b) Derive single point BET equation from BET equation and explain its importance.

c) Give the examples of the cationic and nonionic surfactants with structures.

d) Considering mass action model, determine counter ion binding for an ionic micelle.

e) Draw the structure of a micelle.

f) How can soap and detergent molecules behave against corona virus?

g) Deduce the pressure of a surface film of an insoluble substance in water.

M. Sc. (Chemistry) Examination, 2023

(2nd Semester)

Biochemistry and Environmental Chemistry

Paper – V

Time : Two hours   Full Marks : 40

Use a separate answer script for each Unit.

UNIT – 2051 a & 2051 b

1. Answer *any four* questions. $2\frac{1}{2}\times 4$

   a) Discuss the role of BPG in release of O_2 from mother to developing fetus.

   b) Give an outline of speciation of mercury. Why is CH_3Hg^+ more toxic than inorganic Hg^{2+}?

   c) Discuss the structure and function of different components of nitrogenase enzyme.

   d) What is the role of ATP hydrolysis in nitrogen fixation? What is the function of leghemoglobin in nitrogenase activity?

   e) What do you mean by cooperative interaction in O_2 affinity of hemoglobin? How do you express the phenomenon by Hill equation and Hill plot?

2. Highlight the role of metal ions in maintaining structures of complex biomolecules. With suitable experimental evidence indicate that this is operative. What form or forms of toxicity could disrupt this?

3. Answer *any two* questions.

a) What are particle pollutants? Explain how presence of particle pollutants in the atmosphere enhances secondary pollution of a local area. Give one reason why secondary pollution is more harmful than primary. $\frac{1}{2}+2+\frac{1}{2}$

b) Explain formation of "Criegee intermediate" in reference to atmospheric pollution. Why are they considered important in enhancing secondary pollution? $1\frac{1}{2}+1\frac{1}{2}$

c) Discuss primary & secondary pollutants. Which is more harmful and why? $2+1$

d) Discuss toxicity of mercury in a biological system. What are the chemical reasons that led to the disaster in "Minamata', the port city of Japan? $1+2$

UNIT – 2052 a

4. Answer *any four* of the following questions. $2\frac{1}{2}\times4$

a) What is β-oxidation? Write down the metabolic pathway of β-oxidation and calculate the total number of ATP produced on complete metabolism of one molecule of palmitic acid ($C_{15}H_{31}COOH$). $\frac{1}{2}+1+1$

b) What is urea cycle? Illustrate the metabolic reactions involved in urea cycle and comment on its importance. $\frac{1}{2}+1+1$

c) What do you understand by the terms 'preparatory phase' and 'pay off phase' of glycolysis? How does it differ from the steps involved in gluconeogenesis? $1+1\frac{1}{2}$

d) Derive Lineweaver-Burk equation from Michaelis-Menten equation for an enzyme catalysed single substrate reaction. How can K_M and V_{max} values be determined with this equation? What is K_M? $1+1+\frac{1}{2}$

e) Write down the steps for the interconversion of UDP-glucose and UDP-galactose involving UDP-glucose-4-epimerase and NAD^+. What is Zymogen? $1\frac{1}{2}+1$

f) Distinguish the following pairs.

i) Induce-fit model and Lock-Key model.

ii) Lyases and Ligases. $1\frac{1}{2}+1$

UNIT– 2052 b

5. Answer *any five* questions : 2×5

a) State the assumptions of Harkins-Jura equation for adsorption isotherm. Write down that equation also.