Cell Bio EXAM, UGA Invitational Fall 2021

Student Name:_____ Team Name: _____

Tiebreakers are: 7, 8, 9, 11, 13

1. What is a punctured hole in the cell wall that allows for direct cytoplasmic exchange called? (4 pts)

2. What is the most common excitatory neurotransmitter (NT) in the body? ...the most common inhibitory NT? (4 pts)

   Excitatory:

   Inhibitory:

3. Briefly outline the steps needed for a clathrin-coated vesicle to leave the cell containing NTs? You do not need to mention specific enzymes. (6 pts)

4. In a G protein coupled receptor (GPCR), what structural change does the attachment of a receptor lead to which allows the Gα subunit to detach from the dimer? What is that dimer called? (4 pts)

5. What are GPCRs sometimes also called (hint: how many segments span the membrane)? (3 pts)

6. Which of these are present in a plant cell wall? Circle all that apply. (4 pts)
   a. Pectin
   b. Middle Lamella
   c. Microfibrils

d. Channel proteins

7. What is programmed cell death called? Briefly outline the overall steps in the process, excluding any enzymes. (7 pts)

8. What are the products of glycolysis per glucose molecule (the ATP number here can vary)? Explain the advantage of a cell undergoing the citric acid cycle with the final product of glycolysis compared to just undergoing glycolysis (you are not required to list exact ATP numbers). (6 pts)

9. DNP (2,4 dinitrophenol) is a compound used for weight loss back in the 1930s that was quickly banned because it was too dangerous even with careful medical supervision. It exploited the proton gradient created by the electron transport chain, and essentially allowed protons to move down without creating ATP in the process. Answer the following questions about the electron transport chain as it relates to DNP.

    a. What enzyme do the protons (of the proton gradient) eventually go through to generate ATP? (3 pts)

    b. Doctors often report that patients using DNP often have an elevated respiration rate? Explain why that might be the case. Support your answer with what you know about the electron transport chain. (4 pts)

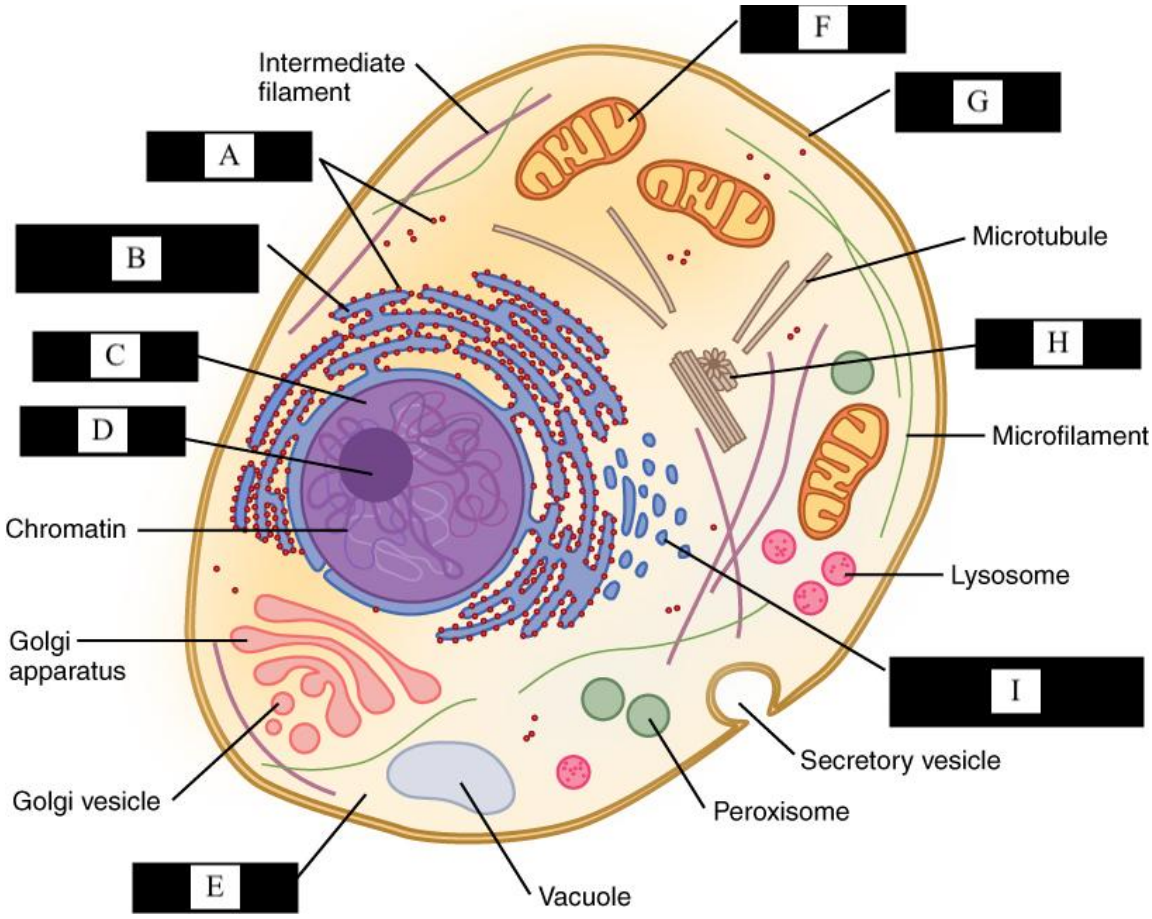
c. Many patients died, not from poisoning or any other direct effects of DNP, but instead from heat stroke. Why would excess heat be made from what you know about DNP's function? (4 pts)

d. Why is DNP an effective weight loss pill? (however, DO NOT USE!! - it is very dangerous as you can see above) (4 pts)

10. When vesicles are used to transport something out of a cell, what is that called? What about when something is transported into a cell? (3 pts)

11. How do competitive, uncompetitive, and noncompetitive inhibitors of enzymes differ? Include how they affect Km and Vmax of the enzyme as well. Does adding more substrate help mitigate the effects of a competitive or noncompetitive inhibitor? (9 pts)

12. Below is a diagram of an animal cell. Label the components and very briefly describe its function (< 10 words). (9 pts)



a.

b.

c.

d.

e.

f.

g.

h.

i.

13. C3 vs C4 vs CAM plants. Answer these questions about the types of photosynthesis.

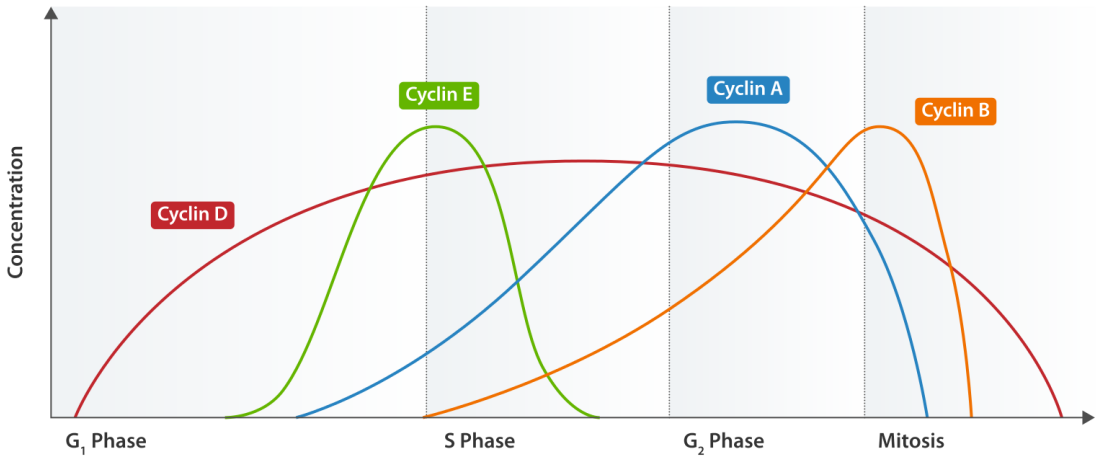
    a. What is the most common form of photosynthesis (of the 3 above)? (2 pts)

    b. Why is CAM photosynthesis preferable to plants in hot environments? (3 pts)

    c. What cycle do plants use to form sugars from ATP & electron carriers? (2 pts)

    d. How do C4 plants minimize photorespiration? Contrast briefly with the C3 cycle, and identify what enzyme causes the wasteful process. (3 pts)

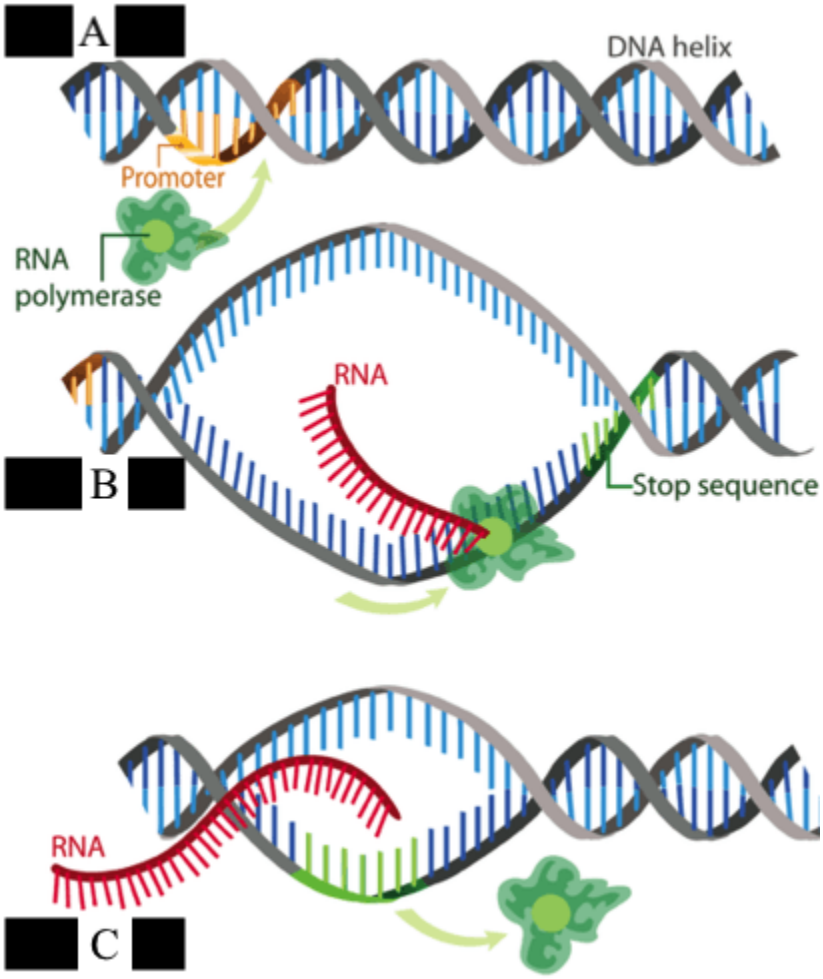
14. Below you will find a graph illustrating cell regulators. Answer the following questions using this chart as a reference.



    a. What family of enzymes do these cyclins bind with to move forward events of the cell? These enzymes are an example of kinases (not the answer to the first question lol). What do kinases normally do? (3 pts)

    b. Cyclins often depend on cues from inside and outside the cell to influence activity of regulators. How might growth factors affect the rate of cyclins? How would DNA damage affect the rate? (4 pts)

15. Identify the 3 steps in transcription in the image below. (3 pts)



a.

b.

c.

MC QUESTIONS (3 pts each)

16. HeLa cells cannot perform what process?
    a. DNA replication
    b. Translation
    c. Apoptosis
    d. Transcription
    e. Proofreading
17. What is a major component of archaeal cell walls?
    a. Pseudopeptidoglycan
    b. Peptidoglycan
    c. Cellulose
    d. Chitin
    e. Phospholipids
18. Which type of vesicle is found on neurons and store neurotransmitters?
    a. Secretory vesicles
    b. Synaptic vesicles
    c. Axonic vesicles
    d. Membrane vesicles
    e. Dendritic vesicles

The following situation will be used for questions 19 and 20

You are stranded on a tiny island, where there is barely anything edible and the only water you can find is the salt water surrounding the island. It has been a week and your body is starving and severely dehydrated.

19. What is a possible effect of drinking the surrounding water on your body?
    A. Nothing - the ocean water could not be absorbed by the cells in your body, so it just comes out as urine
    B. You become hydrated, as the ocean water separates into drinkable water that your cells can use and salt that your body can use for energy
    C. Drinking the water gives you energy because of the microorganisms and salt that you unknowingly consume. This gives you enough energy to paddle to the nearest coast
    D. You become more dehydrated because the salty water pulls what little water is in your cells and your body releases it as urine
    E. You urinate less because the salty water absorbs the urine

20. What major bioenergetic process would your body primarily use to produce energy given your situation?
    A. Glycolysis
    B. Photosynthesis
    C. Oxidative Phosphorylation
    D. Cellular Respiration
    E. Ketosis

21. What type of signaling causes the surrounding cells to undergo some change specified by the cell that sent the signal?
    A. Space signaling
    B. Paracrine signaling
    C. Endocrine signaling
    D. Direct contact signaling
    E. Autocrine signaling

22. Why is the electron microscope useful in studying bacteria?
    A. Bacteria are small
    B. Bacteria move quickly
    C. They produce clearer images
    D. They can show the many organelles inside bacteria
    E. It is not more useful than a regular microscope

23. What is a common difference between prokaryotic cells and eukaryotic cells?
    A. Prokaryotic cells have more organelles
    B. Prokaryotic cells are usually part of multicellular organisms
    C. Prokaryotic cells are smaller than eukaryotic cells
    D. Prokaryotic cells can proofread newly made DNA
    E. Prokaryotic cells are usually specialized

24. Which of the following organelles are found in all cells?
    A. Cell Wall
    B. Ribosomes
    C. Nucleus
    D. Mitochondria
    E. Chloroplast