

BIOS 100 - Summer 2006
Exam II, 14 July, 2006
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Name:

TA:

This exam consists of 54 questions over 7 pages (the codon chart is on page 7). Please check to see that all the pages are present before you begin. Use a #2 pencil and bubble in all answers. Your score will be posted on the UIC Blackboard site as soon as they are in. No kidding. Good Luck!

Matching - Use the key below to select the **best answers** for questions 1 - 8. Here's a hint - most people get really thrown by this section, so take the rest of the exam and come back to it.

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|-------------------------------|---------------------------------------|
| I. Glycolysis | VI. Alcohol Fermentation |
| II. Oxidation of Pyruvate | VII. Cyclic Photophosphorylation |
| III. Krebs Cycle | VIII. Non-cyclic Photophosphorylation |
| IV. Oxidative Phosphorylation | IX. Calvin Cycle |
| V. Lactic Acid Fermentation | |

1. This/these processes produce CO₂:
A. III only B. II & III C. II, III, IV **D. II, III, VI** E. II, III, V, VI
2. This/these processes produce O₂:
A. III only B. VII only **C. VIII only** D. II, III E. VII, VIII
3. This/these processes oxidize NADH to produce NAD⁺:
A. V only B. VI only C. V & VII **D. IV, V, VI** E. None of the above
4. Light is used as an energy source in this/these processes:
A. VII only B. VIII only **C. VII, VIII** D. VII, VIII, IX E. None of the above
5. This/these processes have a net consumption of ATP:
A. V only B. VI only **C. IX only** D. V, VI E. V, VI, IX
6. This/these processes utilize electron transport chains:
A. IV only B. III & IV C. VII, VIII **D. IV, VII, VIII** E. III, IV, VII, VIII
7. This/these processes consume CO₂:
A. V only B. VI only **C. IX only** D. V, VI E. V, VI, IX
8. How many of the above processes produce ATP?
A. Three B. Four **C. Five** D. Six E. Seven
9. Plant cells do not contain mitochondria
A. True **B. False**

10. Which of the following statements (A-D) about the light-dependent reactions of photosynthesis is FALSE? If statements A-D are true, then choose E.
- A. Light is the ultimate source to excite electrons of the two photosystems
 - B. Oxygen is released in non-cyclic photophosphorylation, but not in cyclic photophosphorylation
 - C. In non-cyclic photophosphorylation, electrons are ultimately obtained from the splitting of a water molecule
 - D. ATP is produced in both cyclic and non-cyclic photophosphorylation
 - E. All of the above statements about the light-dependent reactions are TRUE**
11. Which of the following respiratory processes produces the most ATP?
- A. Glycolysis
 - B. Oxidation of Pyruvate
 - C. Krebs Cycle
 - D. Oxidative phosphorylation**
 - E. Fermentation
12. In the Calvin-Benson Cycle, CO₂ is fixed by _____ to produce two molecules of phosphoglycerate (PGA)
- A. RUBP
 - B. Rubisco**
 - C. PEP Carboxylase
 - D. Phosphofructokinase
 - E. B & C
13. In a C₄ plant, where would you expect to find the greatest concentration of Rubisco?
- A. In the epidermis
 - B. In the mesophyll cells
 - C. In the bundle sheath cells**
 - D. In the xylem
 - E. There is no Rubisco in C₄ plants
14. Water boils at 100°C and ethanol at about 75° C. If you were making moonshine (whiskey), ideally, at what temperature should the mixture be heated?
- A. 70°C
 - B. 75°C
 - C. 85°C**
 - D. 100°C
 - E. 120°C
15. During Beta Oxidation:
- A. The fatty acids of a glyceride are broken into 6-carbon units to enter glycolysis
 - B. The fatty acids of a glyceride are broken into 2-carbon units to enter the Krebs cycle**
 - C. NADH is oxidized to NAD⁺ and ATP is produced
 - D. Intermediates from the Krebs cycle are used to produce amino acids and other biologically important molecules
 - E. None of the above
16. When would you expect a CAM plant to open its stomates?
- A. During the day
 - B. During the night**
 - C. During the rain
 - D. Never
 - E. Whenever it wants to
17. Where in the United States would you expect to find the greatest proportion of C₄ plants in the flora?
- A. In New York
 - B. In the Florida Everglades
 - C. In Illinois
 - D. In Nebraska**
 - E. In California

* I will put up a quick map if you don't know where these states are

18. Which of the following statements (A-D) about leaves is FALSE? If statements A-D are true, then choose E.
- A. The blade is the broad, flat surface of a leaf - the petiole is the stalk that connects it to the plant
 - B. The palisade mesophyll contains many air spaces to facilitate gas exchange**
 - C. Leaves have a waxy cuticle to reduce water loss
 - D. Stomates are pores typically found on the underside of leaves to allow gas exchange. Guard cells open and close the stomates
 - E. All of the above statements about leaves are TRUE
19. Which photosystem has an associated complex that can split a water molecule?
- A. PSI (p700) **B. PSII (p680)** C. Both D. Neither
20. Which of the following statements (A-D) about the light-dependent reactions of photosynthesis is FALSE? If statements A-D are true, then choose E.
- A. Plastoquinone is a “mobile” portion of the electron transport chain and can transport H⁺ across the thylakoid membrane
 - B. During both cyclic and non-cyclic photophosphorylation, H⁺ is pumped from the thylakoid space to the stroma**
 - C. During non-cyclic photophosphorylation, the electron is ultimately donated to NADP, reducing it to NADPH. NADPH then floats off into the stroma.
 - D. Light is harvested by an extensive network of accessory pigments known as the antenna complex
 - E. All of the above statements about the light-dependent reactions of photosynthesis are TRUE
21. In a C₄ plant, how many times is a molecule of CO₂ fixed?
- A. Zero B. Once **C. Twice** D. Thrice (that means three times :)
22. Which of the following statements (A-D) about photorespiration is FALSE? If statements A-D are true, then choose E.
- A. Rubisco has more affinity for CO₂ than for O₂
 - B. Phosphoglycerate and phosphoglycolate are formed during photorespiration
 - C. Photorespiration is a tremendous energy loss for plants
 - D. C₄ plants typically exhibit less photorespiration than C₃ plants
 - E. All of the above statements about photorespiration are TRUE**
23. Under which of the below colored lights would a plant exhibit the least amount of the light-dependent reactions of photosynthesis?
- A. Red B. Blue **C. Green**
24. Which of the molecules below inhibits phosphofructokinase?
- A. Glucose **B. ATP**
 - C. NADPH D. O₂

Use the diagrams below to answer questions 25 & 26 about the Messelson-Stahl experiment:

14/14

14/15

15/15

A. B C. D. E.

25. If DNA replication was dispersive, which of the above diagrams would represent what you would see after the second cycle of DNA replication **B**

26. What results did Messelson & Stahl actually see after the second round of DNA replication? **E**

Matching - Match the scientific experiment or finding on the left to the appropriate scientist(s) on the right. Answers may be used once, more than once, or not at all

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|---|----------|-----------------------------|
| 27. First described the process of transformation | B | A. Avery, McCarty & MacLeod |
| 28. Worked with radiolabeled nucleotides to confirm that DNA was the molecule of heredity | E | B. Frederick Griffith |
| 29. X-ray crystallographer whose work was utilized to determine the structure of DNA | D | C. Watson & Crick |
| | | D. Rosalind Franklin |
| | | E. Hershey & Chase |

Matching - Match the description on the left to the appropriate enzyme on the right. Answers may be used once, more than once, or not at all

- | | | |
|--|----------|------------------|
| 30. Removes supercoils from DNA | C | A. DNA pol I |
| 31. Removes the RNA primer from DNA | A | B. DNA pol III |
| 32. Can seal a nick in DNA (eg. repair phosphodiester bonds) | E | C. Topoisomerase |
| | | D. Helicase |
| | | E. Ligase |
33. Which of the following statements (A-D) about telomeres and telomerase is FALSE? If statements A-D are true, then choose E.
- A. Telomeres are regions located on the ends of eukaryotic chromosomes which contain repeating sequences of DNA
 - B. Telomerase is a type of DNA polymerase which can synthesize DNA 3' to 5'
 - C. Telomere regions of chromosomes contain no functional genes
 - D. Almost all human cells contain telomerase**
 - E. All of the above statements are TRUE

34. Prokaryotes contain telomerase
 A. True **B. False**
35. Which of the following statements (A-D) about DNA replication is FALSE? If statements A-D are true, then choose E.
 A. Primase activity is greater on the lagging strand than on the leading strand of a replication fork
 B. In eukaryotes, DNA replication is speeded up by the presence of several replication origins on the linear chromosomes
 C. DNA pol III always synthesizes DNA 5' to 3'
D. DNA replication by DNA pol III is aided by primase, but it can synthesize DNA without the presence of a primer
 E. All of the above statements about DNA replication are TRUE

Use the below piece of DNA to answer questions 36 - 38. You may want to use the codon chart on page 7

**

5' ACCATGGCTTTCTATAGTTGACTG 3'

36. What is the DNA complement to the above piece of DNA?
 A. 3' GTCAGTTGATATCTTTCGGTACCA 5'
 B. 5' ACCATGGCTTTCTATAGTTGACTG 3'
C. 5' CAGTCAAGTATAGAAAGCCATGGT 3'
 D. 5' TGGTACCGAAAGATATGAACTGAC 3'
 E. None of the above
37. If the above piece of DNA is the non-template strand of DNA, what is the second amino acid coded by the mRNA transcribed from the template strand?
 A. **Alanine** B. Methionine C. Serine D. Isoleucine E. None of the above
38. If the nucleotide C (the one with the ** above it) is changed to a G, what is the change in the translated protein?
 A. Alanine to Guanine B. Leucine to Valine C. Serine to Glycine
D. Phenylalanine to Leucine E. No change in the translated protein
39. What is the amino acid attached to a charged tRNA with the following anticodon:
 5' CUG 3'
 A. Leucine B. Valine C. Aspartic acid **D. Glutamine**
40. Which codon position is typically the one with the most potential for wobble?
 A. The first B. The second C. The third

41. In a ribosome, which site typically contains the growing polypeptide chain?
 A. The A site **B. The P site** C. The E site
42. Which of the above is not necessary for initiation of protein synthesis?
 A. A charged tRNA in the P site **B. A charged tRNA in the A site**
 C. A large ribosomal subunit D. A small ribosomal subunit
 E. A mRNA
43. What happens when a stop codon is in the A site?
 A. A stop tRNA enters and binds to the mRNA
 B. The ribosome reads the stop codon and disassociates from the mRNA
C. A release factor enters and binds to the mRNA
 D. A hairpin forms and breaks apart the ribosome
 E. None of the above
44. The insertion or deletion of a nucleotide in a gene is an example of a:
 A. Point mutation B. Missense mutation C. Nonsense mutation
D. Frameshift mutation E. None of the above
45. In the *lac* operon, the repressor protein can bind to the:
 A. Promoter **B. Operator** C. *lac Z* gene D. Terminator
46. What is the allosteric regulator to the repressor protein in the *lac* operon (i.e. what binds to the allosteric site?)
A. Lactose B. ATP C. The Promoter D. The Operator E. Glucose
47. The *lac* operon is an example of a(n) _____ operon. The *trp* operon is an example of a(n) _____ operon.
 A. inducible; inducible **B. inducible; repressible**
 C. repressible; inducible D. repressible; repressible
48. Under which conditions will the *lac* operon be operating at the greatest capacity?
 A. High glucose, high lactose B. High glucose, low lactose
C. Low glucose, hi lactose D. Low glucose, low lactose
49. Which of the following statements (A-D) about eukaryotic gene regulation is FALSE? If statements A-D are true, then choose E.
 A. TFIID is a component of the TATA Binding Protein (TBP)
 B. TFIID must bind to the TATA box
 C. RNA polymerase cannot bind to the promoter without the aid of transcription factors
 D. Most eukaryotic genes require other transcription factors other than TBP to initiate transcription
E. All of the above statements about eukaryotic gene regulation are TRUE

Matching - use the key below to answer questions 50 - 53:

A. Transcription control

B. Post-transcription control

C. Translation control

D. Post-translation control

50. The removal on introns is an example of this level of control **B**
51. Most eukaryotic genetic control occurs at this level **A**
52. The removal of the C-chain in proto-insulin to make functional insulin is an example of this level of genetic control. **D**
53. How many of the above levels of control take place in the nucleus?
A. None B. One **C. Two** D. Three E. Four
54. What would you most likely assume about a protein with zinc fingers?
A. It is an integral membrane protein B. It is a silencer
C. It is a DNA binding protein D. It is an enzyme
E. It tastes like chicken