

CHEMISTRY THEORY

CLASS 12 (2023-24)

Max.Mark. 70

Time 3 hours

General Instructions :

Read following instruction carefully

- (a) There are 33 questions in this question paper with internal choice.
 - (b) SECTION –A consists of 16 multiple choice question carrying one mark each.
 - (c) SECTION-B consists of 5 short answer question carrying two mark each.
 - (d)SECTION-C consists of 7 short answer question carrying three mark each.
 - (e) SECTION-D consists of 2 case based question carrying four mark each.
 - (f) SECTION -E consists of 3 long answer question carrying five mark each.
 - (g) All questions are compulsory.
 - (h) Use of log table and calculators is not allowed.
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SECTION –A

The following questions are multiple choice question with one correct answer. Each question carries 1 mark. There are no internal choice in this section.

Q1. Solubility gas decreases with increase of temperature because dissolution of gas is...

- (a) Endothermic and reversible process
- (b) Exothermic and reversible process
- (c) Endothermic and irreversible process
- (d) exothermic and irreversible process

Q2. Which metal can not replace H_2 from hydrochloric acid

- (a) Zn
- (b) Cu
- (c) Mg
- (d) Al

Q3. The quantity of current required to obtain one mole of Al from Al_2O_3 is

- (a) 1F
- (b) 6F
- (c) 3F
- (d) 2F.

Q4. Activation energy of chemical reaction can be determined by.....

- (a) Determining the rate constant at standard temperature.
- (b) Determining the rate constant at two different temperature.
- (c) Determining probability of collision.
- (d) Using rate constant.

Q5. Rate law for the reaction $A + 2B \rightarrow C$ is found to be

Rate = $k[A][B]$ The concentration of reactant B is doubled, keeping the concentration of A constant, the value of rate constant will be

(a) the same (b) doubled (c) Quadrupled (d) halved

Q6. Electronic configuration of a transition element X in +3 oxidation state is $[Ar] 3d^5$. What is its atomic number.

a) 25 b) 26 c) 27 d) 24

Q7. Which of the following is a diamagnetic ion-

(a) V^{2+} (b) Sc^{3+} (c) Cu^{2+} (d) Mn^{3+}

8). The IUPAC name of iso butyl Bromide is-

a) 1-Bromo-3-Methyl Butane b) 3-Bromo-2-Methyl Propane c) 2-Bromo-2-Methyl Propane d) 1-Bromo-2-Methyl Propane

9) Phenol does not undergo nucleophilic substitution reaction easily due to..

a) Acidic nature of phenol b) Due to +R effect of OH group
c) partial double bond character between C-C bond (d). Instability of phenoxide ion

10. Mono chlorination of Toluene in sunlight followed by hydrolysis with aq. NaOH

a) O-Cresol b) m-cresol c) p-cresol d) Benzyl alcohol

Directions : In the following question an Assertion(A) is followed by corresponding Reason(R). Use the following keys to choose the appropriate answer.

a) both (A) and (R) is the correct and (R) is the correct explanation of (A)
b) both (A) and (R) is correct. But (R) is not correct explanation of A
c) (A) is correct but (R) is not correct.
d) (A) is not correct but (R) is correct

11) Assertion(A): In alcohol, the boiling decreases with decrease in branching of the carbon chain

Reason(R): Vander waals force increase with increase of branching.

12) Assertion(A) Formaldehyde is a planar molecule.

Reason(R): It contains sp^2 hybridised carbon

13. Assertion(A) : Pentan-2-one can be distinguished from pentan-3-one by Iodoform test

Reason(R) : former is methyl ketone, while the latter is not.

14) Soda lime is the mixture of

a) NaOH and CaO in the ratio of 3:2 b) NaOH and CaO in the ratio of 1:3 c). NaOH and CaO in the ratio of 3:1 (d) NaOH and CaO in the ratio of 2:3

15) One molecule of sucrose on hydrolysis gives

a) 2 molecule of glucose b) 2 molecule of fructose
c) 1 molecule of glucose and 1 molecule of fructose d) 2 molecule of glucose and 1 molecule of fructose

16) The vitamin which plays a vital role in clotting of blood is

a) A b) C (c) B_6 (d) K

SECTION-B

This section contains five questions with internal choice in one question. The following questions are very short answer type and carry two mark each.

17. In light of collision theory Explain following “ Can a reaction have zero activation energy”

18. Predict the Intermolecular interaction in following component of following solution.

(i) Temperature decreases during mixing of solvent and solute.

(ii) No Change in volume occur during mixing of solvent and solute.

19. How will you bring about the following conversion

a) Ethanol to but-1-yne

b) Aniline to Chlorobenzene

20) Give reasons:- (a) Electrophilic substitution in benzoic acid take place at meta position.

(b) Carboxylic acid have higher boiling point than correspondence aldehyde , ketone and alcohol.

21) Explain (i) Glycosidic linkage (ii) Denaturation of protein

OR

What are the different type of R.N.A. molecules, which perform different work.

SECTION-C

This section contains seven questions with internal choice in one question . the following questions are short answer type and carry three marks each.

22).(i) Calculate the time required to deposit 1.27 g of Cu at cathode , when 2A was passed the solution of copper Sulphate. (Molar Mass of Cu = 63.5 g mol^{-1})

(ii) What is the effect of temperature on conductance of electrolyte conductor.

23. For a first order reaction :- $X(g) = Y(g) + Z(g)$

The half life time is 10 min. In what period of time would the concentration of X be reduced to 10 % of original concentration.

24) A metal ion M^{n+} having d^4 valency shell electronic configuration , combine with three bidentate ligends to form a complex compound, assuming $\Delta_0 > P$

(i) What type of hybridization metal ion have ?

(ii) Write The electronic configuration of valency shell in term of t_{2g} and e_g orbital.

(iii) Draw the diagram showing d-orbital splitting during complex formation.

25. Answer the following questions?

(i) What happens when bromobenzene is treated with Mg metal in presence of dry ether.

(ii) Which compound out of following pairs will react faster in SN1 reaction and why:-

(a) $\text{CH}_2=\text{CH}-\text{CH}_2-\text{Cl}$ or $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{Cl}$

(b) $(\text{CH}_3)_2\text{C}-\text{Cl}$ or CH_3Cl

OR

Give the reason

- i) Ethyl Iodide undergo SN₂ reaction faster than Ethylbromide.
- (ii) C-X bond length in halobenzene is smaller than that of CH₃X.
- (iii) (dl) -2- Butanol is optically inactive though it contains a chiral carbon atom.

26. Arrange following compounds in increasing order of their property as indicated

- i) CH₃CHO, CH₃CH₂OH, CH₃OCH₃, CH₃COOH (Boiling point)
- ii) Ethanal, Propanal, Propanone, Butan-2-one (Reactivity towards HCN)
- iii) O₂NCH₂COOH, F-CH₂COOH, (CN)CH₂COOH (acidic strength)

27. How will you distinguish following

- (i) Ethanal and Propanal
- (ii) Phenol and Benzoic acid
- (iii) pentan-2-one & Pentan-3-one

28). (i) Name an amino acid which is optically active.

- (ii) Write the chemical of vitamin B₁ and also write name of disease caused by its deficiency.

(iii) What is invert sugar.

SECTION-D

The following questions are case based, each question has an internal choice and carries 4 (1+1+2) Mark each. Read the Passage carefully and answer the questions that follow.

29). The transition metals differ widely in their chemical reactivity. Many of the transition metals are sufficiently electropositive to dissolve in mineral acids. However, some of them remain unaffected by simple acids and behave as noble metals. The reactivity of transition metals can be related to E⁰ values. The metals of first transition series with exception of copper have negative E⁰ value for M²⁺/M couples. The large positive E⁰ value for redox couples Mn³⁺/Mn²⁺ and Co³⁺/Co²⁺ indicate that Mn³⁺ and Co³⁺ ions strongest oxidizing agent in aqueous solution. The negative E⁰ value of for redox couples Ti³⁺/Ti²⁺ and V³⁺/V²⁺ indicate that Ti²⁺, V²⁺, Cr²⁺ are strong reducing agent. Cr³⁺/Cr²⁺, Mn³⁺/Mn²⁺, Fe³⁺/Fe²⁺ are -0.4V, +1.5V and + 0.80V respectively and Cr²⁺/Cr, Mn²⁺/Mn and Fe²⁺/Fe are -0.9V, -1.2V and -0.4V respectively.

- 1) Reduction potential of copper is positive, why?
- 2) Compare the stability of Fe³⁺, Cr³⁺ and Mn³⁺ ion in acid solution.

OR

Arrange Fe, Mn and Cr metal in decreasing order of reducing strength.

- 3) What is standard reduction potential? Can we calculate its absolute value?

30. One of the simplest method to Prevent corrosion is to prevent the surface of metallic object to come in contact with atmosphere. This can be done by applying paints or some chemical on the surface of metal so that the surface does not come in contact with the atmosphere. The other way is to cover the surface by coating the metal surface with inert metals. Like Zinc Tin etc. An electrochemical method is to provide a sacrificial electrode of another metal which corrodes itself but save the object.

- i) Can Chromium used for coating Iron.
- ii) What is sacrificial protection of rusting?

OR

Saline water can cause rusting of iron more quickly than ordinary water how?

iii) Write the equation of reaction which is occurring according to electrochemical theory of rusting.

SECTION-E

This Section contains three question . All questions have internal choice. The following questions are long answer type and carry five mark each.

31. (i) Why constant boiling mixture behave like a single component when subjected to distillation.

(ii) K_H value for Ar(g) CO₂(g) HCHO(g) and CH₄(g) are 40.3, 167, 1.83×10^{-5} and 0.413 K bar respectively. Arrange these gases in increasing order of solubility giving with suitable reason.

(iii) Calculate the boiling point elevation for a solution prepared by adding 10g of MgCl₂ to 200 g of water. Assuming MgCl₂ is completely dissociated. ($K_b = 0.512 \text{ kgkmol}^{-1}$)

OR

i) Why the value of Vant hoff factor of ethanoic acid in benzene close to 0.5 ?

ii) When dehydrated fruits and vegetables are placed in water, they swell and returned to original shape, why ? What is the effect of temperature on this process ?

iii) Give the differences between ideal and non-ideal solution (any three).

32. a) Account for the followings :

i) Transition metals and their compounds show catalytics activities.

ii) Cr⁺² is a strong reducing agent.

iii) Zn⁺² salt are colourless while Ni⁺² are coloured.

b) Write the ionic equation of reaction of MnO₄⁻ in acidic medium with

i) I⁻ ion

ii) Fe⁺² ion

OR.

a) Account for the followings :

i) Transition metal form alloys easily.

ii) Ce³⁺ is a strong oxidising agent

iii) Sc³⁺ is colourless while Ti³⁺ is coloured in aqueous solution.

b) complete and balance the following equations :

i) $\text{KMnO}_4 \xrightarrow{\text{heat}} \dots + \dots$

ii) $\text{Cr}_2\text{O}_7^{2-} + \text{H}^+ + \text{Fe}^{2+} \longrightarrow$

33) . i) Arrange the followings in increase order of their P^{K_b} value in aqueous solution.

C₂H₅NH₂ , (C₂H₅)₂NH , (C₂H₅)₃N

ii) Aniline on nitration gives a substantial amount of m-nitro aniline though amino group is O/P directing , why ?

iii) An aromatic compound A of molecular formula C₇H₆O₂ on treatment with aqueous ammonia and heating form compound B which on heating with Br₂ and aqueous KOH gives C of molecular formula C₆H₇N. Write the structure and I.U.P.A.C. name of A, B and C.

OR

a) Arrange the following in increasing order of property specified.

i) Aniline, Ethanamine, 3-ethylethanamine (solubility in water)

ii) Ethanoic acid, Ethanamine, Ethanol (boiling point)

b) How will you convert

i) Ethanoic acid into methanamine ,

ii) Hexane nitrile into 1-amino-pentane

iii) Ethanamide into methanamine

