GYAN BHARATI SCHOOL
Second Terminal Examination (2016-17)
Class SS2
Subject – Chemistry

Time allowed- Three Hrs MM- 70

General Instructions:

- *All the questions are compulsory.*
- *Q. Nos.1-5 are very short questions, carrying one mark each.*
- *Q. Nos. 6-10 are short answer questions, carrying two marks each.*
- *Q.Nos.11-22 are also short answer questions carrying 3 marks each.*
- *Q. No. 23 is value based question, carrying four marks.*
- *Q. No. 24-26 are long answer questions, carrying 5 marks each.*
- *Use log tables, if needed.*

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1. What is meant by cathodic protection? (1)
2. A delta is formed at the point, where the river enters the sea. Why? (1)
3. Carbonyl complexes are in general more stable than other complexes. Why? (1)
4. Write the IUPAC name of the compound: $CH_3CH=C(CH_3)CH(CH_3)Br$. (1)
5. $K_2Cr_2O_7$ is not used as an oxidizing agent in alkaline medium. Why? (1)
6. Answer the following questions:
   a. What happens when a freshly precipitated $Fe(OH)_3$ is shaken with a little amount of dilute solution of $FeCl_3$?
   b. Why are lyophilic colloidal sols more stable than lyophobic colloidal sols? (1X2)
7. a. Why are depressants used in Froth floatation?
   b. What is the role of silica in the extraction of copper? (1X2)
8. A complex prepared by reacting $CoCl_3$ and ammonia does not precipitate silver chloride with aqueous $AgNO_3$ reacting in equimolar amounts.
   a. Write the structure of the complex.
   b. What type of isomerism does this complex exhibit? (1X2)
9. A colourless gas with a pungent smell is obtained by adding dilute sulphuric acid to a salt. This gas when passed through $K_2Cr_2O_7$ solution turns the solution green in acidic medium. Identify the gas and write the reactions involved. (2)
10. a. Why is Grignard reagent prepared under anhydrous conditions?
    b. Although chlorine is an electron withdrawing group, yet it is *ortho-*, *para-* directing in electrophilic aromatic substitution reactions. Why? (1X2)

OR

10. a. Why is sulphuric acid not used during the reaction of alcohols with KI?
    b. Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides as the chief product. Explain. (1X2)

11. a. Name the non stoichiometric point defect responsible for colour in alkali metal halides
    b. In a solid anion 'C' are arranged in cubic close packing. Cations 'A' occupy 50% of the tetrahedral voids and cations 'B' occupy 50% of the octahedral voids. What is the formula of the solid? (1+

12. Calculate the boiling point of a 1M aqueous solution (density 1.04 g mL^{-1}) of Potassium chloride (Kb for water = 0.52 K kg mol^{-1} , Atomic masses: K=39u, Cl=35.5u) Assume, Potassium chloride is completely dissociated in solution. (3)

13. Account for the following facts:
    a. The reduction of a metal oxide is easier if the metal formed is in the liquid state at the temperature of reduction.
    b. Limestone is used in the manufacture of pig iron from hematite.
    c. Pine oil is used in the froth floatation process used to concentrate sulphide ores. (1X3)

14. Calculate the e.m.f of the cell: $Pt(s)|Br_2(l)|Br^-(0.010\ M)||H^+(0.030\ M)|\ H_2(g)\ (1\ bar)|Pt(s)$. (3)
    $E^\circ\ Br_2/\ Br^- = 1.09$ V.

OR

14. In electrolysis of a molten salt solution a current of 4 Amp was passed for 45 minutes and resulted in deposition of 1.939 g of metal. What is the charge on the cation in the salt if atomic mass of the metal is 52 u. (3)

15. Explain the following:
    a. Hydrogen fluoride is a weaker acid than hydrogen chloride in aqueous solution.
    b. Interhalogens are more reactive than parent halogen.
    c. SF_6 exists but OF_6 does not. (1X

15. a. Amongst the following ions which one has the highest magnetic moment value?
    (i) $[Cr(H_2O)_6]^{3+}$ (ii) $[Fe(H_2O)_6]^{2+}$ (iii) $[Zn(H_2O)_6]^{2+}$
    b. What is the coordination entity formed when excess of aqueous KCN is added to an aqueous solution of copper sulphate? Why is it that no precipitate of copper sulphide is obtained when $H_2S(g)$ is passed through this solution? (1+2

17. An element occurs in the bcc structure with cell edge of 288 pm. The density of the element is 7.2 g cm^{-3}. How many atoms of the element does 208g of the element contain? (3)

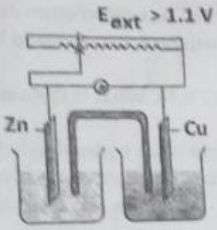
18. a. Aquatic animals feel comfortable in winters than in summers. Why? (1
    b. Calculate the mass of urea (NH_2CONH_2) required in making 2.5 kg of 0.25 molal aqueous solution. (2)

following complexes:

(ii)$[CoCl_2(en)_2]^+$

b. Write the formula of Tetraammineoxalatochromium (III) Sulpahte. (2+1)

20. a. In the diagram:



(i) How will the elctrons flow?
(ii) In which direction current flows?
(iii) Which metal will be dissolved?
(iv) Which metal will be deposited?

b. Given the standard electrode potentials, $K^+/K = -2.93V$, $Ag^+/Ag = 0.80V$, $Hg^{2+}/Hg = 0.79V$ $Mg^{2+}/Mg = -2.37\ V$, $Cr^{3+}/Cr = -0.74V$. Arrange these metals in their increasing order of reducing power. (1/2 x 4 +1)

21.a. Write balanced chemical equations for the disproportionation reaction of orthophosphorus acid.
b. Draw the structure of a noble gas species which is isostructural with BrO_3^-.
c. Why is $Ka_2 << Ka_1$ for H_2SO_4 in water? (1X3)

22. a. Explain on the basis of valence bond theory that $[Ni(CN)_4]^{2-}$ ion is diamagnetic is but the $[NiCl_4]^{2-}$ ion is paramagnetic.
b. Write all the isomers of $[CrCl_2(ox)_2]^{3-}$. (2+1)

23. Meenu and Sheena visited their uncle working in a factory. Near the gate they saw a chimney throwing out black fumes of carbon. They asked their uncle that they want to talk to the owner of the factory about it.
a. What two values are shown by the two girls?
b. What harmful effects would these black fumes cause?
c. What should the owner do to avoid the carbon particles in the exhaust?
d. What type of colloid is smoke? (1x4)

24. a. The half life of a first order reaction is 60 minutes. How long would it take to be 90% complete?
b. The rate constant for a first order reaction is given as: $\log k = 14.34 - 1.25 \times 10^4 K/T$. Calculate the energy of activation for this reaction. (2+3)

OR

24.a. For a reaction $A \rightarrow B$ the rate becomes 64 times if the concentration of A is increased four times. What is the order of the reaction?
b. Sucrose decomposes in acid solution into glucose and fructose according to the first order rate law, with $t_{1/2} = 3.00$ hours. What fraction of sample of sucrose remains after 8 hours?
c. A reaction $P+Q \rightarrow$ Products, is 2^{nd} order w. r. t. P and ½ order w. r. t. Q. What are the units of the rate constant? (1+3+1)

25.a. (i) For M^{2+}/M and M^{3+}/M^{2+} systems, Eo values for some metals are as follows:

$Cr^{2+}/Cr = -0.9V$ $\quad$ $Cr^{3+}/Cr^{2+} = -0.4V$

$Mn^{2+}/Mn = -1.2V$ $\quad$ $Mn^{3+}/Mn^{2+} = +1.5V$

$Fe^{2+}/Fe = -0.4V$ $\quad$ $Fe^{3+}/Fe^{2+} = +0.8V$

Use this data to comment upon (a) the stability of Fe^{3+} in acid solution as compared to that of Cr^{3+} and Mn^{3+} (b) the ease with which iron can be oxidised as compared to the similar process for either Cr or Mn metals. (2)

b. A salt of Chromium shows magnetic moment of 3.89 B.M. What is the oxidation salt of Cr in this salt? (1)

c. A blackish brown coloured solid 'A' is fused with potassium hydroxide in the presence of air, Produces a dark green coloured compound 'B' which upon electrolytic oxidation in alkaline medium gives a dark purple solid 'C'. Identify 'A', 'B', and 'C'. Write the reactions involved. (2)

OR

25. a. Give reasons:

(i). Out of d^4 species, Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidizing.

(ii). Cobalt (II) is stable in aqueous solution but in the presence of complexing agents it is easily oxidised.

(iii) K_2PtCl_6 is well known but K_2NiCl_6 is not known to exist.

b. Write the equations for the following:

(i) $KMnO_4$ is treated with oxalic acid in acidic medium.

(ii) $K_2Cr_2O_7$ is treated with Sodium sulphite in acidic medium. (3+2)

26.a. How do you bring about the following conversions? (1x2)

(i) Ethanol to but-1-yne

(ii) Toluene to benzyl alcohol

b. Arrange the following compounds in order of increasing reactivity towards S_N^2 displacement:

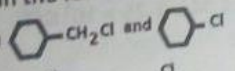
(i) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane and 2-Bromo-3-methylbutane.

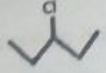
(ii) 1-Bromobutane, 1-Bromo-2,2-dimethylpropane, 1-Bromo-2-methylbutane,1-Bromo-3-methylbutane. (1X2)

c. A hydrocarbon C_5H_{10} does not react with chlorine in dark but gives a single monochloro compound C_5H_9Cl in bright sunlight. Identify the hydrocarbon. (1)

OR

26. a. In the following pairs of halogen compounds, which would undergo SN_2 reaction faster?

(i)  and

(ii)  and 

b. Aryl halides are less reactive than alkyl halides towards nucleophilic substitution. Give two reasons in support of this.

c. How do you convert? (2+1+2)

(i) Ethanol to ethyl fluoride.

(ii) Benzene to 4-bromonitrobenzene.