BRAINWARE UNIVERSITY

Term End Examination 2023-2024
Programme – B.Tech.(CSE)-2023
Course Name – Engineering Chemistry
Course Code - BSCG101
(Semester I)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Indicate the reason for the exceptionally high boiling point of water :

a) There is a covalent bond between hydrogen and oxygen
b) Water molecule is linear
c) due to presence of H-bonding between water molecules
d) water molecules are not linear

(ii) 1-butene on ozonolysis can be transformed to

a) Formaldehyde only
b) Propanal only
c) Both Formaldehyde and propanal
d) Acetone only

(iii) Electrons should be filled in energy sub shells in order of increasing energy values- ---- The principle was stated by

a) Aufbau
b) Pauling
c) Pauli's exclusion principle
d) Hund's rule

(iv) Indicate the compound which one is more effective in nucleophilic addition reaction?

a) CH_3CHO
b) CH_3COCH_3
c) PhCHO
d) HCHO

(v) Predict the intermediate formed in a SN1 type of reaction

a) Carbon radicals
b) Carbocation
c) Carbanion
d) Carbene

(vi) $C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta H = -393$ kJ mol-1

What will be the ΔH value for the reaction $CO_2(g) \rightarrow C(s) + O_2(g)$

a) 393 kJ mol^{-1}
b) -393 kJ mol^{-1}
c) 293 kJ mol^{-1}
d) -293 kJ mol^{-1}

(vii) If 127°C is the temperature of the cold reservoir and that of hot reservoir is 227°C. Calculate the efficiency of the heat engine working between these two reservoirs.

a) 100% b) 60%
c) 30% d) 20%

(viii) The compressibility factor of an ideal gas is

a) 0 b) infinite
c) 1 d) -1

(ix) The force of attraction occurs between two non polar molecules can be described as :

a) Dipole-dipole interaction b) Dipole-induced dipole interaction
c) Instantaneous dipole-induced dipole interaction d) Hydrogen bonding

(x) With increase in temperature, electrical conductivity in semiconductors

a) Increases b) Decreases
c) Almost remains constant d) There is no effect, just heating

(xi) Calculate the number of unpaired electrons present in $[Co(H_2O)_6]^{3+}$

a) 0 b) 1
c) 2 d) 3

(xii) The probability density of an orbital is defined by

a) Square root of the wave function b) Absolute value of the wave function
c) Inverese of the wave function d) Absolute square of the wave function

(xiii) Identify the most non-metallic element among the following.

a) Be b) B
c) Mg d) Al

(xiv) Calculate the bond order of O_2^{2-}

a) 2 b) 1.5
c) 0.5 d) 1

(xv) Recognize the correct unit of absorbance :

a) It is unitless b) mol/l
c) cm^{-1} d) Can not be predicted

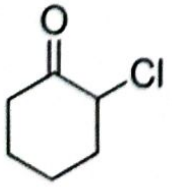
Group-B

(Short Answer Type Questions) 3 x 5=15

2. When aniline is added to an acidic solution which type of shift would you observe in the absorption maxima and why? (3)

3. Examine the bond order of Li_2 and Li_2^+ constructing the M.O of them. (3)

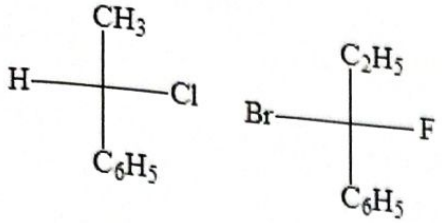
4. (3)



Predict the product when the above compound is treated with OH^-.

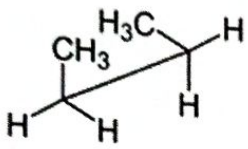
5. Examine the reason behind the fact that ----- KHF_2 exists but $KHCl_2$ does not. (3)

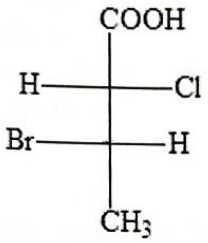
6. Classify the following projection formulae as D or L nomenclature. (3)



OR

Convert the following into Newmann projection formulae. (3)





Group-C

(Long Answer Type Questions) 5 x 6=30

7. Write down the time independent Schrodinger wave equation explaining all the terms properly. Define the term ψ^2. [4 + 1] (5)
8. Comment on the existence of Be_2 molecule from M.O. theory. (5) (5)
9. Explain why $[Fe(H_2O)_6]^{2+}$ is paramagnetic complex but $[FeCN_6]^{4-}$ is diamagnetic from the view point of CFT. (5) (5)
10. Prove that $(\delta H/\delta P)_T = -C_p \cdot \mu_{JT}$ (5) (5)
11. A reaction $A^{2+} + 2B \rightarrow A + 2B^+$ is occurring in a cell. If standard electrode potential of the cell is -0.42 V, predict about the working condition of the cell. Also write down the feasible cell reaction for the particular cell and determine the standard free energy change for the working cell. (1+1+3) (5)
12. Arrange the following in increasing order: i) Ionic or atomic radii : S^{2-}, Ca^{2+} , Ar ii) Ionisation potential : O, P, N iii) Metallic character : Na, Al, Mg, K. Using Slater's rule deduce the effective nuclear charge of 3d electrons of Cr^{2+}. [3 +2] (5)

OR

Explain why : i) P has less electron affinity than Si, though P is smaller in size than Si. ii) Noble gases are unreactive. iii) Cs has more metallic character than sodium. Write down the S.I unit of electron affinity and electronegativity. [3 +2] (5)