HCCS EDUCATIONAL SYSTEM

HSSC – I

CHEMISTRY –I

SECTION – A (Marks 17)

Time Allowed: 25 minutes

ROLL NUMBER					
B					
	0	0	0	0	0
	1	1	1	1	1
	2	2	2	2	2
	3	3	3	3	3
	4	4	4	4	4
	5	5	5	5	5
	6	6	6	6	6
	7	7	7	7	7
	8	8	8	8	8
	9	9	9	9	9

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/ overwriting is not allowed. Do not use lead pencil.

حصہ اول لازمی ہے۔ اس کے جوابات اسی صفحہ پر دے کر ناظم مرکز کے حوالے کریں۔ کاٹ کر دوبارہ لکھنے کی اجازت نہیں ہے۔ لیڈ پنسل کا استعمال ممنوع ہے۔

SENDUP EXAMS, 2023

Student Name: _____ **Answer Sheet No:** _____

Candidate Sign. _____ **Invigilator Sign:** _____

ہر سوال کے سامنے دیے گئے، کریکولم کے مطابق درست دائرہ کو پر کریں۔

Fill the relevant bubble against each question according to curriculum:

	Questions سوال	A	B	C	D	A	B	C	D
1.	Rate equation for a reaction 2A product is Rate = K $[A]^2$. Unit of specific rate constant for this reaction is:	$mol^2dm^{-6}\ S^{-1}$	$mol^{-1}dm^3\ S^{-1}$	$moldm^{-3}$	S^{-1}	○	○	○	○
2.	A substance which itself is not a catalyst but increases the activity of a catalyst is called:	Enzymes	Inhibitors	Promoters	Poisoner	○	○	○	○
3.	Mixture containing 0.01 mole/300cm3 of NH4Cl and 0.1 mole/400cm3 of NH4OH having pK_b = 5 has pH of:	4.12	3.98	4.00	10.0	○	○	○	○
4.	5g of urea (M.wt = 60) is dissolved in 250 cm3 of its solution. Concentration of solution will be:	5 % w/w	5 % v/w	0.34 M	0.34m	○	○	○	○
5.	The gaseous element X exists in diatomic form. One volume of the element X combines with two volume of hydrogen to form two volume of gaseous hydride. What is the formula of hydride of X.?	HX_2	HX_3	H_2X	HX	○	○	○	○
6.	The number of bonds in one molecule of Nitrogen is:	one σ and one pie	one σ and two pie	three σ bond	two σ and one pie	○	○	○	○
7.	Splitting of spectral lines by placing the excited atom in electric field is called:	Zeeman effect	Stark effect	Photoelectric effect	Compton effect	○	○	○	○

8.	In the ground state of an atom, the electron is present:	in the valence shell	in the second shell	nearest to the nucleus	farthest from the nucleus	○	○	○	○
9.	pH of 1×10^{-4} M solution of Phosphoric acid is:	1.10	2.02	3.52	4.13	○	○	○	○
10.	Diamond is bad conductor of electricity because of:	Tight structure	High density	No free electrons	Transparent of light	○	○	○	○
11.	Which of these samples of gas contains the same number of atoms as 1g of hydrogen molecule? (At. Mass C = 12, O = 16, H = 1, Ne = 20)	22 g of CO2	8 g of CH4	20 g of Ne	8 g of O3	○	○	○	○
12.	In which one of the following pairs do the molecules have similar shapes?	CO_2 and $AlCl_3$	NH_2^{-1} and H_2O	CH_4 and PH_3	NH_3 and BCl_3	○	○	○	○
13.	For principle quantum number, n = 4, the total number of orbitals having l = 3 and m = -1,0 is	4	6	10	14	○	○	○	○
14.	In the mixture of NO and CO_2 containing 4 mole of NO and 0.9 mole CO_2 at initially. At equilibrium 0.1 mole of CO_2 was present what is K_c? $NO + CO_2 \rightarrow NO_2 + CO$	0.2	2.0	0.5	5.0	○	○	○	○
15.	The solubility of A_2B_3 is x mol L^{-1}. It solubility product is:	$6x^5$	$64x^5$	$36x^5$	$108x^5$	○	○	○	○
16.	For the reaction products, doubling the concentration of A the rate of the reaction is doubled, but on doubling the concentration of B rate remains unaltered. The overall order of the reaction is:	1	0	2	3	○	○	○	○
17.	Octet rule is not followed in the formation of:	PCl_5	CCl_4	NF_3	CF_4	○	○	○	○

HCCS Educational System

(SENDUP EXAMS, 2023)

CHEMISTRY HSSC–I

Time allowed: 2:40 Hours **Total Marks: 68**

Note: Answer all parts from Section 'B' and all questions from Section 'C' on the E-sheet. Write your answer on the allotted/given spaces.

SECTION-B (Marks 42)

Q.2 Attempt all parts questions. All questions carry equal marks. (14 x 3 = 42)

i. The bond angles of H_2O and NH_3 are not 109.5° as that of CH_4. Although O and N atoms are Sp3 hybridized. Give reason. **(1+2)**

OR

Explain the origin of spectral lines of Lyman, Balmer and Paschen series in H-atom. **(1+1+1)**

ii. How many grams of NH3 will have the same number of molecules as 15.0 g of C6H6? **(3)**
[C=12, H=1]

OR

How can sodium chloride and glucose be dissolved in water? What important forces exist between solute and solvent particles in these solutions? **(1.5 + 1.5)**

iii. Calculate molality of aqueous solution of sulfuric acid from the following data. **(1+2)**
Molar mass 98, Molarity 18M & Density in g/Cm3 1.84

OR

Find PH of buffer (CH_3COOH/CH_3COONa) containing 0.25M CH_3COOH and 0.15 CH_3COONa. K_a for CH_3COOH is 1.8 $x10^{-5}$. **[**H=1, S=32, O=16**]** **(1+2)**

iv. Interpret why water and ethanol can mix easily in all proportions? **(1+2)**

OR

How sigma (σ) bond is different from a pi (π) bond? **(3)**

v. What are quantum numbers? Which Quantum number cannot be explained on the basis of Bohr's Atomic Model? **(1+2)**

OR

The melting and boiling points of hydrazine Propanol are much higher than those of propanone. Give reason**.** **(3)**

vi. Calculate the POH of 0.01M H_2X dibasic acid when dissolved in water. **(1.5+1.5)**

OR

0.350 moles of SO_3 is placed in a 1.0 dm^3 flask and allowed to come equilibrium.0.207mole of SO_3 remains at equilibrium. Calculate K_c of the reaction. **(3)**

vii. Potassium dichromate solution has beautiful orange colour. When a salt is dissolved in water, the following equilibrium is setup. **(3)**

$Cr_2O_7^{-2} + H_2O \rightleftharpoons CrO_4^{-2} + 2H^+$

What will happen if?

a. Dilute sodium hydroxide is added to solution.
b. Dilute hydrochloric acid is added.

OR

Define the following with one example for each: **(1+1+1)**

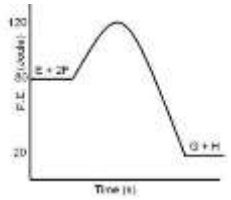
a) Partial miscible liquid
b) Conjugate solution
c) Upper consulate temperature

viii. As both NF_3 and BF_3 are tetra atomic molecules but have different geometry. Explain each according to VSEPR theory. **(1.5+1.5)**

OR

The value of *Kc* for the reaction2A ⇌B + C is 2×10^{-3}. At a given time, the composition of reaction mixture is [A] = [B] = [C] = 3×10^{-4} M. In which direction the reaction will proceed? **(3)**

ix. Analyze the activation energy diagram shown below for the hypothetical reaction:
$E + 2F \rightarrow G + H$ and answer the following questions: **(1+1+1)**



i) What is the activation energy for the forward reaction? The reverse reaction?
ii) What is the value of ΔH for the forward reaction? The reverse reaction?

iii) What is the energy of the activated complex?

OR

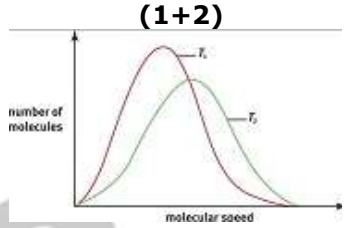
Write an equation to show energy difference between two energy levels, also calculate ionization Energy of H-atom. **(1+2)**

x. Why O_2^{-1} is paramagnetic in nature and explain by Molecular Orbital Theory. **(3)**

OR

What are buffer solutions? Name their types with examples. **(1+2)**

xi. Consider this graph and explain on the basis of Maxwell Boltzmann curve of kinetic energy the effect of temperature on rate of reaction. **(3)**



OR

490g of $KClO_3$ decompose by heating to produce oxygen gas and potassium chloride. Calculate the following: **(1+2)**

a. Moles of oxygen produce
b. Number of molecules produce
c. Volume of the gas produce at S.T.P

xii. An aqueous solution of ammonium chloride is acidic and that of sodium acetate is basic in nature. Give reason with the help of equation. **(3)**

OR

Discuss the shape of following molecules according to VSEPR Theory **(1+2)**

a. SO_2 b. H_3O^+

xiii. Why F_2 is gas at room temperature but I_2 is solid at room temperature? **(3)**

OR

Heats of solution got an important applications in treatment of injuries and wounds. Justify the statement with the help of exothermic and endothermic heats of solutions. **(1.5+1.5)**

xiv. Calculate the molality of 15% (w/w) of Urea $(NH_2)_2CO$ solution. **(3)**

[N=14, C=12, O=16**]**

OR

Chemical kinetics is concerned with rates of chemical reactions and factors that affects the rates of chemical reactions. Consider the following steps of reactions: **(2+1)**

$FeCl_{3(aq)} + 2KI_{(aq)} \longrightarrow FeI_{2(aq)} + 2KCl_{(aq)} + Cl^-_{(aq)}$ (slow)

$2KI_{(aq)} + 2Cl^-_{(aq)} \longrightarrow 2KCl_{(aq)} + I_{2(aq)}$ (fast)

Write the rate law and calculate the order for the above reactions.

SECTION C (Marks 26)

Note: Attempt all the questions. All questions carry equal marks. (26)

Q.3 Derive the equation for the radius of nth orbit of hydrogen atom using Bohr's model. **(2+5)**

OR

What is Buffer Solution? Explain working of Buffer Solution when acid and base added to them. How many factors affecting on buffer solution? **1+2+2+2**

Q.4 Solvay process is used to manufacture sodium carbonate. During this process ammonia is recovered by the following reaction. **(3+3)**

$2NH4Cl + Ca(OH)2 \longrightarrow CaCl2 + 2H2O + 2NH3$

When 100 g of ammonium chloride and 150 g calcium hydroxide are used then

i. Calculate the mass in kg of ammonia produce during chemical reaction.

ii. Calculate the excess mass in gram of one of the reactants left unreacted.

(At. Mass N=14, H=1, Cl= 35.5, Ca=40)

OR

Phosgene (COCl2) is a toxic gas. This gas is prepared by the reaction of carbon monoxide with chlorine. CO (g) + Cl2 (g) COCl2 (g) obtained for kinetic study of this reaction **(4+2)**

Experiment	Initial [CO]	Initial [Cl2]	Initial rate (moles dm-3 s-1)
1	1.000	0.100	1.29×10-29
2	0.100	0.100	1.30×10-30
3	0.100	1.000	1.30×10-30

i. Use the above data and deduce the order of the reaction with respect to CO and Cl2.

ii. Write rate law/equation for this reaction.

Q.5 Consider the following reaction: $N_2 + 3H_2 \rightleftharpoons 2NH_3$ **(3+3)**

i. Derive expression of K_c and unit for the above reaction.

ii. Calculate equilibrium concentration of N2. The equilibrium concentration of H2 and NH3 are 1.0 mol /dm3 and 0.5 moldm^{-3} respectively. K_c of above reaction at 25℃ is 1.85 ×10-3.

OR

What is hybridization? Explain the SP hybridization with structure of Ethyne? **6**

Q.6 Define catalysis and its types with two examples in each case. **(3+3+1)**

OR

a) What is solubility product? Calculate the solubility product of $A_m B_n$. **3**

b) What is Bond energy and how many factors effect on bond energy and explain with one example in each factor. **4**