

Metabolism test

Name: _____

1. Isoleucine will inhibit the reaction pathway shown below when the concentration of isoleucine exceeds the cell requirements.

 E₁ E₂ E₃ E₄ E₅
threonine → intermediate I → intermediate II → intermediate III → intermediate IV → isoleucine

Which enzyme does isoleucine inhibit?

- A. Enzyme E₁
- B. Enzyme E₂
- C. Enzyme E₃
- D. Enzyme E₅

2. What happens when pyruvate is converted to acetyl CoA in the link reaction?

- A. Decarboxylation
- B. Phosphorylation
- C. Hydrolysis
- D. Reduction of pyruvate

3. ATP is needed to change products of the carboxylation of ribulose bisphosphate into triose phosphate. What other substance is also needed?

- A. Rubisco
- B. NADP
- C. NAD
- D. Reduced NADP

4. Metabolic pathways are dependent on enzyme-catalysed reactions. Which term corresponds with the description?

- A. allosteric inhibition: the inhibitor binds to the active site of an enzyme
- B. competitive inhibition: the maximum rate of a reaction is lowered as the substrate concentration increases
- C. non-competitive inhibition: raises the maximum rate of reaction of a given enzyme reaction
- D. end-product inhibition: the end-product in a metabolic pathway binds to an allosteric site of the first enzyme

5. The following processes occur in aerobic cell respiration.

- I. Decarboxylation of pyruvate
- II. Diffusion of protons through ATP synthase
- III. Phosphorylation of glucose

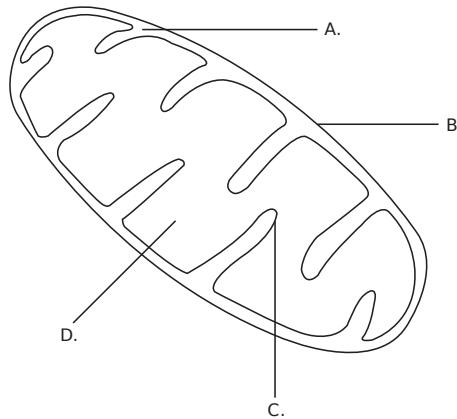
Which is the correct sequence for these processes?

- A. I, II, III
- B. I, III, II
- C. II, III, I
- D. III, I, II

6. What is reduced by Photosystem I ?

- A. ADP
- B. NADP
- C. NAD
- D. FAD

7. The diagram shows a mitochondrion. Which letter indicates the structure where ATP synthase is located?

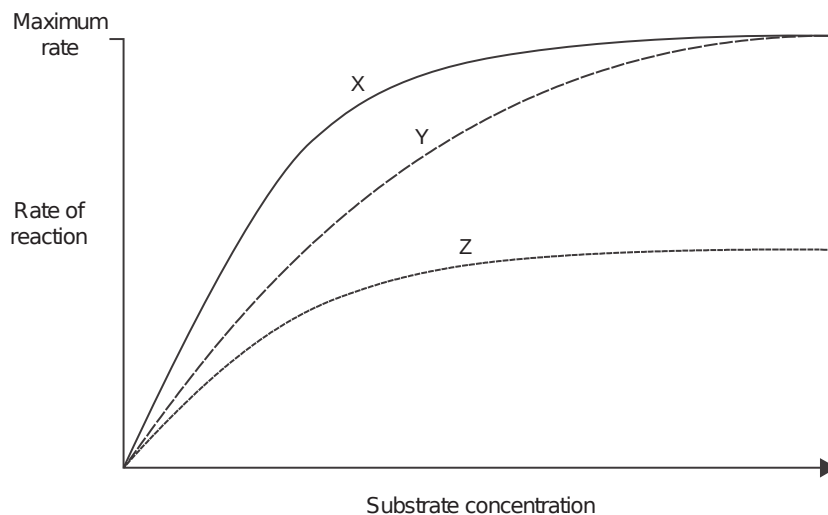


8. Which space has the highest H⁺ concentration in a chloroplast?

- A. Thylakoid space
- B. Stroma
- C. Space between inner and outer membrane
- D. Matrix

9.

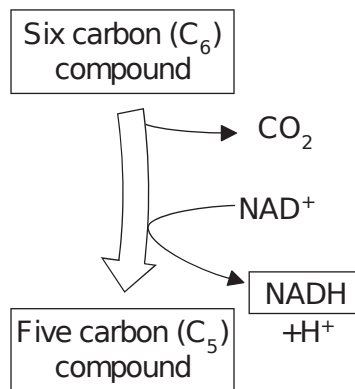
The graph shows the rate of an enzymatic reaction versus the substrate concentration, in the absence or presence of an enzyme inhibitor.



Which condition is indicated by lines Y and Z?

	Y	Z
A.	Non-competitive inhibitor present	No inhibitor present
B.	Non-competitive inhibitor present	Competitive inhibitor present
C.	Competitive inhibitor present	Non-competitive inhibitor present
D.	Competitive inhibitor present	No inhibitor present

10. This reaction occurs in mitochondria.



What explains that this reaction enables energy to be converted into a usable form?

- A. The oxidized NAD⁺ will transfer the energy from the C₆ compound to ATP.
- B. The chemical energy stored in the C₆ compound is used to reduce NAD⁺ allowing ATP production.
- C. Energy stored in the CO₂ molecule will generate an electron gradient.
- D. The C₆ compound is reduced and the energy resulting from the removal of one carbon is used to oxidize NAD⁺.
11. What is used to reduce NADP in the light-dependent reactions of photosynthesis?
- A. Conversion of ATP into ADP + P_i
- B. Electrons from Photosystem I
- C. Protons from the thylakoid space
- D. Oxygen released by photolysis of water
12. Which molecule would first contain ¹⁴C if the alga Chlorella was grown in the presence of light and radioactive CO₂ ?
- A. Glycerate 3-phosphate
- B. Glucose
- C. Rubisco
- D. Ribulose biphosphate (RuBP)
13. What kind of binding changes the shape of an allosteric enzyme so it can slow down a metabolic pathway?
- A. Substrate to active site
- B. Substrate to allosteric site
- C. End-product to active site
- D. End-product to allosteric site

14. From which substrate is the first carbon dioxide molecule released during cellular respiration?
- A. Glucose
 - B. Pyruvate
 - C. Acetyl CoA
 - D. Citrate (a C 6 intermediate compound in the Krebs cycle)
15. During photosynthesis, what happens in the chloroplast at the location called lumen?
- A. Protons accumulate.
 - B. Pyruvate undergoes decarboxylation.
 - C. NADH is oxidized.
 - D. Oxygen is produced.
16. Light-independent reactions:
- I: are a cycle that takes place inside the thylakoid
 - II: use large amounts of energy in the form of ATP and NADPH
 - III: work better when the carbon dioxide concentration is high
 - IV: generate carbohydrates from inorganic compounds
 - V: are the main point of entry of carbon into the food chain
- A. All except I are correct
 - B. All except I and V are correct
 - C. All except III are correct
 - D. All are correct
17. What happens during glycolysis for one molecule of glucose?
- A. Two pyruvates are formed.
 - B. There is a net gain of two NADPH + H + .
 - C. There is a net loss of two ATP.
 - D. Two acetyl CoA are formed.
18. What happens in both respiration and photosynthesis?
- A. Triose phosphates are decarboxylated.
 - B. NADPH is produced.
 - C. ATP is produced.
 - D. Electrons pass through ATP synthase.
19. What is produced overall per glucose molecule, during glycolysis?
- A. 1 pyruvate 2 ATP 1 NADH
 - B. 1 pyruvate 4 ATP 2 NADH
 - C. 2 pyruvate 4 ATP 1 NADH
 - D. 2 pyruvate 2 ATP 2 NADH
20. What causes cyclic photophosphorylation to occur in photosynthesis?
- A. Reduced NADP is accumulating in the stroma.
 - B. Photoactivation of photosystem II is inhibited.
 - C. Light-dependent reactions are slower than light-independent reactions.
 - D. ATP is not required for the Calvin cycle.

Section B.

1. Answer all these questions.

- a) Outline the control of metabolism by end-product inhibition. [5]
- b) Distinguish between anabolism, catabolism and metabolism. [3]
- c) Explain the stages of aerobic respiration that occur in the mitochondria of eukaryotes. [8]
- d) Explain the processes involved in the Krebs cycle [8]

2. Answer one of the options.

- a) Outline the production of carbohydrates in photosynthesis. [4]

OR

Outline how light intensity and concentration of carbon dioxide affect photosynthesis [4]

- b) Explain how chemical energy for use in the cell is generated by electron transport and chemiosmosis. [8]

OR

Explain chemiosmosis as it occurs in photophosphorylation [8]

- c) Distinguish between aerobic and anaerobic respiration [5]

OR

Describe the role of oxygen in aerobic cell respiration [5]