

Sample Paper 13

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. Which one of the following is the strongest base in aqueous solution?
(a) Methylamine (b) Trimethylamine
(c) Aniline (d) Dimethylamine
2. Which is not colligative property?
(a) Freezing Point (b) Lowering of vapour pressure
(c) Depression of freezing point (d) Elevation of boiling point
3. Which of the following compounds is used as a refrigerant?
(a) Acetone (b) CCl_4
(c) CF_4 (d) CCl_4F_2
4. Osmotic pressure of a solution at a given temperature:
(a) increases with concentration
(b) decreases with concentration
(c) remains same
(d) initially increases and then decreases

5. The coordination number of a central metal atom in a complex is determined by
- the number of ligands around a metal ion bonded by sigma and pi-bonds both
 - the number of ligands around a metal ion bonded by pi-bonds
 - the number of ligands around a metal ion bonded by sigma bonds
 - the number of only anionic ligands bonded to the metal ion
6. A catalyst is used
- only for increasing the velocity of the reaction
 - for altering the velocity of the reaction
 - Only for decreasing the velocity of the reaction
 - All a, b and c are correct
7. Which of the following is non-electrolyte?
- | | |
|---|--------------------------|
| (a) NaCl | (b) CaCl ₂ |
| (c) C ₁₂ H ₂₂ O ₁₁ | (d) CH ₃ COOH |
8. The number of essential amino acids in man is
- | | |
|--------|--------|
| (a) 8 | (b) 10 |
| (c) 18 | (d) 20 |
9. The oxidation state of Cr in K₂Cr₂O₇ is:
- | | |
|--------|--------|
| (a) +5 | (b) +3 |
| (c) +6 | (d) +7 |
10. Fuel cells are preferred to other energy producing devices in space because of
- | | |
|---------------------|--------------------|
| (a) high efficiency | (b) pollution free |
| (c) less weight | (d) all of these |
11. The reaction given below is known as
- $$\text{C}_2\text{H}_5\text{ONa} + \text{IC}_2\text{H}_5 \rightarrow \text{C}_2\text{H}_5\text{OC}_2\text{H}_5 + \text{NaI}$$
- | | |
|----------------------------|--------------------------|
| (a) Kolbe's synthesis | (b) Wurtz' synthesis |
| (c) Williamson's synthesis | (d) Grignard's synthesis |
12. Which of the following is incorrect?
- NaHSO₃ is used in detection of carbonyl compound.
 - FeCl₃ is used in detection of phenolic group.
 - Tollen reagent is used in detection of unsaturation.
 - Fehling solution is used in detection of glucose.

Directions (Q. Nos. 13-16) : Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

- 13. Assertion :** Nitrobenzene is used as a solvent in Friedel-Craft's reaction.
Reason : Fusion of nitrobenzene with solid KOH gives a low yield of a mixture of *o*- and *p*-nitrophenols.
- Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
 - Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
 - Assertion is correct but Reason is incorrect.
 - Both the Assertion and Reason are incorrect.
- 14. Assertion :** Alcohols are easily protonated as compared to phenols.
Reason : Alcohols undergo intermolecular hydrogen bonding due to the presence of highly electronegative oxygen.
- Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
 - Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
 - Assertion is correct but Reason is incorrect.
 - Both the Assertion and Reason are incorrect.
- 15. Assertion :** The $[\text{Ni}(\text{en})_3]\text{Cl}_2$ (en = ethylene-diamine) has lower stability than $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$.
Reason : In $[\text{Ni}(\text{en})_3]\text{Cl}_2$, the geometry of Ni is trigonal bipyramidal.
- Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
 - Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
 - Assertion is correct but Reason is incorrect.
 - Both the Assertion and Reason are incorrect.
- 16. Assertion :** $p\text{-O}_2\text{N}\cdot\text{C}_6\text{H}_4\cdot\text{COCH}_3$ is prepared by Freidel Craft's acylation of nitrobenzene.
Reason : Nitrobenzene easily undergoes electrophilic substitution reaction.
- Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
 - Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
 - Assertion is correct but Reason is incorrect.
 - Both the Assertion and Reason are incorrect.

SECTION-B

Directions (Q. No. 17-21) : This section contains 5 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

17. What do you mean by electrode potential ?
18. In first transition series density increases from titanium ($Z=22$) to copper ($Z=29$). Give reason.
19. Dipole moments of aldehydes and ketones are higher than those of alcohols Explain.
20. Write the equation relating $[R]$, $[R]_0$ and reaction time t for a zero order reaction. $[R]$ = concentration of reactant at time t and $[R]_0$ = initial concentration of reactant.

or

Draw the graph that relates the concentration R , of the reactant and t the reaction time for a zero order reaction.

21. How will you convert benzene to chlorobenzene?

SECTION-C

Directions (Q. No. 22-28) : This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

22. Write a reaction which shows that aldehyde group is present in glucose.
23. What is salt bridge ? Give its functions.
24. Explain the variation of molar conductivity with the change in the concentration of the electrolyte. Give reasons.
25. Compare the stability of +2 oxidation state for the elements of the first transition series.
26.
 1. How will you distinguish between isopropyl alcohol and ethyl alcohol.
 2. How will you distinguish between isopropyl alcohol and t-butyl alcohol.
27. Give reasons for the following :
Aniline is less basic than methylamine.

or

What is the basic structural difference between starch and cellulose?

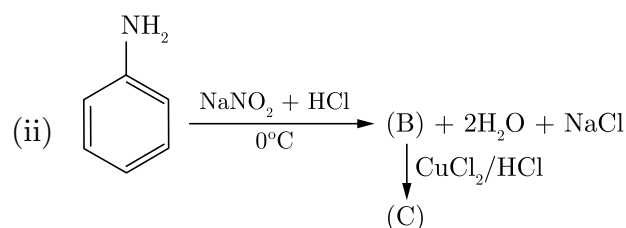
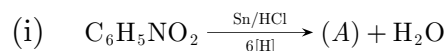
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28. How will you convert (Give only chemical equation):

- (i) Propanamide to ethylamine
- (ii) Ethyl amine to methane
- (iii) Aniline to acetanilide.

or

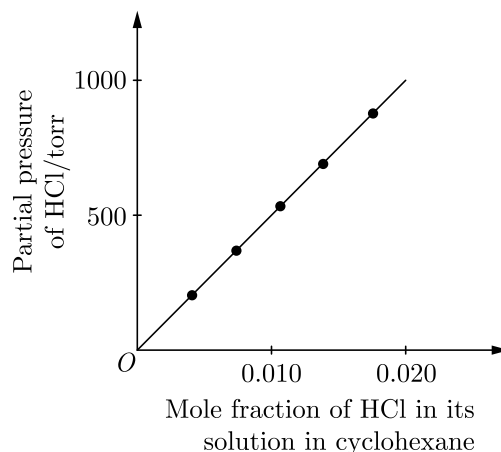
Identify *A*, *B* and *C* in the following equations :



SECTION-D

Directions (Q. No. 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. Many gases dissolve in water, Oxygen dissolves only to small extent which sustains all aquatic life. NH_3 and HCl are highly soluble in water. Solubility of gases increases with increase in pressure and decreases with increase in temperature.



Henry's law states "The partial pressure of the gas in vapour phase (p) is proportional to the mole fraction of the gas in the solution. $p = K_H x$."

Where, K_H is Henry's law constant. If we draw a graph between partial pressure of the gas versus mole fraction of gas in solution, then we will get straight line as shown in graph.

Different gases have different K_H values of the same temperature. This suggests, K_H is a function of nature of gas.

Answer the following questions :

- What is significance of K_H ?
- What is slope of the line given in graph?
- Why does solubility of gas in liquid decreases with increase solution in cyclohexane in temperature?
 - Why are cold drinks filled with CO_2 at high pressure?

or

- What is cause of anoxia at high altitude?
- Why do scuba divers take air diluted with helium?

- 30.** Phenols are acidic in nature. In substituted phenols, electron withdrawing groups such as $-\text{NO}_2$, enhances acidic strength of phenol, if $-\text{NO}_2$ group is present at o- and p-position. It is due to effective delocalisation of negative charge on phenoxide ion. Electron releasing groups, such as alkyl groups, do not favour formation of phenoxide ions resulting in decrease in acid strength e.g. cresols are less acidic than phenols.

The following table gives values of some Phenols and Ethanol.

Compound	Formula	pK_a
o-Nitrophenol	o- $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{OH}$	7.2
m-Nitrophenol	m- $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{OH}$	8.3
p-Nitrophenol	p- $\text{O}_2\text{N}-\text{C}_6\text{H}_4-\text{OH}$	7.1
Phenol	$\text{C}_6\text{H}_5\text{OH}$	10.0
o-Cresol	o- $\text{CH}_3-\text{C}_6\text{H}_4-\text{OH}$	10.2
m-Cresol	m- $\text{CH}_3-\text{C}_6\text{H}_4-\text{OH}$	10.1
p-Cresol	p- $\text{CH}_3-\text{C}_6\text{H}_4-\text{OH}$	10.2
Ethanol	$\text{C}_2\text{H}_5\text{OH}$	15.9

Answer the following questions :

- From the above data, how many times phenol is more acidic than ethanol?
 - Out of phenols given in the table, which phenol is most acidic and why?
 - Arrange the following in increasing order of acidic strength :** phenol, o-nitro phenol, m-nitro phenol, p-nitro phenol, p-cresol
 - Why are phenols less acidic than carboxylic acids?
- or
- Arrange 2, 4, 6-trinitro phenol, 3,5-dinitro phenol, 3-nitro phenol, phenol, propan-1-ol, 4-methyl phenol in increasing order of acidic character.
 - Convert phenol to 2, 4, 6-trinitro phenol.

SECTION-E

Directions (Q. No. 31-33) : The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

- 31.** Write a note of effect of substituents on the acidity of phenols.
- 32.** What do you mean by vapour pressure ? What happens to the vapour pressure, when (i) volatile solute is dissolved in solution. (ii) non-volatile solute is dissolved in solution ?

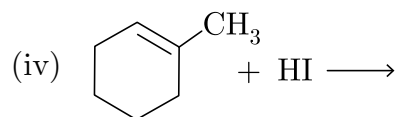
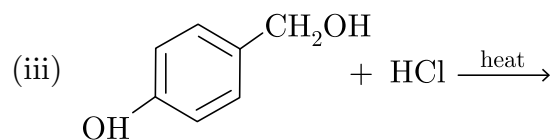
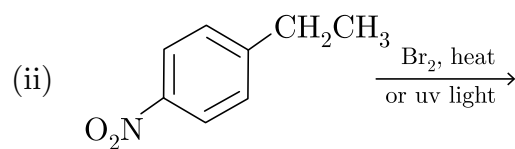
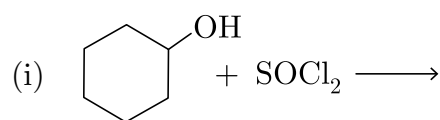
or

Define osmotic pressure. Prove that osmotic pressure is a molecular property.

- 33.** Write the following :
1. Allylic halogenation
 2. Markovnikov's rule
 3. Kharasch effect
 4. Swarts reaction
 5. Finkelstein reaction
 6. Hundsdiecker reaction
 7. Sandmeyer reaction
 8. Preparation of Iodobenzene
 9. Balz-Schiemann reaction
 10. Gattermann reaction.

or

Draw the structures of major mono-halo products in each of the following :



□□□□□□