

**Department of Biochemical Engineering and Biotechnology**  
**BBL 131L: Principles of Biochemistry**  
**Major (1<sup>st</sup> semester 2020-2021)**

**Max. Marks 40**  
**Max. Time 2 hr.**

**Instructions:**

- Major Exam question paper will be available on Microsoft Teams at 9:40 hrs on 8<sup>th</sup> January and is to be submitted before 12:00 hrs. (2 hrs Exam time + 20 minutes for uploading in Microsoft Teams).
- Enough time has been given for uploading answers sheets on Microsoft Teams hence no extra time will be given.
- **If case of any problem in uploading at Microsoft Teams, as exceptional case you can send by email attachment before 11: 45 hrs. No delay will be accepted.**
- Answers have to be uploaded on Microsoft Teams as a single pdf file.
- Answer should be **hand written**. No extra marks will be given for lengthy answers.
- All the Questions should be attempted sequentially. Randomly attempted questions will not be evaluated.

1a	How do you think polar nature of water drives the folding of proteins and formation of cell boundaries? [2]
1b	What are the biological advantages of existence of multienzyme complexes and multimeric proteins? [2]
1c	Lactose exists in two anomeric forms but no anomeric form exists for sucrose why? Erythropoietin (EPO) a glycoprotein is known to stimulate red blood cells, If an endurance athlete has used recombinant EPO, How will you distinguish it from natural EPO produced by kidney? [2]
1d	If you have oligosaccharides composed of 5 different monomers and oligopeptides composed of 5 different monomers, which one will show greater variety and why? Can you correlate your observations with their suitability to cellular recognition? [2]
1e	Name the amino acid(s) that can form O-glycosidic linkage and those that can form N-glycosidic linkage in a glycoprotein. If you expose a protein to pH 2, mostly it loses its biological functions, explain the mechanism. [2]
2a	In an enzyme catalyzed reaction when $[E_t] = 20 \text{ nM}$ , substrate concentration is $40 \text{ } \mu\text{M}$ , reaction velocity is $9.6 \text{ } \mu\text{M s}^{-1}$ , calculate the $K_M$ , if $k_{cat}$ is given as $600 \text{ s}^{-1}$ . [2]
2b	Why is it difficult to purify membrane proteins? Give reasons [2]
2c	A solution of enzyme hexokinase incubated at $45^\circ\text{C}$ lost its 50% activity in 12 minutes, but when incubated at the same temperature in the presence of a very large concentration of one of its substrates, it loses only 3% activity. Explain the reason(s). [2]
2d	Why does phosphoenolpyruvate have high phosphoryl potential? Explain the mechanism [2]
2e	How a patient suffering from galactosemia, who has been advised to stop lactose (galactose) intake, is able to manage synthesis of essential galactose containing glycoproteins? Explain the mechanism. [2]
3a	If you have obtained a mutated form of $\alpha$ subunit of G protein which allows exchange of nucleotide even in the absence of ligand receptor complex formation, what would be the effect of this mutation in signaling pathway? [2]
3b	If ligand binding to receptor increases diacylglycerol concentration in the plasma membrane, what will be signaling pathway? Would you expect the concentration of any other second

	messenger to increase due to same ligand binding?	[2]
3c	What is the role of Fructose 2,6 bis-phosphate in control of glycolysis explain the mechanism. Explain how energy charge regulates glycolysis.	[2]
3d	What is the function of glucokinase? Why it works only when glucose is in abundance?	[2]
3e	What is the energy cost for synthesizing glucose from pyruvate?	[2]
4a	If actively respiring mitochondria are exposed to inhibitor of ATP synthase, the electron transport chain ceases to operate explain the mechanism.	[2]
4b	Why isolated F <sub>1</sub> subunit of ATPase displays ATPase hydrolytic activity and not ATP synthase activity?	[2]
4c	How many NADH and acetyl CoA is generated from the oxidation of palmitic acid (C16:0). Calculate the number of ATP produced per carbon of palmitic acid (C16:0) oxidized.	[2]
4d	Cytochrome b of cytochrome reductase acts as recycling device, justify. Explain the binding change mechanism of ATP synthesis.	[2]
4e	Predict the major consequences of each of the following mutations: i. Loss of AMP binding site in muscle phosphorylase ii. Overexpression of phosphorylase kinase in liver	[2]