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CHEMISTRY HSSC-I
SECTION – A (Marks 17)

Time allowed: 25 Minutes

Version Number	1	8	4	6
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Note: Section – A is compulsory. All parts of this section are to be answered on the separately provided OMR Answer Sheet which should be completed in the first 25 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

- Q. 1** Choose the correct answer A / B / C / D by filling the relevant bubble for each question on the OMR Answer Sheet according to the instructions given there. Each part carries one mark.
- 1) If the amount of a product obtained in a chemical reaction is 250 g while its theoretical yield is 500 g. Its percentage yield will be:
A. 25% B. 35% C. 45% D. 50%
 - 2) According to Bohr's atomic theory, the angular momentum (mvr) of an electron is equal to:
A. $\frac{nh}{2\pi}$ B. $\frac{nh}{\pi}$ C. $\frac{3nh}{2\pi}$ D. $\frac{2nh}{\pi}$
 - 3) In H_2O molecule, there are two bond pairs and two lone pairs around the central atom. Its molecular shape will be:
A. Tetrahedral B. Trigonal planer C. V-shaped D. Trigonal pyramidal
 - 4) Which one of the following is different from others?
A. 1atm B. 14.7Psi C. 760 torr D. 273 °C
 - 5) Surface tension of a liquid is directly related to the strength of inter molecular force of attraction. Indicate the one with lowest surface tension among the following:
A. Benzene B. Water C. Methanol D. Ethanol
 - 6) Carbon exists in both, diamond (cubic form) and graphite (hexagonal form). This phenomenon is known as:
A. Isomorphism B. Polymorphism C. Allotropy D. Anisotropy
 - 7) Consider the following reaction. $NO_{(g)} + O_{3(g)} \longrightarrow NO_{2(g)} + O_{2(g)}$ Rate = $K[NO][O_3]$. Which statement is NOT correct about the given reaction?
A. The reaction is of first order with respect to NO
B. The reaction is of first order with respect to O_3
C. If $[O_3]$ is constant and $[NO]$ is increased twice, the rate of reaction will be increased thrice
D. If $[NO]$ is constant and $[O_3]$ is increased twice rate, the of reaction will be increased twice
 - 8) If pK_a values of different acids are given below, indicate the strongest acid among them:
A. -10.0 B. -9.0 C. -7.0 D. -3.0
 - 9) The rate of a chemical reaction is measured in:
A. $mol.dm^{-3}.S^{-1}$ B. $mol.dm^3.S^{-1}$ C. $mol.dm^3.S$ D. $dm^3.mol^{-1}.S^{-1}$
 - 10) 100g of 10% (W/W) NaOH solution contains 10g of NaOH in:
A. 10g of H_2O B. 90g of H_2O C. 100g of H_2O D. 110g of H_2O
 - 11) "The net heat change in a chemical reaction is same whether, it is brought about in one step or more than one step". It is known as:
A. Henry's law B. Joule Thomson's Effect
C. Hess's law D. Law of conservation of energy
 - 12) The amount of a substance produced during electrolysis by passing one Faraday of electricity is called:
A. Atomic weight B. Equivalent weight
C. Formula weight D. Empirical formula weight
 - 13) What could be the geometrical shape of SF_6 according to VSEPR theory?
A. Trigonal pyramidal B. Tetrahedral
C. Octahedral D. Trigonal bi pyramidal
 - 14) Number of Hydrogen atoms in 1 mole of H_2O is:
A. 6.022×10^{23} B. $2 \times 6.022 \times 10^{23}$ C. $3 \times 6.022 \times 10^{23}$ D. $4 \times 6.022 \times 10^{23}$
 - 15) Which of the following is NOT true for cathode rays?
A. Cathode rays are negatively charged
B. They can produce X-Rays when they strike on an anode
C. They cast a shadow when an opaque medium is placed in their path
D. Their e/m value depends upon the nature of gas in discharge tube
 - 16) K_p, K_c, K_n and K_x are equilibrium constants in terms of pressure, concentration, moles and mole fraction. These constants can be equal when:
A. $\Delta n = 0$ B. $\Delta n = 1$ C. $\Delta n = 2$ D. $\Delta n = 3$
 - 17) The solution in which pH is maintained, when a small amount of acid or base is added to it, is known as:
A. Aqueous solution B. Dilute solution
C. Concentrated solution D. Buffer solution



CHEMISTRY HSSC-I

Time allowed: 2:35 Hours

Total Marks Sections B, C and D: 68

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 to 6)

Q. 2 Answer any SEVEN parts. All parts carry equal marks.

(7 x3 = 21)

- (i) How many covalent bonds are present in 16 grams of O_2 ? (Molar mass of O = 16 gm/mol)
- (ii) What is the relationship between:
 - a) Energy and wavelength
 - b) Frequency and wavelength
- (iii) 1, 2-dichloroethene has cis and trans isomers.
 - a) Draw the structure of these isomers
 - b) Which of them will have $\mu=0$? (where μ is dipole moment)
- (iv) If 465cm^3 of SO_2 can diffuse through porous partition in 30 seconds. How long will 620cm^3 of H_2S take to diffuse through the same partition? [Atomic masses (amu): H = 1, S = 32, O = 16]
- (v) Give any three properties of Plasma.
- (vi) Differentiate between the following:
 - a) Isomorphism and polymorphism
 - b) Amorphous Solids and Crystalline Solids
- (vii) Write the electronic configuration of the following with the help of 'n+l' rule:
 - a) ${}_{25}\text{Mn}$
 - b) ${}_{13}\text{Al}^{3+}$
- (viii) Speed of chemical reaction of covalent compound is slow as compared to ionic compound Justify the statement.
- (ix) Briefly explain why the climate near large water bodies is moderate than interior of the land?
- (x) A photon of light with energy 10^{-19}J is emitted by a source. Find the wave number ($\bar{\nu}$) associated with this energy. (Plank's constant = $6.625 \times 10^{-34}\text{J.S}$, Speed of light = $3.0 \times 10^8\text{ m.s}^{-1}$)

SECTION – C (Marks 21)

(Chapters 7 to 12)

Q. 3 Answer any SEVEN parts. All parts carry equal marks.

(7 x3 = 21)

- (i) Predict the direction of reversible reaction if:
 - a) $Q = K_c$
 - b) $Q > K_c$
 - c) $Q < K_c$

Where $Q = \frac{[\text{product}]}{[\text{reactant}]}$ and $K_c = \text{Equilibrium constant}$

- (ii) How many types of chemical equilibrium are there with respect to physical state of reactants and products? Give an example of each.
- (iii) How many types of salts are there on the basis of reactivity with water? Give an example of each.
- (iv) Calculate pOH of 0.001 M HCl solution.

- (v) Define the following:
- Rate equation
 - Order of reaction
- (vi) (a) Indicate the Slow step (b) Determine the order of reaction (c) Write overall reaction, with the help of the information given below:

$$\text{Rate} = k[\text{NO}_2]^2$$

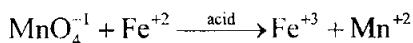
Step 1



Step 2



- (vii) Describe Henry's law and give its one application.
- (viii) Describe the difference between Heat capacity and Molar heat capacity.
- (ix) Write oxidation and reduction half equations from the following redox equation.



- (x) Is the following reaction feasible? (The standard reduction potential values are $E_{\text{Sn}}^0 = -0.14 \text{ V}$ $E_{\text{Fe}}^0 = -0.44 \text{ V}$)



SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks.

(13 x 2 = 26)

(Question 4 from Chapters 1 to 6)

- Q. 4** a. What is surface tension? Also explain in detail the factors affecting it (02+05)
- b. Define the type of solids to which the following substances belong: (06)
- Ice
 - Table salt
 - Diamond

(Question 5 from Chapters 7 to 12)

- Q. 5** a. 1.89 g of an organic compound A was dissolved per 85 cm³ of water (density_{water} = 0.998 gm cm⁻³). The boiling point under one atmospheric pressure of this solution is increased to 100.106 °C. What is the molecular mass of A? (05)
- b. Write the balanced chemical equation associated with each of the following: (values of ΔH° are not required) (08)
- Standard enthalpy of sublimation of iodine.
 - Standard enthalpy of formation of C₂H₃Cl(g)
 - Standard enthalpy of combustion of benzene (l)
 - Standard enthalpy of neutralization

(Question 6 Part (a) from Chapters 1 to 6 and Part (b) Chapters 7 to 12)

- Q. 6** a. NH_{3(g)} is obtained by the combination of N_{2(g)} and H_{2(g)} as shown by the following balanced equation. (Molar mass: Nitrogen = 14, Hydrogen = 1 gm/mol) (06)
- $$\text{N}_{2(\text{g})} + 3\text{H}_{2(\text{g})} \longrightarrow 2\text{NH}_{3(\text{g})}$$
- How many moles of N₂ and H₂ are required to manufacture 50g of NH₃?
- b. Balance the following redox reaction by using oxidation number method. (07)
- $$\text{P} + \text{HNO}_3 \longrightarrow \text{H}_3\text{PO}_4 + \text{NO}$$



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Time allowed: 2:35 Hours

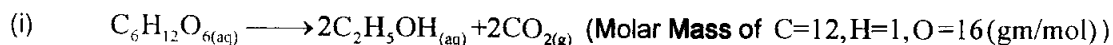
Total Marks Sections B, C and D: 68

NOTE: The Questions of sections B, C and D are to be answered on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)

(Chapters 1 to 6)

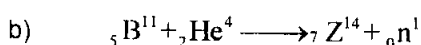
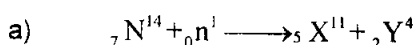
Q. 2 Answer any SEVEN parts. All parts carry equal marks. (7 x3 = 21)



a) What is theoretical yield of ethanol from 10.0 g of glucose ($C_6H_{12}O_6$) ?

b) If in a particular reaction, 10 g of glucose ($C_6H_{12}O_6$) produces 0.664 g of ethanol (C_2H_5OH), Find the percentage yield of Ethanol.

(ii) What are X, Y, and Z in the following reactions?



(iii) What could be the shape of the molecules having following electron pairs around central atom? Give examples.

No of lone pairs	No of bond pairs
0	4
1	3
2	2

(iv) " O_2 is paramagnetic and N_2 is diamagnetic in nature". How can you justify this statement by using molecular orbital theory?

(v) In a Pressure cooker, food can be cooked quickly, as compared to the simple cooker, Give reason.

(vi) How does the electron gas theory explain metallic bonding?

(vii) What is anisotropy? Explain briefly with example.

(viii) "Real gases deviate from the ideal behaviour at high pressure and low temperature". Give two valid reasons to explain this behaviour.

(ix) Find total pressure exerted by 2 grams of ethane (C_2H_6) and 3 grams of CO_2 contained in a 5 dm^3 vessel at 50°C . (Molar mass of C, O and H are 12, 16, 1 gm/mol, respectively; $R=0.0821\text{ atm.K}^{-1}.\text{mol}^{-1}$)

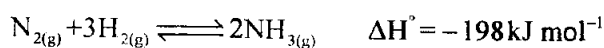
(x) What is Pauli's exclusion principle?

SECTION – C (Marks 21)

(Chapters 7 to 12)

Q. 3 Answer any SEVEN parts. All parts carry equal marks. (7 x3 = 21)

(i) Predict the effect of change in pressure and temperature on the chemical equilibrium in the given reaction.



(ii) The solubility of AgBr is $7.1 \times 10^{-7}\text{ M}$ at 25°C . Calculate its K_{sp}

- (iii) Define the following:
- Acid dissociation constant (K_a)
 - Base dissociation constant (K_b)
- (iv) Which of the following reactions will show high rate of reaction? Also give reason.
- $$\text{Zn}_{(s)} + 2\text{HCl}_{(aq)} \longrightarrow \text{ZnCl}_{2(aq)} + \text{H}_{2(g)} \quad (\text{Zn in powdered form})$$
- (OR)**
- $$\text{Zn}_{(s)} + 2\text{HCl}_{(aq)} \longrightarrow \text{ZnCl}_{2(aq)} + \text{H}_{2(g)} \quad (\text{Zn in form of big pieces})$$
- (v) Define the term "Water of crystallization". Also give two examples of it.
- (vi) One molar aqueous solution of sugar is more concentrated as compared to one molal aqueous solution of sugar at room temperature. Justify the statement.
- (vii) "The standard enthalpy of formation of $\text{SO}_{3(g)}$ is -395.2kJ/mol ". Show the given information with the help of a valid chemical equation.
- (viii) What is electromotive force (emf)? Also define the term Volt.
- (ix) Calculate E°_{cell} and also predict whether or not the cell is feasible:
- $$E^\circ_{\text{Cathode}} = -0.25\text{ V}$$
- $$E^\circ_{\text{Anode}} = -2.38\text{ V}$$
- (x) How many types of salts are there? Give an example of each.

SECTION – D (Marks 26)

Note: Attempt any TWO questions. All questions carry equal marks.

(13 x 2 = 26)

(Question 4 from Chapters 1 to 6)

- Q. 4**
- What is viscosity? Explain the factors affecting it. (02+05)
 - Describe the differences between molecular orbital theory and valence bond theory. (06)

(Question 5 from Chapters 7 to 12)

- Q. 5**
- What is Standard Hydrogen Electrode (SHE). Explain in detail. (07)
 - Define the following terms with examples: (06)
 - State function
 - Heat Capacity
 - Enthalpy of substance

(Question 6 Part (a) from Chapters 1 to 6 and Part (b) Chapters 7 to 12)

- Q. 6**
- Calculate the following in 10g of NH_3 at STP (Molar masses: N=14, H=1 gm/mol): (06)
 - Number of moles
 - Number of molecules
 - Volume in dm^3
 - What is Le-Chatelier's principle? Describe three major steps which could be taken in order to get maximum yield of NH_3 in Haber's process. (02+05)

— 1HA 1809 (ON) —