Cell Biology

Multiple Choice Questions (2 points each)

1. You attempt to study a particular cell-signaling pathway of *C. elegans*. However, though the signal continues to be transducted, a response fails to take place. Which of the following amino acids is the most likely to have been affected?
A. Tyrosine
B. Serine
C. Glycine
D. Tryptophan
E. Histidine

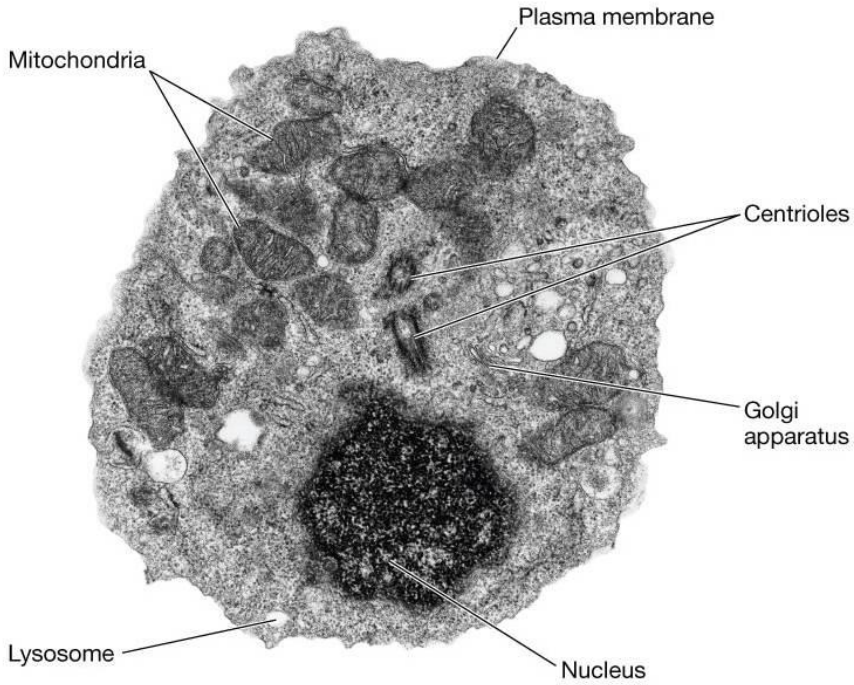
2. Cells must attempt to conform to a standard of pH and osmolarity. In response, cells have many devices, such as contractile vacuoles and cell walls to maintain their own homeostasis. As changes in pH can denature proteins, effectively killing the cell, buffers are needed to prevent large swings in pH. Which of the following functions as buffers to the cell?

I. ATP
II. Histidine
III. Glycine
IV. Glucose
V. Bicarbonate

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

3. Which of the following molecules is correctly associated with its structure and function in a cell?
A. Unsaturated phospholipid- forms micelles within the cell, which are then used for transport.
B. Fructans- form of carbohydrate storage, used by animal cells
C. Acetyl CoA- used primarily in the electron transport chain
D.Catalase- used in peroxisomes to convert hydrogen peroxide to hydrogen oxide
E. Hexokinase- enzyme used to regulate metabolism

Observe the picture below:

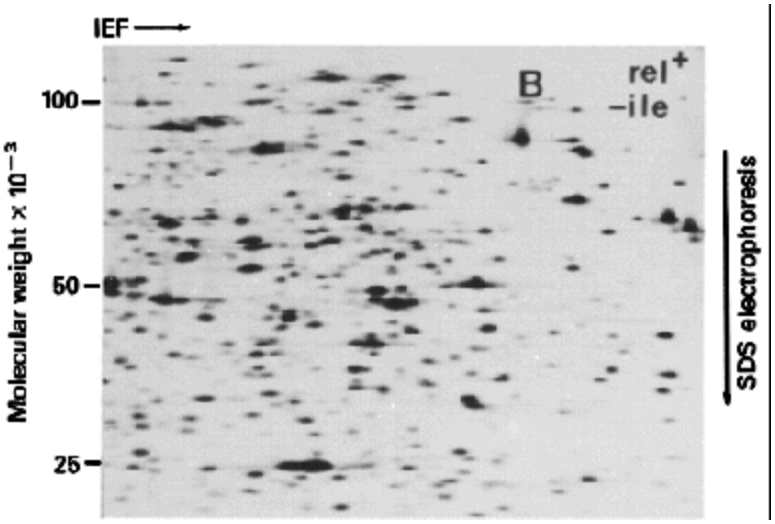


4. By deducing what type of cell this is, about how big is its real size?
A. 1-10 micrometers
B. 10-30 micrometers
C. 10-30 femtometers
D. 10-30 nanometers

5. Apart from being the powerhouse of the cell, mitochondria are also important for which of the following?
A. Regulating apoptosis
B. Participating in the pentose-phosphate cycle
C. Participating in urea production
D. Regulating H+ concentrations in the cell
E. Both A and D

6. Where is rRNA made in the cell?
A. In the transcription initiaion complex
B. In the translation initiation complex
C. In the nucleolus
D. In the mitochondria
E. In the endomembrane system

7. After homogenizing a cell, putting the product into a centrifuge for 3 hours, removing the pellet, and undergoing this following procedure:



What would the products (shown by the black smears on this diagram) generally be, and how were they allowed to spread out in such a way?
A. Histones, beta mercaptoethanol allowed the initial product to re-homogenize
B. Stem cells, dithiothreitol allowed initial product to re-homogenize
C. RNA, SDS (sodium dodecyl sulfate) reduced the product (as in added electrons)
D. Protein, aragose gel was used to obtain extremely high resoltuion
E. 40S, polyacrylamide gel was the medium in which the product to spread according to molecular weight

8. Which of the folllowing is a similarity between Western Blotting (used to identify proteins) and dideoxy sequencing (used to sequence DNA)?
A. The use of 2 different antibodies that were the exact same fluorescent color would mess up the results, as they both need multiple antibodies
B. They both require the use of a laser
C. They both utilize the concept of complementary binding
D. They both require the use of nucleic acid hybridization
E. They both require the use of a nucleic acid probe

9.cDNA is utilized to either examine an mRNA sequence or to simply store vast amounts of genes in a resaonably-effective way. Which one of these would be an effective primer for cDNA, given it binds complementary to a fully-modified mRNA molecule?
A. A long strand of T alternating with G
B. TTTTTTT (length is variable)
C. DNA polymerase II
D. AAAAAA (length is variable)
E. UUUUUU (length is variable)

10. Which of the following cell checkpoints is associated correctly with its regulatory mechanism?
A. G1 checkpoint(restriction point)- prophase spindle
B. Anaphase checkpoint- preprophase spindle
C. Telophase checkpoint- complete replication of chromosomes
D. G2 checkpoint- maturation promoting factor
E. M checkpoint- complete formation of tetrads

11. Which of the following is an accurate statement regarding glycolysis?
A. Glycolysis is a strictly aerobic process
B. Glycolysis is enhanced by the activation of the protein PFK-2
C. Glycolysis does not contain any redox reactions
D. Glycolysis is regulated more by PFK than by hexokinase
E. Glycolysis shares no common enzymes with the C4 pathway in certain plants

12. Which of the following conversions are possible in animal cells?

I. Carbohydrate to lipid
II. Nucleotide to carbohydrate
III. Carbohydrate to nucleotide
IV. Protein to carbohydrate
V. Lipid to carbohydrate

A. I, III, V
B. I,II, IV, V
C. II, IV, V
D. I, II, III, IV, V
E. I, III, IV

13. You are examining a transmembrane protein in a eukaryotic cell. Which of the following amino acids are respectively more likely and less likely to be present in this protein?

I. Tyrosine
II. Threonine
III. Tryptophan
IV. Histidine
V. Cysteine

A. III, IV
B. V, I
C. II, III
D. IV, II
E. I, V

Questions 14-15:
You are attempted to analyze an enzyme, XCD, and some of its inhibitors (A, B, and C). Through experimentation, you attain the following results:

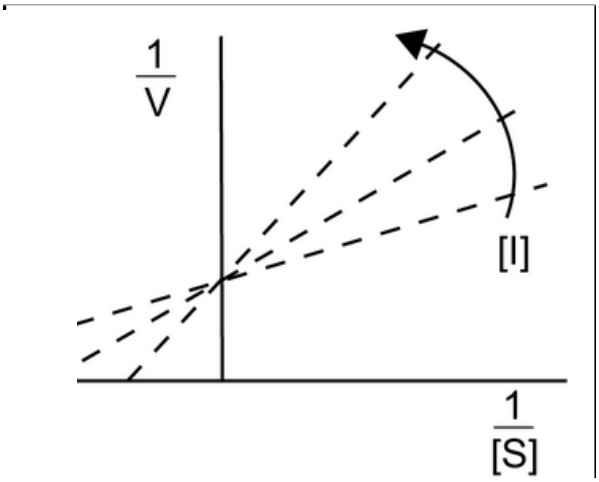
When inhibitor A is added to a solution containing XCD and its substrate, the k_m increases.
When inhibitor B is added (to a new solution), the V_{max} decreases.
When inhibitor C is added, the k_m increases and V_{max} decreases.

14.Which of the following statements are true?

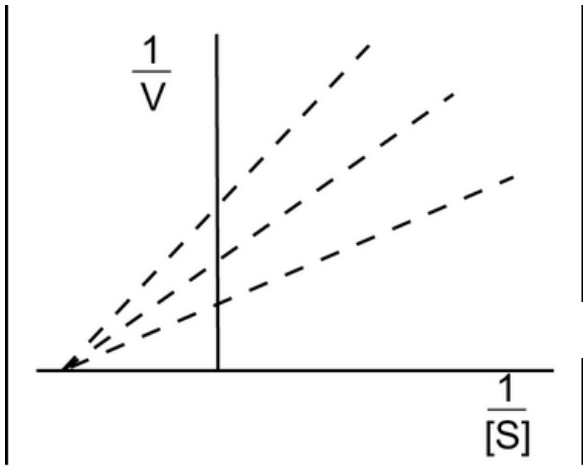
A. XCD is an allosteric enzmye
B. Inhibitor A is a noncompetetive inhibitor
C. Inhibitor B is a competitive inhibitor
D. Inhibitor C is an uncompetitive inhibitor
E. Both inhibitor A and B are competitive inhibitors.

15. Which one of these Lineweaver-Burk graphs correctly shows the addition of inhibitor C?

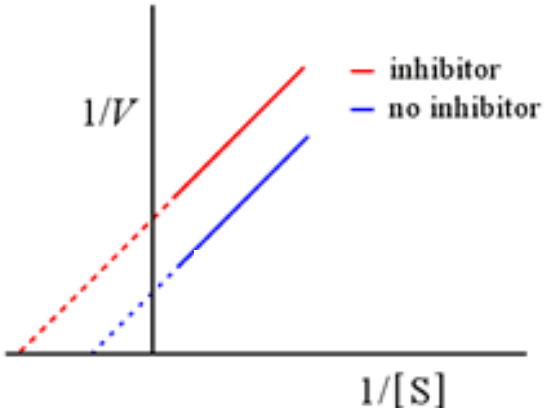
A.



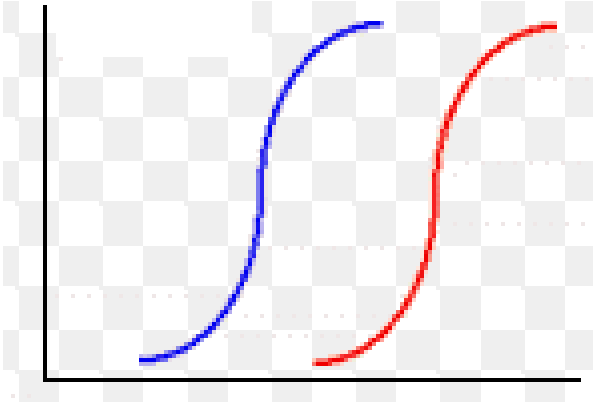
B.



C.



D.



*For A and B, the arrow on A shows increasing concentrations of inhibitor. The legend of C holds true for D.

16. What makes a reaction spontaneous?
A. A Gibbs free energy greater than 0
B. Change in enthalpy greater than 0
C. Change in entropy less than 0
D. Temperature greater than 20ºC
E. Its ability to proceed without an input of energy

17. Which of the following elements is not essential to aerobic cellular respiration?
A. Phosphorus
B. Magnesium
C. Carbon
D. Iron
E. Lithium

18. What marks the stage of prometaphase in mitosis?

I. Fragmentation of the nuclear envelope
II. Creation of kinetochores
III. Creation of tetrads
IV. Creation of centromeres
V. Attachment of microtubules
VI. Increase in concentration of the cyclin of MPF

A. I,II, IV, VI
B. I, II , V
C. II, III, IV
D. I, II, V, VI
E. III, V

19. Which one of the following enzymes is correctly paired with its function?
A. Heme oxygenase- functions as electron carrier in oxidative phosphorylation
B. Phosphofructokinase 2- when phosphorylated, decreases concentration of fructose 2,6-bisphosphate
C. Phosphoenolpyruvate carboxylase- changes PEP to pyruvate
D. Succinate dehydrogenase- changes succinyl CoA to succinate
E. Carbonic anhydrase- creates carbohydrate polymers through dehydration synthesis

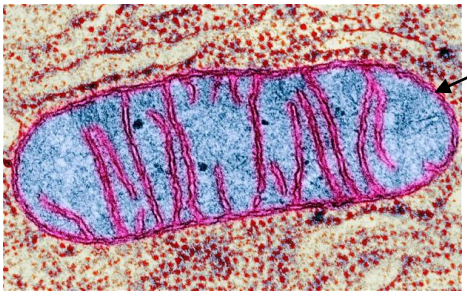
20. Based on what you know about the pH of a plant cell, which of the following statements is correct?
A. Auxin exists as IAAH in the cytosol
B. Auxin exists as IAA+ in the cell wall
C. AUX1 (influx protein) carries auxin as IAA-
D. IAA- is able to exist the cell
E. A and C

Matching Questions (1 point each)

Question 21-30: Match the picture with its correct identification

A. Peroxisome
B. Cristae
C. Cell wall
D. Flagellum
E. Nucleolus
F. Vesicle
G. Ribosome
H. Intermembrane space
I. Thylakoid
J. Golgi Apparatus

21. _____



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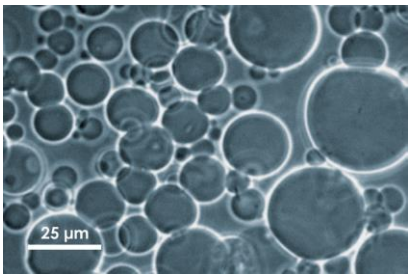
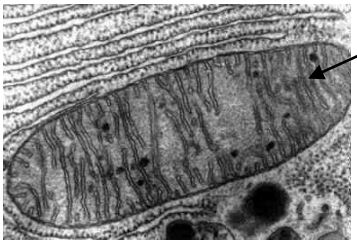


23. _____

24. _____



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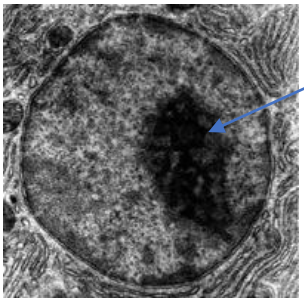

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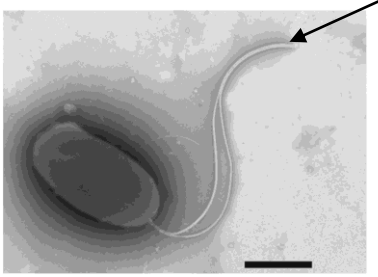

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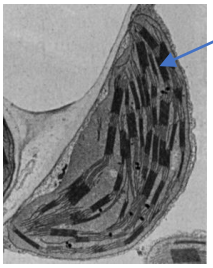

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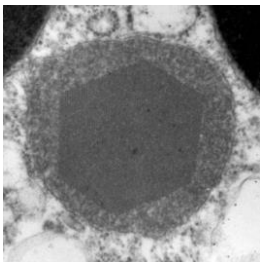
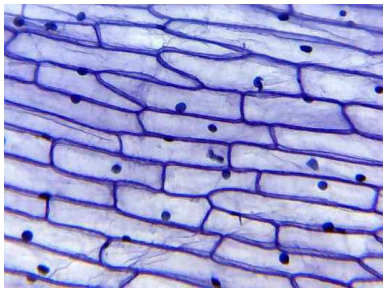
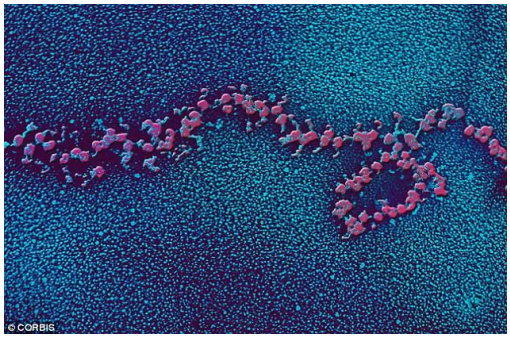


29. _____ 

30. _____ 

Free Response Questions (3 points each)

31. Name one amino acid that is an "alpha-helix breaker".

32. Which amino acid is known for its ability to transport hydrogen ions?

33. How is oxalacetate shuttled to the cytosol? Why is this important?

34. Which vitamin is used to create NADP?

35. Explain the differences between autophototrophs, autochemotrophs, herterophototrophs, and heterochemotrophs.

36. What is the precursor of the cell plate in a plant cell? What is the cell plate first primarily composed of?

37. What conditions cause starch bodies to form in the chloroplast?

38. What is the y-intercept of a Lineweaver-Burk graph? What is the x-intercept?

39. How do lipid-soluble hormones (mainly) affect the target cell? How does this differ from water-soluble hormones?

40. What is cytoplasmic streaming, and what general mechanic allows it to work?