Part I — Multiple Choice (2 pts each)

1 Which organelle is responsible for producing ATP through cellular respiration?

- **A** Ribosome
- **B** Nucleus
- **C** Mitochondria
- **D** Golgi apparatus

2 The light-dependent reactions of photosynthesis occur in the:

- **A** Stroma
- **B** Thylakoid membrane
- **C** Cytoplasm
- **D** Inner mitochondrial membrane

3 Which molecule acts as the primary electron carrier in the electron transport chain?

- **A** ATP
- **B** NADH
- **C** $FADH_2$
- **D** Glucose

4 In glycolysis, one molecule of glucose is broken down into how many molecules of pyruvate?

- **A** One
- **B** Three
- **C** Four
- **D** Two

5 Which gas is released as a by-product of the light-dependent reactions of photosynthesis?

- **A** Carbon dioxide
- **B** Nitrogen
- **C** Oxygen
- **D** Hydrogen

6 The Calvin cycle (light-independent reactions) takes place in the:

- **A** Thylakoid membrane
- **B** Stroma of the chloroplast
- **C** Mitochondrial matrix
- **D** Cell membrane

7 Which of the following correctly describes fermentation?

- **A** An aerobic process that produces large amounts of ATP
- **B** An anaerobic process that regenerates NAD^+ without net ATP gain
- **C** A process that occurs only in plants
- **D** A process that requires oxygen to produce ethanol

8 The net ATP yield from one molecule of glucose in aerobic respiration is approximately:

- **A** 2 ATP
- **B** 4 ATP
- **C** 38 ATP
- **D** 100 ATP

9 Which pigment absorbs most light in the red and blue wavelengths for photosynthesis?

- ○ **A** Carotenoid
- ○ **B** Xanthophyll
- ○ **C** Chlorophyll a
- ○ **D** Phycocyanin

10 During the Krebs cycle, acetyl-CoA combines with oxaloacetate to form:

- ○ **A** Pyruvate
- ○ **B** Citrate
- ○ **C** Succinate
- ○ **D** Malate

Part II — Fill in the Blanks (2 pts each)

1 The process by which plants convert light energy into chemical energy stored in glucose is called _____.

_____

2 The equation for aerobic cellular respiration is: $C_6H_{12}O_6 + 6O_2 \rightarrow$ _____ + $6H_2O$ + ATP.

_____

3 The site of the electron transport chain in eukaryotic cells is the _____ membrane.

_____

Part III — True or False (1 pt each)

1 Photosynthesis and cellular respiration are essentially opposite processes in terms of reactants and products.

○ True ○ False

2 Fermentation can occur in the presence of oxygen if glucose is available.

○ True ○ False

3 The stroma of the chloroplast is the site of the light-dependent reactions.

○ True ○ False

4 NADH donates electrons to the electron transport chain, driving ATP synthesis.

○ True ○ False

Part IV — Matching (1 pt each)

1 Match each process in the first column with its correct definition in the second column.

Process	Definition
A) Glycolysis	1) Breaks glucose into two pyruvate molecules in the cytoplasm
B) Krebs Cycle	2) Completes oxidation of pyruvate; produces NADH, $FADH_2$, and CO_2
C) Electron Transport	3) Uses NADH/$FADH_2$ to pump H^+ and synthesize ATP via ATP synthase
D) Calvin Cycle	4) Uses CO_2 and ATP to synthesize G3P (sugar) in the stroma
E) Light Reactions	5) Splits water, releases O_2, and produces ATP and NADPH

Part V — Short Answer (5 pts each)

1 Explain the role of the electron transport chain in ATP production during cellular respiration. Include the role of NADH, the inner mitochondrial membrane, and ATP synthase. (5 pts) [5 marks]

1) Role of NADH in the electron transport chain:

_____

_____

_____

2) How the proton gradient drives ATP synthesis:

3) Role of oxygen as the final electron acceptor:

2 Compare and contrast photosynthesis and cellular respiration. Address the location, reactants, products, and overall purpose of each process. (5 pts) [5 marks]