Full Syllabus Test 1

Subject: Chemistry

1. A gaseous mixture containing He, CH_4 and SO_2 was allowed to effuse through a fine hole. Find what molar ratio of gases comes out initially, if the mixture contains He, CH_4 and SO_2 in $1:2:3$ mole ratio.

   A. $2:2:3$

   B. $6:6:1$

   C. $\sqrt{2}:\sqrt{2}:3$

   D. $4:4:3$

2. For the dissociation reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$, the degree of dissociation α in terms of K_p and total equilibrium pressure P is:

   A. $\alpha = \sqrt{\frac{4P + K_P}{K_P}}$

   B. $\alpha = \sqrt{\frac{K_P}{4P + K_P}}$

   C. $\alpha = \sqrt{\frac{K_P}{4P}}$

   D. None of these

3. Which of the following is a buffer solution?

   A. $500\ mL\ of\ 0.1\ N\ CH_3COOH + 500\ mL\ of\ 0.1\ N\ NaOH$

   B. $500\ mL\ of\ 0.1\ N\ CH_3COOH + 500\ mL\ of\ 0.1\ N\ HCl$

   C. $500\ mL\ of\ 0.1\ N\ CH_3COOH + 500\ mL\ of\ 0.2\ N\ NaOH$

   D. $500\ mL\ of\ 0.2\ N\ CH_3COOH + 500\ mL\ of\ 0.1\ N\ NaOH$

4. Selenious acid (H_2SeO_3), a diprotic acid has $K_{a1} = 3.0 \times 10^{-3}$ and $K_{a2} = 5.0 \times 10^{-8}$. What is the $[OH^-]$ of a $0.30\ M$ solution of a selenious acid?

   A. 2.85×10^{-3}

   B. 5.0×10^{-6}

   C. 3.5×10^{-12}

   D. 3.5×10^{-13}

5. Which of the following statements for crystals having Schottky defect is not correct?

   A. Schottky defect arises when some of the lattice points are unoccupied called vacancies or holes and the number of missing positive and negative ions is same so that the crystal remains neutral in all

   B. Schottky defect are more common in ionic compounds with high co-ordination number

   C. The density of the crystals having schottky defect is larger than that of the perfect crystal

   D. The crystal having schottky defect is electrically neutral as a whole

6. What size of particles does a colloidal system has?

   A. $10^{-4}\ m\ to\ 10^{-10}\ m$

   B. $10^{-5}\ m\ to\ 10^{-7}\ m$

   C. $10^{-9}\ m\ to\ 10^{-12}\ m$

   D. $10^{-6}\ m\ to\ 10^{-9}\ m$

7. The $d-$ electronic configuration of $Cr^{2+}, Mn^{2+}, Fe^{2+}$ and Ni^{2+} are $3d^4, 3d^5, 3d^6$ and $3d^8$ respectively, which one of the following aqua-complex will exhibit the minimum paramagnetic behaviour?

   A. $[Cr(H_2O)_6]^{2+}$

   B. $[Mn(H_2O)_6]^{2+}$

   C. $[Fe(H_2O)_6]^{2+}$

   D. $[Ni(H_2O)_6]^{2+}$

8. The process of converting hydrated alumina into anhydrous alumina is called

   A. Roasting

   B. Smelting

   C. Dressing

   D. Calcination

9. Glycerol boils at $290\ ^{\circ}C$ with slight decomposition. Impure glycerin can be purified by:

   A. Steam distillation

   B. Vaccum distillation

   C. Simple distillation

   D. Extraction by solvent

10. The carbon-based reduction method is used for the extraction of:

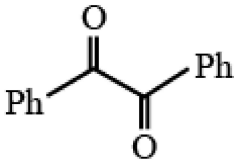
A. Sn from SnO_2

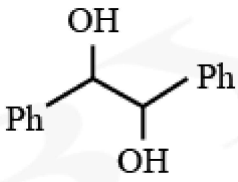
B. Fe from Fe_2O_3

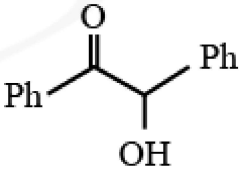
C. Zn from ZnO

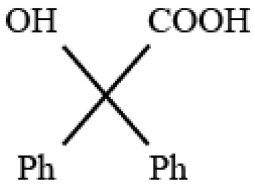
D. All of the above

11. Which structure is related to benzoin?

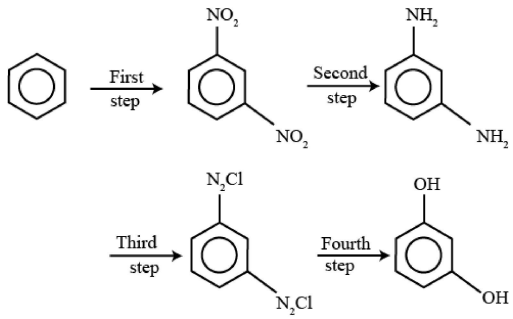
A. 

B. 

C. 

D. 

12. Benzene can be converted in to 1,3-dihydroxy benzene in four steps as follows:



The correct sequence of reagents for this conversion is:

A. Cu_2/H_2O; dil. HNO_3; $NaNO_2/HCl$; Sn/HCl

B. $Conc.\ HNO_3/H_2SO_4$; $NaNO_2/Conc.\ HCl$; Sn/HCl; Cu_2O/H_2O

C. $Conc.\ HNO_3/H_2SO_4$; Sn/HCl; $NaNO_2/Conc.\ HCl$; H_2O

D. $Conc.\ HNO_3/H_2SO_4$; $(NH_4)_2S$; $NaNO_2/Conc.\ HCl$; H_2O

13.

List I	List II
(A) Sucrose	(i) $\beta-$ D-glucose C_1-C_4 glycosidic linkage
(B) Lactose	(ii) $\alpha-$ D-glucose, $\beta-$ D-fructose C_1-C_2 glycosidic linkage
(C) Cellulose	(iii) $\beta-$ D-glucose, $\beta-$ D-galactose C_1-C_4 glycosidic linkage

List-I contains saccharides and List-II contains the monosaccharide units as well as glycosidic bonds.
Choose the correct option considering List-I and List-II.

A. A - (iii), B - (i), (C) - (ii)

B. A - (ii), B - (iii), (C) - (i)

C. A - (i), B - (ii), (C) - (iii)

D. A - (iii), B - (ii), (C) - (i)

14. Correct increasing order for the wavelength of absorbtion in the visible region for the complexes of Co^{3+} is:

A. $[Co(en)_3]^{3+}, [Co(NH_3)_6]^{3+}, [Co(H_2O)_6]^{3+}$

B. $[Co(H_2O)_6]^{3+}, [Co(en)_3]^{3+}, [Co(NH_3)_6]^{3+}$

C. $[Co(H_2O)_6]^{3+}, [Co(NH_3)_6]^{3+}, [Co(en)_6]^{3+}$

D. $[Co(NH_3)_6]^{3+}, [Co(en)_3]^{3+}, [Co(H_2O)_6]^{3+}$

15. For the ideal gaseous reaction, the rate is generally expressed in terms of $\frac{dP}{dt}$ instead of $\frac{dC}{dt}$ or $\frac{dn}{dt}$ (where $C = n/v$ is concentration and n is the number of moles). What is the relation among these three expressions if T and V are constant?

A. $\frac{dC}{dt} = \frac{dn}{dt} = \frac{dP}{dt}$

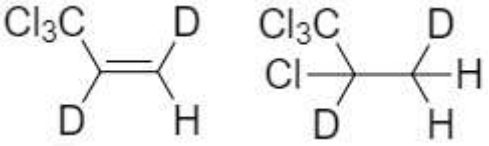
B. $\frac{dC}{dt} = \frac{1}{V}\frac{dn}{dt} = \frac{1}{RT}\left(\frac{dP}{dT}\right)$

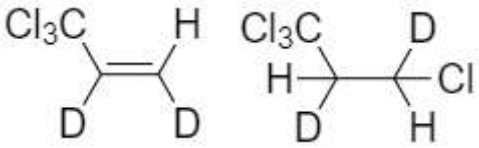
C. $RT\frac{dC}{dt} = \frac{dn}{dt} = \frac{dP}{dt}$

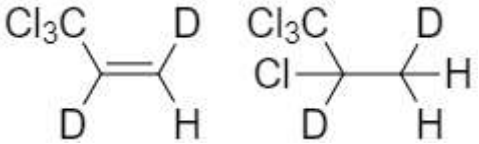
D. None of these

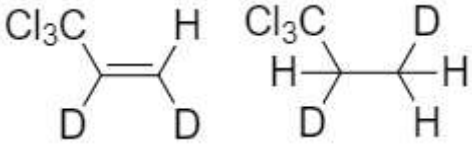
16. $CCl_3 - C \equiv C - H \xrightarrow{D_2/Pd-HaSO_4} A \xrightarrow{HCl} B$

Compound A and B respectively are:

A. 

B. 

C. 

D. 

17. Which of the following salts will not give positive brown ring test?

A. $Cu(NO_3)_2$

B. $Pb(NO_3)_2$

C. $Zn(NO_3)_2$

D. $Mg(NO_3)_2$

18. The methods chiefly used for the reduction of ores of lead and tin are respectively.

A. Self reduction and carbon reduction

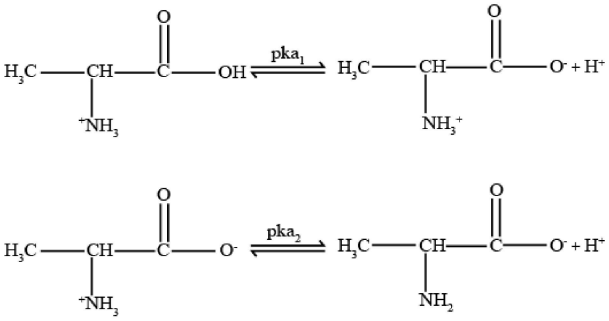
B. Self reduction and electrolytic reduction

C. Carbon reduction and self reduction

D. Cynide process and carbon reduction

19. Consider the following ionic equilibrium

Given $pK_{a1} = 2.3$ and $pK_{a2} = 9.7$



Then what is the isoelectric point of alanine?

A. 8

B. 6

C. 4

D. 5

20. The sum of p orbitals involved in the hybridisation of NH_3 and BF_3 molecules are:

A. 6

B. 5

C. 4

D. 3

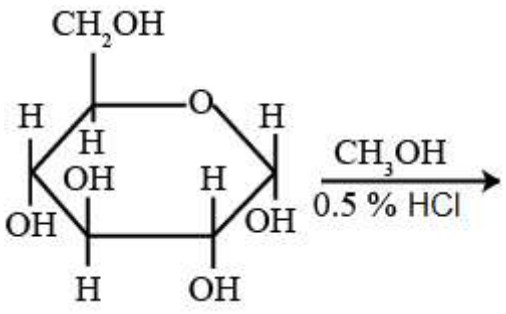
21. $p \times 10^{-q}$ is the molarity of SO_4^{2-} ion in an aqueous solution that contains $34.2\ ppm$ of $Al_2(SO_4)_3$. Calculate $(p+q)$?
(Assume complete dissociation and density of solution $1\ g\ L^{-1}$)

22. Consider an electrochemical cell in which the following reaction occurs :
$Fe^{2+}(aq) + Ag^{+}(aq) \rightarrow Ag(s) + Fe^{3+}(aq)$
Then how many of following changes will decrease the cell voltage:

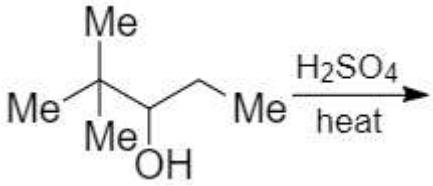
(i) Decrease the $[Ag^{+}]$
(ii) Increase in $[Fe^{3+}]$
(III) Increase the amount of Ag

23. Number of oxygen shared in neosilicates is a, in sorosilicate is b, cyclosilicates is c, phylosilicate is d and tectosilicates is e. Then $a+b+c+d+e$ is

24. Consider the following reaction.



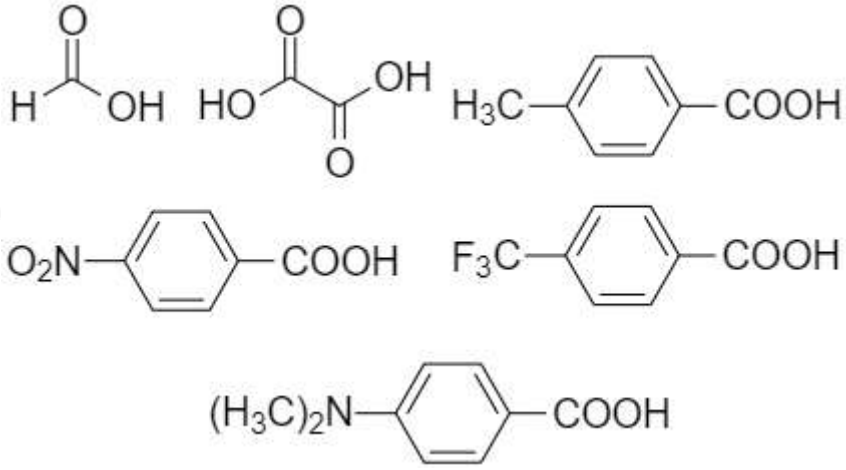
How many methoxy group is/are present in the final product?

25. 

In the given reaction, the total number of alkenes formed (including stereoisomers) is:

26. An organic compound was analysed by Duma's method, $0.40\ \mathrm{g}$ of compound on combustion gave $50\ \mathrm{mL}$ of nitrogen at $27^{\circ}C$ and $756\ \mathrm{mm}$ of pressure. Calculate percentage of nitrogen in the compound.

27. Find out the number of compounds which are more acidic than benzoic acid among the following.



28. If the number of bonds present in borazole are $x\ \sigma$ and $y\ \pi$, then find the value of $x \times y$.

29. 29.2% (w/w) HCl stock solution has a density of $1.25\ \mathrm{g mL^{-1}}$. The molecular weight of HCl is $36.5\ \mathrm{g\ mol^{-1}}$. The volume (mL) of stock solution required to prepare a $200\ \mathrm{mL}$ solution of $0.4\ \mathrm{M}$ HCl is :

30. A decapeptide (Mol. wt. 796) on complete hydrolysis gives glycine (Mol. wt. 75), alanine and phenylalanine.Glycine contributes 47.0% to the total weight of the hydrolysed products. The number of glycine units present in the decapeptide is