

PART : CHEMISTRY

1. Match the following :

	List-I		List-II
(A)	Slaked Lime	(P)	CaSO ₄
(B)	Caustic Soda	(Q)	Ca(OH) ₂
(C)	Washing Soda	(R)	NaOH
(D)	Dead Burnt Plaster	(S)	Na ₂ CO ₃ ·10H ₂ O

(1) A - Q ; B - R ; C - S ; D - P

(2) A - P ; B - Q ; C - R ; D - S

(3) A - Q ; B - P ; C - R ; D - S

(4) A - R ; B - S ; C - P ; D - Q

Ans.
Sol.

Slaked Lime	Ca(OH) ₂
Caustic Soda	NaOH
Washing Soda	Na ₂ CO ₃ ·10H ₂ O
Dead Burnt Plaster	CaSO ₄

2. The sum of oxidation numbers of Bromine in Per bromic acid & Bromic acid is :

Ans. (12)

Sol. HBrO₄ → Perbromic acid

$$(+1) + x + 4(-2) = 0$$

$$x = +7$$

HBrO₃ → Bromic acid

$$(+1) + x + 3(-2) = 0$$

$$x = +5$$

Sum of oxidation numbers of Bromine = 7 + 5 = 12

3. The blue pigment prussian blue is an iron complex with formula

(1) Fe₄[Fe(CN)₆]₃ (2) Fe₃[(CN)₂] (3) Fe[Fe(CN)₆]₂ (4) K₄[Fe(CN)₆]

Ans. (1)

Sol. $4\text{Fe}^{3+} + 3[\text{Fe}(\text{CN})_6]^{4-} \longrightarrow \text{Fe}_4[\text{Fe}(\text{CN})_6]_3 \downarrow$ Prussian blue precipitate.

4. The complex that has highest crystal field splitting energy (Δ), is :

(1) [Fe(CN)₆]³⁻ (2) [Fe(NH₃)₆]³⁺ (3) [Fe(Ox)₃]³⁻ (4) [FeF₆]³⁻

Ans. (1)

Sol. CN⁻ is strong ligand, So [Fe(CN)₆]³⁻ has maximum CFSE

5. **Assertion:** Hydrogen is environmental friendly fuel source of energy.

Reason: Atomic number of Hydrogen is 1 and it is a lightest element.

(1) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

(2) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.

(3) If Assertion is true but Reason is false.

(4) If both Assertion and Reason are false.

Ans. (2)

Sol. Dihydrogen is used in fuel cells for generating electrical energy. It has many advantages over the conventional fossil fuels and electric power. It does not produce any pollution and releases greater energy per unit mass of fuel in comparison to gasoline and other fuels.

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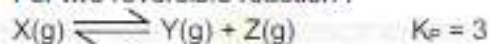
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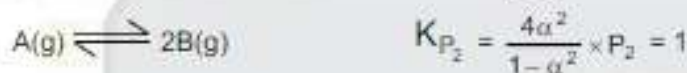
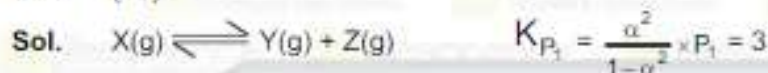
6. For two reversible reaction :



If degree of dissociation of both reactions is same, then ratio of $\left(\frac{P_1}{P_2}\right)$ is.....

[Where P_1 and P_2 are equilibrium pressure of above two reactions]

Ans. (12)



$$\frac{K_{P_1}}{K_{P_2}} = \frac{P_1}{4P_2} = \frac{3}{1}$$

so $\left(\frac{P_1}{P_2}\right) = 12$

7. 3M NaCl solution have density 1.0 gram/ml and its molality is $(X) \times 10^{-2}$, then value of X is :
[Nearest integer]

Ans. (364)

Sol. Molality(m) = $\frac{M \times 1000}{1000 \times d - M \times M_{\text{solute}}}$
 $= \left(\frac{3 \times 1000}{1000 \times 1 - 3 \times 58.5}\right)$
 $= 3.6386 \text{ m}$
 $= 363.86 \times 10^{-2} \text{ m} \quad \text{Ans.} = 364$

8. Average kinetic energy of an ideal gas depends upon :

- (1) Nature of the gas (2) Pressure of the gas
 (3) Temperature of the gas (4) Volume of the gas

Ans. (3)

Sol. Average kinetics energy, $\bar{KE} = \frac{3}{2} kT$

9. For Mn_2O_7

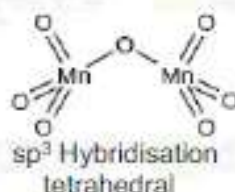
- (A) Mn has tetrahedral geometry (B) Mn has octahedral geometry
 (C) Mn-O-Mn bond is present (D) Mn-Mn bond is present

The correct statements are

- (1) A & C only (2) B & D only
 (3) A & D only (4) B & C only

Ans. (1)

Sol. Mn_2O_7



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10. Which of the following statement/s is/are correct regarding Be
- (A) It's oxide is purely acidic
 - (B) It's sulphate is soluble in water
 - (C) It's shows anomalous properties w.r.t. other element of same group
 - (D) It's carbonate is thermally stable

(1) Only A & B (2) Only B & C (3) Only B, C & D (4) Only A, C & D

Ans. (2)

Sol. BeO is amphoteric. BeSO₄ and MgSO₄ are readily soluble in water. Beryllium, the first member of the Group 2 metals, shows anomalous behaviour as compared to magnesium and rest of the members. Beryllium carbonate is unstable.

11. At what pH reduction potential of electrode $\text{MnO}_4^- (0.1 \text{ M}) | \text{Mn}^{2+} (0.001 \text{ M})$ is 1.282 V
[Given $E^\ominus_{\text{MnO}_4^-/\text{Mn}^{2+}} = -1.54 \text{ V}$] [Nearest integer]

Ans. (3)

Sol. $\text{MnO}_4^- + 8\text{H}^+ + 5e^- \longrightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$
 $10^{-1} \text{ M} \qquad \qquad \qquad 10^{-3} \text{ M}$

$$E_{\text{RP}} = E^\ominus_{\text{RP}} - \frac{0.059}{5} \log \frac{[\text{Mn}^{2+}]}{[\text{MnO}_4^-][\text{H}^+]^8}$$

$$1.282 = 1.54 - \frac{0.059}{5} \log \frac{10^{-3}}{10^{-1} \times [\text{H}^+]^8}$$

$$-0.258 = -\frac{0.06}{5} [\log 10^{-2} - 8 \log [\text{H}^+]]$$

$$-0.258 = -\frac{0.06}{5} [-2 + 8 \text{pH}]$$

$$-21.5 = 2 - 8 \text{pH}$$

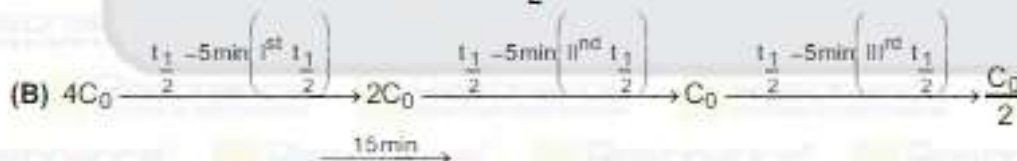
$$+ \frac{23.5}{8} = \text{pH}$$

$$\text{pH} = 2.9375 \approx 3$$

12. Compound A and B are radioactive with half life 15 min and 5 min respectively. Initial concentration of B is 4 times of A then time at which concentration of A and B become equal

Ans. (15)

Sol. (A) Initially $C_0 \xrightarrow[t_1=15\text{min}]{\frac{t_1}{2}} C_{1A} = \frac{C_0}{2}$



Radioactive decay is a 1st order reaction

So, $t = 15 \text{ min}$ when concentration of A = concentration of B

13. In cathode rays electron moving with 1000 m/sec velocity and colloide with metal plate, then how many of the following statements are correct.

[Given mass of $e^- = 9 \times 10^{-31} \text{ kg}$. Plank's constant (h) = $6 \times 10^{-34} \text{ J/sec}$]

- (A) Characteristics of Cathode rays depends on nature of gas.
- (B) Cathode rays travel from cathode to anode
- (C) de Broglie wavelength of moving electron is 666.67 nm
- (D) Characteristics of Cathode rays depends on metal plate

(1) B and C only (2) B and D only (3) A and C only (4) B, C and A only

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Ans. (1)

Sol. Given mass of $e^- = 9 \times 10^{-31} \text{ kg}$ $h = 6 \times 10^{-34} \text{ J/sec}$

$$\text{wavelength } (\lambda) = \frac{h}{m_e v_e} = \frac{6 \times 10^{-34}}{9 \times 10^{-31} \times 10^3}$$

$$= \frac{2}{3} \times 10^{-6} \text{ m}$$

$$= 0.66667 \times 10^{-6} \text{ m} = 666.67 \times 10^{-9} \text{ m}$$

$$= 666.67 \text{ nm}$$

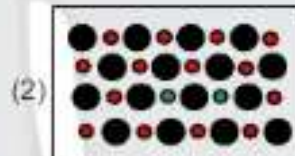
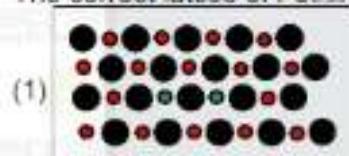
Cathode rays does not depends on nature of gas and metal plate.

14. If Fe^{2+} is represent by ●

Fe^{3+} is represent by ●

O^{2-} is represent by ●

The correct lattice of $\text{Fe}_{0.95}\text{O}$ is



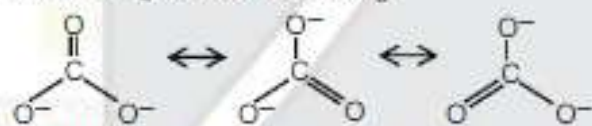
(4) None of these

Ans. (1)

Sol. In FeO lattice when one Fe^{2+} is missing then two Fe^{2+} ions are converted into Fe^{3+} ion. As formula is $\text{Fe}_{0.95}\text{O}$ so 0.05 Fe^{2+} ion are missing and (0.05×2) Fe^{2+} ion are converted in Fe^{3+} ion so for each O^{2-} ion total Fe^{2+} ion 0.85 and Fe^{3+} ion is 0.1.

For 20 O^{2-} ion total 17 Fe^{2+} ion and 2 Fe^{3+} ions.

15. Resonating structures of CO_3^{2-}



Which one of the following is correct

(1) CO_3^{2-} exist as resonance hybrid

(2) All are in dynamic equilibrium

(3) All exist for same time

(4) None of these

Ans. (1)

Sol. CO_3^{2-} exist as resonance hybrid

16. Match the column :

	Column-I		Column-II
(A)	Tranquilizer	(P)	Antidepressant
(B)	Aspirin	(Q)	Salvarsan
(C)	Antibiotic	(R)	Blood clotting
(D)	Antiseptics	(S)	Soframycin

(1) (A) – (R), (B) – (P), (C) – (Q), (D) – (S)

(2) (A) – (P), (B) – (R), (C) – (S), (D) – (Q)

(3) (A) – (P), (B) – (R), (C) – (Q), (D) – (S)

(4) (A) – (P), (B) – (Q), (C) – (R), (D) – (S)

Ans. (3)

Sol. Based on fact given in NCERT.

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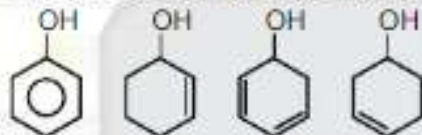
17. Photo chemical smog can be minimized by :

- (1) By tall chimney
- (2) By using catalyst converter
- (3) Metallic catalyst in auto mobile industries
- (4) By full consumption of fuel

Ans. (2)

Sol. Solution from NCERT-XI (vol.-2) Pg. 405

18. The correct order of easy of dehydration of following compounds is :

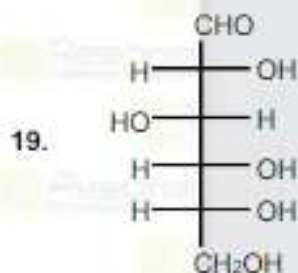


(A) (B) (C) (D)

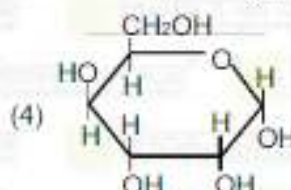
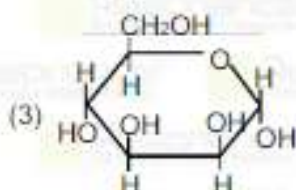
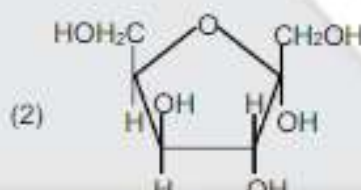
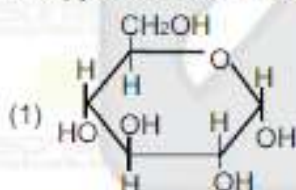
- (1) C > B > A > D
- (2) D > B > C > A
- (3) C > A > D > B
- (4) C > B > D > A

Ans. (4)

Sol. Easy of dehydration \propto stability of carbocation.



The pyranose form of the structure is :



Ans. (1)

Sol. Pyranose form has a 6 member cycle, similar to pyran



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20. A compound $C_9H_{10}O$ which does not react with $NaOH$ & KOH and 2,4-DNP. On hydrogenation it gives $C_9H_{12}O$. The total no. of structural isomer of $C_9H_{12}O$

Ans. (8)



DU = 5 DU = 4

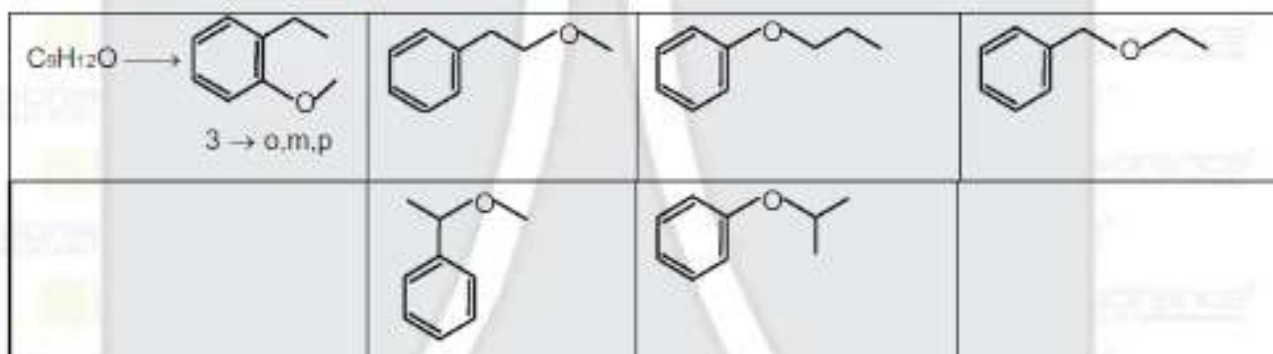
No π bond i.e aromatic

No reaction with $NaOH/KOH \Rightarrow$ no acidic group

No reaction with $NaOH/KOH \Rightarrow$ no aldehyde group

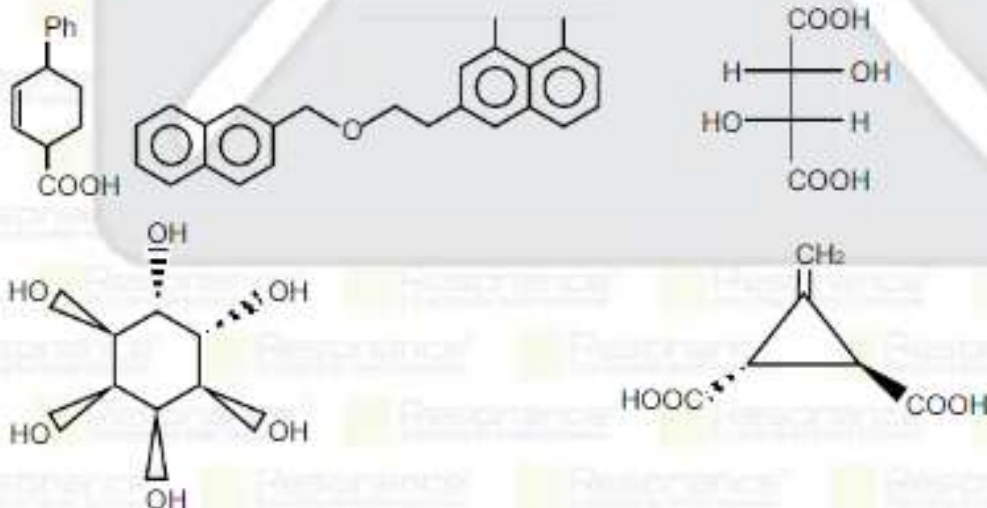
No reaction with 2,4-DNP \Rightarrow no carbonyl group

Therefore only saturated phenyl ether is expected in $C_9H_{12}O$.



Total structural isomer = 3 + 2 + 2 + 1 = 8

21. How many compounds are chiral :



Ans. (4)

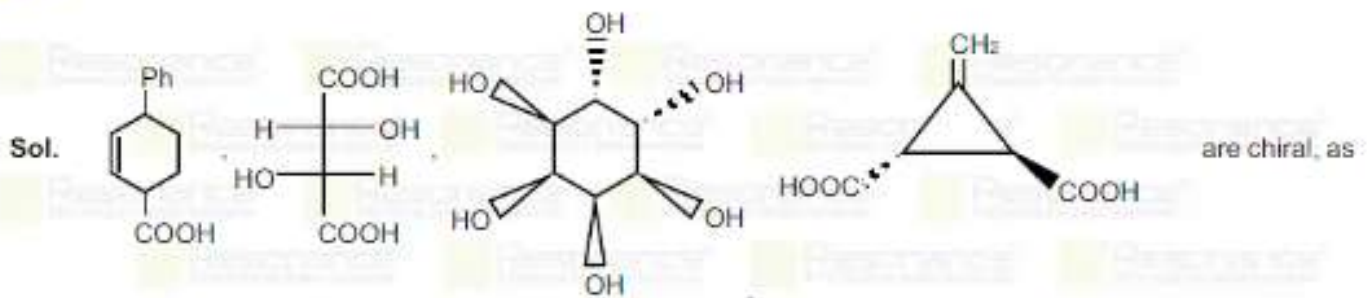
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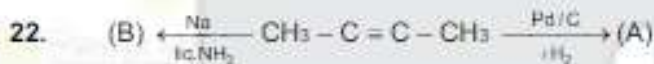
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are chiral, as

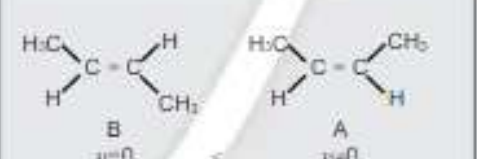
they have neither plane of symmetry nor centre of symmetry.



- (1) A has more dipole moment than B
- (2) B has more dipole moment than A
- (3) B is more soluble than A
- (4) A has more M.P. and B.P. than B

Ans. (1)

Sol.


Physical properties	 $\mu = 0$ < $\mu = 0$	Remarks
Dipole moment	A > B	cis-isomer has resultant of dipoles while in trans isomer dipole moments cancel out
Boiling point	A > B	Molecules having higher dipole moment have higher boiling point due to larger intermolecular force of attraction
Solubility (in H ₂ O)	A > B	More polar molecules are more soluble in H ₂ O.
Melting point	B > A	More symmetric isomers have higher melting points due to better packing in crystalline lattice & trans isomers are more symmetric than cis.

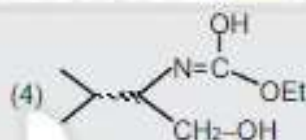
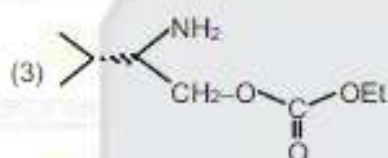
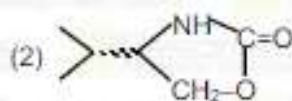
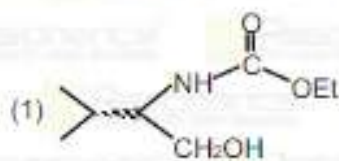
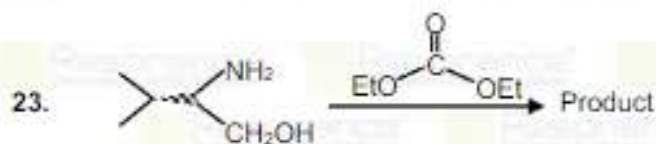
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Ans. (2)

Sol. Given reactant under goes S_N^2 th reaction with diethyl carbonate.

24. Match the following :

	Column-I		Column-II
(A)	Schiff's test	(P)	Carbohydrate
(B)	Carbylamine test	(Q)	Peptide
(C)	Molish test	(R)	Aldehyde
(D)	Biuret test	(S)	1° Amine

(1) A - P ; B - Q ; C - S ; D - R

(2) A - Q ; B - S ; C - R ; D - P

(3) A - S ; B - R ; C - Q ; D - P

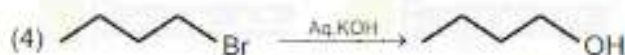
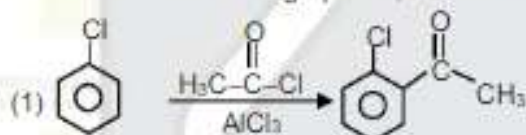
(4) A - R ; B - S ; C - P ; D - Q

Ans. (4)

Sol. (4) A - R ; B - S ; C - P ; D - Q

Based on facts

25. In which of the following options, the reaction does not match with their correct option.



Ans. (4)

Sol. Reaction with alc KOH gives alkene 

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