

SET – 2**sample paper 2021****Class: 12th****Subject: Chemistry Max. Marks: 70****Duration: 03 Hrs 15 mins****Name:****Roll No:****Section:****Invigilator's Sign:****General instructions:**

1. Do not write any answer on the question paper.
2. Attempt all questions and follow the instructions given with question, if any.
3. Marks for each question or parts of it are mentioned in front of the question.
4. 15 minutes have been allotted to read the question paper. You will read the question paper carefully and will not write any answer on the answer script during this time period.
5. Do not unstaple the pages of your question paper if it has multiple pages stapled together.
6. Mention the total number of continuation sheets attached, on the first page of your main answer-sheet.
7. This question paper consists of 8 printed pages.

i There are 33 questions in this question paper. All questions are compulsory.

ii. Section A: Q. No. 1 to 16 are objective type questions. Q. No. 1 and 2 are passage based questions carrying 4 marks each while Q. No. 3 to 16 carry 1 mark each.

iii. Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.

iv. Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.

v. Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.

vi There is no overall choice. However, internal choices have been provided.

vii. Use of calculators and log tables is not permitted.

Set -2**SECTION A (OBJECTIVE TYPE)**

1. Read the passage given below and answer the following questions:

[1 x 4 = 4]

When Lithium ion is doped to well ordered super lattices observed in graphite, polyacetylene and C₆₀Hosts. In situ, resistivity measurements presented a 20-fold decrease upon doping, similar to what is observed in graphite compounds. This can be explained by charge transfer between Li and C again analogous to graphite intercalation compounds. The data exhibited a continuous decrease in charge transfer resistance upon doping consistent with decrease in electronic resistance of the electrode. The high reversible capacity and the high rate performance of single wall carbon nano tubes suggest that they could offer some interest in Li-ion battery applications.

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) Which type of battery is used in mobile phones and laptops?

(a) Silver cell

(b) Mercury cell

(c) Li-ion battery

(d) Ni-Cd cell

(ii) The relationship between specific conductance (K) and resistivity (ρ) is

(a) $\kappa = \frac{1}{\rho}$

(b) $\kappa \times \rho = R$

(c) $\kappa \times \frac{1}{R} = \rho$

(d) $\kappa = \frac{1}{R} \times \rho$

(iii) Δ_m° for NaCl, HCl and CH₃COONa are 126.0, 426. 1000 S cm² mol⁻¹ respectively. If the conductance of 0.001 m CH₃COOH is 5 × 10⁻⁵ S cm⁻¹ the degree of dissociation of CH₃COOH is:

(a) 10%

(b) 12.5%

(c) 15%

(d) 10.5%

(iv) $\ln \Lambda = \Lambda^\circ - A\sqrt{C}$ is equation of straight line, slope and intercept respectively equal to

- (a) $-A, \Lambda^\circ$ (b) $+A, \Lambda^\circ$ (c) $\Lambda^\circ, -A$ (d) $\Lambda^\circ, +A$

Or

When resistivity decreases,

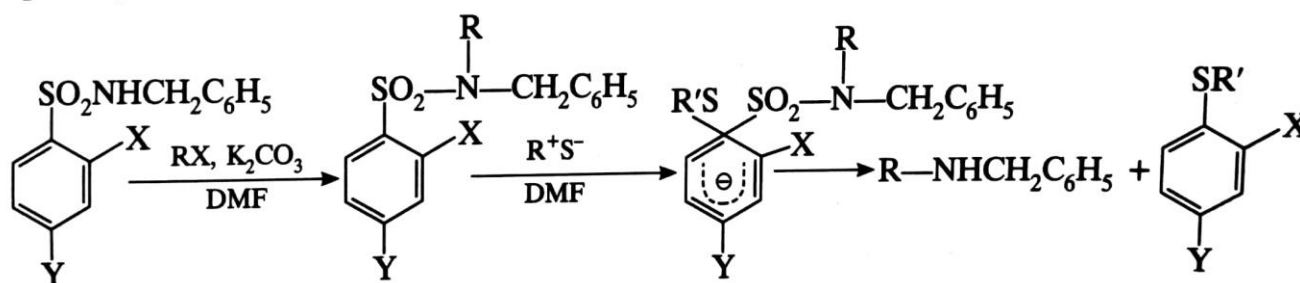
- (a) conductivity decreases (b) conductivity increases
(c) conductivity remains the same (d) resistance increases

2. Read the passage given below and answer the following questions:

[1 x 4 = 4]

2 and 4-Nitrobenzene sulphonamides readily prepared from primary amines, undergo smooth alkylation by Mitsunobu reaction or by conventional methods to give N-alkylated sulphonamides in near quantitative yields. These sulphonamides could be deprotected readily via Meisenheimer complexes upon treatment with thiolates in DMF (Dimethylformamide) at room temperature giving secondary amines in high yields.

Graphic representation



X = NO₂; Y = H

X = H; Y = NO₂

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 correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

(i) Assertion: Isocyanides, on reduction with LiAlH₄ give secondary amines.

Reason: (CH₃)₃CNH₂ is tertiary amine.

(ii) Assertion: CH₃NHC₂H₅ forms yellow oily compound with HNO₂.

Reason: Primary amines liberate N₂ gas with HNO₂.

(iii) Assertion: Sulphonamides are formed when benzene sulphonyl chloride reacts with NH₃.

Reason: Amides are less basic as compared to amines.

(iv) Assertion: Cyanides, on reduction with Na/C₂H₅OH give primary amines.

Reason: Primary amines have lower boiling point than secondary and tertiary amines which are isomeric.

Or

Assertion: p-nitroaniline is less basic than p-toluidine.

Reason: $-\text{NO}_2$ group is electron withdrawing and $-\text{CH}_3$ group is electron releasing.

Following questions (No. 3–11) are multiple choice questions carrying 1 mark each:

3. A hydrogen electrode is dipped in a solution of $\text{pH} = 3.0$ at 298 K. The electrode potential of the hydrogen electrode is

- (a) 0.1773 V (b) 0.0871 V (c) -0.1773 V (d) -0.0591 V

Or

Saturated solution of KNO_3 is used to make salt bridge because

- (a) velocity of K^+ is more than that of NO_3^- (b) velocity of NO_3^- is greater than that K^+
(c) velocity of K^+ and NO_3^- are equal (d) KNO_3 is highly soluble in water

4. Amino acids

- (a) are soluble in water (b) are high melting solids
(c) form internal salt (d) All of these

5. A 20 mL of sample of CuSO_4 (Molar mass = 159.5 g mol^{-1}) solution was evaporated to dryness, leaving 0.967 g of residue. What was molarity of original solution?

- (a) 0.484 M (b) 0.0207 M (c) 4.84 M (d) 0.303 M

6. Which of the following is not stable in aqueous solution?

- (a) Mn^{2+} (b) Cu^{2+} (c) Cu^+ (d) Cr^{3+}

7. The isomer of $\text{C}_3\text{H}_7\text{N}$ which forms yellow oily compound with HNO_2 , is

- (a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ (b) $\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}_3 \\ | \\ \text{NH}_2 \end{array}$
(c) $(\text{CH}_3)_3\text{N}$ (d) $\text{CH}_3\text{NHC}_2\text{H}_5$

Or

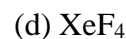
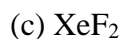
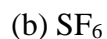
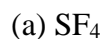
Which of the following forms salt soluble in water with HNO_2 .

- (a) CH_3NH_2 (b) $(\text{CH}_3)_3\text{N}$ (c) CH_3NHCH_3 (d) $\text{CH}_3\text{CH}_2\text{NHCH}_3$

8. Which of the following complex is most stable?

- (a) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ (b) $[\text{Co}(\text{CN})_6]^{3-}$ (c) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (d) $[\text{CoF}_6]^{3-}$

9. Which of the following cannot be hydrolysed?



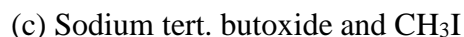
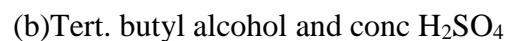
Or

Hydrolysis of which of the following is not a redox reaction?



(d) None of these

10. Which of the following will give methyl tert.butyl ether?



(d) All of these

11. Lithium has bcc structure. Its density is 0.53 g cm⁻³ and its atomic mass is 7.00 g mol⁻¹. The edgelength of unit cell of lithium metal is (Given: $\sqrt{43.7} = 3.53$)

(a) 353 pm

(b) 400 pm

(c) 300 pm

(d) 350 pm

Or

In fcc, what is volume occupied by spheres?

(a) $\frac{4}{3}\pi r^3$

(b) $\frac{8}{3}\pi r^3$

(c) $\frac{16}{3}\pi r^3$

(d) $\frac{64r^3}{3\sqrt{3}}$

In the following questions (Q. No. 12 – 16), 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 correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

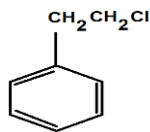
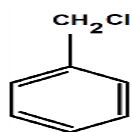
(d) Assertion is wrong statement but reason is correct statement.

12. Assertion: α -glucose and β -glucose differ in position of -OH group on C-1 carbon.Reason: α - and β -glucose differ in optical rotation and melting point.

13. Assertion: F, has high reactivity.

Reason: F-F has low bond dissociation enthalpy, high electron gain enthalpy, F⁻ has highest hydration enthalpy among halide ions.

14. Assertion: Benzene and toluene form ideal solutions.

Reason: $\Delta H = 0$, $\Delta V = 0$ for ideal solution.15.
mechanism.Assertion: reacts faster than towards S_N1Reason: Benzyl carbocation is more stable than C₆H₅CH₂CH₂ due to resonance.

16. Assertion: The IUPAC name of $\text{CH}_3\text{-CH-COOH}$ is lactic acid.



Reason: Lactic acid is present in curd due to which it is sour in taste.

Or

Assertion: Alcohols are more basic than phenol.

Reason: RO^- is more stable than $\text{C}_6\text{H}_5\text{O}^-$.

SECTION B

The following questions, Q. No 17-25 are short answer type and carry 2 marks each.

17. (a) Why does *p*-dichloro benzene have zero dipole moment?

(b) CH_2Cl_2 has higher dipole moment than CHCl_3 ?

18. Find the molality of 95 % mass by volume of H_2SO_4 solution whose density is 1.95 g cm^{-3} . (Molar mass of H_2SO_4 is 98 g mol^{-1})

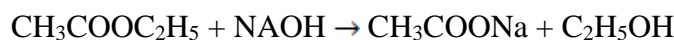
19. (a) $[\text{NiCl}_4]^{2-}$ is paramagnetic, whereas $[\text{Ni}(\text{CO})_4]$ is diamagnetic though both are tetrahedral, why?

(b) Explain $[\text{Co}(\text{NH}_3)_6]^{3+}$ is inner orbital complex, whereas $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is an outer orbital complex.

[Atomic number of Co = 27, Ni = 28]

20. (a) If ' α ' is initial concentration of reaction, what is relationship between half life of *n*th order and initial concentration.

(b) What is molecularity and order of following reaction?



21. (a) Name two factors which affect the adsorption of gas on solid?

(b) Name the method by which gold sol is prepared.

Or

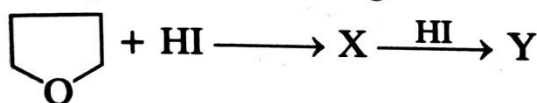
Define (i) Zeta potential (ii) Kraft temperature.

22. (a) Why is CH_3OH more acidic than $\text{C}_2\text{H}_5\text{OH}$?

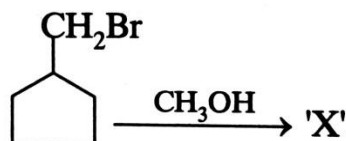
(b) What is bond angle C-O-C in diethyl ether and why?

Or

Complete the following reactions:



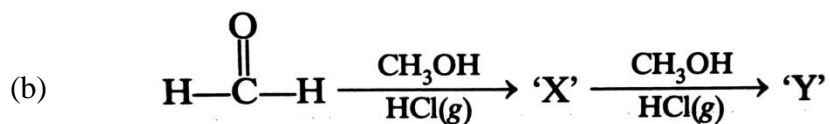
23. Write mechanism of the reaction and correct product.



24. A compound with the formula $C_6H_{12}O$ gives a negative Tollens' reagent test and a positive iodoform test. It produces semicarbazone and can be reduced to n-hexane with Clemmensen reduction. Identify the compound.

Or

(a) What happens when aniline reacts with benzaldehyde?



Identify 'X' and 'Y'.

25. Tungsten has body-centred cubic lattice with edge length 300 pm. If its molar mass is 184 g mol^{-1} calculate its density.

SECTION C

Q.No 26-30 are Short Answer Type II carrying 3 marks each.

26. (a) Why Cr^{2+} good reducing agent?

(b) Why does 'Eu' show +2 oxidation state?

(c) Why do Zr and Hf resemble with each other?

Or

(a) Why do transition metals have high melting point?

(b) Why do transition metals form complexes.

(c) Why are transition metals less electropositive than s-block element?

27. How do you convert the following:

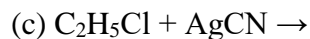
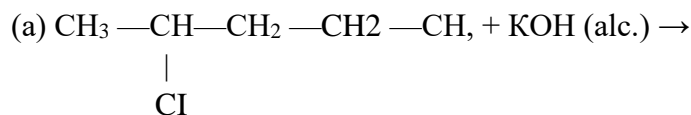
(a) Prop-1-ene to 1-fluoropropane

(b) Chlorobenzene to 2-chlorotoluene

(c) Ethanol to propane nitrile

Or

Complete the following reactions and write the major product.



28. Some ethylene glycol, $\text{HOCH}_2-\text{CH}_2\text{OH}$ is added to your car's cooling system along with 5 kg of water. If freezing point of water glycol solution is -15.0°C , what is the boiling point of the solution? ($K_b = 0.52 \text{ K kg mol}^{-1}$, $K_f = 1.86 \text{ K kg mol}^{-1}$ for water.)

29. (a) What is difference between native protein and denatured protein?
 (b) What are globular proteins?
 (c) What is meant by primary structure of protein?
30. (a) Write the structure formula of Amminechlorido(ethane 1,2-diamine)platinum(II) nitrate.
 (b) What is coordination number of platinum in above complex? Give reason?
 (c) What is hybridisation in $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ and its shape?

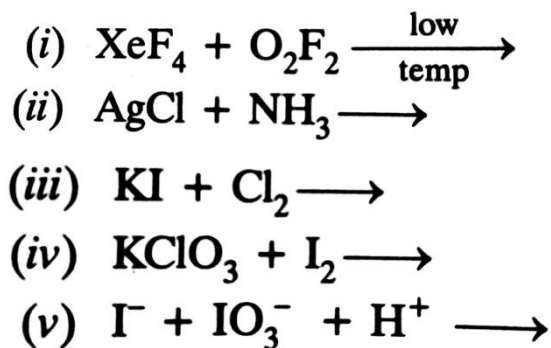
SECTION D

Q.No 31 to 33 are long answer type carrying 5 marks each.

31. (a) Why are group 16 elements called chalcogens?
 (b) ClF_3 is more reactive than Cl_2 , why?
 (c) Why does boiling points of HCl , HBr , HI increase down the group except HF ?
 (d) O_3 is strong oxidising agent, why?
 (e) Why are two bonds in O_3 equal?

Or

Complete the following reactions:



32. Compound A having molecular formula $(\text{C}_7\text{H}_7\text{ON})$, on treatment with Br_2 and KOH gives 'B' ($\text{C}_6\text{H}_7\text{N}$) which on diazotization gives 'C'. 'C' reacts with aqueous solution of H_3PO_2 and forms 'D'. 'C' on reaction with KI gives 'E'. Identify 'A' to 'E' and write the chemical reactions involved.

Or

(a) Carry out the following conversions:

- (i) Aniline to 4-bromoaniline
 (ii) Benzene diazonium chloride to benzylamine
 (ii) Nitrobenzene to phenol.

(b) Arrange the following:

- (i) $\text{C}_2\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_3\text{N}$, $(\text{C}_2\text{H}_5)_2\text{NH}$ in increasing order of their boiling point.

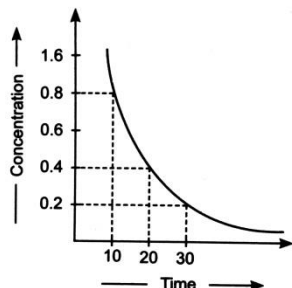
(ii) Aniline, p-nitroaniline, p-methyl aniline in increasing order of their basic strength.

33. (a) What is rate of reaction? Write two factors that affect the rate of reaction.

(b) Analyse the given graph drawn between conc. of reactants vs time.

(i) Predict the order of reaction.

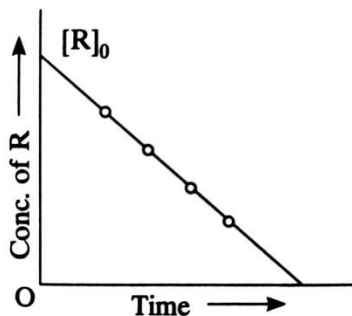
(ii) Theoretically can the concentration of reaction reduce to zero after infinite time? Explain.



Or

(i) In the reaction, $Q + R \rightarrow \text{Products}$,

the time taken for 99% reaction of 'Q' is twice the time taken for 90% reaction of Q. The concentration of 'R' varies with time as shown in figure. What is overall order of the reaction? Give the units of the rate constant for the same. Write the rate expression for the above reaction.



A first order reaction takes 23.1 minutes for 50% completion. Calculate the time required for 75% completion of this reaction. ($\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$)

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