Chapter 3 Cell Metabolism

1. Define the following terms
    a. Metabolism
    b. Catabolic reaction
    c. Kinetics energy
    d. Energy
    e. Potential energy
    f. The Law of Mass Action
    g. Coenzyme
    h. Cofactor
    i. Substrate
    j. Product
    k. Enzyme

l. Chemiosmotic coupling

m. Substrate level phosphorylation

n. Oxidative phosphorylation

o. Glycogenesis

p. Glycogenolysis

q. Gluconeogenesis

r. Lipolysis

s. Beta oxidation

t. Lipogenesis

u. Proteolysis

2. Describe what occurs in the following basic types of metabolic reactions:
    a. catabolic metabolic reactions and anabolic metabolic reactions

    b. *hydrolysis* and *condensation*

c. *phosphorylation* and *dephosphorylation*

d. *oxidation* and *reduction*

3. Match following reactions and the examples

Phosphorylation	$C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$
Hydrolysis	sucrose + $H_2O \rightarrow$ glucose + fructose
Oxidation	ADP+Pi$\rightarrow$ ATP +H_2O

4. Is $C_6H_{12}O_6 + 6\ O_2 \rightarrow 6\ CO_2 + 6\ H_2O$ a catabolic reaction? _____
5. Define *activation energy* and describe its influence on the rates of reactions.

6. Describe the properties of enzymes.

7. Enzyme speeds up chemical action by _____ _____ _____ _____.

8. List the two models related to the mechanism of enzyme binding.

9. Discuss the various factors that influence the rates of enzyme-catalyzed reactions.

10. Interpret diagrams
    a. According to Figure 3.3 (b),
        - Which reaction is going to be a spontaneous reaction (forward or reverse)?
        - Explain:

    b. According to Figure 3.8 (pages 68- 69)
        - With the increase of substrate concentration at the same level of [enzyme], what happen with the reaction rate?
        - The reaction rate is faster with high enzyme concentration (high[E]) or low [E] at the same [S]. Why is that?

- Why is there a maximum reaction rate?

- As the reaction rate is increasing, what happened to the concentration of free enzyme molecules?

11. Apply your knowledge
    a. Page 67: If a person's intake of zinc is deficient, how would this affect the activity of alcohol dehydrogenase and the person's ability to tolerate alcohol? What is the function of zinc in relation to the alcohol dehydrogenase?

    b. Page 81: Discuss the consequence in terms of ATP production if both electrons are shuttled to mitochondrial NAD^+, both are shuttled to mitochondria FAD, or one electron is shuttled to NAD^+ and the other to FAD^+

12. **Complete the table**

I. Aerobic Respiration

	Glycolysis	Pyruvate to Acetyl-CoA Reaction	Krebs Cycle (Citric acid cycle)	Oxidative Phosphorylation (Electron Transport Chain)
Location where it occurs				
Products				
Total ATP Produced				
How is ATP produced? (mechanism: substrate level phosphorylation/ Oxidative phosphorylation)				

II. Anaerobic Respiration: Fermentation

Requirement of Oxygen (yes/no)	Requirement of Mitochondria (yes/no)	Location where it happens in a Cell	Products	# of ATP Produced

13. Discuss the metabolic pathway involves in carbohydrates, lipids and proteins (Pages 85- 90).

14. Fill in the blanks with processes and locations:
    a. Processes: glycogenesis, glycogenolysis, gluconeogenesis, glycolysis, linking step, conversion of pyruvate to lactate, Krebs cycle, lipogenesis, lipolysis, β-oxidation, electron transport chain and oxidative phosphorylation, deamination, condensation, hydrolysis and proteolysis, ketogenesis
    b. Locations: liver, cytoplasm, muscle, mitochondria, adipose tissue