Nagaland Board of Secondary Education Question Paper

2021
CHEMISTRY

Total marks : 70   Time : 3 hours

General instructions:
i)   *Approximately 15 minutes is allotted to read the question paper and revise the answers.*
ii) *The question paper consists of 30 questions. All questions are compulsory.*
iii) *Marks are indicated against each question.*
iv) *Internal choice has been provided in some questions.*
N.B: Check that all pages of the question paper is complete as indicated on the top left side.

1. The appearances of colour in solid alkali metal halides is generally
    due to   **1**
    (a) Schottky defects   (b) Frenkel defects
    (c) F-centre   (d) interstitial defect.

2. The unit of rate constant for a zero order reaction is   **1**
    (a) $Mol\ L^{-1}S^{-1}$ (b) S^{-1}
    (c) $LMol^{-1}S^{-1}$ (d) $L^2Mol^2S^{-1}$.

3. Which of the following compound shows the highest boiling point? **1**
    (a) CH_3Cl (b) CH_3Br
    (c) CH_3F (d) CH_3I.

4. Which of the following is most acidic?   **1**
    (a) CH_3OH (b) CH_3CH_2OH
    (c) $(CH_3)_2CHOH$ (d) $(CH_3)_3COH$.

5. Nucleic acids are polymers of   **1**
    (a) nucleosides   (b) globulins
    (c) nucleons   (d) nucleotides.

6. Define coordination number.   **1**

7. What is an ionic conductance?   **1**

8. What is dialysis?   **1**

9. Give the IUPAC name of $CH_2 \!=\! CHCH_2Br$.   **1**

10. What is an ammonolysis?   **1**

11.   **a.** Why does non-ideal solutions show positive deviations and negative deviations from Raoults law?

<p align="center">**Or**</p>   **2**

     b. What is hypertonic solution and hypotonic solution?

12.   A first order reaction is found to have a rate constant $k = 5.5 \times 10^{-14} S^{-1}$. Find the half life of the reaction.   **2**

13.   **a.** Give reason why zinc, cadmium and mercury are not regarded as transition elements.

<p align="center">**Or**</p>   **2**

     b. Why do the transition elements exhibit higher enthalpies of atomization?

14.   Write the preparation of ether by Williamson synthesis.   **2**

15.   Complete the following reactions: **2**
     (a) $CH_3COOH + PCl_5 \rightarrow$?
     (b) $3CH_3COOH + PCl_3 \rightarrow$?

16.   **a.** Explain carbylamines reaction and write the reaction involved in it.

<p align="center">**Or**</p>   **2**

     b. What happens when
       (i) primary amines reacts with nitrous acid.
       (ii) aromatic amines reacts with nitrous acid.

17.   Silver forms ccp lattice and X-ray studies of its crystals show that the edge length of its unit cell is 408.6 pm. Calculate the density of silver. (Atomic mass = 107.9u).   **3**

18.   **a.** 45g of ethylene glycol ($C_2H_6O_2$) is mixed with 600g of water. Calculate (a) the freezing point depression and (b) the freezing point of the solution.

<p align="center">**Or**</p>   **3**

     b. Calculate the molarity of each of the following solution:
       (a) 30g of $Co(NO_3)_2$ $6H_2O$ (Atomic mass $291 gmol^{-1}$) in 4.3L of solution.
       (b) 30 ml of 0.5M H_2SO_4 diluted in 500ml.

19.   Derive the integrated rate equation for first order reaction.   **3**

20.   **a.** Differentiate between dispersed phase and dispersed medium on the basis of interaction with an example.

<p align="center">**Or**</p>   **3**

     b. Explain the properties of colloidal solution by electrophoresis.

21. Write the preparation of ammonia by Haber process. Give one use.   **3**

22. Name the element in the lanthanoids series which has +4 oxidation state.
Why do transition metal form interstitial compounds?   **3**

23. **a.** Explain the reasons why aryl halides are less reactive towards
nucleophilic substitution reaction.
<div align="center">**Or**</div>   **3**
b. Explain S_N1 or substitution nucleophilic unimolecular reaction
in haloalkanes.

24. Why are phenols more acidic than alcohol and water?   **3**

25. Write Gabriel-phthalimide synthesis with the reaction involved in it.   **3**

26. Explain the classification of proteins on the basis of their molecular shape.
Give example.   **3**

27. **a.** On the basis of valence bond theory, predict the shape, magnetic
behaviour of $[NiCl_4]^{2-}$.
<div align="center">**Or**</div>   **3**
b. Give the IUPAC name of $K_2[Cr(C_2O_4)_3]$. Predict the number of unpaired
electrons in the square planar $[Pt(CN)_4]^2$ ion.

28. **a.** (i) Define molar conductivity.
(ii) The cell in which the following reaction occurs:
$2Fe^{3+}(aq) + 2I^-(aq) \rightarrow 2Fe^{3+}(aq) + I_2(s)$ has $E^o_{cell} = 0.236V$
at 298K. Calculate the standard Gibb's energy and the
equilibrium constant of the cell reaction.(Anti log 7.98=
9.57×10^{-7}).
<div align="center">**Or**</div>   **5**
b. **(**i) What is resistivity? Give the SI unit of resistance.
(ii) Represent the cell in which the following reaction takes place:
$Mg(s) + 2Ag^+(0.0001M) \rightarrow Mg^{2+}(0.130M) + 2Ag(s)$. Calculate
its E_{cell} if $E^o_{cell} = 3.17V$.

29. **a.** (i) Give reasons why
     (a) PH_3 is basic in nature.
     (b) Bond angle in PH_4^+ is higher than PH_3.
     (ii) Explain the properties of oxidation state and ionisation enthalpy of group-16 elements.

<div align="center">**Or**</div> 5

b. (i) What are interhalogen compounds? How are they prepared?
     (ii) Draw the structure of IF_7 and BrF_5 and mention its type of hybridization.

30. **a.** (i) What is Cannizzaro reaction? Give the reaction.
     (ii) (a) CH_3—C—Cl + CH_3—Cd $\rightarrow$
             $\parallel$
             O

     (b) + CrO_2Cl_3 $\rightarrow$
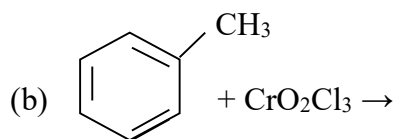
<div align="center">**Or**</div> 5

b. (i) Explain Clemmensen reduction with reaction.
     (ii) Would benzaldehyde be more reactive or less reactive in nucleophilic addition reactions than propanol? Explain.

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