

The exam consists of 50 multiple guess questions and six pages. Please bubble in your name, last name first. Please be sure you use the name with which you are registered here at UIC and not a nickname. If you only learn one thing from college, please learn that whenever you fill out one of these forms, you should use a #2 pencil. Pen just won't work. Really, it won't. Good luck!

Matching - use the choices below to answer questions 1 to 6. Be sure to choose the best answer.

- I. Glycolysis
- II. Conversion of Pyruvate to Acetyl CoA
- III. Krebs Cycle
- IV. Electron Transport Phophorylation (Chemiosmosis)
- V. Lactic Acid Fermentation
- VI. Alcohol Fermentation
- VII. Light-Dependent Reactions of Photosynthesis
- VIII. Light-Independent Reactions of Photosynthesis (Calvin Cycle)

1. This/these processes produce ATP
 - A. I, III
 - B. I, III, IV
 - C. I, III, IV, V, VI
 - D. I, III, IV, VII
 - E. None of the above
2. This/these processes have a net consumption of ATP
 - A. I
 - B. V, VI
 - C. I, V, VI
 - D. VIII
 - E. None of the above
3. This/these processes produce NADH
 - A. I, III
 - B. I, II, III
 - C. I, II, III, IV
 - D. I, III, IV, VII
 - E. None of the above
4. This/these processes produce convert NADH to NAD⁺
 - A. I, II
 - B. I, II, III, IV
 - C. I, IV, V, VI
 - D. VII
 - E. None of the above
5. This/these processes produce CO₂:
 - A. III
 - B. II, III
 - C. II, III, VI
 - D. II, III, V, VI
 - E. None of the above
6. This/these processes produce NADPH
 - A. I, III
 - B. I, II, III
 - C. I, II, III, IV
 - D. VII
 - E. None of the above
7. In non-cyclic photorespiration, from where does PSII replenish its lost electron?
 - A. CO₂
 - B. O₂
 - C. H₂O
 - D. PSI
 - E. NADPH
8. On a hot, sunny day, where would you expect the pH to be lowest?
 - A. Cytoplasm
 - B. Thylakoid space
 - C. Stroma
 - D. The space between the outer and inner chloroplast membrane

9. Where would you expect to find the highest concentration of PSII
- On the outer chloroplast membrane
 - On the inner chloroplast membrane
 - On the thylakoid membrane
 - On the outer mitochondrial membrane
 - On the inner mitochondrial membrane
10. Plant cells have functional mitochondria
- True
 - False
11. Assume a thylakoid is somehow punctured so that the interior of the thylakoid is no longer separated from the stroma by an intact membrane. This damage will have the most direct effect on which process?
- flow of electrons from photosystem II to photosystem I
 - the absorption of light energy by chlorophyll
 - the reduction of NADP⁺ to NADPH
 - the synthesis of ATP by ATP synthase
 - None of the above
12. The reactions of the Calvin cycle require all of the following molecules, EXCEPT
- CO₂
 - RuBP
 - glucose
 - NADPH
 - ATP
13. Which of the following produces ATP and NADPH?
- Glycolysis
 - Krebs Cycle
 - Calvin Cycle
 - Cyclic photophosphorylation
 - Non-cyclic photophosphorylation
14. Which of the following statements about leaves is FALSE?
- Simple leaves have only one blade
 - Most of the light harvesting takes place in the palisade mesophyll
 - The leaf cuticle secretes a waxy cuticle
 - C₄ plants usually possess Kranz Anatomy
 - All of the above statements about leaves are TRUE
15. In a C₄ plant, what enzyme fixes CO₂ in the bundle sheath?
- PEP Carboxylase
 - Rubisco
 - Malate dehydrogenase
 - ATPase
 - None of the above
16. Which of the following photosynthetic systems is most efficient in moist environments?
- C₃
 - C₄
 - CAM
17. Which state would you expect to find the highest concentration of C₄ plants?
- California
 - Kansas
 - Illinois
 - New York
18. An increase in atmospheric CO₂ should lead to increased agricultural yields
- True
 - False
19. Fats can use some of the cellular respiration reactions, by using beta oxidation to cut their fatty acids into two-carbon molecules, which are fed into respiration as:
- FADH₂
 - AcetylCoA
 - Pyruvate
 - Double CO₂

20. Where is ATP synthase located in the mitochondrion?
 A. matrix B. inner membrane C. ribosome D. cytochrome system
21. Which stage of respiration produces the most ATP?
 A. Glycolysis B. Krebs Cycle C. Oxidative Phosphorylation
 D. Fermentation E. None of the above
22. Which of the following statements about respiration pathways is FALSE?
 A. Glycolysis can be divided into two halves, an initial energy-requiring portion and the second, energy-releasing portion
 B. Glycolysis is performed in the matrix
 C. H₂O is formed in oxidative phosphorylation
 D. Lactic acid fermentation is performed by your muscles when they are starved of O₂
 E. All of the above statements about respiration pathways are TRUE
23. Which characteristic is true of both alcohol and lactic acid fermentation?
 A. In the absence of oxygen, sulfur can be used to make H₂S instead of H₂O
 B. Pyruvate is broken down to form 2 more molecules of ATP
 C. CO₂ is given off
 D. electrons that were given to NAD⁺ to make NADH are released, so that NAD⁺ can be recycled back to glycolysis
 E. None of the above
24. Which of the following statements about the Calvin-Benson Cycle is FALSE?
 A. The reactions of the Calvin-Benson Cycle occur in the stroma
 B. Rubisco is the enzyme responsible for fixing CO₂ in the Calvin-Benson Cycle
 C. A glucose molecule is produced for every three "turns" of the cycle (i.e. three CO₂'s are brought in and fixed)
 D. Reaction is fueled by the ATP and the NADPH produced in the light-dependent reactions
 E. All of the above statements are TRUE
25. How many molecules of CO₂ are generated for each molecule of Acetyl CoA introduced into the Krebs cycle?
 A. 1 B. 2 C. 3 D. 4 E. 5
26. The scientist(s) who first published the *Nature* article on the structure of DNA was/were:
 A. Frederick Griffith B. Avery, McCarthy, & MacLeod
 C. Watson & Crick D. Hershey & Chase
 E. None of the above
27. The scientist(s) who performed the X-ray crystallography work that was used by the above without permission was/were:
 A. Frederick Griffith B. Avery, McCarthy, & MacLeod
 C. Watson & Crick D. Hershey & Chase
 E. None of the above
28. The enzyme responsible for removing supercoils from unwinding DNA is:
 A. Topoisomerase B. Ligase
 C. DNA Polymerase III D. Telomerase
 E. Helicase

29. The goal of the Hershey-Chase experiment was to:
- Illustrate bacterial transformation
 - Determine whether protein or DNA was the molecule of heredity
 - Determine the structure of DNA
 - Determine whether DNA replication was conservative, semi-conservative, or dispersive
 - None of the above
30. In a DNA nucleotide, there is a phosphate group attached to the _____ carbon and a hydroxyl group (-OH) attached to the _____ carbon
- 5' 3'
 - 3' 5'
 - 1' 5'
 - 5' 1'
 - 1' 3'
31. This enzyme is unable to function properly unless a primer is present.
- Topoisomerase
 - Ligase
 - DNA Polymerase III
 - Telomerase
 - Helicase
32. On which end of a DNA molecule would you expect telomerase activity to be greatest?
- The 5' end
 - The 3' end
 - Both ends equally
33. Which of the following questions about DNA and events associated with DNA is FALSE?
- DNA replication is semiconservative
 - Topoisomerase is most active during the S phase of the cell cycle
 - A newly replicated DNA molecule is actually composed of DNA and the many RNA primers that were left behind
 - A leading strand is longer than a lagging strand
 - All of the above statements are TRUE

Given the template strand below, answer questions 34 to 36

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3' G T G C T A C G G C T A A T G T C C C A T T G G 5'

34. Which of the strands below is the coding strand?
- 3' GTGCTACGGCTAATGTCCCATTGG 5'
 - 3' GGTTACCCTGTAATCGGCATCGTG 5'
 - 3' CCAATGGGACATTAGCCGTAGCAC 5'
 - 3' CACGATGCCGATTACAGGGTAACC 5'
 - None of the above
35. What is the third amino acid code for in the mRNA that is transcribed from this template strand?
- Alanine
 - Glycine
 - Isoleucine
 - Histidine
 - Proline
36. If the T with the two ** above it was changed to an A, what would be the resulting change in the protein
- Leucine changes to Glutamine
 - Aspartic Acid to Valine
 - Isoleucine changes to Phenylalanine
 - "Stop" changes to Phenylalanine
 - No change in the protein
37. Which of the following mutations usually has the least effect on the protein?
- Neutral
 - Missense
 - Nonsense
 - Frameshift

48. Which of the following statements about Post-Transcriptional control of DNA in eukaryotes is FALSE?
- A. A 5' guanine cap is added to promote mRNA stability
 - B. A 3' polyA tail is added to promote mRNA stability
 - C. Spliceosomes remove exons from the pre-mRNA
 - D. Post-translational modifications of mRNA occur in the nucleus
 - E. All of the above statements about mRNA are TRUE
49. If a person had a mutation so that all of their TFIID proteins were unable to bind to DNA, what would happen?
- A. Nothing would happen - TFIID is only found in prokaryotes
 - B. The lack of TFIID binding would only marginally show down transcription
 - C. Only genes involved in growth would be affected
 - D. The transcription of almost all genes would be affected - the person would die.
50. Sometimes signal sequences are added to proteins which mark them for transport by the Golgi bodies
- A. True
 - B. False

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51. Which of the following prevents the activation of one gene from accidentally activating a nearby gene?
- A. Insulator
 - B. TFIID
 - C. Enhancer
 - D. Spacer
52. Which of the following statements about global CO₂ is FALSE?
- A. Global CO₂ has been steadily increasing since the time of the industrial revolution
 - B. Increased CO₂ will help C3 plants more than C4 plants
 - C. Increased CO₂ will actually improve agricultural yields
 - D. Fossil fuel emissions are thought to be the primary cause of atmospheric CO₂ increases.
 - E. All of the above statements about global CO₂ levels are TRUE
53. Which of the following statements about Electron Transport Phosphorylation is FALSE?
- A. Each NADH oxidized to NAD⁺ ultimately pumps three H⁺ into the intermembrane space
 - B. Each FADH₂ oxidized to FAD⁺ also ultimately pumps three H⁺ into the intermembrane space
 - C. Each H⁺ pumped into the intermembrane can be used to produce one ATP by ATPase
 - D. Electron Transport Phosphorylation can produce up to 32 ATP per glucose molecule
 - E. All of the above statements about Electron Transport Phosphorylation are TRUE
54. Which of the following are valid results of the Messelson-Stahl experiment to determine the nature of DNA replication?
- A. After one round of replication, there were two bands, one corresponding to 100% heavy and one corresponding to 100% light
 - B. After one round of replication, there was one band, corresponding to 100% light
 - C. After two rounds of replication, there was one band, corresponding to 75% light, 25% heavy
 - D. After two rounds of replication, there were two bands, one corresponding to 50% heavy, 50% light and one corresponding to 100% light
 - E. None of the above

