JEE Adv. May 2026

Question Paper With Text Solution

17 May | Paper-1

CHEMISTRY

MATRIX

JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

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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.

1. An ideal gas (0.5 mol), initially at 2 bar pressure, is compressed at a constant temperature of 600 K in two steps: first, against a constant external pressure of P bar ($2 < P < 8$), and then against constant external pressure of 8 bar. At each step, the compression is stopped only when the pressure of the gas becomes equal to the external pressure. The total work done on the gas in these steps is W. Considering all possible values of P ($2 < P < 8$) and taking the gas constant as R (in J K^{-1} mol^{-1}), the minimum value of $|W|$ (in J) is

(A) 207R (B) 600R (C) 630R (D) 900R

Ans. B

Sol. IG $\xrightarrow[P_{ext} = \text{"P" bar}]{T = \cos t}$ V_2 $\xrightarrow[P_{ext} = 8\text{bar}]{T = \cos t}$ V_3

0.5 mol

V_1

2 bar, 600 K "P" bar 8 bar

$V_1 = \dfrac{0.5R(600)}{2}$ $V_2 = \dfrac{0.5R(600)}{P}$ $V_3 = \dfrac{0.5R \times 600}{8}$

$= 150\ R$ $= \dfrac{300R}{P}$ $= \dfrac{300R}{8}$

Against "P" bar

$W_I = -P_{ext}(V_f - V_i)$

$= -P\left(\dfrac{300R}{P} - 150R\right)$

$= -300R + 150\ R(P)$

Against "8" bar

$$W_{II} = -P_{ext}(V_f - V_i)$$

$$= -8\left(\frac{300R}{8} - \frac{300R}{P}\right)$$

$$= -300R + \frac{2400R}{P}$$

$$W_{total} = W_I + W_{II}$$

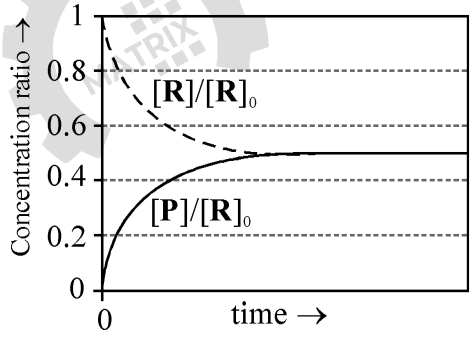
$$W_{total} = -600R + 150R\left(P + \frac{16}{P}\right)$$

$P + \frac{16}{P} \Rightarrow$ will be minimum at $P = 4$

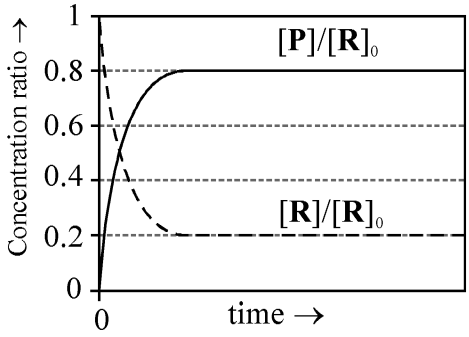
$$W_{total} = -600R + 1200R$$

2. For a reversible reaction $R \rightleftharpoons P$, at constant temperature, both the forward and the backward reactions are first order elementary reactions with rate constants k_f and k_b, respectively. At time zero, the concentration of R is $[R]_0$ and the concentration of P is zero. At any given time, [R] and [P] are the concentrations of R and P, respectively. If $k_b = 4k_f$, the correct graphical representation of the reaction is

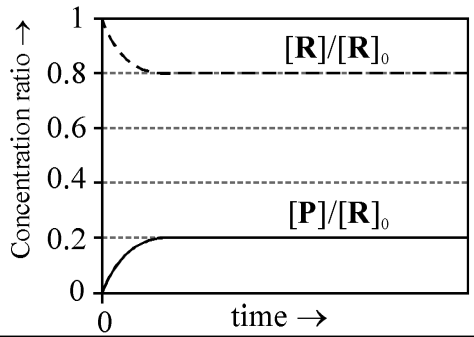
(A)



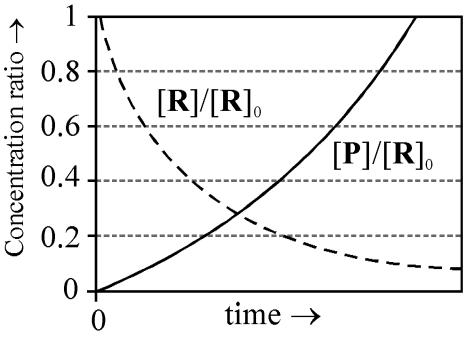
(B)



(C)



(D)



Ans. C

Sol. $R \underset{K_b}{\overset{K_f}{\rightleftharpoons}} P$

$t = 0 \quad [R]_0 \quad O$

$t = t_{eq} \quad [R]_{eq} \quad [P]_{eq}$

At eq^m., $R_f = R_b$

$k_f[R]_{eq} = 4k_f[P]_{eq}$

$$\Rightarrow \frac{[P]_{eq}}{[R]_{eq}} = \frac{1}{4}$$

Also, $[R]_{eq} + [P]_{eq} = [R]_0$

$4[P]_{eq} + [P]_{eq} = [R]_0$

$5[P]_{eq} = [R]_0$

$$[P]_{eq} = \frac{1}{5}[R]_0 = 0.2[R]_0$$

and $$[R]_{eq} = \frac{4}{5}[R]_0 = 0.8[R]_0$$

It satisfies Graph (C).

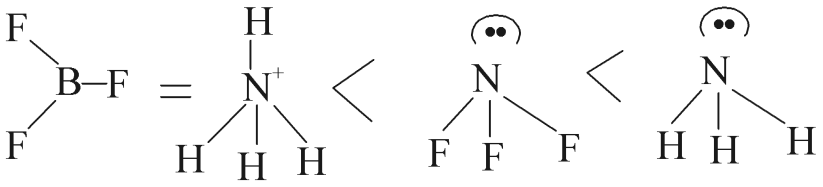
3. The correct order of dipole moments for the given species is

(A) $BF_3 = NH_4^+ < NF_3 < NH_3$ (B) $BF_3 < NH_4^+ < NF_3 < NH_3$

(C) $NH_4^+ < BF_3 < NH_3 < NF_3$ (D) $BF_3 < NH_4^+ < NH_3 < NF_3$

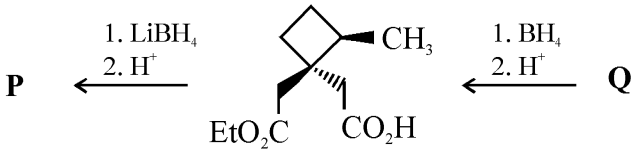
Ans. A

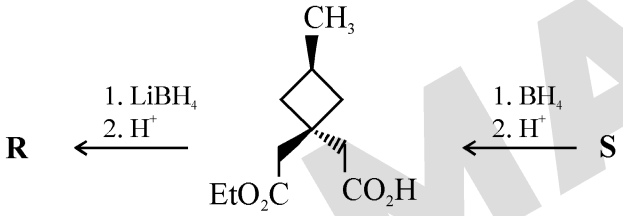
Sol. (A) $BF_3 = NH_4^+ < NF_3 < NH_3$



0 D 0 D 0.23 D 1.47 D

4. C onsidering $LiBH_4$ reduces an ester group to the corresponding alcohol and does not reduce a carboxylic acid group, the correct statement about the major products P, Q, R and S is

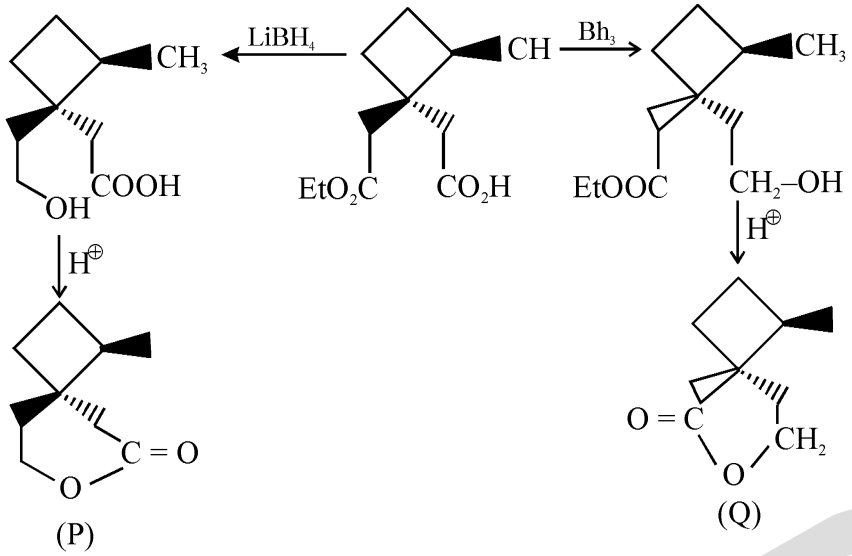




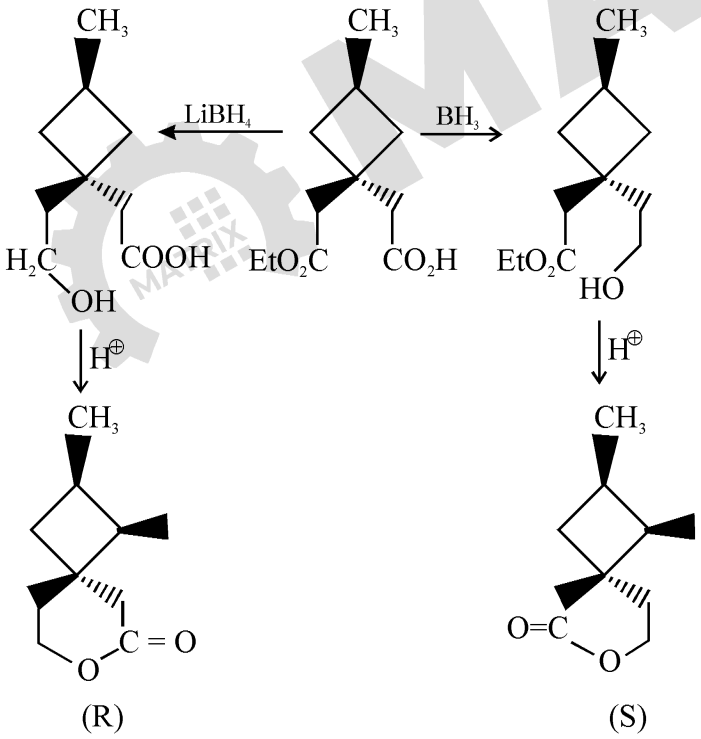
(A) P & Q are identical, and R & S are diastereomers.
(B) P & Q are diastereomers, and R & S are identical.
(C) P & Q are diastereomers, and R & S are diastereomers.
(D) P & Q are identical, and R & S are identical.

Ans. C

Sol.



P and Q are diastereomers



R and S are geometrical isomers. So, are diastereomers.

Option (C).

SECTION 2 (Maximum Marks: 16)

- This section contains **FOUR (04)** 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.

5. The 2s and the 2p orbital energies of hydrogen atom are $E_{2s}(H)$ and $E_{2p}(H)$, respectively. The 2s and the 2p orbital energies of lithium atom are $E_{2s}(Li)$ and $E_{2p}(Li)$, respectively. The correct option(s) about the orbital energies is(are)

(A) $E_{2s}(Li) < E_{2p}(Li)$ (B) $E_{2s}(H) = E_{2p}(H)$
(C) $E_{2p}(H) < E_{2s}(Li)$ (D) $E_{2s}(H) > E_{2s}(Li)$

Ans. ABD

Sol. $H \rightarrow$ Monoelectronic species

$2s = 2p$

$Li \rightarrow$ Polyelectronic species

$2s < 2p$

$\Rightarrow$ as Z increases, energy for same n decreases.

$2S(H) > 2S(Li)$

6. C orrect statement(s) about the compounds X, Y and Z is(are)

$$MnO_2 + \text{Conc.HCl} \rightarrow MnCl_2 + \underset{\text{(greenish yellow gas)}}{X} + H_2O$$

$$NH_3 + \underset{\text{(excess)}}{X} \rightarrow Y + HCl$$

$$X + \underset{\text{(excess)}}{F_2} \xrightarrow{573\ K} Z$$

(A) X is used for sterilizing drinking water.
(B) Y has a planar structure.
(C) Z is used in the enrichment of ^{235}U.
(D) Y is a stronger Lewis base than ammonia.

Ans. **AC**

Sol. $MnO_2 + \text{Conc. HCl} \rightarrow MnCl_2 + \underset{\substack{\text{Greenish-yellow}\\ \text{gas (X)}}}{Cl_2} + H_2O$

$$NH_3 + \underset{\text{Excess}}{3Cl_2} \rightarrow \underset{\text{(Y)}}{NCl_3} + 3HCl$$

$$Cl_2 + \underset{\text{Excess}}{F_2} \xrightarrow{573} ClF_3\,(Z)$$

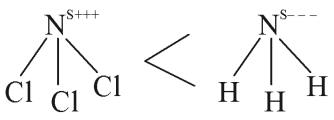
(A) Cl_2 is used for sterilizing drinking water.

(B) NCl_3 has pyramidal structure.

(C) ClF_3 is used for the production of UF_6 in the enrichment of U^{235}.

$$U(s) + 3ClF_3(l) \longrightarrow UF_6(g) + 3ClF(g)$$

(D) Lewis base :-



7. R eaction of PtF_6 with oxygen (O_2) gas results in the formation of an ionic compound, X^+Y^-. Correct statement(s)

is(are)

(A) The bond order of X^+ is 1.5.

(B) Valence d-orbitals of the metal ion in X^+Y^- has 5 electrons.

(C) PtF_6 acts as an oxidant in this reaction.

(D) PtF_6 acts as a fluorinating agent in this reaction.

Ans. BC

Sol. $\underset{\text{R.A.}}{O_2} + \underset{\text{O.A.}}{PtF_6} \longrightarrow O_2^+[PtF_6]^-$

Ans. B, C

(A) O_2^+, Bond order = 2.5

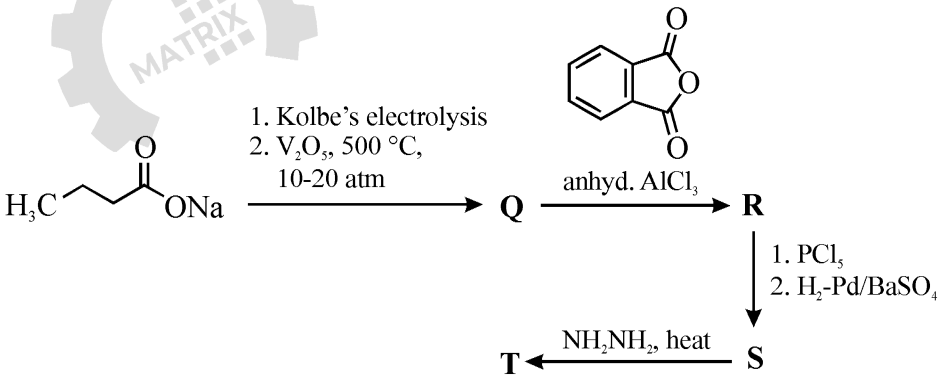
(B) $Pt^{+5} \rightarrow 5d^5$ $(5e^-)$

(C) $\underset{\text{R.A.}}{O_2} \xrightarrow{\text{Oxidation}} O_2^+$

$\underset{\text{O.A.}}{PtF_6} \xrightarrow{\text{Reduction}} PtF_6^-$

(D) A fluorinating agent transfers fluorine atoms or fluoride.

8. I n the following reaction sequence, Q, R, S and T are the major products.



The correct statement(s) about Q, R, S and T is(are)

(A) S on warming with ammoniacal $AgNO_3$ results in the formation of silver mirror.

(B) Q on treatment with Cl_2(excess)/UV gives gammaxane.

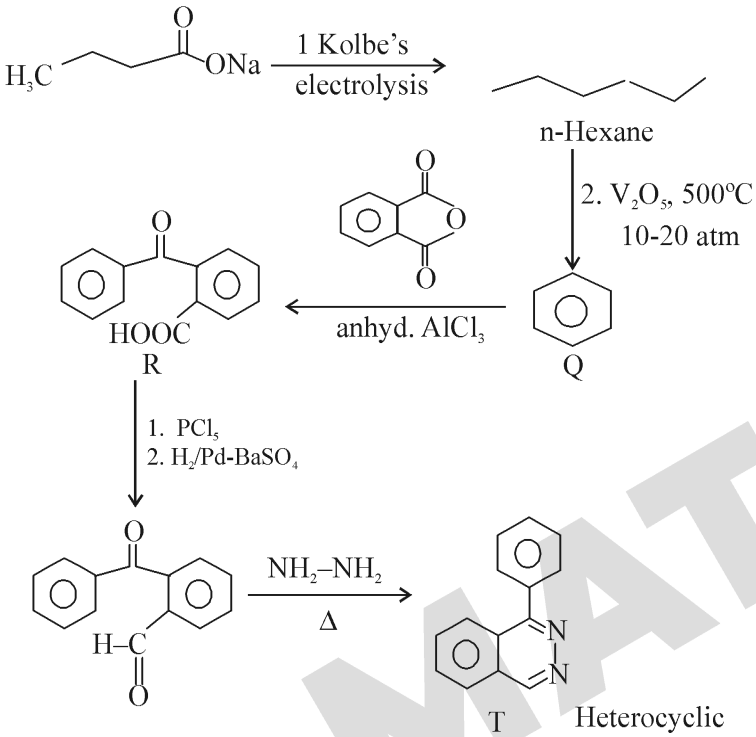
(C) T is a heterocyclic compound.

(D) R on acid catalyzed intramolecular cyclization followed by treatment with Zn-Hg/HCl gives 9,10-

dihydroxyanthracene.

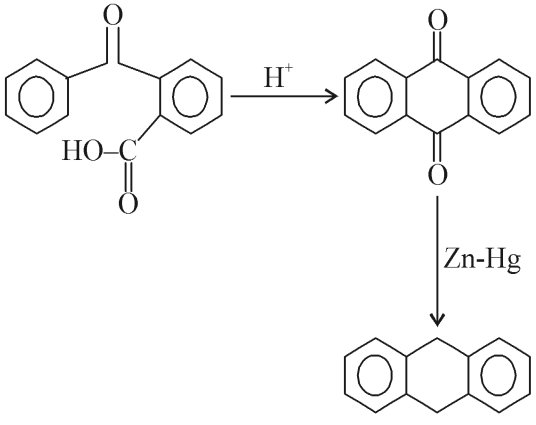
Ans. ABC

Sol.



→ S gives silver mirror with ammonia $AgNO_3$ due to aldehyde group.

→ Q is benzene which gives gammaxane with Cl_2(excess)/UV.



9, 10-dihydroanthracene

A, B, C are correct.

SECTION 3 (Maximum Marks: 16)

- This section contains **FOUR (04)** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- 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.

9. T wo cylinders, both fitted with frictionless pistons, are filled with mixtures of He and Ar gases. In the first cylinder, the masses of He and Ar are m_1 and m_2, respectively. In the second cylinder, the masses of He and Ar are m_2 and m_1, respectively. The molar mass of Ar is 10 times the molar mass of He. The external pressure applied by the piston on the first cylinder needs to be 5 times that on the second cylinder so that the volume of the gas mixtures in both the cylinders are equal at the same temperature. Assuming He and Ar behave like ideal gases, the value of (m_1/m_2) is ____.

Ans. 9.80

Sol. Cylinder I

$He(g) \xrightarrow{mass} m_1$

$Ar(g) \longrightarrow m_2$

Given, $P_{cylinder\text{-}I} = 5\,(P_{Cylinder\text{-}II})$

$PV = nRT$

$(5P)V = \left(\frac{m_1}{4} + \frac{m_2}{40}\right)RT$ ....(1)

Cylinder II

$He(g) \xrightarrow{mass} m_2$

$Ar(g) \longrightarrow m_1$

$PV = nRT$

$PV = \left(\frac{m_2}{4} + \frac{m_1}{40}\right)RT$ ....(2)

$$Eq^n \frac{(1)}{(2)} \Rightarrow \frac{5PV}{PV} = \frac{\left(\frac{m_1}{4} + \frac{m_2}{40}\right)RT}{\left(\frac{m_2}{4} + \frac{m_1}{40}\right)RT}$$

$$\frac{5m_2}{4} + \frac{m_1}{8} = \frac{m_1}{4} + \frac{m_2}{40}$$

$$\left(\frac{5}{4}-\frac{1}{40}\right)m_2 = m_1\left(\frac{1}{4}-\frac{1}{8}\right)$$

$$\frac{49}{40}m_2 = \frac{m_1}{8}$$

$$\Rightarrow \frac{m_1}{m_2} = \frac{49}{5} = 9.8$$

10. The total number of all possible isomers for the square planar complex with formula K[M(NCS)(NO_2)(gly)] is ____.

(M = metal ion and gly = $NH_2CH_2COO^-$)

Ans. 8

Sol. $[M(NCS)(NO_2)(gly)]^-$

Possible combination of linkage isomers

(1) $[M(NCS)(NO_2)(gly)]^-$

(2) $[M(NCS)(ONO)(gly)]^-$

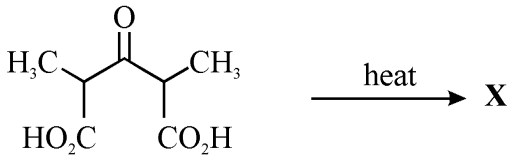
(3) $[M(SCN)(NO_2)(gly)]^-$

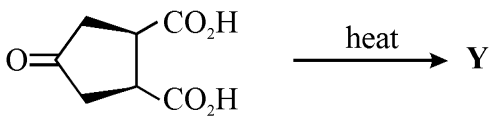
(4) $[M(SCN)(ONO)(gly)]^-$

Every linkage isomer has 2 G.I.

$4 \times 2 = 8$ Total isomers

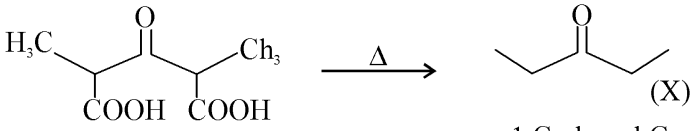
11. The sum of total number of carbonyl groups (> C = O) present in the major products X and Y in the following reactions is ____.



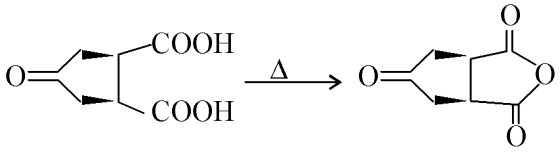


Ans. 4

Sol.



1 Carbonyl Group



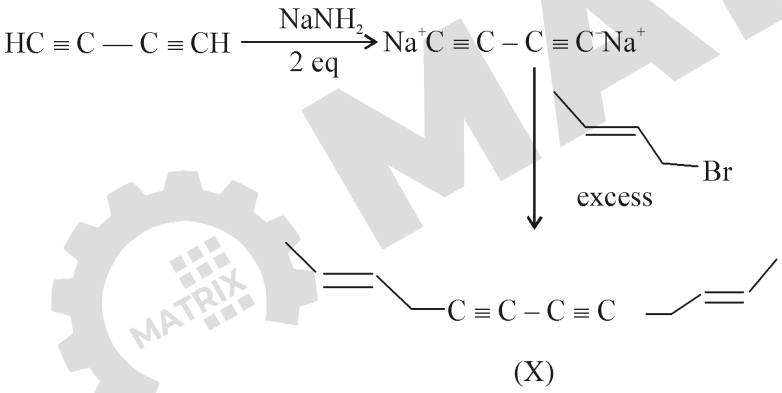
3 Carbonyl groups

X + Y = 4

12. T reatment of buta-1,3-diyne with $NaNH_2$ (2 equivalents), followed by reaction with excess of trans-CH3-CH = CH – CH_2-Br gives X as the major product. The maximum number of carbon atoms that are collinear (in a straight line) in X is ____.

Ans. 6

Sol.



(X)

Maximum number of carbon artoms that are collinear = 6.

SECTION 4 (Maximum Marks: 16)

- This section contains **FOUR (04)** 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.

13. **List-I** contains various physical/chemical processes, and **List-II** contains combinations of changes in enthalpy (ΔH) and entropy (ΔS). Match each entry in **List-I** to the appropriate entry in **List-II**, and choose the correct option.

List-I	**List-II**
(P) Physisorption	(1) $\Delta H > 0$ and $\Delta S > 0$
(Q) Diamond $\rightarrow$ Graphite	(2) $\Delta H < 0$ and $\Delta S < 0$
(R) Denaturation of protein	(3) $\Delta H < 0$ and $\Delta S = 0$
(S) Propene $\rightarrow$ Cyclopropane	(4) $\Delta H > 0$ and $\Delta S < 0$
	(5) $\Delta H < 0$ and $\Delta S > 0$

The correct option is :

(A) P $\rightarrow$ 2; Q $\rightarrow$ 3; R $\rightarrow$ 5; S $\rightarrow$ 4

(B) P $\rightarrow$ 4; Q $\rightarrow$ 3; R $\rightarrow$ 5; S $\rightarrow$ 1

(C) P $\rightarrow$ 2; Q $\rightarrow$ 5; R $\rightarrow$ 1; S $\rightarrow$ 4

(D) P $\rightarrow$ 2; Q $\rightarrow$ 5; R $\rightarrow$ 1; S $\rightarrow$ 3

Ans. C

Sol. (P) Physiosorption

(Adsorbtion of gas on solid surface)

Gas + Solid $\longrightarrow$ Gas/Solid

$\Delta S < 0$ (Randomness $\downarrow$)

$\Delta H < 0$ (Exothermic)

(Q) C (Diamond) $\rightarrow$ C(Graphite)

$\Downarrow$ $\Downarrow$

Hard — Soft (More randomness)

Less stable — More stable form (less energy)

$\Delta S > 0$

$\Delta H < 0$

(R) Denaturation of proteins

In this phenomenon, structure get break energy is absorbed during bond breaking.

$\Delta H > 0$ (Endothermic)

$\Delta S > 0$ (Randomness $\uparrow$)

(S) $CH_3–CH=CH_2 \longrightarrow \Delta$

More stable | Less stable due to angle strain

(less energy)

$\Delta H > 0$ (Endothermic)

$\Delta S < 0$ (Randomness $\downarrow$)

Option (C)

14. Consider the following species:

$SOCl_2$, $XeOF_4$, ClF_3, ClF_5, XeF_5^+, SO_3^{2-}, XeF_3^+, SF_4

List-I contains different molecular shapes and **List-II** contains total number of species with the same molecular shapes from the given species. Match each entry in **List-I** with the appropriate entry in **List-II** and choose the correct option.

List-I	**List-II**
(P) See-saw	(1) one
(Q) T-Shaped	(2) two
(R) Trigonal Planar	(3) three
(S) Square Pyramidal	(4) four
	(5) zero

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

Ans. A

Sol.

Molecular Species	**Molecular Shape**
$SOCl_2$	Pyramidal
SO_3^{2-}	Pyramidal
$XeOF_4$	Square pyramidal
ClF_5	Square pyramidal
ClF_3	T-shaped
XeF_5^+	Square pyramidal
XeF_3^+	T-shaped
SF_4	See-saw

(P) See-saw $\rightarrow$ (1) one

(Q) T-shaped → (2) Two

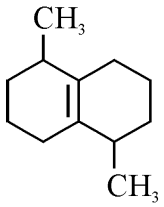
(R) Trigonal Planar → (5) zero

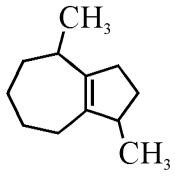
(S) Square pyramidal → (3) Three

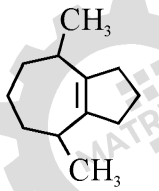
Ans. (A)

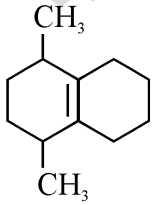
15. The List-II contains products obtained from the reaction of compounds in List-I with O_3/Zn-H_2O followed by cyclization (via more stable enolate) in the presence of aqueous NaOH. Match each entry in List-I with appropriate entry in List-II and choose the correct option.

List-I

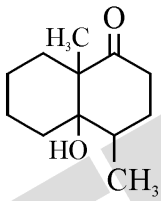
(P) 

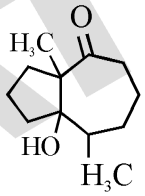
(Q) 

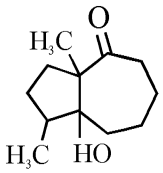
(R) 

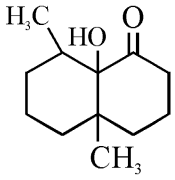
(S) 

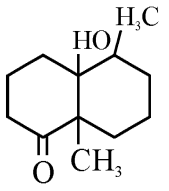
List-II

(1) 

(2) 

(3) 

(4) 

(5) 

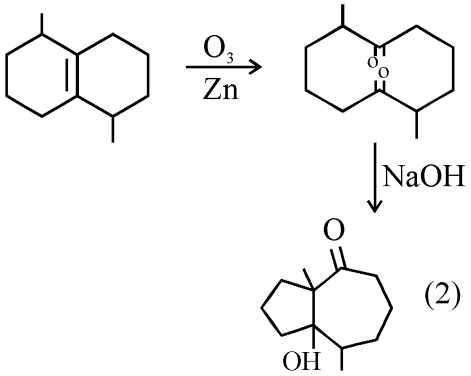
(A) P → 2; Q → 4; R → 1; S → 3

(B) P → 3; Q → 4; R → 5; S → 2

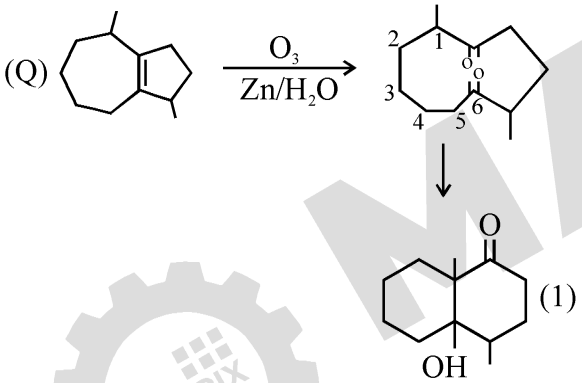
(C) P → 2; Q → 1; R → 5; S → 3

(D) P → 3; Q → 5; R → 4; S → 2

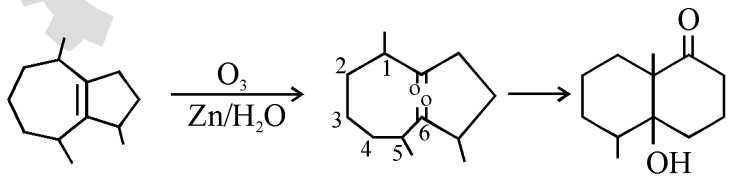
Ans. C

Sol. (P) 

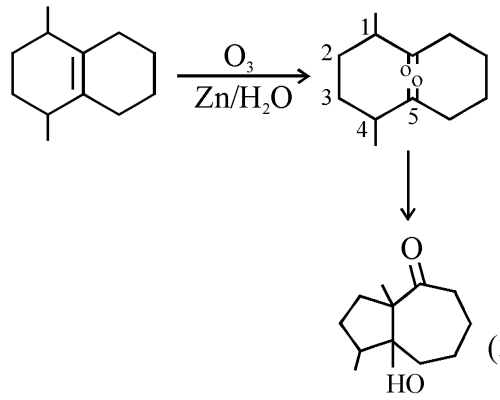
(2)

(Q) 

(1)

(R) 

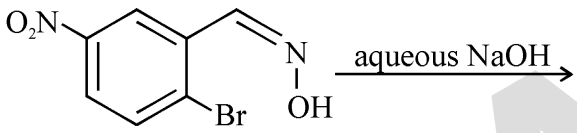
(5)

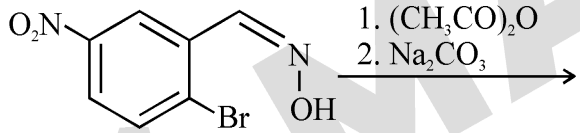
(S) 

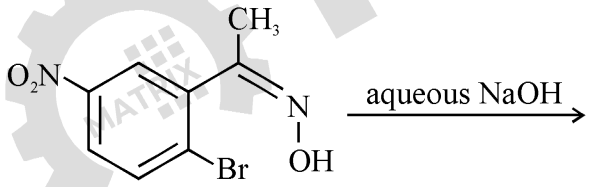
(3)

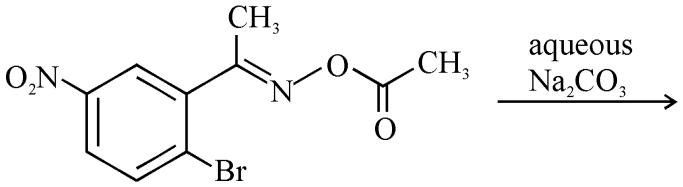
16. Match the major products obtained in the reactions given in **List-I** with the corresponding structures in **List-II** and choose the correct option.

List -I

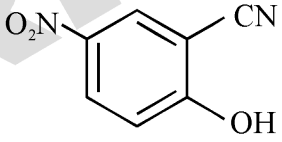
(P) 

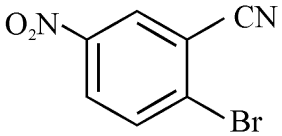
(Q) 

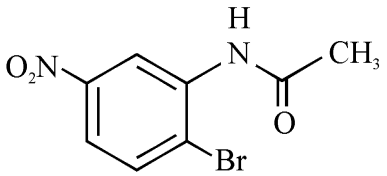
(R) 

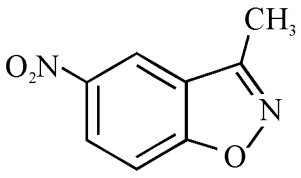
(S) 

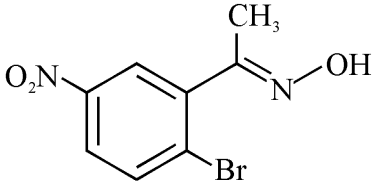
List-II

(1) 

(2) 

(3) 

(4) 

(5) 

(A) P $\rightarrow$ 2; Q $\rightarrow$ 1; R $\rightarrow$ 5; S $\rightarrow$ 4

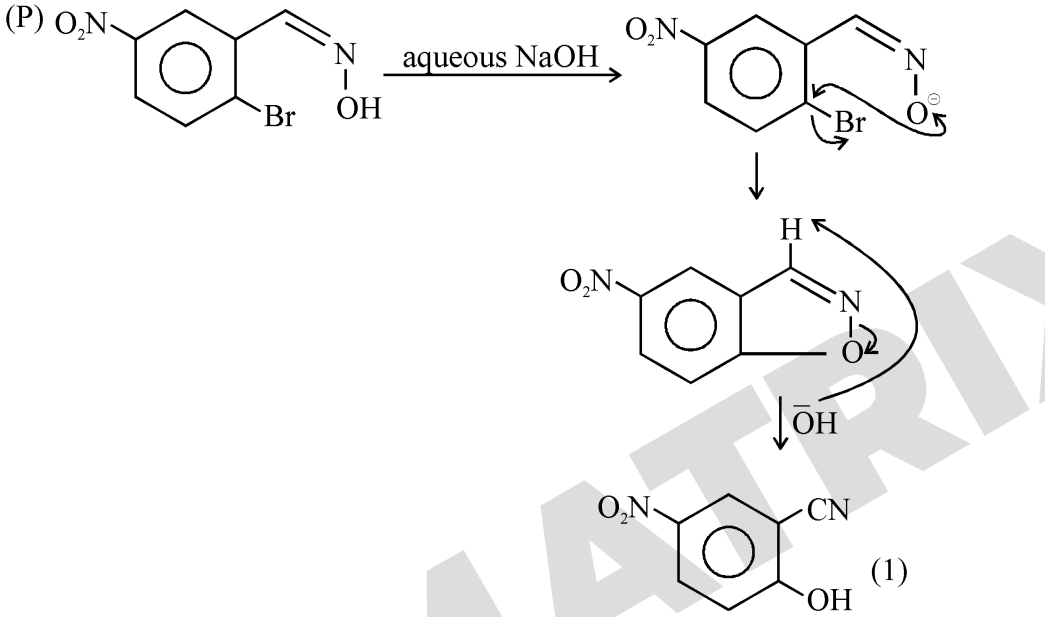
(B) P $\rightarrow$ 1; Q $\rightarrow$ 2; R $\rightarrow$ 4; S $\rightarrow$ 5

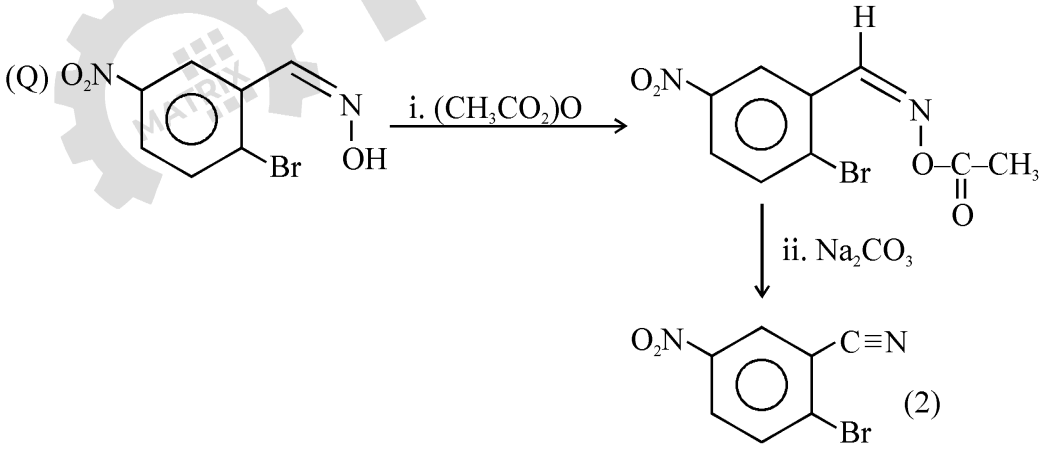
(C) P → 1; Q → 2; R → 3; S → 4

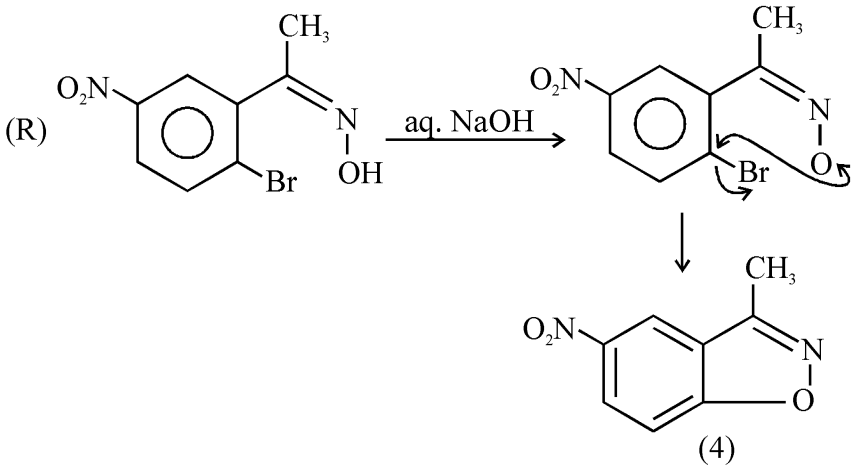
(D) P → 2; Q → 1; R → 3; S → 5

Ans. B

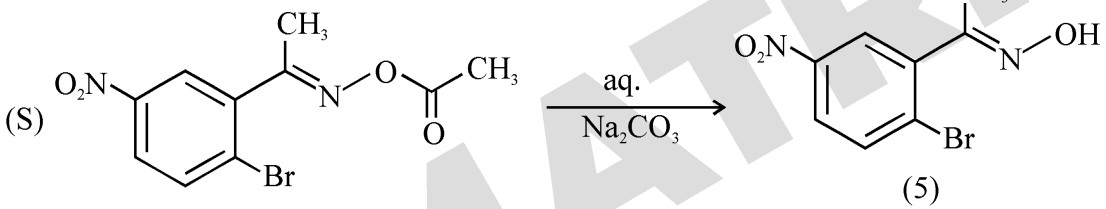
Sol.






(R)
CH_3
O_2N
N
OH
Br
aq. NaOH
CH_3
O_2N
N
O
Br
CH_3
O_2N
N
O

(4)


(S)
CH_3
O_2N
N
O
CH_3
O
Br
aq.
Na_2CO_3
CH_3
O_2N
N
OH
Br

(5)