CBSE Annual Examination Question Paper 2013

CHEMISTRY (THEORY)

Time allowed: 3 hours]   **[Maximum marks: 70**

General Instructions:

(i)   All questions are compulsory.

(ii)   Question Nos. **1** to **8** are very short-answer type questions and carry **1** marks each.

(iii)   Question Nos. **9** to **18** are short-answer type questions and carry **2** marks each.

(iv)   Question Nos. **19** to **27** are also short-answer type questions and carry **3** marks each.

(v)   Question No. **28** to **30** are long-answer questions and carry **5** marks.

(vi)   Use Log Table, if necessary. Use of calculators is not allowed.

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1.   How many atoms constitute one unit cell of a face-centered cubic crystal?

2.   Name the method used for the refining of Nickel metal.

3.   What is the covalency of nitrogen in N_2O_5?

4.   Write the IUPAC name of

$$CH_3 - \underset{\underset{Cl}{|}}{CH} - CH_2 - CH = CH_2$$

5.   What happens when CH_3-Br is treated with KCN?

6.   Write the structure of 3-methyl butanal.

7.   Arrange the following in increasing order of their basic strength in aqueous solution:

$CH_3.NH_2,(CH_3)_3N,(CH_3)_2NH$

8.   What are three types of RNA molecules which perform different functions?

9.   18g of glucose, $C_6H_{12}O_6$ (Molar Mass= 180g mol^{-1}) is dissolved in 1Kg of water in a sauce pan. At what temperature will this solution boil?

10.   The conductivity of 0.20 M solution of KCl at 298 K is 0.025 S cm^{-1}. Calculate its molar conductivity.

11.   Write the dispersed phase and dispersion medium of the following colloidal system:

(i)   Smoke   (ii)   Milk   **OR**

What are lyophilic and lyophobic colloids? Which of these sols can be easily coagulated on the addition of small amounts of electrolytes?

12. Write the differences between physisorption and chemisorption with respect to the following:

   (i)   Specificity

   (ii) Temperature dependence

   (iii) Reversibility and

   (iv) Enthalpy change

13. (a) Which solution is used for the leaching of silver metal in the presence of air in the metallurgy of silver?

   (b) Out of C and CO, which is a better reducing agent at the lower temperature range in the blast furnace to extract iron from the oxide ore?
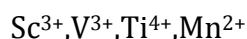
14. What happens when

   (i) PCl_5 is heated?

   (ii) H_3PO_3 is heated?

   Write the reaction involved.

15. (a) Which metal in the first transition series (3d series) exhibits +1 oxidation state most frequently and why?
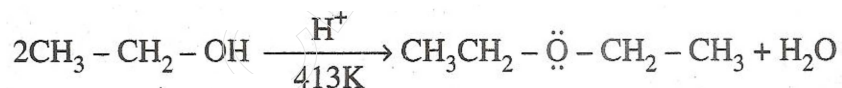
   (b) Which of the following cations are colored in aqueous solutions and why?

   $Sc^{3+}, V^{3+}, Ti^{4+}, Mn^{2+}$

   (At. nos. Sc = 21, V= 23, Ti = 22, Mn = 25)

16. Chlorobenzene is extremely less reactive towards a nucleophilic substitution reaction. Give two reasons for the same.

17. Explain the mechanism of the following reaction:

$$2CH_3 - CH_2 - OH \xrightarrow[413K]{H^+} CH_3CH_2 - \overset{..}{\underset{..}{O}} - CH_2 - CH_3 + H_2O$$

18. How will you convert:

   (i)   Propene to Propan-2-ol?

   (ii) Phenol to 2, 4, 6 – trinitrophenol?

19. (a) What type of semiconductor is obtained when silicon is doped with boron?

   (b) What type of magnetism is shown in the following alignment of magnetic moments?
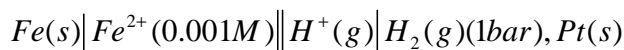
   ↑   ↑   ↑   ↑   ↑   ↑

   (c) What type of point defect is produced when AgCl is doped with $CdCL_2$?

20. Determine the osmotic pressure of a solution prepared by dissolving $2.5 \times 10^{-2} g$ of K_2SO_4 in 2L of water at $25^\circ C$, assuming that it is completely dissociated.

(R=0.0821 L atm K^{-1}mol^{-1}, Molar mass of K_2SO_4=174g mol^{-1}).
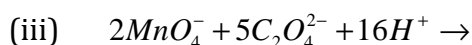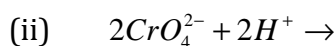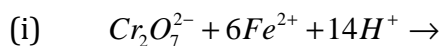
21. Calculate the emf of the following cell at 298 K:

$$Fe(s) \big| Fe^{2+} (0.001M) \big\| H^+(g) \big| H_2(g)(1bar), Pt(s)$$

$$(Given_{cell}^o = +0.44V)$$

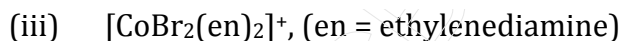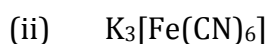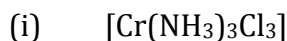**22.** How would you account for the following?

(i)   Transition metals exhibit variable oxidation states.

(ii)   Zr (Z=40) and Hf (Z=72) have almost identical radii.

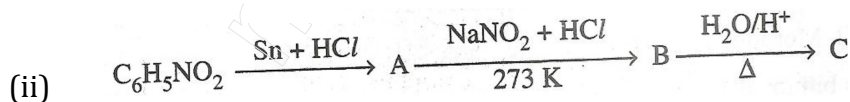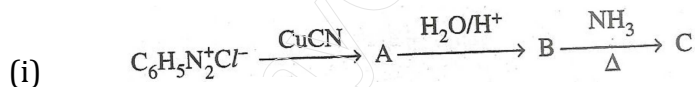(iii) Transition metals and their compounds act as catalyst.

OR

Complete the following chemical equations:

(i) $Cr_2O_7^{2-} + 6Fe^{2+} + 14H^+ \rightarrow$

(ii) $2CrO_4^{2-} + 2H^+ \rightarrow$

(iii) $2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \rightarrow$

23. Write the IUPAC names of the following coordination compounds:

(i)   [Cr(NH₃)₃Cl₃]

(ii)   K₃[Fe(CN)₆]

(iii) [CoBr₂(en)₂]⁺, (en = ethylenediamine)

24. Give the structures of A, B and C in the following reactions:

(i)
$$C_6H_5N_2^+Cl^- \xrightarrow{CuCN} A \xrightarrow{H_2O/H^+} B \xrightarrow[\Delta]{NH_3} C$$

(ii)
$$C_6H_5NO_2 \xrightarrow{Sn + HCl} A \xrightarrow[273\ K]{NaNO_2 + HCl} B \xrightarrow[\Delta]{H_2O/H^+} C$$

25. Write the names and structures of the monomers of the following polymers:

(i)   Buna-S

(ii)   Neoprene

(iii) Nylone-6, 6

26. After watching a programme on TV about the adverse effects of junk food and soft drinks on the health of school children, Sonali, a student of Class XII, discussed the issue with the school principal. Principal immediately instructed the canteen contractor to replace the fast food with the fibre and vitamins rich food like sprouts, salad, fruits etc. This decision was welcomed by the parents and the students.

After reading the above passage, answer the following questions:

(a) What values are expressed by Sonali and the Principal of the school?

(b) Give two examples of water-soluble vitamins.

27. (a) Which one of the following is a food preservative?

Equanil, Morphine, Sodium benzoate

(b) Why is bithional added to soap?

(c) Which class of drugs is used in sleeping pills?

28. (a) A reaction is second order in A and first order in B.

(i) Write the differential rate equation.

(ii) How is the rate affected on increasing the concentration of A three times?

(iii) How is the rate affected when the concentration of both A and B are doubled?

(b) A first order reaction takes 40 minutes for 30% decomposition. Calculate $t_{1/2}$ for this reaction.

(Given log 1.428=0.1548)

OR

(a) For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction.

(b) Rate constant 'k' of a reaction varies with temperature 'T' according to the equation: $\log k = \log A - \dfrac{E_a}{2.303R}\left(\dfrac{1}{T}\right)$

Where E_a is the activation energy. When a graph is plotted for log k Vs. $\dfrac{1}{T}$, a straight line with a slope of -4250 K is obtained. Calculated 'E_a' for the reaction. (R=8.314 JK⁻¹mol⁻¹)
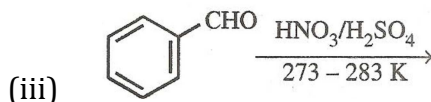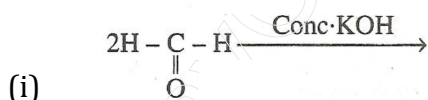
29. (a) Give reasons for the following:

(i) Bond enthalpy of F_2 is lower than that of Cl_2.

(ii) PH_3 has lower boiling point than NH_3.

(b) Draw the structures of the following molecules:

(i) BrF_3 (ii) $(HPO_3)_3$

OR

(a) Account for the following:

(i) Helium is used in diving apparatus.

(ii) Fluorine does not exhibit positive oxidation state.

(iii) Oxygen shows catenation behavior less than sulphur.

(b) Draw the structures of the following molecules.

(i) XeF_2 (ii) $H_2S_2O_8$

30. (a) Although phenoxide ion has more number of resonating structures than Carboxylate ion, Carboxylic acid is a stronger acid than phenol. Give two reasons.

(b) How will you bring about the following conversions?

(i) Propanone to propane

(ii) Benzoyl chloride to benzaldehyde

(iii) Ethanal to but-2-enal

OR

(a) Complete the following reactions:

(i) $2H-\underset{\overset{\|}{O}}{C}-H \xrightarrow{\text{Conc·KOH}}$

(ii) $CH_3COOH \xrightarrow{Br_2/P}$

(iii)

$\underset{}{\text{(benzene ring)}} {}^{CHO} \xrightarrow[273-283\ K]{HNO_3/H_2SO_4}$

(b) Give simple chemical tests to distinguish between the following pairs of compounds:

(i) Ethanal and Propanal   (ii) Benzoic acid and Phenol

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