

CBSE Class 12 Chemistry 2011 - Set 56/1 (Outside Delhi)



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 30 questions. All questions are compulsory.
- (ii) Marks for each question are indicated against it.
- (iii) Questions 1 to 8 are very short-answer questions carrying 1 mark each.
- (iv) Questions 9 to 18 are short-answer questions carrying 2 marks each.
- (v) Questions 19 to 27 are also short-answer questions carrying 3 marks each.
- (vi) Questions 28 to 30 are long-answer questions carrying 5 marks each.
- (vii) Use log tables, if necessary. Use of calculators is not allowed.

Questions

1. Define 'order of a reaction'.
2. What is meant by 'shape-selective catalysis'?
3. Differentiate between a mineral and an ore.
4. What is meant by 'lanthanoid contraction'?
5. Write the IUPAC name of the following compound: $\text{CH}_2=\text{CH}-\text{CH}_2-\text{Br}$
6. Draw the structure of 4-chloropentan-2-one.
7. How would you convert ethanol to ethene?
8. Rearrange the following compounds in increasing order of their basic strengths: $\text{C}_6\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$ and CH_3NH_2 .
9. Explain how you can determine the atomic mass of an unknown metal if you know its mass density and the dimensions of the unit cell of its crystal.
10. Calculate the packing efficiency of a metal crystal for a simple cubic lattice.
11. State the following:
 - (i) Raoult's law in its general form in reference to solutions.
 - (ii) Henry's law about partial pressure of a gas in a mixture.
12. What do you understand by the rate law and rate constant of a reaction? Identify the order of a reaction if the units of its rate constant are:
 - (i) $\text{L}^{-1} \text{mol s}^{-1}$
 - (ii) $\text{L mol}^{-1} \text{s}^{-1}$

13. The thermal decomposition of HCO_2H is a first-order reaction with a rate constant of $2.4 \times 10^{-3} \text{s}^{-1}$ at a certain temperature. Calculate how long it will take for three-fourths of the initial quantity of HCO_2H to decompose. ($\log 0.25 = -0.6021$)
14. Describe the principle controlling each of the following processes:
 - (i) Vapour phase refining of titanium metal
 - (ii) Froth flotation method of concentration of a sulphide ore
15. How would you account for the following:
 - (i) Cr^{2+} is reducing in nature while, with the same d-orbital configuration (d^4), Mn^{3+} is an oxidising agent.
 - (ii) In a transition series of metals, the metal which exhibits the greatest number of oxidation states occurs in the middle of the series.
16. Complete the following chemical equations:
 - (i) $\text{MnO}_4^- (\text{aq}) + \text{S}_2\text{O}_3^{2-} (\text{aq}) + \text{H}_2\text{O} (\text{l}) \rightarrow$
 - (ii) $\text{Cr}_2\text{O}_7^{2-} (\text{aq}) + \text{Fe}^{2+} (\text{aq}) + \text{H}^+ (\text{aq}) \rightarrow$

OR

16. State reasons for the following:
 - (i) Cu^+ ion is not stable in an aqueous solution.
 - (ii) Unlike Cr^{3+} , Mn^{2+} , Fe^{3+} and the subsequent other M^{2+} ions of the 3d series of elements, the 4d and the 5d series metals generally do not form stable cationic species.
17. Explain what is meant by the following:
 - (i) Peptide linkage
 - (ii) Pyranose structure of glucose

18. Write the main structural difference between DNA and RNA. Of the four bases, name those which are common to both DNA and RNA.

19. A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 mL of water has an osmotic pressure of 0.335 torr at 25°C. Assuming that the gene fragment is a non-electrolyte, calculate its molar mass.

20. Classify colloids where the dispersion medium is water. State their characteristics and write an example of each of these classes.

OR

20. Explain what is observed when

- (i) an electric current is passed through a colloidal solution
- (ii) a beam of light is passed through a colloidal solution
- (iii) an electrolyte (say NaCl) is added to ferric hydroxide sol

21. How would you account for the following:

- (i) H_2S is more acidic than H_2O .
- (ii) The N–O bond in NO_2^- is shorter than the N–O bond in NO_3^- .
- (iii) Both O_2 and F_2 stabilise high oxidation states, but the ability of oxygen to stabilise the higher oxidation state exceeds that of fluorine.

22. Explain the following terms, giving a suitable example in each case:

- (i) Ambidentate ligand
- (ii) Denticity of a ligand
- (iii) Crystal field splitting in an octahedral field

23. Rearrange the compounds of each of the following sets in order of reactivity towards $\text{S}_{\text{N}}2$ displacement:

- (i) 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane
- (ii) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 2-Bromo-3-methylbutane
- (iii) 1-Bromobutane, 1-Bromo-2,2-dimethylpropane, 1-Bromo-2-methylbutane

24. How would you obtain the following:

- (i) Benzoquinone from phenol
- (ii) 2-Methylpropan-2-ol from methylmagnesium bromide
- (iii) Propan-2-ol from propene

25. State reasons for the following:

- (i) pK_{b} value for aniline is more than that for methylamine.
- (ii) Ethylamine is soluble in water whereas aniline is not soluble in water.
- (iii) Primary amines have higher boiling points than tertiary amines.

26. Draw the structures of the monomers of the following polymers:

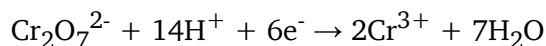
- (i) Polythene
- (ii) PVC
- (iii) Teflon

27. What are the following substances? Give one example of each.

- (i) Food preservatives
- (ii) Synthetic detergents
- (iii) Antacids

28. (a) What type of battery is a lead storage battery? Write the anode and cathode reactions and the overall cell reaction occurring in the operation of a lead storage battery.

(b) Calculate the potential for a half-cell containing 0.10 M $\text{K}_2\text{Cr}_2\text{O}_7(\text{aq})$, 0.20 M $\text{Cr}^{3+}(\text{aq})$ and 1.0×10^{-4} M $\text{H}^+(\text{aq})$. The half-cell reaction is



and the standard electrode potential is given as $E^\circ = 1.33$ V.

OR

28. (a) How many moles of mercury will be produced by electrolysis of 1.0 M $\text{Hg}(\text{NO}_3)_2$ solution with a current of 2.00 A for 3 hours? [$\text{Hg}(\text{NO}_3)_2 = 200.6 \text{ g mol}^{-1}$]

(b) A voltaic cell is set up at 25°C with the following half-cells: Al^{3+} (0.001 M) and Ni^{2+} (0.50 M). Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.

Given: $E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25$ V; $E^\circ_{\text{Al}^{3+}/\text{Al}} = -1.66$ V.

29. (a) Draw the structures of the following molecules:

(i) $(\text{HPO}_3)_3$

(ii) BrF_3

(b) Complete the following chemical equations:

(i) $\text{HgCl}_2 + \text{PH}_3 \rightarrow$

(ii) $\text{SO}_3 + \text{H}_2\text{SO}_4 \rightarrow$

(iii) $\text{XeF}_4 + \text{H}_2\text{O} \rightarrow$

OR

29. (a) What happens when

(i) chlorine gas is passed through a hot concentrated solution of NaOH ?

(ii) sulphur dioxide gas is passed through an aqueous solution of a $\text{Fe}(\text{III})$ salt?

(b) Answer the following:

(i) What is the basicity of H_3PO_3 and why?

(ii) Why does fluorine not play the role of a central atom in interhalogen compounds?

(iii) Why do noble gases have very low boiling points?

30. (a) Illustrate the following name reactions:

(i) Cannizzaro's reaction

(ii) Clemmensen reduction

(b) How would you obtain the following:

(i) But-2-enal from ethanal

(ii) Butanoic acid from butan-1-ol

(iii) Benzoic acid from ethylbenzene

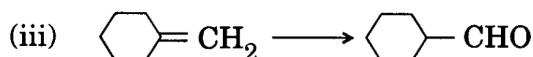
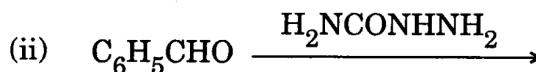
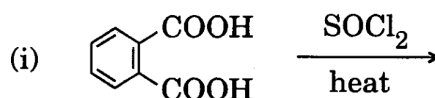
OR

30. (a) Give chemical tests to distinguish between the following:

(i) Benzoic acid and ethyl benzoate

(ii) Benzaldehyde and acetophenone

(b) Complete each synthesis by giving missing reagents or products in the following:



- End of Question Paper -