

Sample Paper 17

Class XII 2023-24

Chemistry

Time: 3 Hours

Max. Marks: 70

General Instructions:

1. There are 33 questions in this question paper with internal choice.
 2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
 3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
 4. SECTION C consists of 7 short answer questions carrying 3 marks each.
 5. SECTION D consists of 2 case-based questions carrying 4 marks each.
 6. SECTION E consists of 3 long answer questions carrying 5 marks each.
 7. All questions are compulsory.
 8. Use of log tables and calculators is not allowed.
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SECTION-A

Directions (Q. Nos. 1-16) : The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Sodium formate on heating yields
 - (a) Oxalic acid and H_2
 - (b) Sodium oxalate and H_2
 - (c) CO_2 and NaOH
 - (d) Sodium oxalate
2. Blood cells retain their normal shape in solution which are:
 - (a) hypotonic to blood
 - (b) isotonic to blood
 - (c) hypertonic to blood
 - (d) equinormal to blood
3. The complex ion $[Co(NH_3)_6]^{3+}$ is formed by $sp^3 d^2$ hybridisation. Hence the ion should possess.
 - (a) Octahedral geometry
 - (b) Tetrahedral geometry
 - (c) Square planar geometry
 - (d) Tetragonal geometry
4. The activation energy for a simple chemical reaction $A \longrightarrow B$ is E_a in forward direction. The activation energy for reverse reaction
 - (a) is always double of E_a
 - (b) is negative of E_a
 - (c) is always less than E_a
 - (d) can be less than or more than E_a

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5. Which of the following is an insulator ?
- (a) Graphite (b) Aluminium
(c) Diamond (d) Silicon
6. In a reversible reaction the energy of activation of the forward reaction is 50 kcal. The energy of activation for the reverse reaction will be :
- (a) <50 kcal
(b) either greater than or less than 50 kcal
(c) 50 kcal
(d) >50 kcal
7. Oxidation of primary alcohols with chlorine yields
- (a) Acyl chloride (b) Alkyl chloride
(c) Aldehyde (d) Ketone
8. Butane-2-ol is
- (a) Primary alcohol (b) Secondary alcohol
(c) Tertiary alcohol (d) Aldehyde
9. Which of the following reactions will not give a primary amine ?
- (a) $\text{CH}_3\text{CONH}_2 \xrightarrow{\text{Br}_2/\text{KOH}}$ (b) $\text{CH}_3\text{CN} \xrightarrow{\text{LiAlH}_4}$
(c) $\text{CH}_3\text{NC} \xrightarrow{\text{LiAlH}_4}$ (d) $\text{CH}_3\text{CONH}_2 \xrightarrow{\text{LiAlH}_4}$
10. Co-ordination compounds have great importance in biological systems. In this context which of the following statements is incorrect?
- (a) Cynacobalamin is B_{12} and contains cobalt
(b) Haemoglobin is the red pigment of blood and contains iron
(c) Chlorophylls are green pigments in plants and contain calcium
(d) Carboxypeptidase – A is an enzyme and contains zinc.
11. Fused NaCl on electrolysis gives on cathode.
- (a) chlorine (b) sodium
(c) sodium amalgam (d) hydrogen

12. Which of the following statements about vitamin B₁₂ is incorrect?

- (a) It has a cobalt atom
- (b) It also occurs in plants
- (c) It is also present in rain water
- (d) It is needed for human body in very small amounts

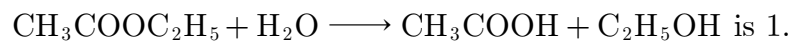
Directions (Q. No. 13-16) : Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

13. **Assertion :** Acetylene on treatment with alkaline KMnO₄ produces acetaldehyde.

Reason : Alkaline KMnO₄ is a reducing agent.

- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
- (b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
- (c) Assertion is correct but Reason is incorrect.
- (d) Both the Assertion and Reason are incorrect.

14. **Assertion :** The order of the reaction



Reason : The molecularity of this reactions is 2.

- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
- (b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
- (c) Assertion is correct but Reason is incorrect.
- (d) Both the Assertion and Reason are incorrect.

15. **Assertion :** The [Ni(en)₃]Cl₂ (en = ethylenediamine) has lower stability than [Ni(NH₃)₆]Cl₂.

Reason : In [Ni(en)₃]Cl₂ the geometry of Ni is octahedral.

- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
- (b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
- (c) Assertion is correct but Reason is incorrect.
- (d) Both the Assertion and Reason are incorrect.

- 16. Assertion :** ROCOl , $(\text{RCO})_2\text{O}$ and RCOOR' all react with Grignard reagents to form 3° alcohols.
Reason : RCOCl reacts with R_2Cd to form ketones but $(\text{RCO})_2\text{O}$ and RCOOR' do not react at all.
- (a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Both the Assertion and Reason are incorrect.

SECTION-B

Directions (Q. Nos. 17-21) : This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

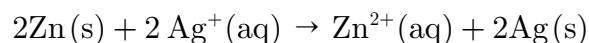
17. Define solubility. Name the factors on which solubility of a solute in a solvent depends.
18. How are ethers named in IUPAC system ?
- or**
- Explain why is $-\text{OH}$ group in phenols more strongly held as compared too OH group in alcohols.
19. Given the standard electrode potentials $\text{K}^+/\text{K} = -2.93 \text{ V}$, $\text{Ag}^+/\text{Ag} = 0.80 \text{ V}$, $\text{Hg}^{2+}/\text{Hg} = 0.79 \text{ V}$, $\text{Mg}^{2+}/\text{Mg} = -2.37 \text{ V}$, $\text{Cr}^{2+}/\text{Cr} = -0.74 \text{ V}$.
Arrange these metals in their increasing order of reducing power.
20. Show that carbonyl group is meta directing group.
21. Write IUPAC names of the following:
- (a) $\text{K}_2[\text{Ni}(\text{CN})_4]$
(b) $[\text{CoCl}_2(\text{NH}_3)_4]\text{Cl}$

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SECTION-C

Directions (Q. Nos. 22-28) : This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Depict the galvanic cell in which the reaction

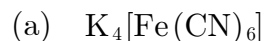


takes place, Further, show

1. Which of the electrodes is negatively charged ?
2. The carriers of the current in the cell.
3. Individual reaction at each electrode.

23. Out of ethyl bromide and ethyl chloride which has higher boiling point and why ?

24. Specify oxidation numbers of the metals in the following co-ordination compounds:



25. Does the presence of two chiral carbon atoms always make the molecule optically active? Explain giving an example.

26. Write a note on Haloform reaction.

27. *p*-Nitrophenol is more acidic than phenol explain why ?

or

Define fermentation. How ethanol is formed by fermentation.

28. Explain two important uses of formalin.

or

Give reasons for the following :

1. Ethyne is more acidic than ethane.
2. Lower members of aldehyde are more soluble in water.

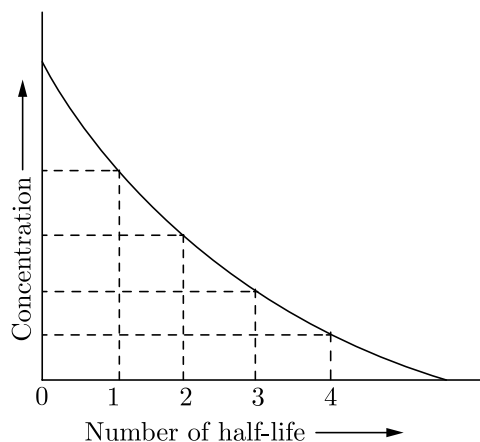
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SECTION-D

Directions (Q. Nos. 29-30) : The following questions are case-based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.

29. The half-life of a reaction is the time required for the concentration of reactant to decrease by half, i.e.,

$$[A]_t = \frac{1}{2}[A]$$



For first order of reaction,

$$\frac{t}{\frac{1}{2}} = \frac{0.693}{k}$$

This means $t_{1/2}$ is independent of initial concentration. Figure shows that typical variation of concentration of reactant exhibiting first order kinetics. It may be noted that though the major portion of the first order kinetics may be over in a finite time, but the reaction will never cease as the concentration of reactant will be zero only at infinite time.

Read the above passage and answer the following questions:

- A first order reaction has a rate constant $k = 3.01 \times 10^{-3} \text{ s}^{-1}$. How long will it take to decompose half of the reactant ?
- Draw the plot of $t_{1/2}$ vs initial concentration $[A]_0$ for a first order reaction.
- The rate constant for a first order reaction is $7.0 \times 10^{-4} \text{ s}^{-1}$. If initial concentration of reactant is 0.080 M, what is the half life of reaction?

or

- The rate of a first order reaction is $0.04 \text{ mol L}^{-1} \text{ s}^{-1}$ after 10 minutes and $0.03 \text{ mol L}^{-1} \text{ s}^{-1}$ after 20 minutes of initiation. What is the half-life of reaction?

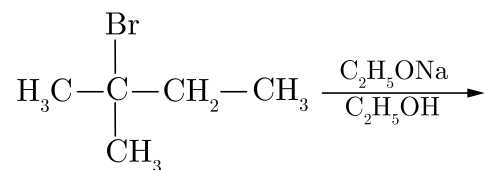
30. When haloalkanes with β -hydrogen atom are boiled with alcoholic solution of KOH, they undergo elimination of hydrogen halide resulting in the formation of alkenes. These reactions are called β -elimination reactions or dehydrohalogenation reactions. These reactions follow Saytzeff's rule. Substitution and elimination reactions often compete with each other. Mostly bases behave as nucleophiles and therefore can engage in substitution or elimination reactions depending upon the alkyl halide and the reaction conditions.

Answer the following questions :

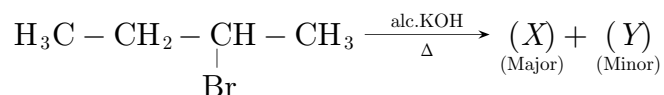
(a) Which of the following is the correct method for synthesising methyl tert-butyl ether and why?



(b) What will be the major product in the following reaction?



(c) Consider the following reaction:



Identify (x) and (y)

or

(d) Predict all the alkenes that would be formed by dehydrohalogenation of 2,2,3-trimethyl-3-bromopentane with sodium ethoxide in ethanol ?

SECTION-E

Directions (Q. Nos. 31-33) : The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

31. Draw the structures of α -D-glucose and β -D-glucose.

32. Define rate constant of a reaction. Derive an expression for the rate constant of 1st order reaction

or

1. Define zero order reaction.
2. Derive integrated rate equation for zero order reaction.
3. Derive an expression for half life period of a zero order reaction.

- 33.** Describe the preparation of potassium permanganate from pyrolusite ore by electrochemical method. Discuss its important properties and uses.

or

What is lanthanoid contraction? Give its cause. What are the consequences of lanthanoid contraction?

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