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CLASS XII, MODEL EXAMINATION(2022-23)
CHEMISTRY(043)

Time: 3 Hours

Maximum Marks: 70

General Instructions:

1. All questions are compulsory. There are 35 questions in this question paper with internal choice.
2. This question paper has five sections. Section A, B, C, D, E
3. Section A consists of 18 MCQ, Assertion-reason questions carrying 1 mark each. (1×18=18)
4. Section B consists of 7 very short answer questions carrying 2 marks each (2×7=14)
5. Section C consists of 5 short answer questions carrying 3 marks each. (3×5=15)
6. Section D consists of two Case based questions carrying 4 marks each (4×2=8)
7. Section E consists of 3 long answer questions carrying 5 marks each (5×3=15)
8. Use of log tables and calculators is not allowed.

Answer the following multiple-choice questions: (1×18=18)

- Q.1. Which of the following will show a negative deviation from Raoult's law?
a) Acetone-benzene b) Acetone - ethanol c) Benzene-methanol d) Acetone-chloroform
- Q.2. While charging the lead storage battery ----
a) PbSO_4 anode is reduced to Pb. b) PbSO_4 cathode is reduced to Pb.
c) PbSO_4 cathode is oxidised to Pb. d) PbSO_4 anode is oxidised to PbO_2
- Q.3. The unit of rate constant depends upon the
a) molecularity of the reaction. b) activation energy of the reaction.
c) order of the reaction d) temperature of the reaction.
- Q.4. Which of the following pairs has the same ionic size?
a) Zr^{4+} , Hf^{4+} b) Zn^{4+} , Hf^{4+}
c) Fe^{2+} , Ni^{2+} d) Zr^{4+} , Ti^{4+}
- Q.5. The coordination number of platinum in $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]^{2+}$ ion is
a) 2 b) 4 c) 6 d) 8
- Q.6. The reaction $\text{RX} + 2\text{Na} + \text{RX} \xrightarrow{\text{Dry ether}}$ $\text{R-R} + 2\text{NaX}$ is called
a) Sandmeyer's reaction
b) Wurtz reaction
c) Fittig reaction
d) Williamson's synthesis
- Q.7. Which of the following compounds is most acidic?
a) CH_4
b) C_2H_6
c) C_2H_2
d) $\text{C}_2\text{H}_5\text{OH}$
- Q.8. The reagent used in Clemmensen's reduction is
a) Conc. H_2SO_4
b) $\text{Zn-Hg}/ \text{conc. HCl}$
c) Aq. KOH
d) Alc. KOH
- Q.9. Primary, secondary and tertiary amines can be distinguished by
a) Schiff's test b) Fehling's test c) Tollen's test d) Hinsberg's test
- Q.10. What is the chemical name of the vitamin B_2
a) Riboflavin b) Thiamin c) Cynaocobalamine d) Pyridoxin
- Q.11. Desalination of sea water is now done using :
a) Reverse osmosis b) Osmosis c) Filtration d) Evaporation
- Q.12. In fuel cell
a) chemical energy is converted to electrical energy .
b) energy of combustion of fuel is converted to chemical energy.
c) energy of combustion of fuel is converted to electrical energy.

d) electrical energy is converted to chemical energy .

Q.13. For which order half-life period is independent of initial concentration?

- a) Zero b) First c) Second d) Third

Q.14. IUPAC name of $[K_3Fe(CN)_6]$ is

- a) potassium ferricyanide b) potassium hexacyanoferrate (I)
c) potassium hexacyanoferrate (III) d) potassium hexacyanoferrate (II)

In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- a) Assertion and Reason both are correct statements and reason is correct explanation for assertion.
b) Assertion and Reason both are correct statements but reason is not the correct explanation for assertion.
c) Assertion is correct statement but reason is wrong statement.
d) Assertion is wrong statement but reason is correct statement.

Q.15. Assertion : Presence of a nitro group at ortho or para position increases the reactivity of haloarenes towards nucleophilic substitution.

Reason: Nitro group, being an electron withdrawing group decreases the electron density over the benzene ring.

Q.16. Assertion: p-nitrophenol is more acidic than phenol.

Reason: Nitro group helps in the stabilisation of the phenoxide ion by dispersal of negative charge due to resonance.

Q.17. Assertion: p-chlorobenzoic acid is stronger than benzoic acid.

Reason: Chlorine has electron donating resonance (+R) effect.

Q.18. Assertion: Hoffmann bromamide reaction is given by primary amines.

Reason: Primary amines are more basic than secondary amines.

Answer the following (2x7=14)

Q.19. Write difference between essential and non-essential aminoacids.

Q.20. Calculate the mass of Ag deposited at cathode when a current of 2A was passed through a solution of $AgNO_3$ for 15 min. (Given : Molar mass of Ag= 108gmol⁻¹ , 1F = 96500 Cm⁻¹)

Q.21. The rate constant for a zero order reaction in A is 0.0030 mol L⁻¹ s⁻¹. How long will it take for the initial concentration of A to fall from 0.10M to 0.075 M ?

Q.22.i) Why alcohols and phenols are soluble in water?

ii) In alcohols the boiling points decrease with increase of branching in carbon chain. Why?

Q.23 .i) Write the structure of 3-methylbutoxybenzene.

ii) The reaction of CH_3ONa with $(CH_3)_3CBr$ gives exclusively 2-methylpropene. Why?

Q.24. a) Explain Gabriel phthalimide synthesis

b) Define ammonolysis.

Q.25.a) convert (i) 3-methylaniline into 3-nitrotoluene .

(ii) Aniline into 1,3,5-tribromobenzene.

Answer the following (3x5=15)

Q.26. The rate of most reactions become double when their temperature is raised from 298K to 308K. Calculate their activation energy. (Given = 8.314JK⁻¹mol⁻¹, log4=0.6021, log2=0.3010, log3=0.4771)

Q.27.a) Zn^{2+} salts are white while Cu^{2+} salts are coloured. Why?

b) In 3d series (Sc to Zn) which element shows the maximum number of oxidation states and why?

c) Transition metals and many of their compounds act as good catalysts .Why?

Q.28. Complete the reactions:

a) $4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow$

b) $2Na_2CrO_4 + 2H^+ \rightarrow$

c) $2MnO_2 + 4KOH + O_2 \rightarrow$

Q.29. . i) Write the IUPAC name of $(CH_3)_2C=CHCOOH$

ii) Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reactions:

Benzaldehyde, p-Tolualdehyde, p-Nitrobenzaldehyde, Acetophenone

iii) Convert butan-1-ol to butanoic acid

Q.30.i) Explain wolff Kishner reduction.

ii) Convert bromobenzene to benzoic acid.

iii) Write distinguish test to differentiate between Ethanal and propanone

Case based question answer (4x2=8)

Q.31. The nucleophilic substitution in alkyl halides can take place through two different mechanisms, SN1 and SN2.

The SN1 mechanism involves carbocation as intermediate while SN2 reaction occurs through a single step concerted mechanism involving a transition state.

- i) The order of reactivity of various alkyl halides through SN1 mechanism is
a) $1^\circ > 2^\circ > 3^\circ$ b) $3^\circ > 2^\circ > 1^\circ$ c) $2^\circ > 3^\circ > 1^\circ$ d) $2^\circ > 1^\circ > 3^\circ$
- ii) The reaction of an optically active alkyl halide through SN2 mechanism results in.
a) Complete racemisation b) Partial racemisation
c) Complete inversion of configuration d) Partial inversion of configuration
- iii) Which of the following factors doesn't favour SN1 mechanism?
a) 3° alkyl halides b) Strong nucleophile
c) Polar solvent d) Low concentration of nucleophile
- iv) Which of the following alkyl halides is most likely to react through SN2 mechanism?
a) 2-bromobutane b) 2-bromo-2-methylpropane
c) 1-bromo-2-methylpropane d) 1-bromobutane

Q.32. Carbohydrates, proteins, nucleic acids, etc. form the basis of life and are responsible for the growth and maintenance of living systems. Therefore, they are referred to as biomolecules. Carbohydrates are widely distributed in nature. Carbohydrates are optically active polyhydroxy aldehydes or ketones or the compounds which produce such units on hydrolysis. Glucose, fructose, sucrose, starch, cellulose, etc. are some naturally occurring carbohydrates. They act as the major source of energy for animal's and human beings.

Monosaccharides are the simple carbohydrates that cannot be broken further into smaller units on hydrolysis, e.g. glucose and fructose, ribose, etc. Oligosaccharides are the carbohydrates which on hydrolysis give two to ten units of monosaccharides e.g. sucrose, maltose, etc. Polysaccharides are the carbohydrates which produce a large number of monosaccharide units on hydrolysis e.g. starch, cellulose etc.

- i) Which carbohydrate provides instant energy to the body?
ii) Which disaccharide is found only in animals and not in plants?
iii) Which carbohydrate is the main constituent of plant cell wall?
iv) Write the name of two monosaccharides obtained on hydrolysis of lactose sugar.

OR

Define Glycosidic linkage.

Answer the following (5x3=15)

Q.33. Calculate the emf and ΔG for the following cell $\text{Mg(s)} | \text{Mg}^{2+} (0.001\text{M}) || \text{Cu}^{2+} (0.0001\text{M}) | \text{Cu(s)}$

(Given $E^\circ (\text{Mg}^{2+} / \text{Mg}) = -2.37\text{V}$, $E^\circ (\text{Cu}^{2+} / \text{Cu}) = 0.34\text{V}$)

- Q.34. a) Write the IUPAC names of $[\text{Ni}(\text{CN})_4]^{2-}$ and explain the structure on the basis of VBT. Also write the magnetic properties and type of hybridisation along with type of spin and geometry. (3)
b) Explain ionization isomerism with the help of example. (2)

OR

- i) Define ambidentate ligands. Give example.
ii) When a coordination compound $\text{CoCl}_3 \cdot 6\text{NH}_3$ is mixed with AgNO_3 , 3 moles of AgCl are precipitated per mole of the compound, write the structural formula of complex.
iii) Explain the term Crystal field splitting in an octahedral field.
iv) Describe the role of coordination compounds in biological system with one example.
- Q.35. a) State Henry's law and mention any one important application.
b) Calculate the boiling point of a solution prepared by adding 15g of NaCl to 250g of water. (Given K_b for water = $0.512 \text{ K kg mol}^{-1}$, molar mass of $\text{NaCl} = 58.44 \text{ gmol}^{-1}$)

