CHEMISTRY

Time: **1** Hour   Max.Marks : 60

Instructions:
(1) *Answer must be written either in English or the medium of instruction of the candidate in high school.*
(2) *There will be no negative marking*
(3) *Use of calculators or graph papers is not permitted*
(4) *There are TWENTY questions. Answer all the questions.*

SECTION - A

Marks10x2=20

1. The reaction between dichromate ions and iron (II) ions can be carried in the presence of either dilute HCl (or) sulphuric acids. But the dilute HCl cannot be used to acidify the solution for titration between Iron (II) and permanganate ion system. The reason for this is _____.

2. Acetic acid is a weak acid and hydrochloric acid is a strong acid it follows that the
    (A) pH of the 0.1M HCl will be 1
    (B) Solution containing 0.1 mole acetic acid and 0.1 mole of sodium acetate will be a good buffer
    (C) pH of the 0.1M HCl will be less than that of 0.1M acetic acid
    (D) pH of a solution formed by mixing equimolar quantities of sodium hydroxide and HCl will be greater that of a similar solution formed from sodium hydroxide and acetic acid.

    The correct statement(s) is/are _____

3. A metal oxide has formula X_2O_3 it can be reduced by hydrogen to give free metal and water. 0.1596 g of metal oxide requires 6 mg of hydrogen for complete reduction. The atomic weight of the metal is _____.

4. Helium is mixed with the oxygen gas for deep sea divers. The percent by volume of oxygen gas in the mixture of the diver has to submerge to a depth where the total pressure is 4.2 atm and partial pressure of oxygen is maintained at 0.2 atm at this depth is _____ .

5. In the reaction A + B $\rightarrow$ products, if the concentration of B is kept constant and concentration of A is doubled, the rate becomes four times of initial rate and when A is kept constant and concentration of B is doubled rate remains the same. This indicates that reaction rate is proportional to the _____ of concentration of _____ and rate equation is _____.

6. One _____ of a substance is equal to its atomic or molecular mass expressed in _____ and contains 6.023×10^{23} chemical particles, which is known as _____ of particles. Since 1 mole of any chemical substance contains same number _____ as 1 mole of any other chemical substance, we can calculate the weight of one chemical that will react with a given weight of other by using their _____ in other calculations.

7. 15 moles of H_2 and 5.2 moles of I_2 are mixed and allowed to attain equilibrium. Concentration of HI is found to be 10 moles the equilibrium constant for the formation of HI is _____.

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8. 600 ml of a mixture of O_2 and O_3 weighs 1 gram at NTP. The volume of ozone in the mixture _____.

9. At 27^0C 4.6 grams of N_2O_4 undergoes decomposition and exerts an equilibrium pressure of 1.6 atmosphere when vapourised in a 1 lit flask. The fraction of N_2O_4 dissociated is _____. [$N_2O_4(g) \rightleftharpoons 2NO_2(g)$]

10. A compound contains 28% nitrogen and 72% metal by mass. 3 atoms of the metal combine with 2 atoms of the nitrogen. The atomic weight of the metal is _____

Marks 5x1=5

11. The V.D of Gas is 15. 15 g of this gas will occupy a volume of _____ cc at 273^0C and 1 atm.

12. You are given 500 ml of 2N HCl and 500 ml of 5N HCl. The maximum volume of the 3 M that you can make from these two solutions is _____.

13. The equilibrium constant for the reaction $2A + 2B \rightleftharpoons 2C + 2D$ is 100. The equilibrium constant for the $A + B \rightleftharpoons C + D$ at same temperature is _____ .

14. The solubility product of sparingly soluble salt Ag_2CrO_4 is $4x10^{-12}$. The molar solubility of the salt is _____

15. For the preparation of HBr in the lab the corresponding bromide salt should be treated with _____ acid.
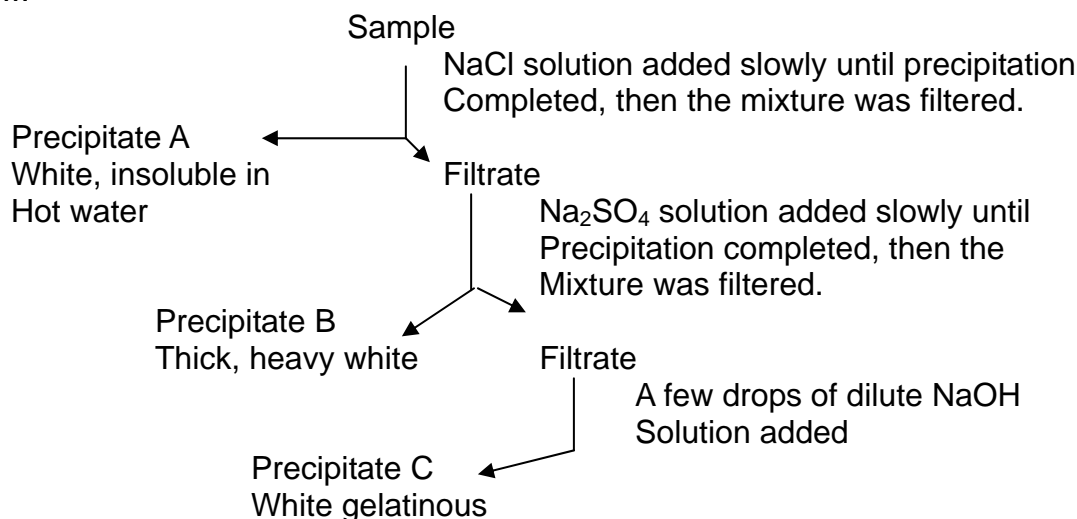
SECTION - B

Marks 10x2=20

16. *Differentiate the following*:

    (a) Redox reaction   –   disproportionation reaction

    (b) Primary standard substance   –   Secondary standard substance

    (c) Electrolysis   –   Hydrolysis

    (d) Gangue   –   Slag

    (e) Lattice energy   –   Hydration energy

    (f) Equilibrium constant   –   Rate constant

    (g) Ionic product   –   Solubility product

    (h) Activation energy   –   Threshold energy

    (i) Valence   –   Oxidation number

    (j) Allotropy   –   Enantiotropy

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17. A compound of oxygen and nitrogen has the composition 1.52 g N and 3.47 g of oxygen. The molar mass of this compound is known to be between 90 and 95 g. Determine the molecular formula and molecular mass of compound. **3M**

18. A transition metal X forms an oxide of formula X_2O_3. It is found that only 50% of X atoms in this compound are in the +3 oxidation state. The only other stable oxidation states of X are +2 and +5. What percentage of X atoms are in the +2 oxidation state in this compound? **4M**

19. Many diabetics must determine their blood sugar content daily. The measurements provided by the devices used for such purpose are in milligrams per deciliter. **3M**
(a) What is the concentration of glucose [$C_6H_{12}O_6$] in grams per liter when a reading of 95 is observed?
(b) What is the concentration in moles per litre?

20. A student was given a sample of colourless solution containing three cations and was asked to identify the cations. The student carried out a series of reactions as shown in the flow chart below. **5M**

Sample
NaCl solution added slowly until precipitation Completed, then the mixture was filtered.

Precipitate A
White, insoluble in
Hot water   Filtrate
                   Na_2SO_4 solution added slowly until
                   Precipitation completed, then the
                   Mixture was filtered.

Precipitate B
Thick, heavy white   Filtrate
                          A few drops of dilute NaOH
                          Solution added

Precipitate C
White gelatinous

(i) From the information above, suggest three cations which could be in the sample and would form the precipitates A, B and C. Give the formula for each precipitate,

(ii) Give an additional test which would help to confirm the presence of each cation,

(iii) Name any other cations that would fit the requirements for precipitates A, B and C.

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