

Metabolism Remedial Test Opportunity 2022

- **Do not open this booklet until you are instructed to do so.**
- Print your name at the top of the BACK PAGE of this booklet.
- Indicate all of your answers to the questions on the separate Response Form. No credit will be given for anything written in this booklet, but you may use the booklet for notes or rough work. No additional time will be given after the exam to transfer your answers to the Response Form.
- After you have decided which of the suggested answers is best, fill in the corresponding answer on the Response Form. Give only one answer to each question. If you change an answer, be sure that the previous mark is erased completely. Print neatly using UPPER CASE letters, ambiguous answers will not be marked.
- Use your time effectively. Do not spend too much time on questions that are too difficult. Go on to other questions and come back to the difficult ones later if you have time. This is a timed test, you need to work efficiently.

1. Metabolism is defined as
 - a. all endergonic reactions that occur in a cell.
 - b. all anabolic reactions that occur in a cell.
 - c. all reactions that release Gibbs free energy.
 - d. all the chemical reactions in a cell that transform matter and energy.
 - e. None of these statements defines metabolism.

2. In the electron transport chain of the mitochondria, coenzyme Q accepts a pair of electrons from FADH_2 . In this reaction the coenzyme Q undergoes
 - a. isomer formation.
 - b. reduction.
 - c. oxidation.
 - d. hydrolysis.
 - e. neutralization

3. ATP is used by cells as
 - a. energy to synthesize molecules.
 - b. energy to break down molecules.
 - c. energy for movement of muscles.
 - d. energy to actively transport molecules across membranes.
 - e. All of the above are true

4. Which statement about the hydrolysis of ATP to ADP and P_i is **false**?
 - a. It is anabolic.
 - b. It releases 30.5 kJ/mol of free energy.
 - c. It occurs in all cells.
 - d. It is a reversible reaction.
 - e. It is exothermic.

5. Which of the following statements about cellular respiration is **false**?
 - a. In aerobic cellular respiration, for each glucose oxidized, 36 ATP are produced.
 - b. Each FADH_2 has enough energy to phosphorylate 2 ATP.
 - c. Most of the ATP is produced in the Krebs Cycle.
 - d. ATP is produced in Krebs cycle by substrate level phosphorylation.
 - e. ATP is a reactant and a product in glycolysis.

6. Which statement about the transition reaction is **false**?
 - a. The process starts in the cytoplasm.
 - b. The process occurs once for each glucose molecule.
 - c. The process occurs across the outer and then the inner mitochondrial membranes.
 - d. The process involves a decarboxylation.
 - e. The process reduces NAD^+ to NADH.

7. Which statement shows the best equation for cellular respiration?
 - a. $\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O}$
 - b. $6 \text{CO}_2 + 6 \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2$
 - c. $\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O} + 36 \text{ATP}$
 - d. $6 \text{CO}_2 + 6 \text{H}_2\text{O} + 36 \text{ADP} + 36 \text{P}_i \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 + 36 \text{ATP}$
 - e. $\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 + 36 \text{ADP} + 36 \text{P}_i \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O} + 36 \text{ATP}$

8. At the end of **glycolysis**, most of the energy originally found in glucose is located in molecules of

- a. phosphoglyceraldehyde (PGAL).
- b. NADH.
- c. pyruvate.
- d. acetyl Co-enzyme
- e. ATP.

9. The following molecules can be found at various stages during cellular respiration:

- | | | | |
|------|----------------|-----|----------------|
| I. | acetyl-CoA | IV. | H ⁺ |
| II. | carbon dioxide | V. | pyruvate |
| III. | glucose | | |

Which of the following sequences represents the above molecules in order from the largest to the smallest amount of **chemical energy stored in the molecule**?

- a. II, I, V, IV, III
- b. III, V, IV, I, II
- c. III, V, I, II, IV
- d. III, V, I, IV, II
- e. IV, III, II, I, V

10. What happens to electrons in an oxidation reaction?

- a. Electrons are shared equally.
- b. Electrons are shared but not equally.
- c. Electrons are gained.
- d. Electrons are lost.
- e. Electrons are sometimes shared equally.

11. Cellular respiration depends on enzymes to facilitate glucose metabolism on a scale that can fulfill a cell's energetic needs. How do enzymes accomplish this?

- a. Enzymes provide enough input energy to begin the process of cellular respiration.
- b. Enzymes allow the process to progress much faster because they are easily consumed in place of normal substrates.
- c. Enzymes act as cofactors in the initial steps of cellular respiration, and are therefore not consumed in the reaction but rather make it occur faster.
- d. Enzymes lower the activation energy of each chemical reaction, making the net process faster than without an enzyme.
- e. Enzymes raise the activation energy of each chemical reaction, making the net process faster than without an enzyme.

12. In mitochondria, H⁺ ions are moved by the electron transport chain. What is this an example of?

- a. Active transport
- b. Facilitated diffusion
- c. Passive transport
- d. Electron transport
- e. Electrochemical gradient transport

13. Violet eats an entire bag of gummy bear candies, which are high in glucose. How could a glucose molecule from a gummy bear provide the energy used to do work in Violet's cells?

- a. The glucose molecule is digested into simpler molecules, which have more energy.
- b. The glucose molecule is converted into ATP (adenosine triphosphate).
- c. The atoms of the glucose molecule are turned into energy.
- d. The energy within the glucose molecule is used to form molecules such as ATP.
- e. The energy of the glucose molecule is transferred to CO_2 and H_2O .

14. Which statement pertains to the process of glycolysis?

- | | |
|---|---|
| a. Cells need to have access to molecular oxygen for glycolysis to occur. | d. Glycolysis only takes place in cells undergoing anaerobic respiration. |
| b. Glycolysis produces CO_2 . | e. Glycolysis produces two three-carbon molecules. |
| c. A key product of glycolysis is ADP. | |

15. What is the primary reason why the electron transport chain is valuable to a cell?

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|--|---|
| a. It directly makes ATP | d. It transfers electrons to an electron carrier |
| b. It produces water | e. It creates a proton (H^+ ion) gradient across a membrane |
| c. It uses both NADH and FADH_2 | |

16. Identify the correct order of the four stages of cellular respiration.

- a. electron transport chain, glycolysis, Krebs cycle, transition reaction
- b. Krebs cycle, transition reaction, electron transport chain, glycolysis
- c. transition reaction, electron transport chain, glycolysis, Krebs cycle
- d. glycolysis, transition reaction, Krebs cycle, electron transport chain
- e. Krebs cycle, glycolysis, electron transport chain, transition reaction

17. In aerobic respiration, what is the final electron acceptor in the electron transport chain?

- | | |
|------------------|-------------------------|
| a. NADH | d. H_2O |
| b. ATP | e. oxygen |
| c. hydrogen ions | |

18. In glycolysis, the net production of ATP is ____ ATP. In the Krebs cycle, it is ____ ATP, and in the electron transport chain, it is ____ ATP. Thus, a total of ____ ATP are produced during cellular respiration.

- a. 2, 4, 16, 32
- b. 4, 4, 30, 36
- c. 2, 2, 32, 36
- d. 1, 2, 32, 36
- e. 4, 8, 16, 32

19. In the transition reaction of aerobic respiration, what is the starting substrate?

- | | |
|------------|-------------|
| a. glucose | b. pyruvate |
| | c. NADH |

e. oxygen

d. ADP

20. Glycolysis best describes the process of:

- a. Making proteins on ribosomes
- b. Breaking glycogen into glucose
- c. Making glycogen in the liver
- d. Using oxygen to produce energy
- e. Breaking glucose into pyruvate

21. Most of the ATP produced during aerobic cellular respiration occurs during which step?

- a. Electron transport chain
- b. Krebs cycle
- c. Calvin cycle
- d. Transition reaction
- e. None of the above

22. Isomers are molecules that

- a. react readily with one another
- b. have the same molecular formula
- c. have different molecular masses
- d. differ in the number of unsaturated bonds
- e. must contain the same functional group

23. Catabolic processes

- a. make complex molecules from simpler ones
- b. break complex molecules into simpler ones
- c. occur only in autotrophs
- d. occur only in heterotrophs
- e. none of the above

24. What substance is produced by the oxidation of pyruvate and feeds into the citric acid cycle?

- a. pyruvate
- b. glucose
- c. acetyl-CoA
- d. O_2
- e. CO_2

25. During aerobic respiration, $FADH_2$ is produced in

- a. glycolysis
- b. the oxidation of pyruvate
- c. the Krebs cycle
- d. the electron transport chain
- e. fermentation

26. NADH is produced during

- a. glycolysis
- b. the oxidation of pyruvate
- c. the Krebs cycle
- d. all of the above
- e. two of the above

27. Each molecule of FADH_2 results in the production of how many ATP molecules during aerobic respiration?

- a. 2
- b. 3
- c. 4
- d. 18
- e. 36

28. During the process of glycolysis, some hydrogen atoms are essentially removed from glucose. This is an example of

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| a. hydrolysis | d. dehydration |
| b. dehydration synthesis
(condensation) | e. neutralization |
| c. oxidation | |

29. ATP can be formed through substrate-level phosphorylation and this process requires

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|--|-----------------------------|
| a. an input of energy | d. the protein ATP synthase |
| b. a high-energy phosphate group that is transferred directly to ADP | e. oxygen |
| c. a concentration gradient of protons | |

Metabolism Remedial Test Opportunity

Name: _____

All multiple choice answers must be recorded in this table. When you are finished answering all the multiple choice questions transfer your answers to this table. Print neatly using UPPER CASE letters, ambiguous answers will not be marked.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	