

PART : CHEMISTRY

1. If Thomson model is considered to be true then in Rutherford model.
 (1) All α particles deflects at 180° (2) They deflect at wide range of angle
 (3) All will pass through foil without deflection (4) They will pass but with reduced speed.

Ans. (1)

Sol. Theory Based.

2. Identify the correct increasing order of 1st ionisation enthalpy order of Mg, Al, P, S
 (1) Al, Mg, S, P (2) Mg, Al, P, S (3) Al, Mg, P, S (4) Mg, Al, S, P

Ans. (1)

Sol. Correct increasing order of 1st ionisation enthalpy is : Al < Mg < S < P.

3. **List-I**

- (a) Li
 (b) Na
 (c) K
 (d) Cs

Identify the correct match

- (1) a – ii, b – iii, c – iv, d – I
 (3) a – i, b – ii, c – iii, d – iv

List-II

- (i) used in devising photoelectric cell
 (ii) used to make electrochemical cell
 (iii) used as coolant in nuclear reactor
 (iv) used in absorption of CO₂

- (2) a – i, b – iii, c – iv, d – ii
 (4) a – ii, b – iv, c – iii, d – i

Ans. (1)

Sol. (a) Li \Rightarrow used in electrochemical cell
 (b) Na \Rightarrow used as coolant in fast breeder nuclear reactors
 (c) K \Rightarrow used as an absorbent of CO₂
 (d) Cs \Rightarrow used in devising photoelectric cell.

4. How many number of electron are there in bonding molecular orbital of O₂²⁻.

Ans. 10

Sol. O₂²⁻ (Total electron = 18)

$$EC = (\sigma 1s)^2(\sigma^* 1s)^2(\sigma 2s)^2(\sigma^* 2s)^2(\sigma 2p_z)^2(\pi 2p_x)^2 = \pi 2p_y^2(\pi^* 2p_x)^2 = \pi^* 2p_y^2$$

Total electron in BMO = 10.

5. How many total Cl=O bonds are there in HClO₄, HClO₃ and HClO₂.

Ans. 6

Sol.

Compounds	Structure	Total C=O bond
HClO ₄		3
HClO ₃		2
HClO ₂		1

6. Identify the incorrect statement from following.

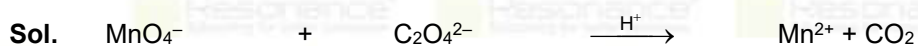
- (1) crystalline solids are isotropic
- (2) amorphous solids are also called pseudo solid
- (3) amorphous solids do not have definite enthalpy of fusion
- (4) crystalline solids are long range order

Ans. (1)

Sol. Crystalline solids are anisotropic in nature.

7. 10 ml 0.05 M KMnO₄ is titrated with 10 ml of oxalic acid, find strength of oxalic acid (in g/l).
[Report your answer to nearest integer]

Ans. 11



Valency factor = 5

Valency factor = 2

mili eq. of C₂O₄²⁻ = mili eq. of MnO₄⁻

$$2 [M \times 10] = 5 [0.05 \times 10]$$

M = 0.125 mole/lit.

Strength of oxalic acid = 0.125 × 90 = 11.25 g/l.

8. 1 mole of A takes 100 minutes to give 0.2 mole of B in the reaction $A \longrightarrow 2B$ (According to 1st order reaction). The half life of the reaction is :

[Report your answer to nearest integer]

[Given $\ln 2 = 0.693$ & $\ln 10 = 2.303$]

Ans. 752

Sol. $A \longrightarrow 2B$

Initially 1 mole 0
 After 100 min (1 - 0.1)mole 0.2 mole

$$k = \frac{1}{t} \ln \left(\frac{a}{a-x} \right)$$

$$k = \frac{2.303}{100} \log \left(\frac{1}{0.9} \right)$$

$$\frac{\ln 2}{t_{1/2}} = \frac{2.303}{100} [\log 10 - \log 9]$$

$$\frac{0.693}{t_{1/2}} = \frac{2.303}{100} [1 - 2 \times 0.48]$$

$$t_{1/2} = \frac{69.3}{2.303 \times 0.04} \text{ min}$$

$$t_{1/2} = 752.3 \text{ min}$$

9. The total number of neutrons and electrons present in radioactive isotope of Hydrogen is :

Ans. (3)

Sol. Radioactive isotope of Hydrogen is tritium (${}^3_1\text{H}$)

Number of {P = 1, n = 2, e⁻ = 1}, so (n + e⁻) = 3

10. For reaction $\text{MO(s)} \rightleftharpoons \text{M(s)} + \frac{1}{2} \text{O}_2(\text{g})$

K_p is 4, then partial pressure of $\text{O}_2(\text{g})$ in atm is :

Ans. (16)

Sol. $K_p = (P_{\text{O}_2})^{\frac{1}{2}} = 4$

$$P_{\text{O}_2} = 16$$

11. Assertion : SO₂ is highly adsorbed on charcoal than H₂.

Reason : SO₂ has high critical temperature than H₂.

- (1) Assertion is True, Reason is True; Reason is a correct explanation for Assertion.
 (2) Assertion is True, Reason is True; Reason is NOT a correct explanation for Assertion.
 (3) Assertion is True, Reason is False.
 (4) Assertion is False, Reason is True.

Ans. (1)

Sol. SO₂ is adsorb more than H₂ on charcoal as critical temperature of SO₂ is higher than H₂ as higher the critical temperature, easier is liquification of gas and more is adsorption of gas on charcoal.

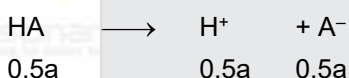
12. An electrolyte AB is 50% dimerise and rest is ionise in a solvent, then Van't hoff factor (i) for this acid is.

- (1) 1 (2) 1.25 (3) 2 (4) 1.5

Ans. (2)

Sol. $i = \frac{\text{Total no. of particle after dissociation/association}}{\text{Total number of particle before dissociation/association}}$

dissociation [Let total mole of acid HA = a]



association



$$i = \left(\frac{a + 0.5a}{a}\right) = 1.25$$

13. S₁ : [Mn(CN)₆]³⁻, [Fe(CN)₆]³⁻ and [Co(CN)₆]³⁻ have d²sp³ hybridisation.

S₂ : [MnCl₆]³⁻ and [FeCl₆]³⁻ are paramagnetic with 4 and 5 unpaired electrons respectively.

- (1) Both S₁ & S₂ are true. (2) S₁ is true and S₂ is false
 (3) S₁ is false and S₂ is true (4) Both S₁ & S₂ are false.

Ans. (1)

Sol. [Mn(CN)₆]³⁻ ⇒ Mn³⁺ ⇒ 3d⁴ ⇒ t_{2g}^{2,1,1}, eg^{0,0} d²sp³

[Fe(CN)₆]³⁻ ⇒ Fe³⁺ ⇒ 3d⁵ ⇒ t_{2g}^{2,2,1}, eg^{0,0} d²sp³

[Co(CN)₆]³⁻ ⇒ Co³⁺ ⇒ 3d⁶ ⇒ t_{2g}^{2,2,2}, eg^{0,0} d²sp³

[MnCl₆]³⁻ ⇒ Mn³⁺ ⇒ 3d⁴ ⇒ t_{2g}^{1,1,1}, eg^{1,0} 4 unpaired e⁻

[FeCl₆]³⁻ ⇒ Fe³⁺ ⇒ 3d⁵ ⇒ t_{2g}^{1,1,1}, eg^{1,1} 5 unpaired e⁻

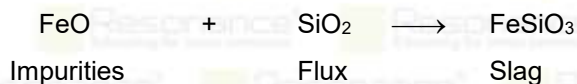
so both S₁ & S₂ are true.

14. What is the reason to add silica during metallurgy of copper ore.

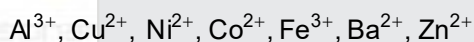
- (1) To reduce temperature (2) To convert Cu to copper silicate
 (3) To convert CuO to copper silicate (4) To remove impurities of iron as FeSiO₃

Ans. (4)

Sol. During metallurgy of copper from copper ore



15. How many cations will get precipitated from



When H₂S is passed along with dil. HCl.

Ans. 1

Sol. H₂S + dil. HCl is 2nd group reagent so Cu²⁺ get precipitate

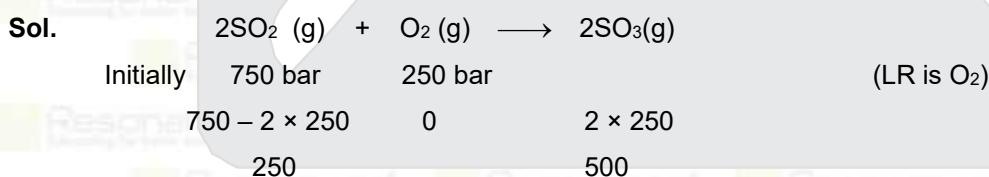
- $$\left\{ \begin{array}{l} 2^{\text{nd}} \text{ group cation } \text{Cu}^{2+} \\ 3^{\text{rd}} \text{ group cation } \text{Al}^{3+}, \text{Fe}^{3+} \\ 4^{\text{th}} \text{ group cation } \text{Co}^{2+}, \text{Ni}^{2+}, \text{Zn}^{2+} \\ 5^{\text{th}} \text{ group cation } \text{Ba}^{2+} \end{array} \right.$$

16. In a closed container initially SO₂ and O₂ are taken at 750 bar and 250 bar and following reaction takes place.



then what will be the total pressure of gases after completion of reaction (in bar.)

Ans. 750



$$P_{\text{Total}} = 250 + 500 = 750 \text{ bar}$$

17. 1 Mole of complex CoCl₃.6NH₃ on reaction with AgNO₃ gives 3 moles of AgCl precipitate. The secondary valency of complex is-

Ans. 6

Sol. As complex give 3 moles AgCl precipitate so all 3 chloride ions are in ionisation sphere so complex is [Co(NH₃)₆] Cl₃

secondary valency of complex = 6.

18.

List - I (Metal)	List - II (Colour during flame test)
a) Li	(i) Golden yellow
b) Na	(ii) Crimson red
c) Ca	(iii) Apple green
d) Ba	(iv) Brick Red

Identify the correct matching from List – I with List - II :

- (1) a-(ii) b-(i) c-(iv) d-(iii) (2) a-(i) b-(ii) c-(iii) d-(iv)
 (3) a-(ii) b-(i) c-(iii) d-(iv) (4) a-(i) b-(ii) c-(iv) d-(iii)

Ans. (1)

Sol.	Metal	Flame colour test
	(i) Li	Crimson Red
	(ii) Na	Golden Yellow
	(iii) Ca	Brick Red
	(iv) Ba	Apple green

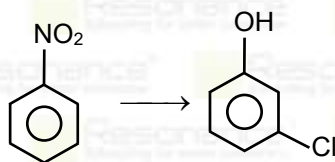
19. Statement-I : Hyper conjugation is a permanent effect.

Statement-II : In $\text{CH}_3 - \overset{\oplus}{\text{C}}\text{H}_2$ $\text{sp}^2_{\text{C-H}_2}$ overlap with the adjacent vacant p-orbital.

- (1) Both Statement-I & Statement-II are correct.
 (2) Statement-I is correct and Statement-II is incorrect.
 (3) Statement-I is incorrect and Statement-II is correct.
 (4) Both Statement-I and Statement-II are incorrect.

Ans. (2)

20. For the following conversion



the appropriate sequence of reagent will be.

- (1) NaNO_2/HCl , AlCl_3/Fe , Fe/HCl , $\text{H}_2\text{O}/\Delta$ (2) Fe/HCl , AlCl_3/Fe , NaNO_2/HCl , $\text{H}_2\text{O}/\Delta$
 (3) AlCl_3/Fe , Fe/HCl , NaNO_2/HCl , $\text{H}_2\text{O}/\Delta$ (4) Fe/HCl , AlCl_3/Fe , $\text{H}_2\text{O}/\Delta$, NaNO_2/HCl

Ans. (3)

21. D-Galactose & D-Glucose are formed by the hydrolysis of following disaccharide.

- (1) Sucrose (2) Lactose (3) Maltose (4) Amylose

Ans. (2)

22. Statement-I : Penicillin is Bacteriostatic.

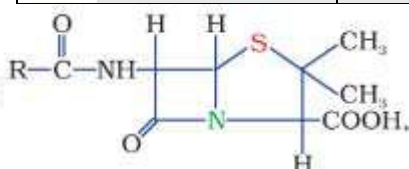
Statement-II : The correct structure of penicillin is.

- (1) Both Statement-I & Statement-II are correct
 (2) Statement-I is correct and Statement-II is incorrect
 (3) Statement-I is incorrect and Statement-II is correct
 (4) Both Statement-I and Statement-II are incorrect

Ans. (3)

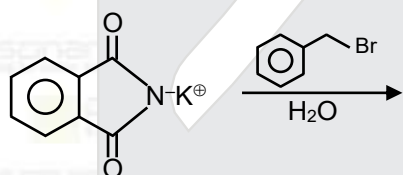
Sol.

Bactericidal	Bacteriostatic
Penicillin	Erythromycin
Aminoglycosides	Tetracycline
Ofloxacin	Chloramphenicol



General Structure of Penicillin

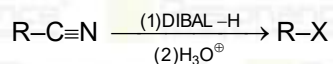
23. In following sequence of reaction final product will be



- (1) (2)
- (3) (4)

Ans. (2)

24. In the following reaction

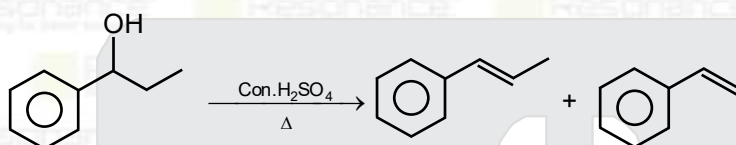


-X will be

- (1) -CHO (2) -COOH (3) -CH₂NH₂ (4) -CH₂OH

Ans. (1)

25.



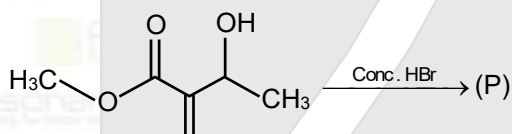
- (1) The Rx is not possible in acid medium. (2) Compound B will be major product
 (3) Compound A will be major product (4) Both A and B are equally formed

Ans. (3)

26. Dihedral angle in 1,1,1-trichloro ethane in staggered conformation (in degree) is

Ans. 60

27. Which of the following product is not possible



Product (P)

- (1)
- (2)
- (3)
- (4) + CH₃Br

Ans. (4)