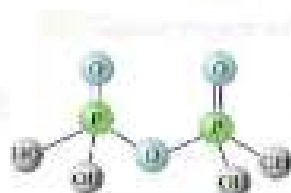


PART : CHEMISTRY

1. Number of P-O-P bond in $H_4P_2O_7$, P_2O_{10} and $(HPO_3)_3$ respectively :

- (1) 1, 6, 3 (2) 0, 1, 2 (3) 3, 2, 1 (4) 1, 2, 1

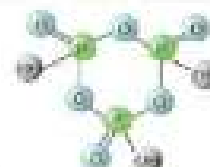
Ans. (1)



$H_4P_2O_7$: Pyrophosphoric acid



P_2O_{10} : Dimer of phosphorus pentoxide



$(HPO_3)_3$: Cyclotrimetaphosphoric acid

Sol.

Number of P-O-P bond	
Pyrophosphoric acid	1
Dimer of phosphorus pentoxide	6
Cyclotrimetaphosphoric acid	3

2. How many of the following statements are incorrect :

- (1) Conductivity (K) decreases with increase in dilution for both strong and weak electrolyte.
 (2) Molar conductivity increases with increase in dilution for both strong and weak electrolyte.
 (3) Molar conductivity increases with increases in ' α ' for weak electrolyte.
 (4) Change in molar conductivity is same for both strong and weak electrolyte with increases in dilution.

Ans. (4)

Sol. (1) On dilution, Molarity decrease, conductivity decrease, volume increase.

Number of ions per unit volume decrease so conductivity decrease.

(2) Molar conductivity increase on dilution.

(3) On increase ' α ' for weak electrolyte Molar conductivity increase.

3. **Statement-I** : According to Bohr's model, angular momentum is quantised for stationary orbits.

Statement-II : Bohr's model doesn't follow Heisenberg's uncertainty principle.

- (1) Both Statement-I and Statement-II are true. (2) Statement-I is true and Statement-II is false.
 (3) Statement-I is false and Statement-II is true. (4) Both Statement-I and Statement-II are false.

Ans. (1)

Sol. According to Bohr's model orbit angular momentum of stationary orbit is quantized it is equal to $\frac{nh}{2\pi}$ (n =

No. of orbit) Heisenberg's uncertainty principle explain orbital concept, which is depends on finding probability of electron.

4. How many of the following are isoelectric species

F^- , Al^{3+} , F , O_2^- , Na^+ , Mg^{2+} , Al , Na , O^{2-}

Ans. (5)

Sol.

Species :	F^-	Al^{3+}	F	O_2^-	Na^+	Mg^{2+}	Al	Na	O^{2-}
No. of e^- :	10	10	9	15	10	10	13	11	10

5. The interionic distance in CsCl structure is

$(r^+ + r^-)$

- (1) $\frac{a}{\sqrt{2}}$ (2) $\frac{\sqrt{3}a}{4}$ (3) $\frac{\sqrt{3}a}{2}$ (4) $\frac{a}{2}$

Ans. (3)

Sol. CsCl has body centred unit cell (BCC)

So body diagonal $\sqrt{3}a = 2(r^+ + r^-)$

$$(r^+ + r^-) = \left(\frac{\sqrt{3}a}{2}\right)$$

6. In a complex of Co^{2+} with ligand H_2O in octahedral complex number of unpaired electron in t_{2g} orbital _____

Ans. (1)

Sol. $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$; $\text{Co}^{2+} = d^7$ configuration



No. of unpaired electron = 1 in t_{2g}

7. Which of the following statement are correct ?

- (a) NF_3 has triangular planer structure
 (b) Bond length of N_2 is smaller than O_2
 (c) For isoelectronic species bond order will be same
 (d) Dipole moment of H_2S is lesser than H_2O

- (1) Only b, c, d.
 (2) Only a, b, c.
 (3) Only a, c, d.
 (4) Only a, b, d.

Ans. (1)

Sol. (a) NF_3 has triangular pyramidal structure



- (b) **Molecule** : N_2 O_2
 B.O. 3 2
 B. L $\text{N}_2 < \text{O}_2$

(d) Dipole moment $\text{H}_2\text{S} < \text{H}_2\text{O}$ due to less EN difference b/w H and S as compare to H and O

8. **Assertion** : BeCl_2 and MgCl_2 give characteristic colour to flame.

Reason : Excitation enthalpy are very high for BeCl_2 and MgCl_2 .

- (1) Assertion, Reason both are correct Reason is correct explanation of Assertion.
 (2) Assertion, Reason both are correct Reason is not correct explanation of Assertion.
 (3) Assertion is correct Reason is not correct.
 (4) Assertion is not correct Reason is correct.

Ans. (4)

Sol. Due small size and high EN of Be and Mg.

13. Which of the following reaction is not a calcination process.

- (1) $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$
 (2) $\text{CaCO}_3, \text{MgCO}_3 \xrightarrow{\Delta} \text{MgO} + \text{CaO} + \text{CO}_2$
 (3) $\text{PbS} + \text{O}_2 \longrightarrow \text{PbO} + \text{SO}_2$
 (4) $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O} \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + x\text{H}_2\text{O}$

Ans. (3)

Sol. $\text{PbS} + \text{O}_2 \longrightarrow \text{PbO} + \text{SO}_2$ is a roasting reaction.

14. Which of the following having highest value of splitting energy (Δ_0).

- (1) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ (2) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
 (3) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ (4) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$

Ans. (2)

Sol. From L to R in 3d series M^{3+} ion size decreases, charge density increase, so attraction b/w M^{3+} and ligand increase so Δ_0 increase.

15. For water gas shift reaction, which of the following is correct.

- (1) CO get oxidised in CO_2
 (2) CO_2 get reduced in CO
 (3) Water get vaporised
 (4) CO get reduced in CH_4

Ans. (1)

Sol. The production of dihydrogen can be increased by reacting CO of Syn gas mixture with steam in the presence of iron chromate as catalyst



Water gas shift Reaction

16. For a radioactive decay $t_{1/2} = 15$ years, what will be the rate constant (yr^{-1})

Ans. 0.05 yr^{-1}

Sol. radioactive decay is 1st order,

$$\text{so rate constant } K = \frac{0.693}{t_{1/2}} = \frac{0.693}{15} = 0.0462$$

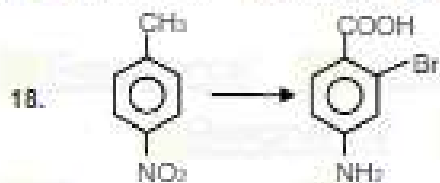
$$= 0.05 \text{ yr}^{-1}$$

17. **Statement-I** : pH of 10^{-4} M HCl is 8 at 25°C

Statement-II : Titration of weak acid and strong base at half equivalence point gives $\text{pH} = \frac{\text{p}K_a}{2}$

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

Ans. (2)



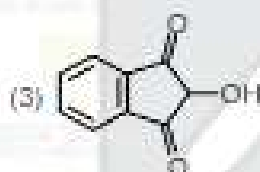
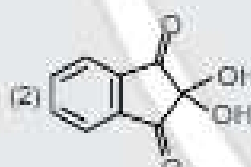
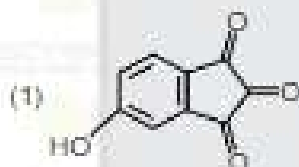
(1) Br_2/Fe , KMnO_4 , LiAlH_4

(2) H_2/Pd , Br_2/Fe , KMnO_4

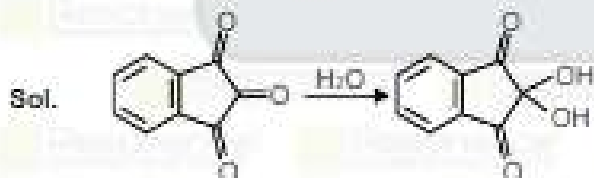
(3) Br_2/Fe , KMnO_4 , H_2/Pd

(4) KMnO_4 , Br_2/Fe , LiAlH_4

Ans. (3)



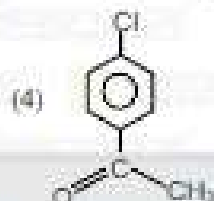
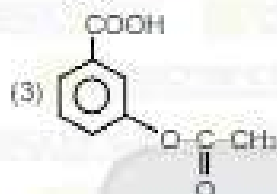
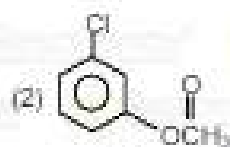
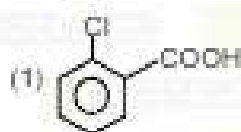
Ans. (2)



Ninhydrin

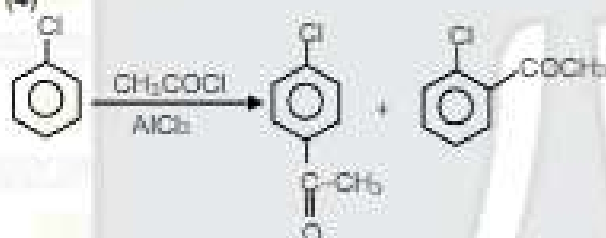
Ninhydrin-hydrate

20. Friedel-craft acylation in chlorobenzene gives.



Ans. (4)

Sol.



21. Photochemical smog is minimum

(1) In Kolkata (October)

(2) In Mumbai - (May)

(3) In Chennai (July)

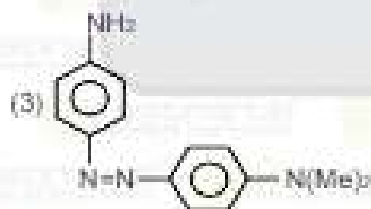
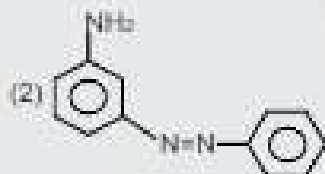
(4) In Jammu & Kashmir (January & February)

Ans. (4)

22.



Find B.



Ans. (1)

Sol.

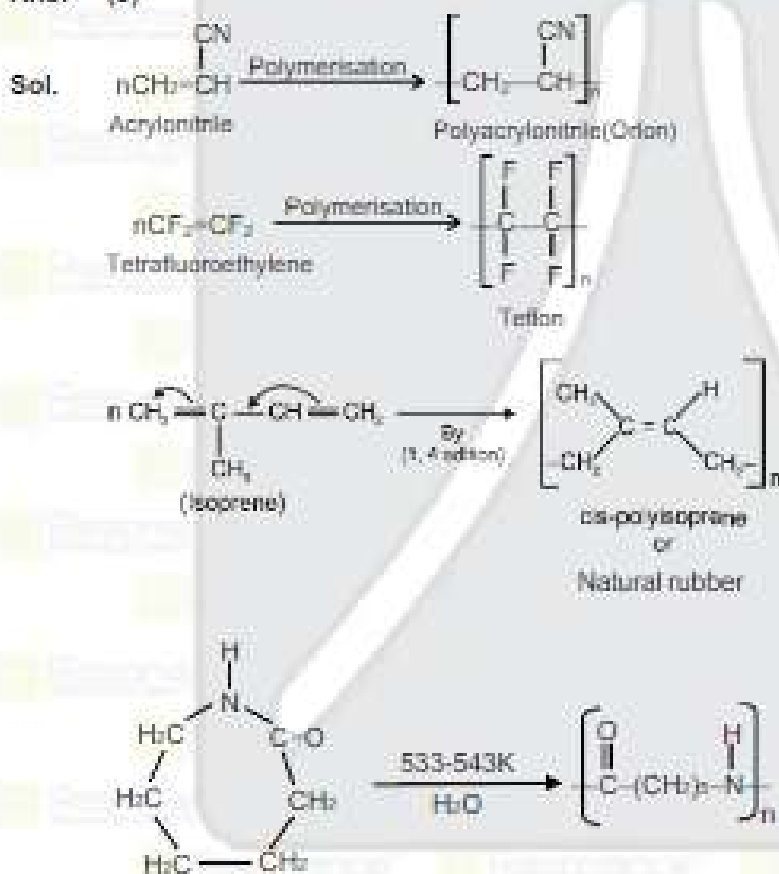


23. The correct match is.

	LIST-I (Monomer)		LIST-II (Polymer)
(A)	Tetrafluoroethylene	(I)	Orlon
(B)	Caprolactum	(II)	Natural rubber
(C)	Acrylonitrile	(III)	Nylon-6
(D)	Isoprene	(IV)	Teflon

- (1) (A) – (IV) ; (B) – (III) ; (C) – (II) ; (D) – (I)
 (2) (A) – (IV) ; (B) – (II) ; (C) – (III) ; (D) – (I)
 (3) (A) – (IV) ; (B) – (III) ; (C) – (I) ; (D) – (II)
 (4) (A) – (III) ; (B) – (II) ; (C) – (IV) ; (D) – (I)

Ans. (3)



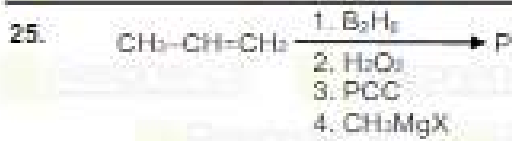
24. Increasing order of rate of electrophilic aromatic substitution reaction is



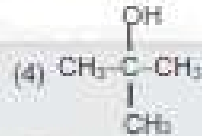
- (1) C < B < A < D < E
 (2) C < B < A < E < D
 (3) C < B < D < E < A
 (4) C < A < D < E < B

Ans. (1)

Sol. Rate of electrophilic substitution reaction \propto Electron density in benzene ring.



Product 'P' is



Ans. (3)

