

CHEMISTRY

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

Choose the correct answer :

1. Correct order of bond angle of following compounds is BF_3 , PF_3 , ClF_3
 (1) $\text{BF}_3 > \text{PF}_3 > \text{ClF}_3$ (2) $\text{PF}_3 > \text{ClF}_3 > \text{BF}_3$
 (3) $\text{ClF}_3 > \text{PF}_3 > \text{BF}_3$ (4) $\text{BF}_3 > \text{ClF}_3 > \text{PF}_3$

Answer (1)

Sol. $\text{BF}_3 \Rightarrow sp^2 \Rightarrow \text{Bond angle} = 120^\circ$

$\text{PF}_3 \Rightarrow sp^3 \Rightarrow \text{Bond angle} \approx 109^\circ 28'$

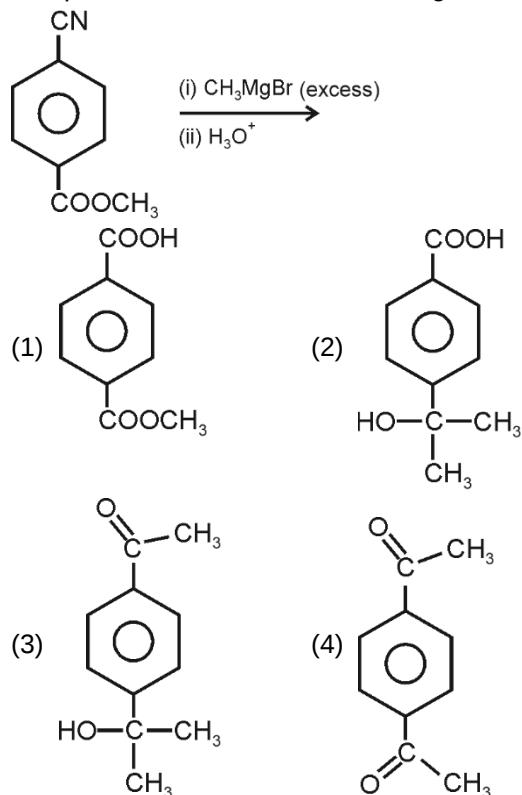
$\text{ClF}_3 \Rightarrow sp^3d \Rightarrow \text{Bond angle} \approx 90^\circ$

2. Identify the correct electronic configuration of Einsteinium is
 (1) $[\text{Rn}] 5f^{14}6d^{17}s^2$ (2) $[\text{Rn}] 5f^{117}s^2$
 (3) $[\text{Rn}] 5f^{10}6d^{17}s^2$ (4) $[\text{Rn}] 5f^{116}d^{17}s^1$

Answer (2)

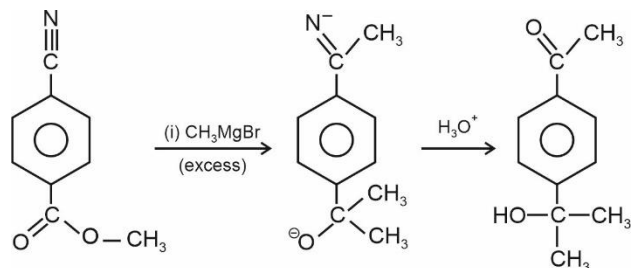
Sol. Es ($Z = 99$) $\Rightarrow [\text{Rn}] 5f^{117}s^2$

3. The product obtained in the following reaction is:



Answer (3)

Sol.



4. Ca^{2+} makes which type of complex with EDTA?

- (1) Trigonal bipyramidal
 (2) Square planar
 (3) Tetrahedral
 (4) Octahedral

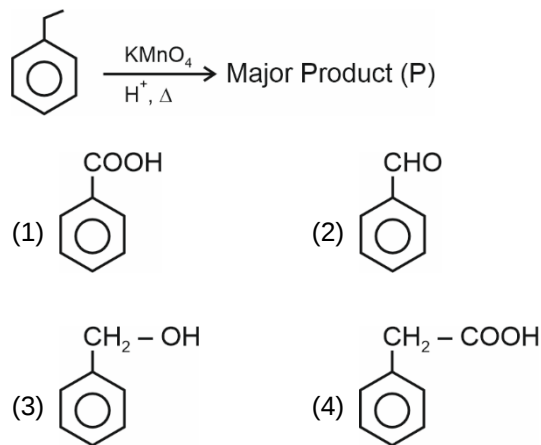
Answer (4)

Sol. Co-ordination number of Ca^{2+} with EDTA is 6

Hybridisation = sp^3d^2

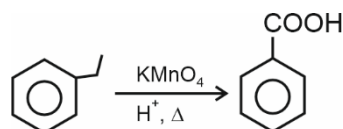
Shape = Octahedral

5. Consider the following reaction and identify the major product P.



Answer (1)

Sol. The reaction is benzylic oxidation reaction



6. Match the complexes given in List-I with the hybridisation of central metal atom/ion given in List-II and choose the correct option.

	List-I (Complexes)		List-II (Hybridisation)
(A)	$K_2[Ni(CN)_4]$	(I)	sp^3
(B)	$[Ni(CO)_4]$	(II)	sp^3d^2
(C)	$[Co(NH_3)_6]Cl_3$	(III)	dsp^2
(D)	$Na_3[CoF_6]$	(IV)	d^2sp^3

(1) (A)-(I); (B)-(II) (C)-(III); (D)-(IV)

(2) (A)-(III); (B)-(I) (C)-(IV); (D)-(II)

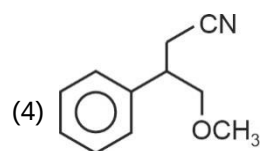
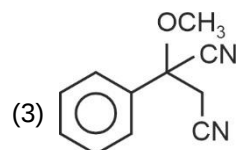
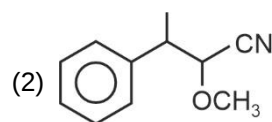
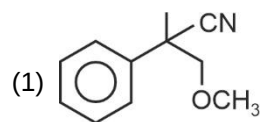
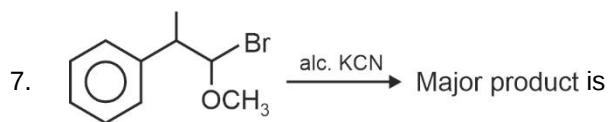
(3) (A)-(IV); (B)-(III) (C)-(II); (D)-(I)

(4) (A)-(I); (B)-(II) (C)-(IV); (D)-(III)

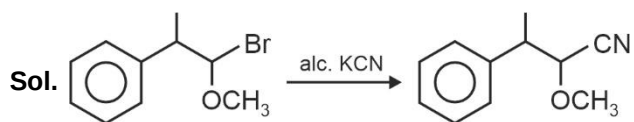
Answer (2)

Sol.

(A)	$K_2[Ni(CN)_4]$ $Ni^{2+} : 3d^8$	;	dsp^2 hybridisation as CN^- is strong field ligand
(B)	$[Ni(CO)_4]$ $Ni^0 : 3d^8 4s^2$	;	sp^3 hybridisation as CO is strong field ligand
(C)	$[Co(NH_3)_6]Cl_3$ $Co^{3+} : 3d^6$	;	d^2sp^3 hybridisation as NH_3 is strong field ligand
(D)	$Na_3[CoF_6]$ $[CoF_6]^{3-}; Co^{3+} : 3d^6$	;	sp^3d^2 hybridisation as F^- ion is a weak field ligand



Answer (2)



8. Which of the following is correct for strong electrolyte ($B > 0$)

(1) $\lambda_m - \lambda_m^0 - B\sqrt{C} = 0$

(2) $\lambda_m + \lambda_m^0 - B\sqrt{C} = 0$

(3) $\lambda_m - \lambda_m^0 + B\sqrt{C} = 0$

(4) $\lambda_m + \lambda_m^0 + B\sqrt{C} = 0$

Answer (3)

Sol. $\lambda_m = \lambda_m^0 - B\sqrt{C}$

$\lambda_m - \lambda_m^0 + B\sqrt{C} = 0$

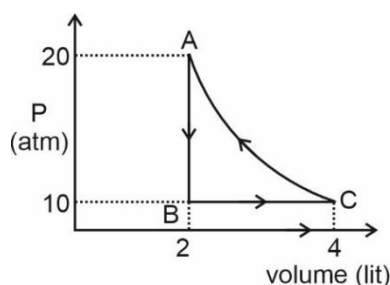
9. Which one of the following statements regarding glucose is incorrect?

- (1) Glucose is one of the monosaccharides of sucrose
- (2) Glucose dissolves in water because it has aldehyde group.
- (3) Glucose has six carbon atoms in its structure
- (4) Glucose is an aldose

Answer (2)

Sol. Glucose is an aldohexose having molecular formula $C_6H_{12}O_6$. It is soluble in water due to number of hydroxyl groups which can form H-bonds with water. $\alpha(D)$ Glucose condenses with $\beta(D)$ fructose to form sucrose.

10.



What is the work done on the gas in cyclic process ABCA

- (1) +773.7 J
- (2) -773.7 J
- (3) +4762.3 J
- (4) -4762.3 J

Answer (1)

Sol. $W_{AB} = 0$

$$W_{BC} = -10(4 - 2) \\ = -20 \text{ atm. Lit}$$

$$W_{CA} = 2.303(40) \log 2 \\ = 27.636 \text{ atm. Lit}$$

$$W_{\text{total}} = 7.636 \text{ atm. Lit} \\ = 773.7 \text{ Joule}$$

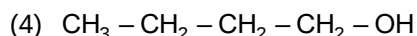
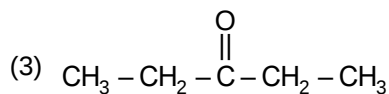
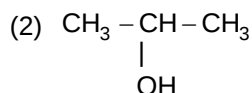
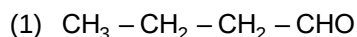
11. Which of the following compounds does not give Tollen's test?

- (1) Formaldehyde
- (2) Formic acid
- (3) Benzaldehyde
- (4) Acetone

Answer (4)

Sol. Aldehyde and Formic acid can give Tollen's test with ammoniacal silver nitrate solution.

12. Which of the following will give positive Iodoform test?



Answer (2)

Sol. Molecules having

Groups as $\overset{\overset{O}{||}}{C} - CH_3$ or $\underset{\substack{| \\ OH}}{CH} - CH_3$ gives positive iodoform test.

13. Match the List and choose correct option.

	List-I		List-II
(i)	Ni-Cd cell	(a)	Rechargeable
(ii)	Fuel cell	(b)	Anode ($Zn \rightarrow Zn^{2+} + 2e^-$)
(iii)	Mercury cell	(c)	Used in hearing aid
(iv)	Leclanche cell	(d)	Combustion energy in to electrical energy

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

Answer (1)

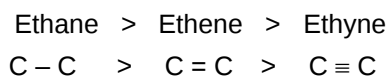
Sol. Ni-Cd cell is secondary cell and are rechargeable mercury cell is used in hearing aid.

14. What is the correct order of C - C bond length of ethane, ethene and ethyne?

- (1) Ethane > Ethene > Ethyne
- (2) Ethene > Ethane > Ethyne
- (3) Ethyne > Ethene > Ethane
- (4) Ethyne > Ethane > Ethene

Answer (1)

Sol. Correct order of C - C bond length is



15.

16.

- 17.
- 18.
- 19.
- 20.

SECTION - B

Numerical Value Type Questions: This section contains 10 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.

21. Fuming sulphuric acid has how many oxygen atoms?

Answer (7)

Sol. Fuming sulphuric acid is oleum ($\text{H}_2\text{S}_2\text{O}_7$)

$\therefore$ 7 O-atoms are present in fuming sulphuric acid.

22. Total sum of number of electrons in π^* orbitals of O_2 , O_2^+ and O_2^- is

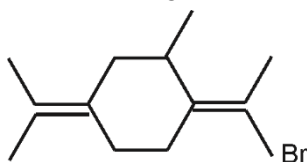
Answer (6)

Sol. O_2 ($16e^-$) :

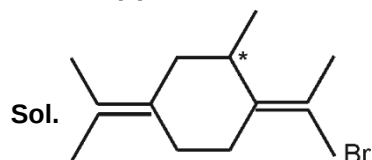
$$\sigma_{1s}^2 \sigma_{1s}^{*2} \sigma_{2s}^2 \sigma_{2s}^{*2} \sigma_{2p_z}^2 \begin{pmatrix} \pi_{2p_x}^2 \\ \pi_{2p_y}^2 \end{pmatrix} \begin{pmatrix} \pi_{2p_x}^{*1} \\ \pi_{2p_x}^{*1} \end{pmatrix} \sigma_{2p_z}^*$$

Total number of e^- in π^* orbitals of O_2 , O_2^+ , O_2^-
 $= 2 + 1 + 3 = 6$

23. How many total number of stereoisomers are possible for the following structure



Answer (4)



The structure has two stereogenic centres, one geometrical centre and one optical centre. Hence it has total 4 stereoisomers.

$$2^2 = 4$$

24. Among the elements – Sc, Ti, V, Cr, Mn find magnetic moment of element which have highest ionization enthalpy in +2 oxidation state. [Nearest integer]

Answer (6)

Sol. Sc^{+2} Ti^{+2} V^{+2} Cr^{+2} Mn^{+2}

Mn^{+2} will have highest I.E. due to its stable half filled configuration.

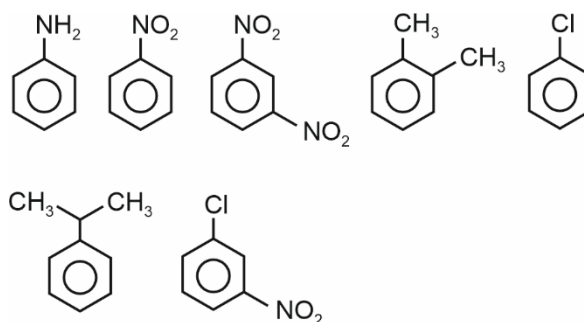
$$\text{Mn} \rightarrow [\text{Ar}] 4s^2 3d^5 \rightarrow 5 \text{ unpaired } e^-$$

$$\mu_{\text{spin}} = \sqrt{5(5+2)} \text{ BM}$$

$$= \sqrt{35}$$

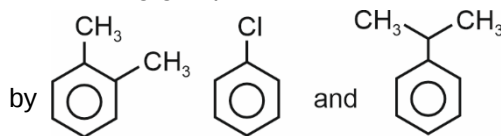
$$\approx 6$$

25. How many of the following compounds will give Friedel Craft's reaction?



Answer (3)

Sol. Friedel Craft's reaction is not given by those aromatic compounds which have strong deactivating groups like $-\text{NO}_2$ group. Even aniline does not give Friedel Crafts reaction because the Lewis acid AlCl_3 will form co-ordinate bond with $-\text{NH}_2$ group thus converting it into strongly deactivating group, Friedel Crafts reaction is given



- 26.
- 27.
- 28.
- 29.
- 30.