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HBSE MODEL PAPER 2024



Practice Papers

MODEL PAPERS

Marking Scheme

ANSWER KEY

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Sample Paper (2023-24)

Class 12th (Sr. Secondary) **Code: CHE-856**

Roll No. | | | | | | | | | | |

Chemistry

(English Medium)

Academic / Open

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

General Instructions:-

Read the following instructions carefully and strictly follow them.

(i) This question paper is divided into five sections A, B, C, D and E.

(ii) This question paper contains 35 questions. All questions are compulsory.

(iii) In Section A – Question No. 1 to 18 are multiple choice (MCQ) type questions carrying 1 mark each.

(iv) In Section B – Question No. 19 to 25 are very short answer (VSA) type questions carrying 2 marks each.

(v) In Section C – Question No. 26 to 30 are short answer (SA) type questions carrying 3 marks each.

(vi) In Section D – Question No. 31 and 32 are case based questions carrying 4 marks each.

(vii) In Section E – Question No. 33 to 35 are long answer (LA) type questions carrying 5 marks each.

(viii) There is no overall choice. However an internal choice has been provided in two questions in Section B, two questions in Section C, two questions in Section D and two questions in Section E.

(ix) Use of calculators is not allowed.

SECTION-A

Question No. 1 to 18 are multiple choice (MCQ) type questions, carrying 1 mark each. (18x1=18)

1. The deficiency of which of the following Vitamins causes pernicious anemia.

   (a) Vitamin B_1 (b) Vitamin B_2

   (c) Vitamin B_6 (d) Vitamin B_{12}

2. In comparison to 0.01 M solution of glucose, the depression in freezing point of 0.01 M $MgCl_2$ solution is

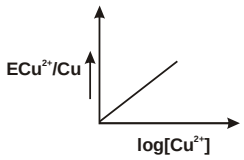
   (a) the same (b) about twice

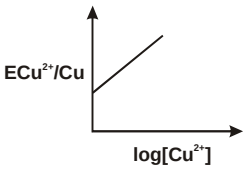
   (c) about three times (d) about six times

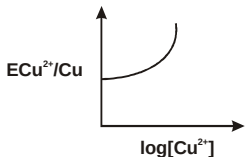
3. Electrode potential for Cu electrode varies according to the equation.

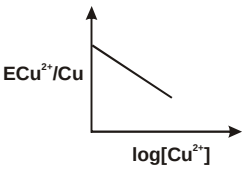
   $ECu^{2+}/Cu = E°cu^{2+/cu} - \frac{0.0591}{2} \log \frac{1}{[Cu^{2+}]}$

   The graph of E $cu^{2+/cu}$ vs log $[cu^{2+}]$ is

   (a) 

   (b) 

   (b) 

   (d) 

4. For a first order reaction, the time taken to reduce the initial concentration by a factor of $\frac{1}{4}$th is 20 minutes. The time required to reduce initial concentration by a factor of $\frac{1}{16}$th is

   (a) 20 min (b) 10 min

   (c) 80 min (d) 40 min

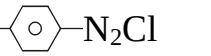
5. Glucose on treatment with sodium amalgam gives.

   (a) n-heptanoic acid (b) Sorbitol

   (c) Gluconic acid (d) Glucaric acid

6. The reaction of chloroform with alcoholic KOH and p-toluidine forms.

(a)  (b) 

(c)  (d) 

7. When 1mol $CrCl_3.6H_2O$ is treated with excess of $AgNO_3$, 3 mol of AgCl are obtained. The Formula of Complex is

(a) $[CrCl_3(H_2O)_3].3H_2O$ (b) $[CrCl_3(H_2O)_4]Cl.2H_2O$

(c) $[CrCl(H_2O)_5]Cl_2.H_2O$ (d) $[Cr\ (H_2O)_6]Cl_3$

8. Monochlorination of toluene in sunlight followed by hydrolysis with aqueous NaOH yield.

(a) o-cresol (b) m-cresol

(c) 2,4 – dihydroxy toluene (d) Benzyl alcohol

9. At PH=11, $Cr_2O_7^{2-}$ ion changes to

(a) CrO_3 (b) CrO_4^{2-}

(c) Cr^{3+} (d) CrO_2^{2+}

10. Ethanol on warming with Conc H_2SO_4 at 413 K gives

(a) Ethene (b) Diethyl ether

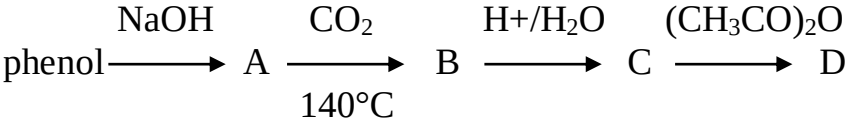
(c) Dimethyl ether (d) Ethyl hydrogen sulphate

11. Which of the following compound will dissolve in an alkali solution after it undergoes reaction with Hinsberg's reagent.

(a) $CH_3\ NH_2$ (b) $(CH_3)_2\ NH$

(c) $C_6H_5NHC_6H_5$ (d) $(CH_3)_3\ N$

12. The end product in the following sequence is



(a) Salicylic Acid (b) Salicylaldehyde

(c) Phenyl acetate (d) Aspirin

13. Aniline on oxidation with $Na_2Cr_2O_7$ and H_2SO_4 gives

(a) Benzoic acid (b) m-amino benzoic acid

(c) Schiff's base (d) p-Benzoquinone

14. We are having three aqueous solutions of K_2SO_4 labelled as 'X', 'Y' and 'Z' with the concentration of 0.001M, 0.01 M, 0.1 M respectively. The value of Van't Hoff factor for these solutions will be in the order.

(a) $i_x < i_y < i_z$ (b) $i_x > i_y > i_z$

(c) $i_x = i_y = i_z$ (d) $i_x < i_y > i_z$

For Questions 15 to 18 two statements are given-one labeled as Assertion (A) and the other labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both Assertion (A) and Reason (R) are true and the Reason (R) is the correct explanation of the Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of the Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

15. Assertion (A): For CH_3COOH the Molar conductance of 0.1 M CH_3COOH and equivalent conductance of 0.1 N CH_3COOH is same.

Reason (R): These do not depend upon concentration.

16. Assertion (A): For an exothermic reaction activation energy for the backward reaction is more than the activation energy of the forward reaction.

Reason (R): If the activation energy is high, the reaction is slow.

17. Assertion (A): Lanthanoids show a limited number of oxidation states where as Actinoids show a large number of oxidation states.

Reason (R): Energy gap between 4f, 5d and 6s subshell is small where as that between 5f, 6d and 7s subshell in large.

18. Assertion (A): Aniline is more basic than ethylamine.

Reason (R): The lone pair on N atom is present in Conjugation with benzene ring and becomes less available for protonation because of resonance.

SECTION-B

19. Account for the following:-

(a) Aniline does not undergo Friedal craft reaction.

(b) Methylamine is water reacts with ferric chloride to precipitate hydrated ferric oxide. (2x1=2)

20. Among the isomeric alkanes of molecular formula C_5H_{12}, identify the one which on photochemical chlorination yields

(a) a single monochloride

(b) four isomeric monochlorides (2x1=2)

OR

Explain:

(a) Why Grignard reagent should be prepared under anhydrous conditions.

(b) Why the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride. (2x1=2)

21. (a) Give one structural difference between amylase and amylopectin.

(b) What type of bonding helps in stabilising the $\propto$-helix structure of proteins. (2x1=2)

22. Draw all the isomers (geometrical and optical) of $[COCl_2(en)_2]^+$ (2)

23. How many electrons flow through a metallic wire if a current of 0.5A is passed for 4 hours. (2)

24. (a) Explain the following through example

(i) Azeotropic mixture

(ii) Isotonic solutions (2x1=2)

OR

(b) Derive relationship between mole fraction and vapour pressure of components of an ideal solution in liquid phase and vapour phase. (2)

25. What is the effect of adding a catalyst on

(i) Activation Energy (Ea) of the reaction

(ii) Gibbs free energy (ΔG) of the reaction. (2x1=2)

SECTION-C

26. Define the following as related to protein

(a) Peptide linkage

(b) Denaturation

(c) Primary structure (3x1=3)

OR

How do you explain the amphoteric behaviour of amino acid. (3)

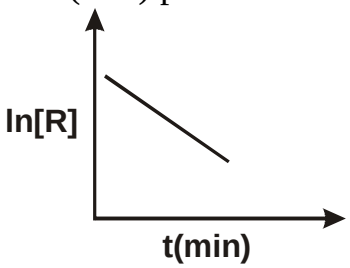
27. Give equations of the following reactions.

(a) Oxidation of propano1 with alkaline $KMnO_4$ solution

(b) Bromine in CS_2 with phenol

(c) Propanone with methyl magnesium bromide. (3x1=3)

28. For a certain chemical reaction, variation in the concentration, ln[R] vs time(min) plot is shown below.



For this reaction

(a) What is the order of reaction?

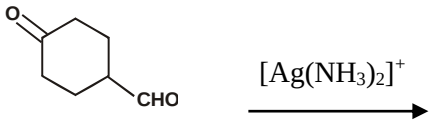
(b) What are the units of rate constant K for this reaction?

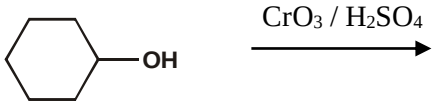
(c) Give the relationship between K and t½ of this reaction. (3x1=3)

29. Two elements A and B form compounds having formula AB_2 and AB_4 when dissolved in 20gm of benzene (C_6H_6), 1 gm of AB_2 lowers the freezing point by 2.3K where as 1.0 gm of AB_4 lowers it by 1.3K. The molal depression constant for benzene is 5.1Kkg./mol. Calculate atomic masses of A and B.(3)

30. Write the product of the following reactions:-

(a) $C_6H_5CHO \xrightarrow{H_2NCONHNH_2}$

(b) 

(c) 

(3x1=3)

OR

Do the following conversions:-

(a) Ethanal to But-2-enal

(b) Benzaldehyde to 3-phenyl propan-l-ol

(c) Benzone acid to Benzaldehyde (3x1=3)

SECTION-D

The following questions are case based questions. Read the case carefully and answer the questions that follow:-

31. One of the latest theory to explain bonding in coordination compounds is crystal field theory which consider metal ligand bond to be ionic unlike valence bond theory. It considers the effect of ligands on the relative energy of d orbitals of the central metal atom/ion. In free transition metal ion, all the d-orbitals are degenerate. However this degeneracy split in the presence of ligands which may be anions or polar molecules like H_2O, NH_3 etc. The pattern of splitting depends upon the nature of crystal field generated by the ligands around the metal ion.

Answer the following questions:-

(a) What is the crystal field splitting energy? (1)

(b) Draw crystal field splitting diagram for Octahedral field. (2)

OR

(b) The hexaaqua manganese(II) ion contains five unpaired electrons while the hexacyano ion contain only one unpaired electron. Explain using crystal field theory. (2)

(c) How does the magnitude of Δo decide the actual configuration of d-orbital in a coordination entity. (1)

32. Alkyl halides undergo two types of nucleophillic substitution reactions SN_1 and SN_2. SN_1 reactions are two step reactions which proceed through the

formation of carbocation while SN_2 are one step reactions proceed through the formation of transition state.

Answer the following questions:-

(a) Out of $C_6H_5CH_2Cl$ and $C_6H_5CHClC_6H_5$ which is more easily hydrolysed by aqueous KOH following SN_1 mechanism. (1)

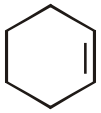
(b) Arrange the following compounds in the order of reactivity towards SN_2 displacement (1)

2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane

(c) Why allyl chloride is hydrolysed through SN_1 mechanism. (1)

(d) Why 1-Jodobutane is more reactive than 1-Chlorobutane towards nucleophilic substitution reaction. (1)

OR

(d)  $+ Br_2 \xrightarrow[\text{UV light}]{\text{heat}}$ predict the product of this reaction. (1)

SECTION-E

33. (a) Describe the preparation of potassium dichromate from iron chromite ore. Write reactions involved in the preparation. (3)

(b) Describe the oxidizing action of potassium dichromate on

i. Iodide ion

ii. Iron (II) solution.

Write Ionic equation for the reactions. (2)

OR

(a) Describe the preparation of potassium permanganate. (2)

(b) Compare the chemistry of actinoids with that of lanthanoids with special reference to

i. Electronic Configuration

ii. Atomic and Ionic size

iii. Chemical reactivity (3)

34. (a) Write the Nernst equation and calculate emf of the following cells at 298K

$Mg(s) \mid Mg^{2+}(0.001M) \parallel Cu^{2+}(0.0001M)/Cu(s)$

$E°Mg^{2+}/Mg$ -2.36V $E°\ Cu^{2+}/Cu$ 0.34V (3)

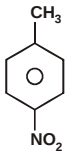
(b) Why does the conductivity of a solution decrease with dilution? (2)

OR

(a) Write the chemistry of recharging of the lead storage battery highlighting all the material that are involved during recharging. (3)

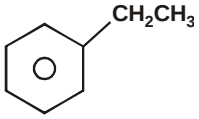
(b) Can we store copper sulphate solution in a zinc pot? (2)

35. Write the structures of product of the following reactions:-

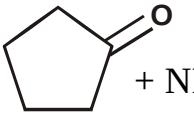
(a) 

(a) CrO_2Cl_2

(b) H_3O^+

(b) 

$\xrightarrow[KOH,\ heat]{KMnO_4}$

(c) 

$+ NH_2OH \longrightarrow$

(d) $HCHO + Conc.\ NaOH \longrightarrow$

(e) $CH_3CHO + CH_3CH_2CHO \xrightarrow[NaOH]{Dil}$ (5x1=5)

OR

(a) Give chemical test to distinguish between phenol and benzoic acid. (1)

(b) Out of acetaldehyde and acetone which is more reactive towards nucleophillic addition reaction and why? (1)

(c) An organic compound with the molecular formula $C_9H_{10}O$ forms $2_1$4-DNP derivative, reduces tollen's reagent and undergoes eannizaro reaction. On vigorous oxidation it gives 1,2-benzene dicarboxylic acid. Identify the compound. Write the reactions involved. (3)