JEE-MAIN EXAM JANUARY, 2024

Date: - 31-01-2024 (SHIFT-1)

CHEMISTRY

SECTION-A

1. Match List I with List II

LIST - I (Complexion)		LIST - II (Electronic Configuration)	
A.	$\left[Cr(H_2O)_6\right]^{3+}$	I.	$t_{2g}^{2}e_g^{0}$
B.	$\left[Fe(H_2O)_6\right]^{3+}$	II.	$t_{2g}^{3}e_g^{0}$
C.	$\left[Ni(H_2O)_6\right]^{2+}$	III.	$t_{2g}^{3}e_g^{2}$
D.	$\left[V(H_2O)_6\right]^{3+}$	IV.	$t_{2g}^{6}e^{2}$

Choose the correct answer from the options given below :

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

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

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

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

2. A sample of $CaCO_3$ and $MgCO_3$ weighed 2.21 g is ignited to constant weight of 1.152 g. The composition of mixture is :

(Given molar mass in $gmol^{-1}$ $CaCO_3: 100, MgCO_3: 84$)

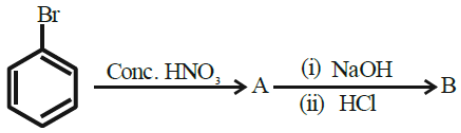
(1) $1.187\ gCaCO_3 + 1.023\ gMgCO_3$

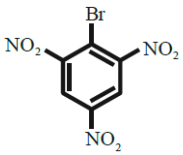
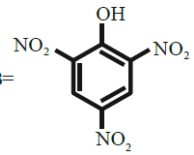
(2) $1.023\ gCaCO_3 + 1.023\ gMgCO_3$

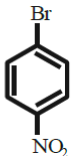
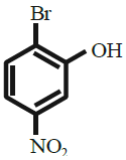
(3) $1.187\ gCaCO_3 + 1.187\ gMgCO_3$

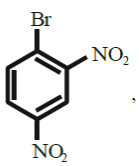
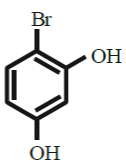
(4) $1.023\ gCaCO_3 + 1.187\ gMgCO_3$

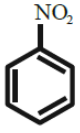
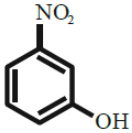
3. Identify A and B in the following reaction sequence.



(1) A=  , B= 

(2) A=  , B= 

(3) A=  , B= 

(4) A=  , B= 

4. Given below are two statements :

Statement I: S_8 solid undergoes disproportionation reaction under alkaline conditions to form S^{2-} and $S_2O_3^{\ 2-}$

Statement II: ClO_4^- can undergo disproportionation reaction under acidic condition. In the light of the above statements, choose the most appropriate answer from the options given below :

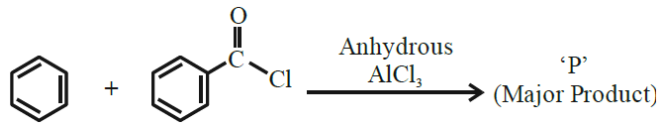
(1) Statement I is correct but statement II is incorrect.

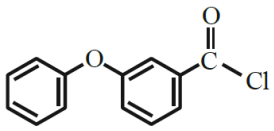
(2) Statement I is incorrect but statement II is correct

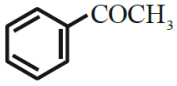
(3) Both statement I and statement II are incorrect

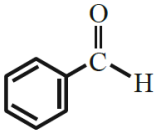
(4) Both statement I and statement II are correct

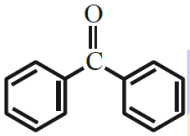
5. Identify major product ' P ' formed in the following reaction



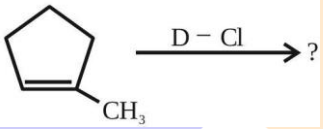
(1) 

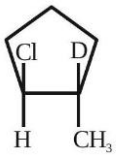
(2) 

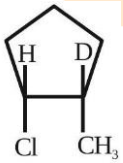
(3) 

(4) 

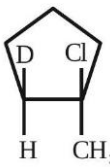
6. Major product of the following reaction is -



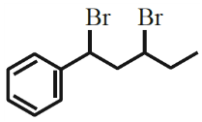
(1) 

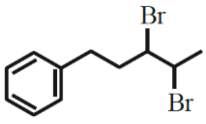
(2) 

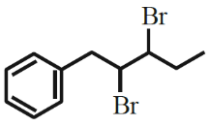
(3) 

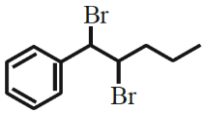
(4) 

7. Identify structure of 2,3-dibromo-1-phenylpentane.

(1) 

(2) 

(3) 

(4) 

8. Select the option with correct property –

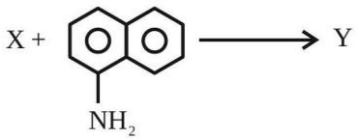
(1) $[Ni(CO)_4]$ and $[NiCl_4]^{2-}$ both diamagnetic

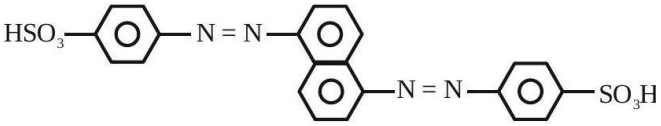
(2) $[Ni(CO)_4]$ and $[NiCl_4]^{2-}$ both paramagnetic

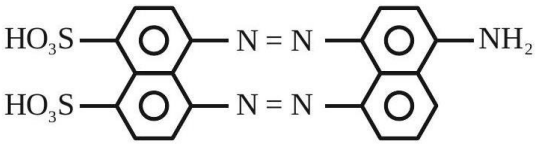
(3) $[NiCl_4]^{2-}$ diamagnetic, $[Ni(CO)_4]$ paramagnetic

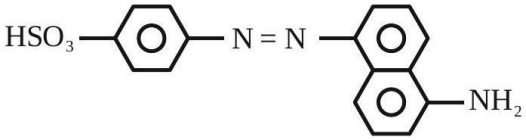
(4) $[Ni(CO)_4]$ diamagnetic, $[NiCl_4]^{2-}$ paramagnetic

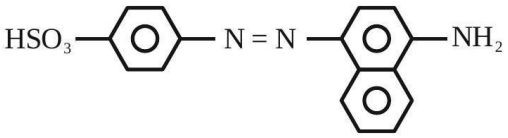
9. The azo-dye (Y) formed in the following reactions is Sulphanilic acid $+NaNO_2 + CH_3COOH \rightarrow X$



(1) 

(2) 

(3) 

(4) 

10. Given below are two statements :

Statement I: Aniline reacts with con. H_2SO_4 followed by heating at $453 - 473$ K gives p – aminobenzene sulphonic acid, which gives blood red colour in the 'Lassaigne's test'.

Statement II: In Friedel - Craft's alkylation and acylation reactions, aniline forms salt with the $AlCl_3$ catalyst. Due to this, nitrogen of aniline aquires a positive charge and acts as deactivating group.

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is false but statement II is true

(2) Both statement I and statement II are false

(3) Statement I is true but statement II is false

(4) Both statement I and statement II are true

11. $A_{(g)} \rightleftharpoons B_{(g)} + \frac{C}{2}(g)$ The correct relationship between K_P, α and equilibrium pressure P is

(1) $K_P = \frac{\alpha^{1/2}P^{1/2}}{(2+\alpha)^{1/2}}$ (2) $K_P = \frac{\alpha^{3/2}P^{1/2}}{(2+\alpha)^{1/2}(1-\alpha)}$ (3) $K_P = \frac{\alpha^{1/2}P^{3/2}}{(2+\alpha)^{3/2}}$ (4) $K_P = \frac{\alpha^{1/2}P^{1/2}}{(2+\alpha)^{3/2}}$

12. Choose the correct statements from the following

A. All group 16 elements form oxides of general formula EO_2 and EO_3 where $E = S$, Se, Te and Po. Both the types of oxides are acidic in nature.

B. TeO_2 is an oxidising agent while SO_2 is reducing in nature.

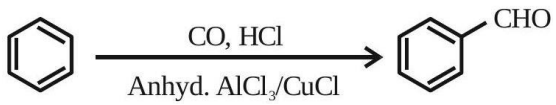
C. The reducing property decreases from H_2S to H_2Te down the group.

D. The ozone molecule contains five lone pairs of electrons.

Choose the correct answer from the options given below:

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

13. Identify the name reaction.



(1) Stephen reaction (2) Etard reaction

(3) Gatterman-koch reaction (4) Rosenmund reduction

14. Which of the following is least ionic ?

(1) $BaCl_2$ (2) $AgCl$ (3) KCl (4) $CoCl_2$

15. The fragrance of flowers is due to the presence of some steam volatile organic compounds called essential oils. These are generally insoluble in water at room temperature but are miscible with water vapour in vapour phase. A suitable method for the extraction of these oils from the flowers is

(1) crystallisation (2) distillation under reduced pressure

(3) distillation (4) steam distillation

16. Given below are two statements :

Statement I: Group 13 trivalent halides get easily hydrolyzed by water due to their covalent nature.

Statement II: $AlCl_3$ upon hydrolysis in acidified aqueous solution forms octahedral $[Al(H_2O)_6]^{3+}$ ion.

In the light of the above statements, choose the correct answer from the options given below :

(1) Statement I is true but statement II is false

(2) Statement I is false but statement II is true

(3) Both statement I and statement II are false

(4) Both statement I and statement II are true

17. The four quantum numbers for the electron in the outer most orbital of potassium (atomic no. 19) are

(1) $n = 4, l = 2, m = -1, s = +\frac{1}{2}$ (2) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

(3) $n = 3, l = 0, m = 1, s = +\frac{1}{2}$ (4) $n = 2, l = 0, m = 0, s = +\frac{1}{2}$

18. Choose the correct statements from the following

A. Mn_2O_7 is an oil at room temperature

B. V_2O_4 reacts with acid to give VO_2^{2+}

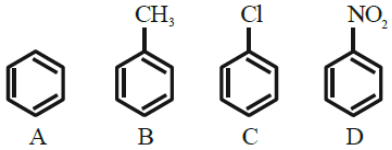
C. CrO is a basic oxide

D. V_2O_5 does not react with acid

Choose the correct answer from the options given below :

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

19. The correct order of reactivity in electrophilic substitution reaction of the following compounds is :



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

20. Consider the following elements.

Group ↓ A'B' → Period
C'D'

Which of the following is/are true about A', B', C' and D' ?

A. Order of atomic radii: $B' < A' < D' < C'$

B. Order of metallic character : $B' < A' < D' < C'$

C. Size of the element: $D' < C' < B' < A'$

D. Order of ionic radii : $B'^{+} < A^{++} < D'^{+} < C'^{+}$

Choose the correct answer from the options given below

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

SECTION-B

21. A diatomic molecule has a dipole moment of 1.2 D. If the bond distance is 1□, then fractional charge on each atom is _____ $\times 10^{-1}$ esu .

(Given $1D = 10^{-18}$ esu cm)

22. $r = k[A]$ for a reaction, 50% of A is decomposed in 120 minutes. The time taken for 90% decomposition of A is _____ minutes.

23. A compound (x) with molar mass 108 g mol^{-1} undergoes acetylation to give product with molar mass 192 g mol^{-1}. The number of amino groups in the compound (x) is _____ .

24. Number of isomeric products formed by monochlorination of 2-methylbutane in presence of sunlight is

25. Number of moles of H^{+}ions required by 1 mole of $MnO_4^-$to oxidise oxalate ion to CO_2 is _____ .

26. In the reaction of potassium dichromate, potassium chloride and sulfuric acid (conc.), the oxidation state of the chromium in the product is (+) _____.

27. The molarity of 1 L orthophosphoric acid (H_3PO_4) having 70% purity by weight (specific gravity 1.54 g cm^{-3}) is _____M.

(Molar mass of H_3PO_4 = 98 g mol^{-1})

28. The values of conductivity of some materials at 298.15 K^{-1} in Sm^{-1} are 2.1×10^3, 1.0×10^{-16}, 1.2×10,3.91,1.5×10^{-2}, 1×10^{-7}, 1.0×10^3. The number of conductors among the materials is _____ .

29. From the vitamins A, B_1, B_6, B_{12}, C, D, E and K, the number vitamins that can be stored in our body is _____.

30. If 5 moles of an ideal gas expands from 10 L to a volume of 100 L at 300 K under isothermal and reversible condition then work, w, is $-x$ J. The value of x is _____ .

(Given R = 8.314 J K^{-1} mol^{-1})

NTA ANSWERS

1.	(4)	2.	(1)	3.	(1)	4.	(1)	5.	(4)	6.	(3 or 4)		
7.	(3)	8.	(4)	9.	(4)	10.	(4)	11.	(2)	12.	(4)	13.	(3)
14.	(2)	15.	(4)	16.	(4)	17.	(2)	18.	(2)	19.	(4)	20.	(2)
21.	(0)	22.	(399)	23.	(2)	24.	(6)	25.	(8)	26.	(6)	27.	(11)
28.	(4)	29.	(5)	30.	(28721)								