CBSE Class 12 Chemistry 2015 - Set 56/3/C

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

Time Allowed: 3 Hours **Maximum Marks: 70**

General Instructions

(i) This question paper contains 26 questions. All questions are compulsory.
(ii) All questions are compulsory.
(iii) Questions number 1 to 5 are very short answer questions and carry 1 mark each.
(iv) Questions number 6 to 10 are short answer questions and carry 2 marks each.
(v) Questions number 11 to 22 are also short answer questions and carry 3 marks each.
(vi) Question number 23 is a value based question and carry 4 marks.
(vii) Questions number 24 to 26 are long answer questions and carry 5 marks each.
(viii) Use log tables, if necessary. Use of calculators is not allowed.

Questions

1. Write the IUPAC name of the given compound:

$HO-CH_2-CH(CH_3)-CH_2-OH$

2. Out of white phosphorus and red phosphorus, which one is more reactive and why?

3. Which would undergo S_N1 reaction faster in the following pair and why?

CH_3-CH_2-Br and $(CH_3)_3C-Br$

4. Write a method by which lyophobic colloids can be coagulated.

5. What is the formula of a compound in which the element Y forms hcp lattice and atoms of X occupy 2/3rd of tetrahedral voids?

6. (i) Write down the IUPAC name of the following complex:

$[Co(NH_3)_5(NO_2)](NO_3)_2$

(ii) Write the formula for the following complex:

Potassium tetracyanidonickelate(II)

7. Name the reagents used in the following reactions:

(i) $CH_3-CO-CH_3 \rightarrow (CH_3)_2C(OH)-CH_3$

(ii) $CH_3-COOH \rightarrow Cl-CH_2-COOH$

8(a). State Henry's law. Why do gases always tend to be less soluble in liquids as the temperature is raised?

OR

8(b). State Raoult's law for the solution containing volatile components. Write two differences between an ideal solution and a non-ideal solution.

9. Why do the transition elements have higher enthalpies of atomisation? In the 3d series (Sc to Zn), which element has the lowest enthalpy of atomisation and why?

10. (a) Following reactions occur at cathode during the electrolysis of aqueous sodium chloride solution:

$Na^+(aq) + e^- \rightarrow Na(s)$, $E^\circ = -2.71$ V

$H^+(aq) + e^- \rightarrow \frac{1}{2}H_2(g)$, $E^\circ = 0.00$ V

On the basis of their standard reduction electrode potential (E°) values, which reaction is feasible at the cathode and why?

(b) Why does the cell potential of mercury cell remain constant throughout its life?

11(a). How do you convert the following:

(i) Prop-1-ene to 1-fluoropropane

(ii) Chlorobenzene to 2-chlorotoluene

(iii) Ethanol to propanenitrile

OR

11(b). Write the main products when:

(i) n-Butyl chloride is treated with alcoholic KOH.

(ii) 2,4,6-Trinitrochlorobenzene is subjected to hydrolysis.

(iii) Methyl chloride is treated with AgCN.

12. Give reasons for the following:

(i) o-Nitrophenol is more acidic than o-methoxyphenol.

(ii) Butan-1-ol has a higher boiling point than diethyl ether.

(iii) $(CH_3)_3C-O-CH_3$ on reaction with HI gives $(CH_3)_3C-I$ and CH_3-OH as the main products and not $(CH_3)_3C-OH$ and CH_3-I.

13. Calculate the amount of $CaCl_2$ (molar mass = 111 g mol^{-1}) which must be added to 500 g of water to lower its freezing point by 2 K, assuming $CaCl_2$ is completely dissociated. (K_f for water = 1.86 K kg mol^{-1})

14. An element with density 10 g cm^{-3} forms a cubic unit cell with edge length of 3×10^{-8} cm. What is the nature of the cubic unit cell if the atomic mass of the element is 81 g mol^{-1}?

15. Calculate the emf of the following cell at 25°C:

Sn | Sn^{2+}(0.001 M) || H^+(0.01 M) | H_2(g)(1 bar) | Pt(s)

$E^\circ_{(Sn^{2+}/Sn)} = -0.14$ V, $E^\circ_{(H^+/H_2)} = 0.00$ V

16. (i) Draw the geometrical isomers of complex $[Co(en)_2Cl_2]^+$.

(ii) On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_0 > P$.

(iii) $[NiCl_4]^{2-}$ is paramagnetic while $[Ni(CO)_4]$ is diamagnetic, though both are tetrahedral. Why? (Atomic number of Ni = 28)

17. Give reasons for the following observations:

(i) Physisorption decreases with increase in temperature.

(ii) Addition of alum purifies the water.

(iii) Brownian movement provides stability to the colloidal solution.

18. (i) Name the method used for the refining of zirconium.

(ii) What is the role of CO in the extraction of iron?

(iii) Reduction of metal oxide to metal becomes easier if the metal obtained is in liquid state. Why?

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

(i) Nylon-6

(ii) Novolac

(iii) Buna-N

20. (i) Which one of the following is a polysaccharide: Starch, Maltose, Fructose, Glucose?

(ii) What is the difference between native protein and denatured protein?

(iii) Write the name of the vitamin responsible for the coagulation of blood.

21. Predict the products of the following reactions:

(i) $CH_3CH_2CH_2CHO + HCN \rightarrow$

(ii) $C_6H_5COCl + H_2 \xrightarrow{Pd/BaSO_4}$

(iii) $CH_3COOH + SOCl_2 \rightarrow$

22. (a) How would you account for the following:

(i) The chemistry of actinoids is more complicated as compared to lanthanoids.

(ii) Transition metals form complex compounds.

(b) Complete the following equation:

$2MnO_4^- + 6H^+ + 5SO_3^{2-} \rightarrow$

23. **Case Study:** Seeing the growing cases of diabetes and depression among young children, Mr. Lugani, the principal of one reputed school organized a seminar in which he invited parents and principals. They all resolved this issue by strictly banning junk food in schools and introducing healthy snacks and drinks like soup, lassi, milk, etc. in school canteens. They also decided to make compulsory half an hour of daily physical activities for the students in the morning assembly. After six months, Mr. Lugani conducted the health survey in most of the schools and discovered a tremendous improvement in the health of the students.

After reading the above passage, answer the following questions:

(i) What are the values (at least two) displayed by Mr. Lugani?

(ii) As a student, how can you spread awareness about this issue?

(iii) What are antidepressant drugs? Give an example.

(iv) Name the sweetening agent used in the preparation of sweets for a diabetic patient.

24(a). (a) Account for the following:

(i) Interhalogens are more reactive than pure halogens.

(ii) N_2 is less reactive at room temperature.

(iii) Reducing character increases from NH_3 to BiH_3.

(b) Draw the structures of the following:

(i) $H_4P_2O_7$ (pyrophosphoric acid)

(ii) XeF_4

OR

24(b). (a) When white phosphorus is heated with concentrated NaOH solution, which poisonous gas is evolved? Write the related chemical equation.

(b) Which noble gas has the lowest boiling point?

(c) Fluorine is a stronger oxidising agent than chlorine. Why?

(d) What happens when H_3PO_3 is heated?

(e) Complete the equation: $PbS + O_3 \rightarrow$

25(a). (a) Illustrate the following reactions giving a suitable example in each case:

(i) Hoffmann bromamide degradation reaction

(ii) Diazotisation

(iii) Gabriel phthalimide synthesis

(b) Distinguish between the following pairs of compounds:

(i) Aniline and N-methylaniline

(ii) $(CH_3)_2NH$ and $(CH_3)_3N$

OR

25(b). (a) Write the structures of main products when benzenediazonium chloride ($C_6H_5N_2^+Cl^-$) reacts with the following reagents:

(i) CuCN/KCN

(ii) H_2O

(iii) CH_3CH_2OH

(b) Arrange the following:

(i) $C_2H_5NH_2$, C_2H_5OH, $(CH_3)_3N$ in increasing order of their boiling point

(ii) Aniline, p-nitroaniline, p-methylaniline in increasing order of their basic strength

26(a). (a) What is rate of reaction? Write two factors that affect the rate of reaction.

(b) The rate constant of a first order reaction increases from 4×10^2 to 8×10^2 when the temperature changes from 27°C to 37°C. Calculate the energy of activation (E_a).

(log 2 = 0.301, log 3 = 0.4771, log 4 = 0.6021)

OR

26(b). (a) For a reaction A + B → P, the rate is given by Rate = $k[A][B]^2$.

(i) How is the rate of reaction affected if the concentration of B is doubled?

(ii) What is the overall order of reaction if A is present in large excess?

(b) A first order reaction takes 23.1 minutes for 50% completion. Calculate the time required for 75% completion of this reaction.

(log 2 = 0.301, log 3 = 0.4771, log 4 = 0.6021)

- End of Question Paper -