

Exam #2



And he gave it for his opinion, that whoever could make two ears of corn or two blades of grass to grow upon a spot where only one grew before, would deserve better of mankind, and do more essential service to his country than a whole race of politicians put together.

Gulliver's Travels - Jonathan Swift

Directions: Like a good politician, dutifully write your name on the first page of the exam and code in your name on the answer sheet. Answer the multiple choice questions on the computerized answer sheet in pencil and non-multiple choice questions should be answered directly in the test booklet. Please sign the Honor Pledge at the end of the exam - assuming of course, that you have complied with its terms. Notes: (1) unless otherwise indicated, questions are worth one point; (2) in some cases you have a choice of questions to answer; (3) some questions require complete sentences; and (4) if you have questions, ask. **Good luck young Jedi Warriors - may the Force be with you!**

Multiple Choice Questions: *Darken the single, best choice in the appropriate place on the answer sheet.*

1. During photosynthetic electron transport, the inter-membrane space of the thylakoid membranes becomes:
 - a. more acidic than the stroma
 - b. more alkaline than the stroma
 - c. the pH of the intermembrane space doesn't change
2. What three events occur during the light-dependent reactions of photosynthesis?
 - a. reduction of oxygen; oxidation of NADPH; formation of ATP
 - b. oxidation of water; reduction of NADP⁺; formation of ATP
 - c. oxidation of water; reduction of NADP⁺; hydrolysis of ATP
 - d. fixation of carbon dioxide; release of oxygen; synthesis of glucose
 - e. release of oxygen; fixation of carbon dioxide; hydrolysis of ATP
3. The carbon fixation reactions of photosynthesis occur:
 - a. in the matrix
 - b. in the stroma
 - c. in the cytoplasm
 - d. on the surface of the thylakoid membranes
 - e. on the outer membranes of the chloroplasts
4. The oxygen released during photosynthesis comes directly from:
 - a. carbon dioxide
 - b. glucose
 - c. photosystem I
 - d. RuBP
 - e. water
5. During non-cyclic photophosphorylation, the electrons used to reduce NADP⁺ come from:
 - a. carbon dioxide
 - b. glucose
 - c. NADPH
 - d. oxygen
 - e. water

Pigment Matching. Match each of the following with the appropriate pigment.

- a. carotenes and xanthophylls
- b. chlorophyll a only
- c. chlorophyll b only
- d. chlorophyll a & b
- e. all of the pigments

- 6. Yellow to orange in color
- 7. P680 and P700 are examples
- 8. Occur in the thylakoid membranes

9. Assume a thylakoid is somehow punctured so that the thylakoid space (lumen) is no longer separated from the stroma. This damage will have the most direct effect on which of the following processes?

- a. the synthesis of ATP
 - b. the splitting of water
 - c. the reduction of NADP+
 - d. the absorption of light energy by chlorophyll
 - e. the flow of electrons from photosystem II to photosystem I
10. Which of the following does NOT occur during photosystem II?
- a. Light energy excites electrons in an antenna pigment
 - b. The spitting of water yields molecular oxygen as a by-product
 - c. Excitation energy from chlorophyll is passed along to the P680 reaction center
 - d. The reaction center donates a pair electrons to NADPH which is converted to NADP+
 - e. The electron vacancy in the P680 reaction center is filled by electrons derived from water
11. The primary function of the light-dependent reactions of photosynthesis is to:
- a. produce carbon dioxide
 - b. produce ATP and NADPH.
 - c. convert light energy to glucose.
 - d. produce glucose from carbon dioxide and water.
12. Which of the wavelengths of light is LEAST effective in photosynthesis?
- a. blue
 - b. red
 - c. green
13. van Helmont placed a willow seedling in a sealed pot. He watered the plant regularly. At the beginning of the experiment the plant weighed five pounds and it weighed 169 pounds at the end of the experiment five years later. The primary source of the increased weight of the plant is from:
- a. water
 - b. carbon dioxide in the air
 - c. oxygen in the atmosphere
 - d. minerals that were present in the soil
 - e. sugars the plant absorbed through its roots

True or False (*this is just like voting for a politician, tis true, tis false!?*)

- 14. Water gives its electrons to PSII.
 - a. False
 - b. True
- 15. NADP is reduced in PSII.
 - a. False
 - b. True
- 16. The Z-scheme occurs in the stroma of the chloroplast.
 - a. False
 - b. True
- 17. The Calvin cycle is a complex of proteins embedded in the thylakoid membrane.
 - a. False
 - b. True
- 18. PSII is comprised of photosynthetic with pigments, electron carriers and the P700 reaction center.

- a. False b. True
19. A proton gradient provides the energy needed to synthesize ATP by in the ATPase coupling factor.
a. False b. True
20. The Calvin cycle must turn six times and fix six carbon dioxide molecules to yield one net glucose
a. False b. True
21. The Calvin cycle occurs in the light.
a. False b. True
22. The Z-scheme occurs in the dark.
a. False b. True
23. The Calvin cycle requires ATP and NADPH that are supplied from the Z-scheme.
a. False b. True
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24. The polar "head" of a phospholipid molecule is:
a. water insoluble c. hydrophobic
b. non-polar d. hydrophilic
25. One of the functions of cholesterol and other sterols in cell membranes is to:
a. transport proteins across the membrane
b. speed up the rate of diffusion
c. serve as the catalyst for active transport
d. prevent water from entering the cell
e. maintain membrane fluidity
26. The currently accepted model for the cell membrane is called the:
a. mayonnaise model
b. sandwich model
c. unit membrane model
d. fluid mosaic model
e. Who cares? And all this talk about sandwiches and mayo is making me hungry
27. The hydrophilic regions of a membrane protein are most likely to be found
a. associated with the fatty acid region of the lipids.
b. in the interior of the membrane.
c. exposed on the surface of the membrane.
d. either on the surface or inserted in the interior of the membrane.
28. When a red blood cell is placed in an isotonic solution, which of the following will occur?
a. The cell will shrivel.
b. The cell does not change
c. The cell will swell and burst.
d. The cell will temporarily shrivel, and then return to normal.
29. Which of the following molecules most readily diffuses across the plasma membrane?
a. K^+ c. a long chain fatty acid
b. Na^+ d. glucose
30. Given the general equation for photosynthesis: $CO_2 + H_2O \rightarrow (H_2O)_n + O_2$, which of the following is TRUE?
a. water is reduced to oxygen

- b. water is oxidized to a carbohydrate
- c. carbon dioxide is oxidized to oxygen
- d. carbon dioxide is reduced to a carbohydrate
- e. carbon dioxide and water are both oxidized

31. If NAD was required for this reaction, during the reaction it would be converted from:

- a. $\text{NAD}^+ \rightarrow \text{NADPH} + \text{H}^+$
- b. $\text{NADH} + \text{H}^+ \rightarrow \text{NAD}^+$

32. The concentration of iodine in the cells of the thyroid gland is many times greater than in surrounding cells. Iodine enters the cells of the thyroid from the surroundings by:

- a. exocytosis
- b. active transport across the membrane.
- c. passive diffusion across the membrane.
- d. facilitated diffusion across the membrane.

U-2B QUESTION . The diagram below represents a U-tube that is separated by a semi-permeable membrane. Side A is filled with a sucrose solution (10 mOsm/L) and side B is filled with water. The membrane allows the passage of water but not sucrose. Use this diagram to answer the questions.

33. The net movement of water in this system will be from:

- a. Side A to Side B
- b. Side B to Side A
- c. there will be no net movement of the water
- d. there is not enough information given to answer

34. Side A is _____ to Side B.

- a. hypotonic
- b. hypertonic
- c. isotonic

35. The water will rise up the tube on:

- a. Side A
- b. Side B

36. If a red blood cell with an internal concentration equivalent to 20 mOsm/L is placed in Side A it will:

- a. swell and burst
- b. undergo plasmolysis
- c. not change

37. The movement of water from one side of the system to the other is an example of:

- a. bulk flow
- b. diffusion
- c. facilitated diffusion
- d. active transport

38. If the semi-permeable membrane is removed, the sucrose will:

- a. move from Side A to Side B
- b. move Side B to Side A
- c. show no change

39. Cells that have a wall, such as plant or bacterial cells, would be least likely to take up nutrients and other materials by:

- a. active transport
- b. diffusion
- c. osmosis


- d. phagocytosis
40. Which of the following would indicate that facilitated diffusion was taking place?
- Substances were moving against a diffusion gradient.
 - ATP was being rapidly consumed as the substance moved.
 - A substance was diffusing much faster than the conditions indicate it should.
 - A substance was moving from a region of low concentration into a region of higher concentration of the substance.
41. Prokaryotic cells typically have a larger surface-to-volume ratio than eukaryotic cells.
- True
 - False
42. After ingesting an amatoxin-containing mushroom, a person's cells begin to self-destruct and digest themselves. This suggests that the amatoxin poison might selectively destroy the:
- cell membrane
 - endoplasmic reticulum
 - golgi apparatus
 - lysosomes
 - mitochondria
43. Which of the following structures occurs in BOTH animal and plant cells?
- cell wall
 - central vacuole
 - centriole
 - lysosome
 - plastid
44. The DNA in the nucleus is termed:
- chromatin
 - nuclear lamina
 - nuclear pores
 - nucleoplasm
 - nucleolus
45. Which of the following organelles is surrounded by a single membrane?
- chloroplast
 - lysosome
 - mitochondrion
 - nucleus
 - ribosome
46. Matrix is to mitochondria as _____ is to chloroplast
- cristae
 - grana
 - stroma
 - thylakoid
47. Which of the following structures is NOT part of the endomembrane system?
- cell membrane
 - endoplasmic reticulum
 - golgi apparatus
 - mitochondrion
 - vacuoles
48. Which of the following are made of two intertwined strands of actin?
- microtubules
 - microfilaments
 - intermediate filaments
 - all of the above

Whew, you're almost finished....answer the remainder of the questions directly in the test booklet

Cell Fill-In-The-Blanks: Fill in the blanks with the appropriate letter. Some answers may be used more than once, others not at all.

- | | | |
|-----------------|----------------|------------------|
| a. amyloplast | g. endoplasmic | l. microfilament |
| b. basal body | reticulum | m. microtubule |
| c. centrioles | h. flagella | n. mitochondria |
| d. chloroplasts | i. glyoxisome | o. nucleolus |
| e. cilia | j. golgi body | p. nucleoplasm |
| f. cytoplasm | k. lysosomes | q. peroxisome |

1. _____ anchors the cilia and flagella
2. _____ Cell highway, for transport and synthesis, network of tubules and sacs
3. _____ Cell packaging, processing and shipping center
4. _____ Cell structure with a 9 x 3 arrangement of microtubules
5. _____ Gel-like material in which the organelles are embedded
6. _____ involved in cell division in animal cells but not plants
7. _____ Liquid inside the nucleus
8. _____ Organelle that has a polarity (cis and trans sides)
9. _____ Organelle that often has ribosomes attached to it
10. _____ Organelle used for fat metabolism; especially abundant in seeds
11. _____ Site of ATP production; cellular respiration
12. _____ Site of enzyme production
13. _____ Site of photosynthesis
14. _____ Site of ribosome synthesis

Membrane Question: In class we discussed how to make mayonnaise by emulsifying vegetable oil in vinegar by adding lecithin from an egg yoke. If the circles below represent a drop of oil in the vinegar, draw how the phospholipids from lecithin would arrange themselves relative to the oil droplet. Use this symbol -  - to represent a phospholipid.

Complete the Sentence Question: Complete each sentence with the appropriate word or phrase.

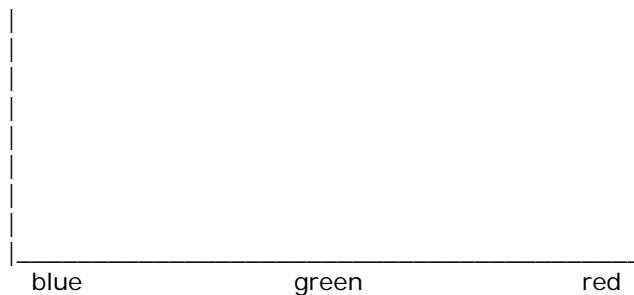
1. A coenzyme is
2. Aquaporins are.....

Short Answer Questions: Answer using complete sentences that would make even the most silver-tongued politician jealous. **Answer FOUR.** (3 points each)

1. Why are cells small?
3. Explain how prokaryotic and eukaryotic cells differ.
4. What is rubisco? (2 points)
5. Identify 4 things that can happen when a chlorophyll molecules becomes excited (4 pts)
 - a.
 - b.
 - c.
 - d.

Over the Rainbow Question: *Oh Toto, I don't think we're in Kansas anymore!*

1. Imagine that you've discovered a strange new photosynthetic organism that has a single photosynthetic pigment which is blue. Using a Spectronic 20 you measure the absorption spectrum of this pigment. Plot on the following graph, the likely absorption spectrum for this BLUE pigment. (2 pts)



2. What wavelengths of light would this organism use for photosynthesis? Explain. (2 pts)

Congratulations, You Made It!!!! You've Completed Your Second Concepts 115 Exam!!

Pledge: I have neither given nor received help when taking this exam.

Signature _____ **Date** _____

Bonus Questions: *Earn one bonus point for each correct response. No points are deducted for incorrect responses.*

1. What is a liposome?
2. Name the pigment that colors maple leaves in the autumn.
3. Write a question that you wished had been on the exam, but wasn't.