calcium carbide). The mass of CaC_2 (97% pure) required to generate the gas to be stored in 50L cylinder at 27 °C and 101.3 kPa is _____

[Given: C = 12 g/mol and Ca = 40 g/mol]

(a) 63 g (b) 134 g

(c) 32 g (d) 99 g

Answer (b)

Sol. $CaC_2 + H_2O \rightarrow C_2H_2$

97%

$$n_{C_2H_2} = \frac{1 \times 50}{0.821 \times 300} = 2.03 \text{ mole}$$

2 moles CaC_2

Mass of $CaC_2 = 64 \times 2 \approx 128$ g

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

$$\% \text{ purity} = \frac{128}{w} \times 100$$

= 134 g

24. Which of the following statement(s) is/are correct?

A. The oxidation states of S in Caro's acid and thiosulphate ion are +6 and +2, respectively.

B. In dithionic acid, there are four S=O, two S-OH groups and one S-S bond.

C. The SF_2 is angular, SF_4 is tetrahedral and SF_6 is octahedral in shape.

D. S is present in methionine and serine amino acids.

Choose the correct option:

(a) A only (b) A and B

(c) C and D (d) B, C and D

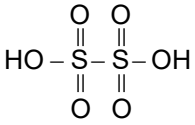
Answer (b)

Sol. Caro's acid

$\overset{+6}{H_2SO_5}$ $\overset{+2}{S_2}O_3^{2-}$

A is correct.

Dithionic acid, $H_2S_2O_6$



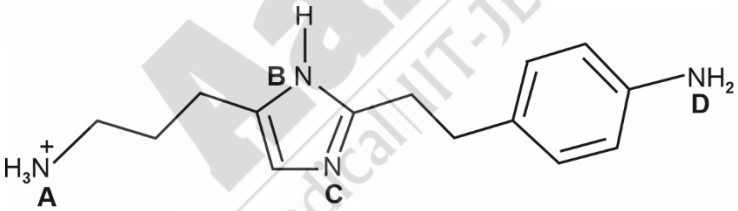
B is correct

C is in correct

Methionine: $-CH_2-CH_2-S-CH_3$

Serine: $-CH_2-OH$

25. The order of decreasing basic strength of the nitrogen atoms labelled as **A, B, C** and **D** in the following molecule is



(a) B > C > D > A (b) C > D > B > A

(c) B > D > A > C (d) C > A > B > D

Answer (b)

Sol. C ⇒ Localised l.p.

D ⇒ available for donation

B ⇒ in conjugation

A ⇒ cannot accept H^+

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

26. Consider the following statements about the halides of phosphorous.

A. PF_5, a colourless gas, is molecular and stereo chemically non-rigid molecule and shows 'pseudorotation'.

B. PCl_5 is molecular in gas phase but ionic in the solid phase, $[PCl_4]^+$ $[PCl_6]^-$

C. Both PBr_5 and PI_5 are ionic in solid phase and exists as $[PBr_4]^+$ $[Br]^-$ and $[PI_4]^+$ $[I]^-$ respectively.

D. The mixed chlorofluorides, PCl_4F and PCl_3F_2 have F atoms in axial position(s)

(a) C and D (b) A, C and D

(c) A, B and D (d) A, B, C and D

Answer (c)

Sol. (A) PF_5 colourless, gas exhibits pseudoratation. (A) is correct.

(B) PCl_5, molecular in gas phase in solid state $[PCl_4]^+$ and $[PCl_6]^-$

(C) $PBr_5 \Rightarrow$ $[PBr_4]^+ Br^-$ in solid state

$PI_5 \Rightarrow [PI_4]^+ [I]^-$ is solution phase (c) incorrect.

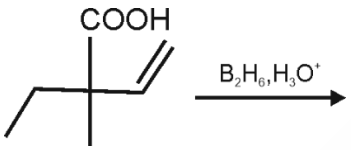
(D) $PCl_4F \Rightarrow$ F-axial

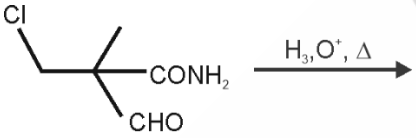
$PCl_3F_2 \Rightarrow$ F-axial

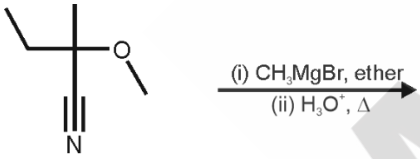
(D) correct

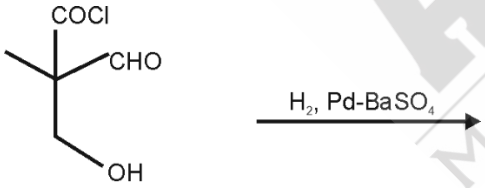
option (c) A, B and D

27. Examine the following reactions

I. 

II. 

III. 

IV. 

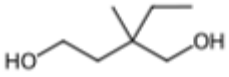
The reaction(s) in which an achiral product is/are obtained

(a) II and IV (b) I only

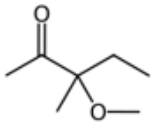
(c) I, III and IV (d) IV only

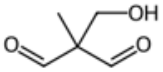
Answer (d)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. I.  Chiral

II. Chiral molecule is formed.

III.  Chiral

IV.  Achiral

28. Co^{2+}(aq) is pink in colour. When excess of HCl solution is added to its aqueous solution it becomes deep blue. The reason is

(a) Octahedral $[Co(H_2O)_6]^{2+}$ changed to tetrahedral $[CoCl_4]^{2-}$

(b) Octahedral $[Co(H_2O)_6]^{2+}$ changed to octahedral $[CoCl_6]^{4-}$

(c) Octahedral $[Co(H_2O)_6]^{2+}$ changed to octahedral $[Co(H_2O)_6]^{3+}$

(d) High spin octahedral $[Co(H_2O)_6]^{2+}$ changed to low spin octahedral $[Co(H_2O)_6]^{2+}$

Answer (a)

Sol. Co^{2+} (aq) is pink in colour

$[Co(H_2O)_6]^{2+}$ pink

$$[Co(H_2O)_6]^{2+} + HCl \longrightarrow [CoCl_4]^{2-} + 6H_2O$$

Deep blue

$Cl^{\ominus}$ is a (WFL) and much bulkier than H_2O, so $4Cl^{\ominus}$ fit around Co^{2+} in a (T_d) arrangement rather than 6.

29. Surface tension

(a) is an extensive property

(b) is numerically equal to surface energy

(c) has the units N m^{-2}

(d) is independent of intermolecular forces

Answer (b)

Sol. Surface tension is an intensive property.

Its SI unit is Nm^{-1}.

Surface tension is numerically equal to surface energy per unit area.

$$\gamma = \frac{\text{Surface energy}}{\text{Area}}$$

It depends on intermolecular forces.

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

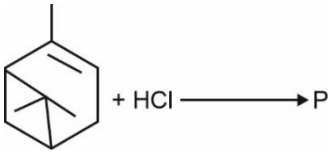
134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

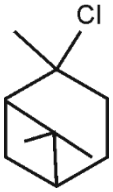
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

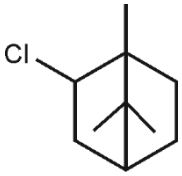
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

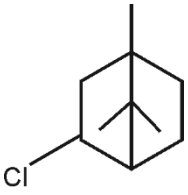
30. A carbocation intermediate is formed during dehydrohalogenation, and the intermediate is capable of structural rearrangements to give a more stable product. In the following reaction identify the product P.



The product P is

(a) 

(b) 

(c) 

(d) 

Answer (b)

Sol. 

31. A Student sets up a galvanic cell as shown below and records its EMF as 0.71V.

$(-)Mg\,(s)\,|MgSO_4\,(1Maq.)\,||Al_2(SO_4)_3(1Maq.)\,|Al\,(s)\,(+)$

While working with the cell, she accidently dropped some amount of $MgSO_4$ into the magnesium half-cell which readily dissolved. This caused EMF of the cell change to 0.698V. The quantity of $MgSO_4$ in g that fell into the Magnesium half-cell is closer to

[Given: E^0 Al = - 1.66 V and E^0 Mg = -2.37 V]

(a) 9.30 (b) 15.30

(c) 6.02 (d) 3.12

Answer (a)

Sol. $(-)\ Mg(s)\,|\,MgSO_4\,(1\,M\,aq)\,||\,Al_2(SO_4)_3\,(1\,M\,aq)\,|\,Al(s)\,(+)$

$$3Mg(s) + 2Al^{3+}(aq) \longrightarrow 3Mg^{2+}(aq) + 2Al(s)$$

$$E_{cell} = E^{\circ}_{cell} - \frac{0.059}{6}\log\frac{\left[Mg^{2+}\right]^3}{\left[Al^{3+}\right]^2}$$

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

$$E^{o}_{cell} = E^{o}_{Al^{3+}/Al} - E^{o}_{Mg^{2+}/Mg} = -1.66 + 2.37 = 0.71\,V$$

$$0.698 = 0.71 - \frac{0.059}{6}\log\frac{\left[Mg^{2+}\right]^3}{1}$$

$$0.012 = \frac{0.059}{6}\log\left[Mg^{2+}\right]^3$$

$$0.012 = 0.01\times 3\log\left[Mg^{2+}\right]$$

$$\frac{0.004}{0.01} = \log\left[Mg^{2+}\right]$$

$$\log\left[Mg^{2+}\right] = 0.4$$

$$\left[Mg^{2+}\right] = 2.5\ M$$

(Assume 50 mL solution)

$$\text{Moles of } MgSO_4 \text{ added} = (2.5-1)\times\frac{50}{1000}$$

$$\text{Mass added} = \frac{1.5\times 50}{1000}\times 120 \approx 9\ g$$

32. The structure of XeF_5^- does not resemble with:

A. Pentaiodide ion
B. Bromine pentafluoride
C. Iron pentacarbonyl
D. PCl_3F_2 (Both F are at axial positions)

Choose the correct option:

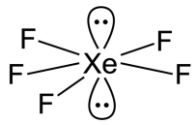
(a) A
(b) A and C
(c) B, C and D
(d) A, B, C and D

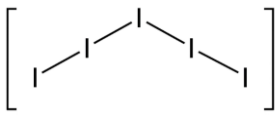
Answer (d)

Sol. XeF_5^-

Hybridisation = sp^3d^3

Shape = pentagonal planar

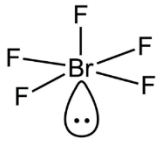


(A) Pentaiodide ion,  not isostructural

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

(B) Bromine pentafluoride,

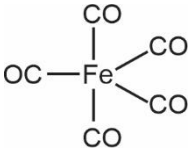
BrF_5: sp^3d^2,



Square pyramidal

not resemble

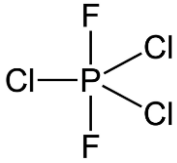
(C) $Fe(CO)_5$:



trigonal bipyramidal

not resemble

(D) PCl_3F_2: sp^3d,



trigonal bipyramidal

not resemble

Correct answer: (d) A, B, C and D

33. A solution containing 0.319 g of $CrCl_3.6H_2O$ was passed through a cation exchange resin and the liberated acid was titrated with a standard solution of NaOH. The neutralization required 19.0 mL of 0.125 N NaOH. Choose the correct structural formula of Cr(III) complex. (Molar mass of $CrCl_3.6H_2O$ = 266.35 g/mol)

(a) $[Cr(H_2O)_5Cl]Cl_2.H_2O$ (b) $[Cr(H_2O)_4Cl_2]Cl.2H_2O$

(c) $[Cr(H_2O)_3Cl_3].3H_2O$ (d) $[Cr(H_2O)_6]Cl_3$

Answer (a)

Sol. 19.0 mL of 0.125 N NaOH = 2.375 milli equivalents

$$\text{mmoles of } CrCl_3 \cdot 6H_2O = \frac{0.319}{266.35} = 1.198 \text{ mmoles}$$

mmoles of HCl = 2.375 mmoles

$$\text{No. of } Cl^- \text{ per molecule} = \frac{2.375}{1.198} \approx 2$$

2 free Cl^- ions

$\left[Cr\left(H_2O\right)_5 Cl\right]Cl_2 \cdot H_2O$

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

34. The precipitate is formed when 20 mL of an aqueous solution of KI (1% (w/v)) is mixed with 20 mL of an aqueous solution of 1.5% (w/v) $Pb(NO_3)_2$ solution. The number of anions present in the mixed solution are _____

(a) 4.0×10^{19} I^- ions (b) 8.0×10^{19} NO_3^- ions

(c) 1.412×10^{20} I^- and 1.412×10^{20} NO_3^- ions (d) 3.65×10^{20} NO_3^- ions

Answer (No correct option)

Sol. $Pb(NO_3)_2 + 2KI \longrightarrow PbI_2 \downarrow + 2KNO_3$

$$M_{Pb(NO_3)_2} = \frac{1.5 \times 1000}{331 \times 100} = 0.045 \text{ M}$$

$$M_{KI} = \frac{1 \times 1000}{166 \times 100} = 0.060 \text{ M}$$

$Pb(NO_3)_2$	+	$2KI$	$\rightarrow$	$PbI_2 \downarrow$	+	$2KNO_3$
0.045×20 mmol $= 0.9$ mmol		0.060×20 mmol $= 1.2$ mmol **(LR)**		—		—
$0.9 - 0.6 = 0.3$ mmol		—		0.6 mmol		1.2 mmol

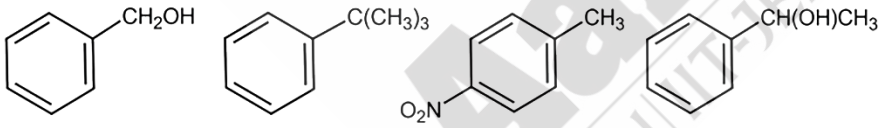
Total mmoles of NO_3^- ion $= 0.6 + 1.2 = 1.8$ mmol

$n_{NO_3^-} = 1.8 \times 10^{-3}$ mol

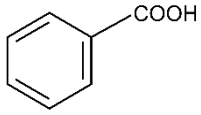
No. of ions $= 1.8 \times 6.022 \times 10^{20}$ ions

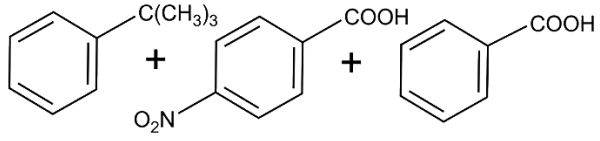
$\approx 1.09 \times 10^{21}$ ions of NO_3^-

35. A mixture of the following organic compounds is oxidized using hot chromic acid.

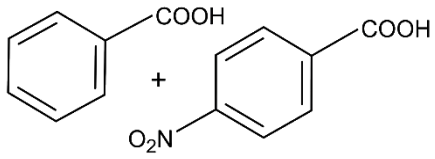


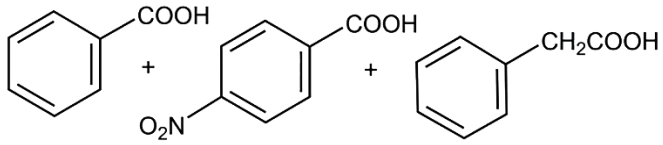
The reaction mixture contains:

(a) only 

(b) 

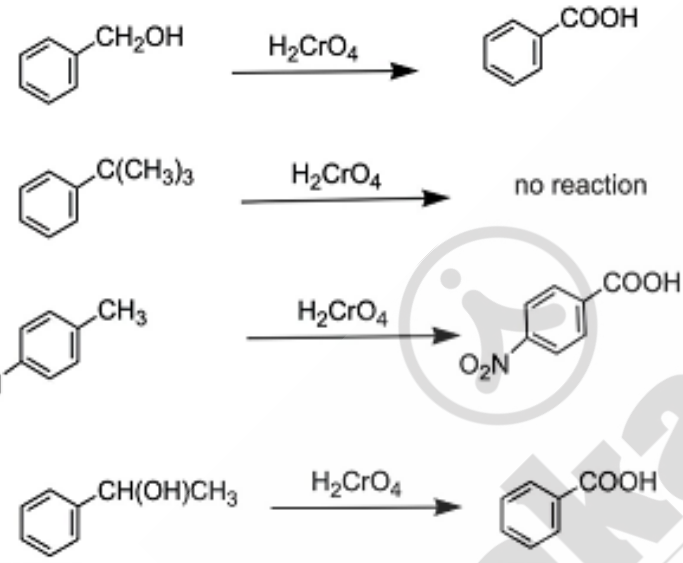
Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

(c) 

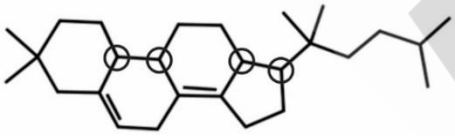
(d) 

Answer (b)

Sol.



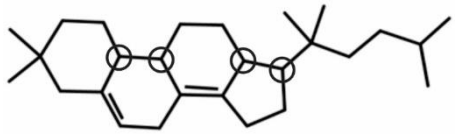
36. How many chiral centers are present in the following structure?



(a) 4 (b) 10

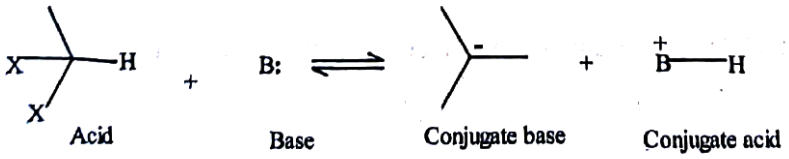
(c) 6 (d) 8

Answer (a)

Sol. 

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

37. Consider the following reaction:

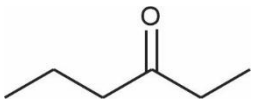


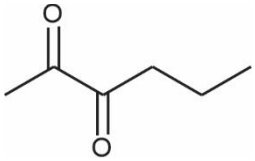
The acid in the above representation is known as a **carbon acid** where **X** is an electron withdrawing group. The most 'acidic' carbon acid amongst the following is:

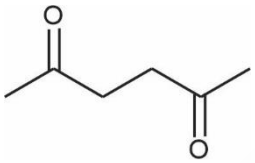
(a) 3-hexanone (b) 2,3-hexandione

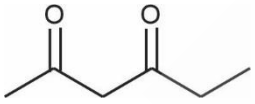
(c) 2,5-hexandione (d) 2,4-hexandione

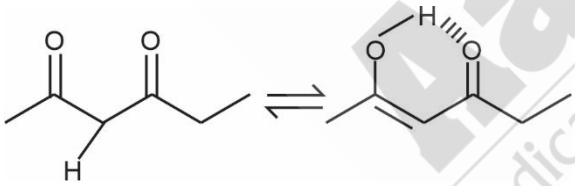
Answer (d)

Sol. (a) 

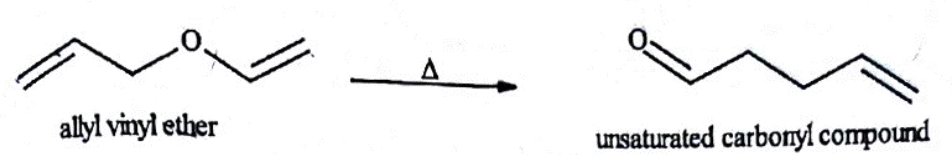
(b) 

(c) 

(d)  most acidic

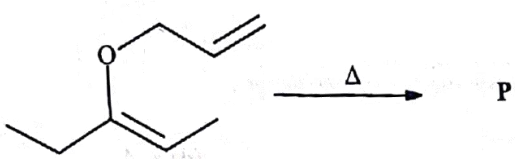


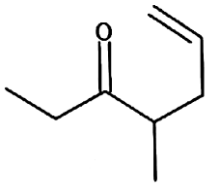
38. Claisen rearrangement is a chemical reaction which involves heating of an allyl vinyl ether to form a 1,4-enone. There is an intramolecular rearrangement of the π system where a σ bond is broken and reformed in a different position in the product. A simple illustration is shown below:

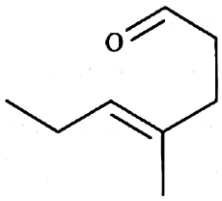


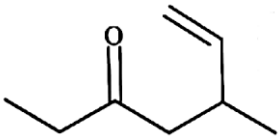
Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

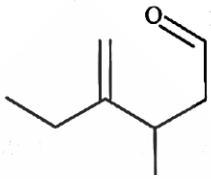
Consider the following reaction and identify the structure of **P**, which readily forms the product.



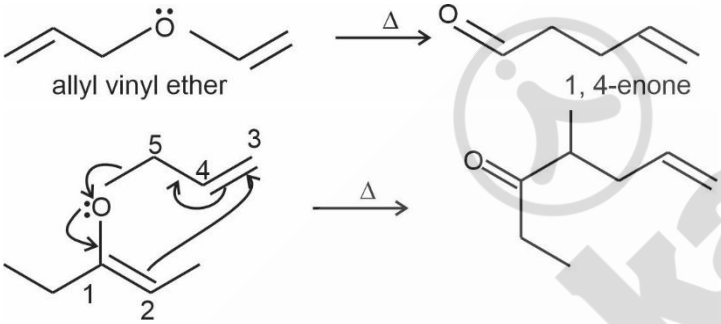
(a) 

(b) 

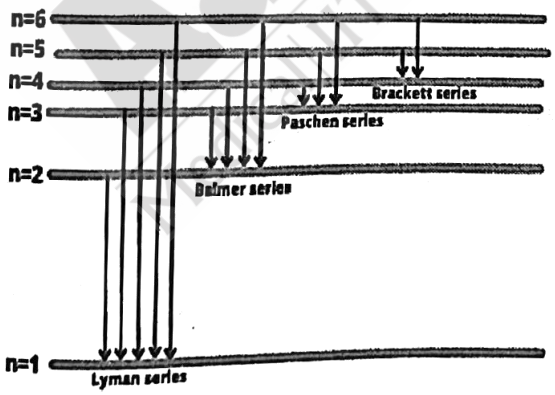
(c) 

(d) 

Answer (a)

Sol. 

39. The line spectrum of hydrogen atom is shown below. Identify the statement that is correct *(Diagram is for representative purpose only and not to scale)*



Energy transitions for the Hydrogen Atom

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

(a) First line of the Lyman series (n = 2 → 1) for hydrogen atom has the same wavelength as the first line of the Balmer series (n = 3 → 2) for the He^+ ion.

(b) First Balmer line (n = 3 → 2) in hydrogen has the same wavelength as the transition from line (n = 6 → 4) in the second line of the Brackett series.

(c) The first line of the Paschen series of hydrogen atom has the same wavelength as the first line of the Balmer series of Li^{+2} ion.

(d) The first line of the Lyman series (n = 2 → 1) of Li^{+2} ion has the same wavelength as the third line (n = 5 → 2) of the Balmer series of He^+ ion.

Answer (No answer matching)

Sol. (a) H, $2 \to 1$: $\bar{\nu}_1 = R_H 1^2\left[1-\frac{1}{2^2}\right] = \frac{3}{4}R_H$

He^+ $3 \to 2$: $\bar{\nu}_2 = R_H 2^2\left[\frac{1}{2^2}-\frac{1}{3^2}\right] = \frac{5R_H}{9}$

(a) is incorrect.

(b) H, $3 \to 2$: $\bar{\nu}_3 = R_H 1^2\left[\frac{1}{2^2}-\frac{1}{3^2}\right] = \frac{5R_H}{36}$

He^+ not given

If He^+, $6 \to 4$: $\bar{\nu}_4 = R_H 2^2\left[\frac{1}{4^2}-\frac{1}{6^2}\right] = \frac{5R_H}{36}$

(c) H, 1st Paschen, $4 \to 3$: $\bar{\nu}_5 = R_H 1^2\left[\frac{1}{3^2}-\frac{1}{4^2}\right] = \frac{7R_H}{144}$

Li^{2+}, 1st Balmer, $3 \to 2$: $\bar{\nu}_6 = R_H 3^2\left[\frac{1}{2^2}-\frac{1}{3^2}\right] = \frac{5R_H}{4}$

(c) is incorrect.

(d) Li^{2+}, 1st Lyman, $2 \to 1$: $\bar{\nu}_7 = R_H 3^2\left[\frac{1}{1^2}-\frac{1}{2^2}\right] = \frac{27R_H}{4}$

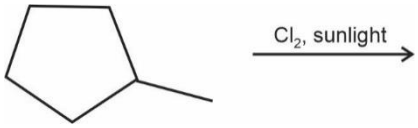
He^+, 3rd Balmer, $5 \to 2$: $\bar{\nu}_8 = R_H 2^2\left[\frac{1}{2^2}-\frac{1}{5^2}\right] = \frac{21}{25}R_H$

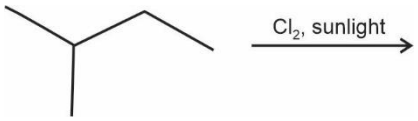
(d) is incorrect.

Option (b) He^+ not mentioned

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

40. The total number of monochlorinated products (including the stereoisomers) in the following reactions **I** and **II** are respectively:

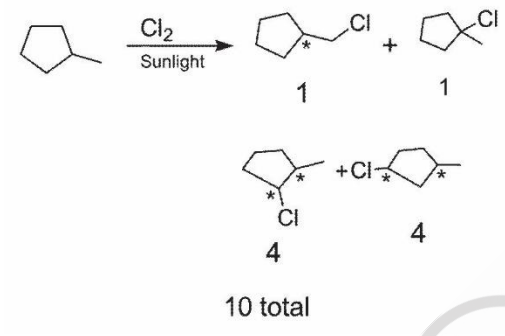
I. 

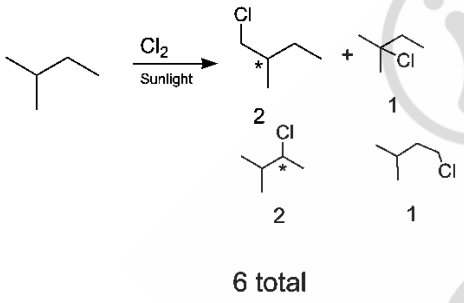
II. 

(a) 5, 5 (b) 10, 5

(c) 6, 5 (d) 8, 4

Answer (No option matching)

Sol. I. 

II. 

10, 6

No option Matches

41. For the following stoichiometric oxidation of NO by O_2

$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$

Experimental kinetic data obtained is given in the following table

NO/mol dm^{-3}	O_2/mol dm^{-3}	Initial rate/mol $dm^{-3}s^{-1}$
0.0200	0.0200	7.11×10^{-5}
0.0400	0.0200	2.8×10^{-4}
0.0200	0.0400	1.41×10^{-4}

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

The rate law that can be deduced form the kinetic data is

(a) $-d[NO_2]/dt = k\,[NO]^2\,[O_2]$

(b) $\frac{1}{2}\,d[NO_2]/dt = k\,[NO]^2\,[O_2]$

(c) $\frac{1}{2}\,d[NO_2]/dt = k\,[NO]\,[O_2]^2$

(d) $d[NO]/dt = k\,[NO]^2\,[O_2]$

Answer (b)

Sol. $r = k[NO]^x[O_2]^y$

$7.11\times10^{-5} = k[0.02]^x[0.02]^y$ ...(i)

$2.8\times10^{-4} = k[0.04]^x[0.02]^y$ ...(ii)

$1.41\times10^{-4} = k[0.02]^x[0.04]^y$ ...(iii)

(i) ÷ (ii):

$$\Rightarrow \frac{7.11\times10^{-5}}{2.8\times10^{-4}} = \left(\frac{1}{2}\right)^x$$

$$\Rightarrow \frac{7.11}{2.8\times10} = \left(\frac{1}{2}\right)^x$$

$$\Rightarrow \left(\frac{1}{4}\right) = \left(\frac{1}{2}\right)^x \Rightarrow x = 2$$

(i) ÷ (iii):

$$\Rightarrow \frac{7.11\times10^{-5}}{1.41\times10^{-4}} = \left(\frac{1}{2}\right)^y$$

$$\Rightarrow \frac{7.11}{1.41\times10} = \left(\frac{1}{2}\right)^y$$

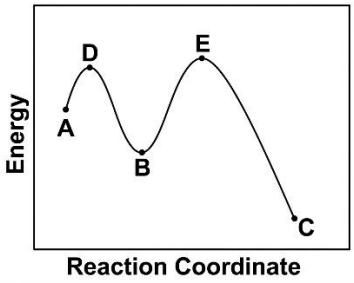
$$\Rightarrow \left(\frac{1}{2}\right) = \left(\frac{1}{2}\right)^y \Rightarrow y = 1$$

$\therefore r = k[NO]^2[O_2]$

$$-\frac{1}{2}\frac{d[NO]}{dt} = -\frac{d[O_2]}{dt} = +\frac{1}{2}\frac{d[NO_2]}{dt} = k[NO]^2[O_2]$$

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

42. The given energy profile diagram corresponds to the reaction $A \rightarrow B \rightarrow C$, Activation energies and the rate constants for the reaction I; $A \rightarrow B$ and for II; $B \rightarrow C$ are E_1 and k_1 and E_2 and k_2, respectively.



The correct statement among the following is:

(a) Reaction I is rate determining

(b) $k_1 > k_2$

(c) $(E_1 + E_2)$ is the activation energy for the reaction $C \rightarrow A$.

(d) D is an intermediate and E is a transition state.

Answer (b)

Sol. $E_2 > E_1 \Rightarrow k_1 > k_2$

$\Rightarrow$ $B \rightarrow C$ (Reaction II is rds)

Higher $E_a \Rightarrow$ lower rate constant.

43. Choose the correct option of spontaneous and non-spontaneous processes in the following table

Process	(a)	(b)	(c)	(d)
Radioactive decay	spontaneous	Non-spontaneous	spontaneous	Non-spontaneous
Freezing water above 0 °C	Non-spontaneous	Non-spontaneous	spontaneous	Non-spontaneous
Adsorption of nitrogen on activated charcoal	spontaneous	spontaneous	spontaneous	spontaneous
Burning of coal	Spontaneous	spontaneous	Non spontaneous	spontaneous
Evaporation of water at 25 °C	Non-spontaneous	Non-spontaneous	Non-spontaneous	spontaneous

Answer (None of the options is matching)

Sol. Radioactive decay $\rightarrow$ spontaneous.

Water freezes at 0 °C (spontaneous); freezing water above 0 °C $\rightarrow$ non-spontaneous.

$\Rightarrow$ Adsorption $\rightarrow$ spontaneous ($\Delta S < 0$, $\Delta H < 0$).

$\Rightarrow$ Evaporation at 25 °C is spontaneous in air, as ΔS is large and positive.

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

44. Most of the biochemical reactions are enzyme catalyzed. The mechanism of an enzyme catalyzed reaction can be written as follows

$$E + S \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} ES \underset{k_{-2}}{\overset{k_2}{\rightleftharpoons}} E + P$$

Where E and S stands for Enzyme and Substrate, while k_1, k_2, k_{-1} and k_{-2} represent rate constants at the respective steps as shown in the mechanism. The concentration of ES, assuming initial concentration of Enzyme is $[E]_0$ is given by the equation

$$[ES] = \frac{[E]_0[S]}{\frac{k_{-1}+k_2}{k_1}+[S]} = \frac{[E]_0[S]}{K_m+[S]}$$

Which of the following statement is correct with respect to above expression?

(a) When $K_m > [S]$, then the reaction is zero order with respect to substrate

(b) When $K_m = [S]$, it offers lowest possible rate for the enzymatic reaction

(c) K_m has the unit of concentration

(d) When $[S] > K_m$, reaction is first order with respect to substrate

Answer (c)

Sol. Given

$$[ES] = \frac{[E_0][S]}{K_m+[S]} \text{ (since rate is proportional to [ES])}$$

$$K_m = \frac{k_{-1}+k_2}{k_1}$$

K_m is expressed as concentration unit of K_m = mol L^{-1}

When $[S] < K_m$

$$[ES] \approx \frac{[E_0][S]}{K_m}$$

The reaction is first order with respect to the substrate.

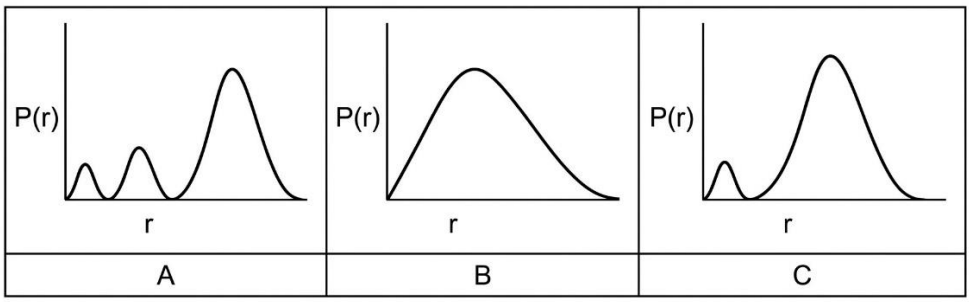
When $[S] >> K_m$

$$[ES] \propto [E_0]$$

Reaction is zero order w.r.t. substrate

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

45. A rough sketch of the variation in the radial probability **P(r)** as function of distance **r** from center of nucleus are represented below.



The correct orbital to which they can be associated is

	A	B	C
(a)	2p	3s	3d
(b)	3s	3d	4s
(c)	3s	2p	2s
(d)	3p	3d	3s

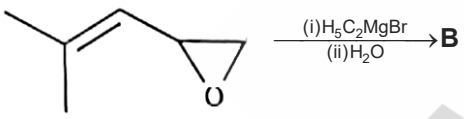
Answer (c)

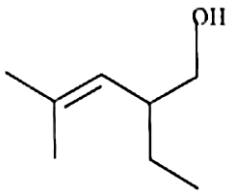
Sol. Plot (A) → 3s / 4p / 5d

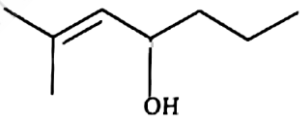
Plot (B) → 1s / 2p / 3d

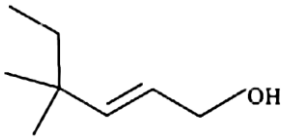
Plot (C) → 2s / 3p / 4d

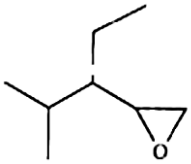
46. Product **B** in the following reaction is:



(a) 

(b) 

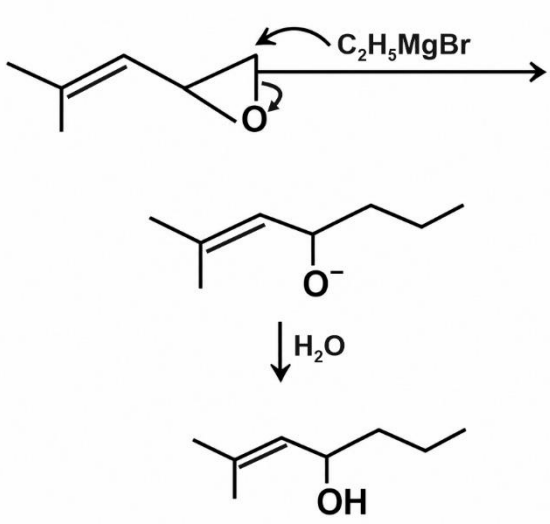
(c) 

(d) 

Answer (b)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol.



47. A human brain typically operates at 25W (1W = 1 J/s). The mass of glucose that must be consumed to sustain brain activity for 1h is _____.

(Assuming the energy comes from the following reaction)

$C_6H_{12}O_6 + O_2 \rightarrow 6CO_2 + 6H_2O + \Delta U$

Given that at 25 °C the energy of the reaction is $\Delta U = 2828$ kJ/mol . Molar mass of glucose = 180g/mol

(a) 5.73 g

(b) 1.59 mg

(c) 5.73 kg

(d) 1.59 g

Answer (a)

Sol. Total energy required for 1 hr:

$= 25 \times 60 \times 60$ J

$= \frac{25 \times 60 \times 60}{1000}$ kJ

$= 90$ kJ

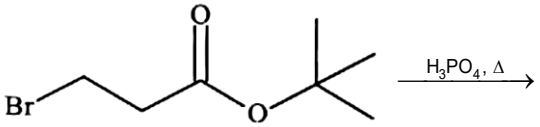
For 2828 kJ $\rightarrow$ 180 g glucose is required

For 90 kJ $\rightarrow \frac{180}{2828} \times 90$ g

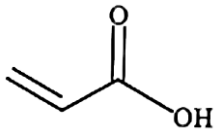
$= 5.728$ g ≈ 5.73 g

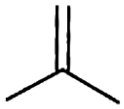
Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

48. The following reaction was carried out.

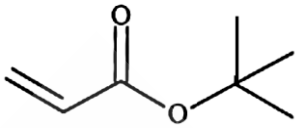


On investigation it was found that multiple products were obtained. One of the products decolourized bromine water. This particular product is:

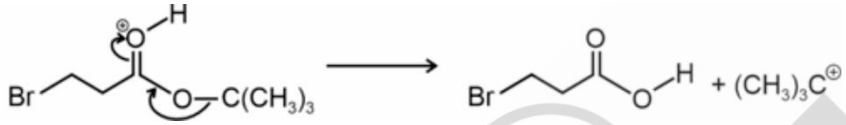
(a) 

(b) 

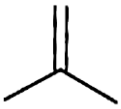
(c) 

(d) 

Answer (b)

Sol. 

$$(CH_3)_3C^+ + H_2O \xrightarrow{\Delta} (CH_3)_2C=CH_2$$



Ans. (b) is correct.

A – 2

ANY NUMBER OF OPTIONS (4, 3, 2 or 1) MAY BE CORRECT

MARKS WILL BE AWARDED ONLY IF ALL THE CORRECT OPTIONS ARE BUBBLED AND NO INCORRECT

49. When equal volumes of 0.02 M $AgNO_3$ and 0.02 M NaCl are mixed, AgCl precipitates out (K_{sp} of AgCl at 298 K = 1.8×10^{-10}), which of the following statement(s) is/are true?

(a) The addition of ammonium hydroxide to the mixture will cause the precipitate to redissolve due to the formation of a soluble complex ion.

(b) If the temperature is increased, the K_{sp} of AgCl increases, causing more precipitate to dissolve.

(c) The solubility of AgCl in 0.01 M NaCl will be higher than its solubility in pure water.

(d) If the initial concentration of both reactants is lowered to 0.00002 M, no precipitation will occur.

Answer (a, b, d)

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. K_{sp} of AgCl $= 1.8 \times 10^{-10}\ M^2$

$\left[Ag^+\right] = \left[Cl^-\right] = 10^{-2}$ M

$Q_{sp} = 10^{-2} \times 10^{-2} = 10^{-4}$

$Q_{sp} > K_{sp}$

Precipitate will form.

On addition of NH_4OH, complex formation takes place and solubility increases.

On increasing temperature K_{sp} increases, so solubility will increase.

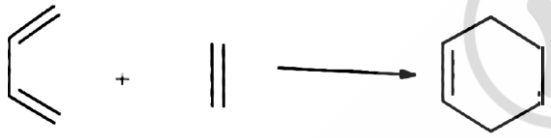
Due to the common ion effect of 10^{-2} M Cl^- ion, the solubility of AgCl is lower than its solubility in water.

When $\left[Ag^+\right] = \left[Cl^-\right] = 10^{-5}$ M

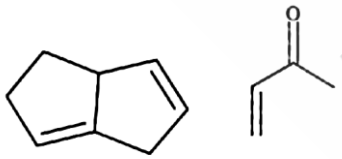
$Q_{sp} = 10^{-10}$

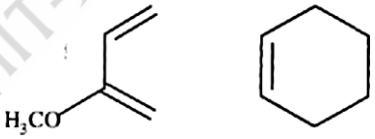
$K_{sp} > Q_{sp}$, No precipitate will form.

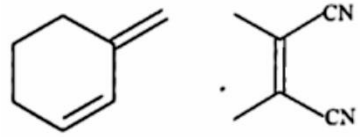
50. A conjugated diene and an unsaturated compound can undergo a thermal cycloaddition to cyclohexene even on mere heating to 50 °C. A simple example is shown below.

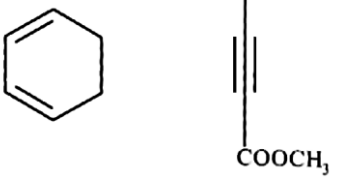


Presence of electron releasing groups on the diene and electron withdrawing groups on the unsaturated compound favour the formation of the cyclohexene derivative. From the following combinations, mark the option(s) of the diene and unsaturated compound that can react favorably to form the cyclic system.

(a) 

(b) 

(c) 

(d) 

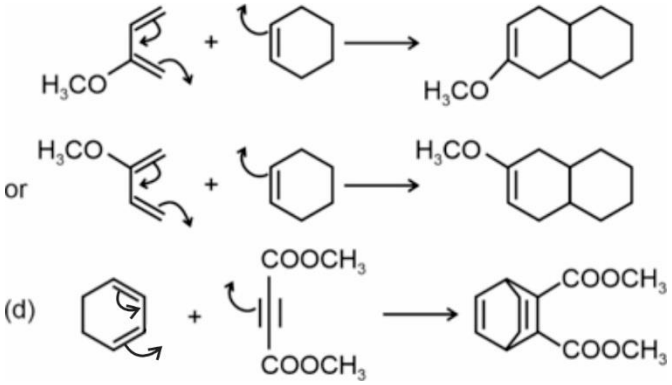
Answer (b, d)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. Diels Alder reaction:

Conjugated diene ⇒ cis position.

(b), (d) → will undergo this reaction.



51. Resonance in the covalent molecules brings out the following changes. Which of the following statements are correct?

(a) In a canonical structure the bond lengths become identical and lie between single bond and double bond

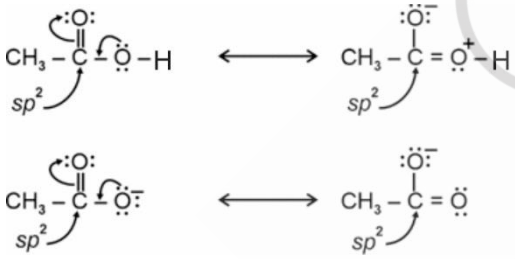
(b) The hybridization of the central atom changes between different canonical structures

(c) The resonance hybrid has lower energy than normal covalent molecule

(d) Resonance forces the combining atoms into a planar arrangement to allow π-electron delocalization

Answer (c, d)

Sol.



- Bond length may or may not be identical
- Resonance hybrid has lower energy than normal covalent molecule
- Hybridisation of central atom remains same

52. Identify the correct statements about the complexes "A" and "B" among $[CoCl(NH_3)_5]^{2+}$, $[Co(NH_3)_5(H_2O)]^{3+}$, $[Co(NH_3)_6]^{3+}$, $[Co(CN)_6]^{3-}$, $[Cu(H_2O)_4]^{2+}$, $[Cu(NH_3)_4]^{2+}$, $[Ti(H_2O)_6]^{3+}$, which absorb light at highest and lowest wavelengths, respectively.

(a) A has a square planar geometry

(b) B has an octahedral geometry

(c) A is paramagnetic and B is diamagnetic

(d) Both A and B do not exhibit geometrical isomerism

Answer (b, c, d)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. $\Delta_0 = \frac{hc}{\lambda}$

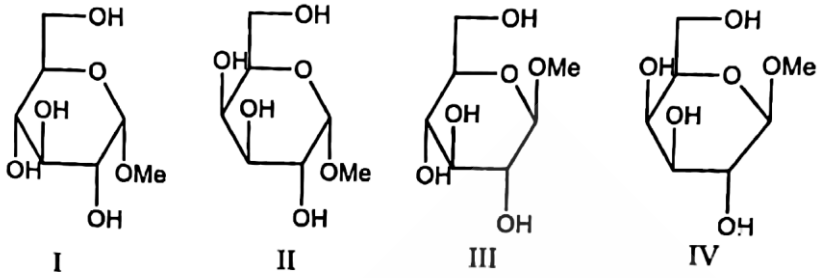
For λ_{max} Δ_0 should be minimum

For λ_{min} Δ_0 should be maximum

Complex A is $[Cu(H_2O)_4]^{2+} \rightarrow$ tetrahedral

Complex B is $[Cu(CN)_6]^{3-} \rightarrow$ octahedral

53. Identify the correct set of stereochemical relationship amongst the following monomethyl monosaccharides labelled as I to IV.



(a) I and II are anomers; I and III are epimers

(b) I and III are anomers; II and IV are anomers

(c) I and II are epimers; III and IV are epimers

(d) II and III are epimers; I and IV are anomers

Answer (b, c)

Sol. I & II differ at C_4, hence epimers

III & IV differ at C_4, hence epimers

I & III differ at C_1, hence anomers

II & IV differ at C_1, hence anomers

54. The equilibrium constants of the following isomerisation reaction at 400 K and 298 K are 2.07 and 3.42 respectively.

$$\text{cis} - \text{butene} \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} \text{trans} - \text{butene}$$

Which of the following is/are correct?

I. The forward reaction is exothermic

II. The forward reaction is endothermic

III. At both 400 K and 298 K, 50 % of cis-butene and 50 % of trans-butene are present at equilibrium

IV. At both 298 K and 400 K, $k_1 = k_{-1}$

V. The forward reaction is thermodynamically favoured at lower temperatures

(a) I, IV and V (b) I and V

(c) II and III (d) I, II, III and V

Answer (b)

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

Sol. cis butene $\underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}}$ trans – butene

At 298 K, K_{eq} = 3.42

At 400 K, K_{eq} = 2.07

On increasing temp. K_{eq} decreases hence reaction is exothermic, ΔH is negative.

55. Identify the correct statements about Ellingham diagram from the following. Choose the correct answer from the following options

(a) The curve for most of the reactions of formation of metal oxide $M_xO(s)$ has positive slope.

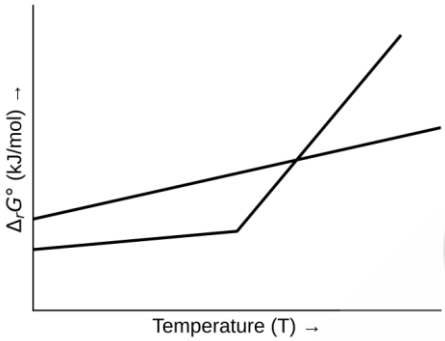
(b) The change in phase is indicated by straight line and upward slope

(c) Ellingham diagram can be used to explain the difficulties involved in the reduction of metal sulphides

(d) The values of ΔH and ΔS remain nearly constant even on varying the temperature

Answer (a, b, c, d)

Sol.



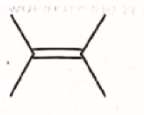
$\Delta_r G^\circ = \Delta_r H^\circ - T\Delta_r S^\circ$

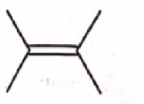
$M_{(s)} + \frac{1}{2}O_2 \quad MO_{(s)}$

$\Delta_r S^\circ = -ve$

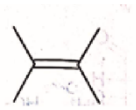
Slope = +ve

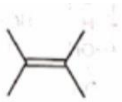
56. The reactions that will form vicinal diols as products from the following, are:

(a)  → i) MCPBA, ii) H_2O, H^+

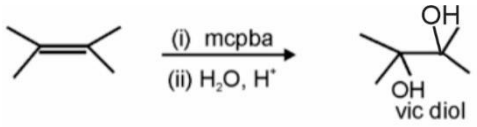
(b)  → i) $KMnO_4$, ii) H_2O

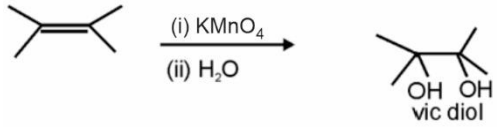
Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

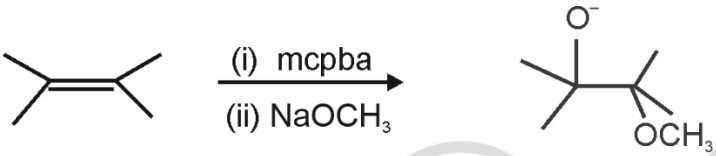
(c)  → i) MCPBA, ii) $NaOCH_3$

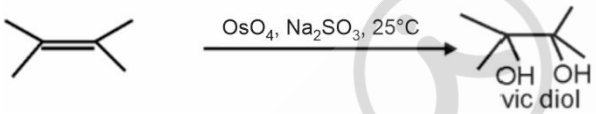
(d)  → OsO_4, Na_2SO_3, 25°C

Answer (a, b, d)

Sol. **(a)** 

(b) 

(c) 

(d) 

57. Which of the following statement(s) is /are correct?

(a) H_2O_2 is prepared on an industrial scale by the autoxidation of 4-alkyl anthraquinols, which is extracted by water and concentrated to ~30% (by weight) by distillation under reduced pressure.

(b) H_2O_2 in gas phase adopts a skew configuration with a dihedral angle of 111.5°, which is due to the repulsive interaction of the O-H bonds with the lone pair of electrons on each O atom.

(c) $H_2O_2(l) \rightarrow H_2O(l) + \frac{1}{2} O_2(g)$; $\Delta G° = -119.2$ kJ mol^{-1}.

In the absence of catalysts, H_2O_2 decomposes negligibly slow but the above reaction is strongly catalysed by metal surfaces (Pt, Ag) or by MnO_2 or by the traces of alkali (dissolved from glass).

(d) H_2O_2 oxidises Mn^{2+} to Mn^{4+} in alkaline medium and reduces MnO_4^- to Mn^{2+} in acidic medium.

Answer (b, c, d)

Sol. H_2O_2 is prepared by auto-oxidation of 2-alkyl anthraquinols.

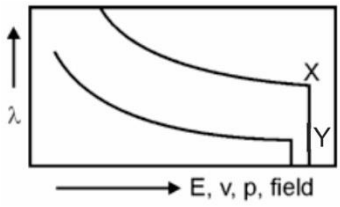
Metal surfaces or traces of alkali present in glass containers catalyse the reaction.

$$Mn^{2+} + H_2O_2 \longrightarrow Mn^{4+} + 2OH^-$$

$$6H^+ + MnO_4^- + H_2O_2 \longrightarrow Mn^{2+} + H_2O + O_2$$

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

58. The following figure shows variation of the de Broglie wavelength λ with the kinetic energy (E), velocity (v), momentum (p) and the applied electric field for two particles namely an electron and a proton. Qualitatively the curves X and Y represent the two particles.



The statement(s) that are true according to the figure is /are

(a) the curve X is for an electron and curve Y is for a proton, if the two carries equal energy

(b) the curve X is for an electron and curve Y is for a proton, if the two are moving with equal velocity

(c) the curve X is for an electron and curve Y is for a proton, if the two are having equal momentum.

(d) the curve X is for an electron and curve Y is for a proton, if the two have been accelerated by same electric field.

Answer (a, b, d)

Sol. $\lambda = \frac{h}{\sqrt{2m \cdot KE}}$

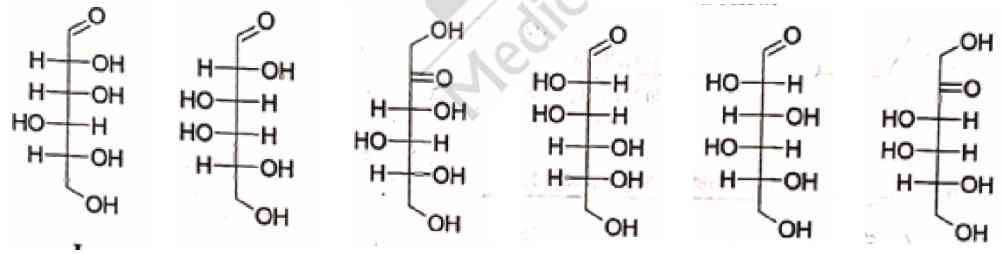
$\lambda = \frac{h}{mv}$

$\lambda = \frac{h}{p}$

59. Osazones are derivatives of carbohydrates, obtained by the reaction of excess phenyl hydrazine with the carbohydrate. A general representation of the structure of osazone derivative is drawn below:



A few structures **I, II, III, IV, V** and **VI** of monosaccharides are drawn below.



I **II** **III** **IV** **V** **VI**

Olympiads Results
777 Classroom Students Aakashians Qualified in IOQM 2025
134 Classroom Students Aakashians Qualified in RMO 2025-26
378 Classroom Students Aakashians Qualified in NSEs 2025-26
26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26
2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26

From the above structures, mark the pair(s) in the options that will give the same osazone derivative.

(a) I and III (b) II and VI

(c) II and III (d) I and V

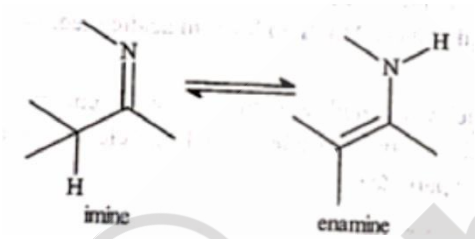
Answer (a, b, d)

Sol. I & III form the same osazone.

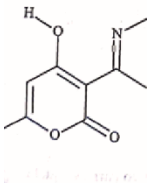
II & VI form the same osazone

I & V form the same osazone.

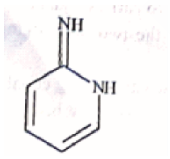
60. Similar to the keto-enol tautomerism is another common tautomeric relationship consisting of equilibrium between **imines** (also known as **Schiff bases**) and **enamines**, which are the nitrogen equivalents of enols. An illustration is shown below.



Which of the following can exhibit imine-enamine tautomerism?

(a) 

(b) 

(c) 

(d) 

Answer (a, b, c)

Sol. (a), (b), (c) will exhibit imine–enamine tautomerism

❑ ❑ ❑

Olympiads Results

777 Classroom Students Aakashians Qualified in IOQM 2025

134 Classroom Students Aakashians Qualified in RMO 2025-26

378 Classroom Students Aakashians Qualified in NSEs 2025-26

26 Classroom Students Aakashians Qualified for OCSCs/IMOTC /APMO 2025-26

2072 Classroom Students Aakashians Qualified in NSO (Level-1) 2025-26