Ex/Chem/H/32/XVIII/77/2018

FINAL B. SC. EXAMINATION, 2018

(2nd Semester)

CHEMISTRY (HONOURS)

PAPER - XVIII

ANALYTICAL CHEMISTRY

Time : Two hours Full Marks : 25

Answer ***any two*** questions.

1. a) i) What is smog ? Write the chemical reactions for smog formation.

   ii) What is the total hardness and permanent hardness in ppm of a sample of water containing $Ca(HCO_3)_2$=16·2 mg/litre ; $Mg(HCO_3)_2$=7·3 mg/litre ; $MgCl_2$=9·5 mg/litre ; $CaSO_4$ = 13·6 mg/litre ?

   $2+1\frac{1}{2}$

   b) i) The solution of Erichrome Black T is red below pH 5·5, blue between pH 7 and pH 11, while yellowish-orange above pH 11·5. Give appropriate reason(s) for the observed colour change as a function of the pH of the solution.

   ii) Outline a procedure whereby the amount of sulphate in a sample can be estimated comeplexometrically.

   $1\frac{1}{2}+1\frac{1}{2}$

[Turn over

c) Suggest a titrimetric method of analysis of vanadium. 3

d) Account on the role of pH in the Solvent Extraction Process. Write significance of $pH_{1/2}$. 3

2. a) i) Suggest a suitable reagent which can effectively mask both Zn^{2+} and Cd^{2+} in presence of Mn^{2+}, Pb^{2+} and alkaline earth metals in their 2+ oxidation state. How can you demask the Zn^{2+} and Cd^{2+} species again ? 3

ii) Draw a probable structure of the product when an aqueous solution of Cr^{3+} salt is treated with Na_2EDTA in alkaline medium. Do you expect that the product exhibits any isomerism ? $2+1\frac{1}{2}$

b) Give volumetric method for quantitative estimation of Mn in a steel sample (Write the chemical reactions involved). 3

c) What are the conditions of a Gravimetric reagent ? Mention one Gravimetric reagent and its use in the estimation of a metal ion. 3

d) i) What are CO_x, NO_x and SO_x ? How these binary composites are responsible for environmental pollution.

ii) Why the salinity of Bay of Bengal is less than that of Arabian Sea ? 2+1

3. a) i) In the preparation of Fe(III), Fe(II), A1(III), Ag(I) or other heavy metal ions a little mineral acid is added. Explain with reason. Why do you add HCl and HNO_3 during digestion of dolomite ?

ii) Between extractive and precipitative separation of Fe(III) from a mixture of Cu(II)-Fe(III), which one is more accurate? Explain your answer with reasons. $2+1\frac{1}{2}$

b) i) Define COD and BOD.

ii) What is chelation therapy ? Give some examples of chelating ligand for clinical use. 1+2

c) i) What is the difference between "indicator constant" and the "conditional indicator constant". Illustrate with suitable example.

ii) What do you understand by 'stepwise' and 'overall' formation constants ? What is the relation between them ? $1\frac{1}{2}+1\frac{1}{2}$

d) What is meant by co-precipitation ? How can this be avoided in gravimetric analysis ? 3