CHEMISTRY

Paper – 1 (THEORY)

Three hours and a quarter

"MURTHBOUNTS, COM (The first 15 minutes of the examination are for reading the paper only. Candidates must NOT start writing during this time). Answer all questions in Part I. From Part II, answer any four questions from Section A, any three questions from Section B and any two questions from Section C. All workings, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer. The intended marks for questions are given in brackets []. Balanced equations must be given wherever possible and diagrams where they are helpful. When solving numerical problems, all essential working must be shown. *In working out problems, use the following data:* Gas Constant R = 1.987 cal $deg^{-1} mol^{-1} = 8.314 \text{ JK}^{-1} mol^{-1} = 0.0821 \text{ dm}^3 \text{ atm K}^{-1} mol^{-1}$ PART I (40 marks) Answer all questions. Question 1. [4] Correct the following statements. Colligative properties are used for determining melting and boiling points. An invariant system has three degrees of freedom. Electrical neutrality in the electrochemical cell is maintained by the electrode potential. Freezing of water involves increase in randomness and decrease in

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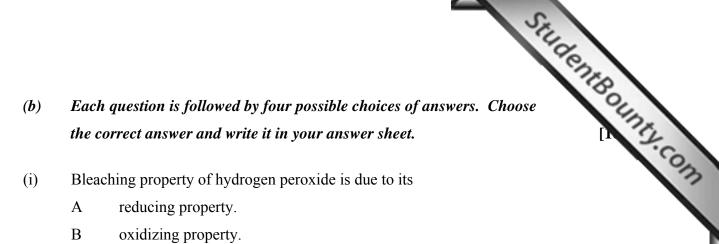
(a)

(i)

(ii)

(iii)

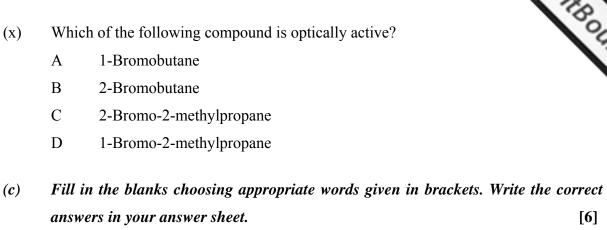
(iv)



- Bleaching property of hydrogen peroxide is due to its (i)
 - Α reducing property.
 - oxidizing property. В
 - \mathbf{C} thermal unstability.
 - acidic nature. D
- (ii) Which acid is the strongest?
 - HCOOH. A
 - В CH₃COOH.
 - \mathbf{C} Cl₃CCOOH.
 - ClCH₂COOH. D
- (iii) Buffer solution is a mixture of
 - weak base and weak acid. A
 - В weak base and strong acid.
 - \mathbf{C} weak acid and conjugate acid.
 - D weak acid and its conjugate base.
- (iv) One of the raw material to form nylon 66 is
 - A adipic acid.
 - В butadiene.
 - \mathbf{C} ehtylene.
 - D isoprene.

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- (v) Hydrogenation of benzoyl chloride in presence of Pd and BaSO₄ givesA benzyl alcohol.
 - B benzaldehyde.
 - C benzoic acid.
 - D phenol.
- (vi) 1.0g of radioactive isotope was found to reduce to 125 mg after 24 hours, the half-life of the isotope is
 - A 4 hours.
 - B 6 hours.
 - C 8 hours.
 - D 24 hours.
- (vii) Which of the following has the highest bond angle?
 - A CH₄
 - B NH₃
 - C BeF₂
 - D H₂O
- (viii) Electromeric effect arises due to
 - A polarity in the molecule.
 - B electrons in sigma bond.
 - C distortion of the electron cloud.
 - D demand of the attacking reagent.
- (ix) When glucose is heated with Fehling's solution, it gives a precipitate of
 - A Cu.
 - B CuO.
 - C Cu_2O .
 - D Cu_2O_2 .



answers in your answer sheet.

(ethyl alcohol, anode, formaldehyde, toluene, cathode, ether, ammonia, aldehyde, benzene)

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- (i) In a galvanic cell, the movement of current in the external circuit is from to
- (ii) Urotropine is obtained by the reaction of with
- (iii) A tincture of iodine contains iodine in potassium iodide and
- (iv) When phenol is distilled with zinc, is formed.
- (d) Match the items of column A with the items in column B. Rewrite the correct pairs in your answer sheet. [4]

| Column A | Column B |
|---|----------------------------------|
| (i) anisotropic | (a) lead sulphide |
| (ii) glasses | (b) strong base Vs. weak acid |
| (iii) electrophiles(iv) methyl orange(v) nucleophiles | (c) hydroxyl ion |
| | (d) tin stone |
| | (e) silver glance |
| (vi) phenolphthalein | (f) silicon |
| (vii) galena | (g) graphite |
| (viii)cassiterite | (h) strong acid Vs. weak base |
| | (i) super cooled liquids |
| | (j) NO ₂ ⁺ |
| | $0)$ 100_2 |

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PART II

Answer any four questions.

SECTION A (28 marks)

Question 2.

- "AGENTBOUNTY.COM (a) An aqueous solution of cane sugar freezes at -0.372°C. Calculate the molaity of the solution. [The cryoscopic constant (K_f) of water is 1.86 K mol⁻¹ Kg⁻¹] [2]
- (b) The boiling point of 0.1M BaCl₂ is higher than the boiling point of 0.1M urea. Give a reason. [2]
- On the basis of molecular Orbital Theory, state the following for O_2 and O_2^+ : [3] (c)
 - electronic configuration (i)
 - bond order (ii)
 - diamagnetic / paramagnetic (iii)

Question 3.

- A piece of wood was found to have C^{14}/C^{12} ratio 0.7 times that in a living plant. (a) Calculate the period when the plant died. [Half life of $C^{14} = 5760$ years] [3]
- (b) Complete and balance the following nuclear equations. [1]
 - ${}_{28}\text{Ni}^{58} + {}_{1}\text{H}^{1} \rightarrow \dots + {}_{0}\text{n}^{1}$
 - $_{15}P^{31} + \dots \longrightarrow _{15}P^{32} + _{1}H^{1}$ (ii)
- Give the graphical representation of Arrhenious equation showing the (c) (i) variation of rate constant with temperature. [2]
 - (ii) How will you find the energy of Activation from the above graph? [1]

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Question 4.

- On the basis of copper crystal, answer the following: (a)
 - (i) nature of bond holding the particles together.
 - (ii) type of unit cell.
- ARIGENT BOUNTS, COM 10g of an organic compound is present in 100cm³ of water. You are provided (b) with 100cm³ of ether to recover it from water. Show by calculation that it is better to use two lots of 50cm³ ether rather than in one lot of 100cm³. The given organic compound is 4 times soluble in ether than in water. [4]
- What type of hybridization exists in diamond and graphite? (c) [1]

Question 5.

- If the solubility of the sparingly soluble salt silver chromate (a) (Ag₂CrO₄) is 'S'. How can you relate its solubility with its solubility product? [2]
- For a standard cell, (b) [3] $Cu_{(s)} / Cu^{2+}_{(aq)} / / Ag^{+}_{(aq)} / Ag_{(s)}$

Given
$$E^0 Cu^{2+} / Cu = +0.34v$$
 and $E^0 Ag^+ / Ag = +0.80v$

- (i) Identify the cathode and anode.
- Write the reaction taking place at the cathode and anode. (ii)
- (iii) Calculate the standard cell potential (e.mf).
- (c) What is a catalytic promoter? Mention its significance in chemical processes. [2]

Question 6.

- (a) Based on the collision theory, explain the factors which affect the rate of a reaction. [3]
- Define Phase rule? Write its mathematical form. What will be the degree of (b) freedom for water system at the triple point? [2]

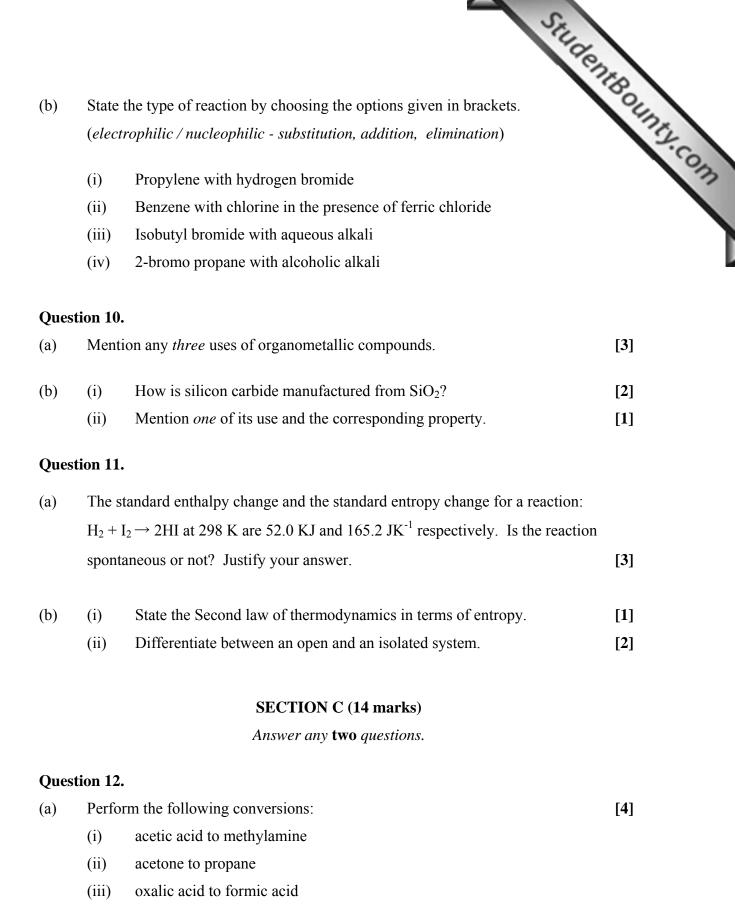
| | | N.BOL | |
|------|--|-------|--|
| (c) | Cations of Group IV are precipitated as sulphide in ammonical medium. | | |
| () | Explain the statement. | [2] | |
| | | | |
| Ques | stion 7. | | |
| (a) | The resistance of 0.05N solution of an electrolyte is 200 Ohms. Calculate | | |
| | (i) conductance. | | |
| | (ii) specific conductance. | | |
| | The cell constant of the conductivity cell is 2.0 cm ⁻¹ . | | |
| (b) | Aqueous solution of ammonium chloride is acidic while that of sodium acetate is | | |
| | basic. Prove this statement. | [2] | |
| | | | |
| (c) | | | |
| | What does it signify? | [3] | |
| | SECTION B (18 marks) | | |
| | Answer any three questions. | | |
| | The state of the s | | |
| Ques | stion 8. | | |
| (a) | How is copper extracted from copper pyrites? Give the equations for the | | |
| | chemical changes involved. | [4] | |
| (b) | The reaction: $RX + OH^{-} \rightarrow ROH + X^{-}$ is found to be first order. | [2] | |
| | (i) What type of reaction does RX undergo? | | |
| | (ii) Name an alkyl halide which undergoes this type of reaction. | | |
| | | | |
| Ques | stion 9. | | |
| (a) | Write the balanced equations for the following: | [2] | |
| | (i) Hydrochloric acid is added to sodium thiosulphate solution. | | |

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Hydrogen sulphide is bubbled through copper sulphate solution.

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(ii)



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- (i) Zwitter ion
- (ii) Soap

Question 13.

(a) Complete the following and name the reaction.

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(i)
$$C_6H_5Cl + 2Na + C_6H_5Cl \rightarrow \dots + \dots$$

- (ii) $C_6H_5NH_2 + CHCl_3 + KOH \rightarrow \dots + \dots + \dots + \dots$
- (b) Carry out the following conversions:

[3]

- (i) starch to glucose
- (ii) glucose to fructose

Question 14.

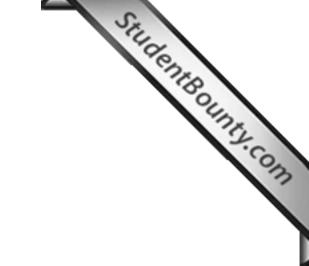
(a) Compound 'A' has molecular formula C₂H₄O₂. On chlorination with phosphorus pentachloride, a compound 'B' is formed. The compound 'B' on further reaction with ammonia forms 'C'. The product 'C' reacts with bromine water and alkali giving 'D'. Identify A, B, C and D.

[4]

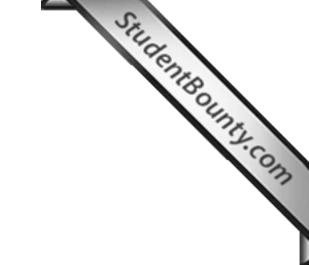
(b) Give the reactions for the synthesis of the following polymers:

[3]

- (i) Terylene
- (ii) Teflon



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