

Biology 150: 1st in-class examination
February 27, 2019

Name Answer Key

Indicate the lab you are registered in:

Tuesday, 9:00-11:50 _____; Tuesday, 11:00-12:50 _____; Tuesday, 1:00-2:50 _____

Answer the questions in the space provided and you may also use the back of the page to complete your response. There are 29 questions worth a total of 50 points, actually 51 since there was only 49 points on the first 50 point test. There are also plus three one-point bonus questions. The point value of individual questions appears in parentheses.

1. Name (do not give the one letter abbreviations) the pyrimidine bases of the nucleic acids. Which one occurs in DNA but not RNA? (2)

cytosine, Thymine (in DNA but not RNA), and Uracil (in RNA but not DNA)

2. The phosphates of a nucleotide are bonded to which of the carbons of the nucleotide sugar? (1)

5' carbon

3. The missing Oxygen in DNA is bonded to which sugar carbon of the RNA nucleotides? (1)

2' carbon

4. In DNA, which bases hydrogen bond together between the strands? (1)

A-T, G-C or Adenine - thymine
Guanine - cytosine

5. In DNA the strands are anti-parallel. What does that mean? (1)



6. Generally speaking, what is the diameter of a bacterial cell? (1)

1-3 μm

7. What distinctive characteristic separates eukaryote cells from prokaryote cells? (1)

eukaryotes have a nucleus (and other organelles)

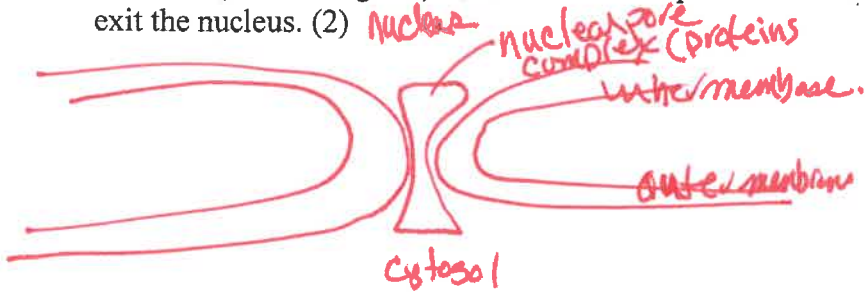
8. What happens to the surface area to volume ratio of a cell as it grows and why does this limit cell size? (3)

- as a cell gets bigger its ratio of surface area to volume decreases
- thus for the same rate of biochemical activity in the cytoplasm each unit area of membrane must transport more nutrients
- there is a limit to the transport capacity of a patch of membrane so

9. Distinguish between protoplasm, cytosol, and cytoplasm. (1)

protoplasm - the contents of the cell
cytoplasm - the contents of the cell exclusive of the nucleus
cytosol - the contents of the cell exclusive of the organelles.
a large cell must have slower biochemistry (metabolism)

10. Describe (and or diagram) the nuclear envelope and the structures through which entities enter and exit the nucleus. (2)



- nuclear envelope consists of 2 membranes that interconnect at nuclear pores
- entities enter/exit through the pores moving past the nuclear pore complex

11. What is the function of ribosomes? (1)

→ assemble proteins

12. How is it that some very large molecules and particles can exit the nucleus while some much smaller molecules can't. (1)

- very small molecules (to the size of nucleotides) pass freely
- some much larger molecules interact w pore complex to pass through. Those passing possess molecular passports

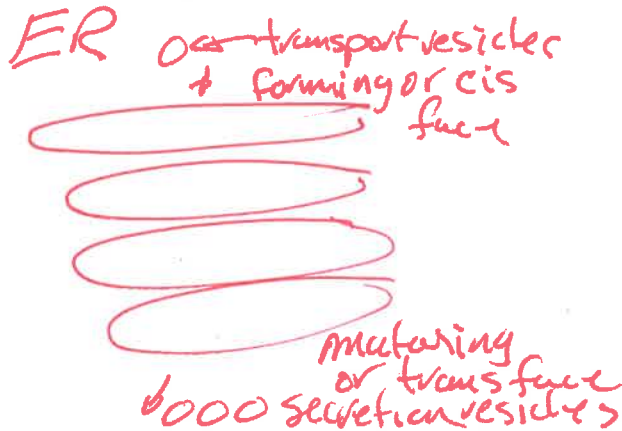
13. Name the types of endoplasmic reticulum and describe what happens there. (3)

RER - rough endoplasmic reticulum - protein synthesis

SER - smooth endoplasmic reticulum - lipid synthesis

transitional ER - where vesicles (transport vesicles) form

14. What happens in the golgi? Name the "faces" and explain the cisternal maturation model. (5)



- molecules are modified, sorted and packaged in vesicles for final destination.
- model: each cisterna are thought to pass through the golgi without exchanging material with the others.

15. What is a primary lysosome and how does it differ from a secondary lysosome? (2)

- primary lysosomes are vesicles produced by the golgi containing hydrolytic enzymes
- a secondary lysosome is formed by the fusion of a primary lysosome to a food vacuole

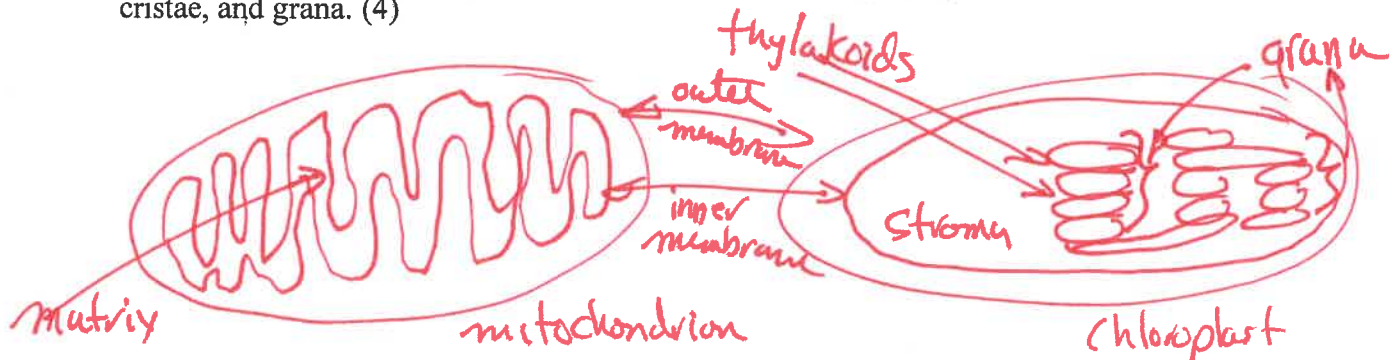
16. What distinguishes a microbody from other organelles? (1)

microbodies include a crystal(s)

17. What happens in glyoxisomes? (1)

~~Sugars~~ fats are converted to sugars (in plants & cells only)

18. Diagram a mitochondrion and a chloroplast. Label the membranes, stroma, matrix, thylakoids, cristae, and grana. (4)



19. What evidence supports the endosymbiosis theory? (2)

- DNA of plastids + mitochondria is prokaryotic (not associated to proteins), circular, and containing prokaryote genes

20. Intermediate filaments are composed primarily of what protein? (1)

keratin s

21. Name the motor protein that interacts with actin in muscle contraction. (1)

myosin

22. Microtubules are associated with motility in three ways. Explain. (3)

- ① using motor proteins organelles can move along microtubules
- ② motor proteins can move microtubules along other microtubules moving attached organelles
- ③ microtubules can move by polymerization at one end and depolymerization at the other

23. Describe the structure of the basal body. (1)

contain a ring of nine triplets of fused microtubules

24. How are cilia and flagella different? (2)

cilia have a rowing motion (force is ~~perpendicular~~ ^{parallel} to cell membrane) — short

flagella have a waving motion (force is perpendicular to the membrane) — short

25. Name two structural proteins of the extracellular matrix. (2)

collagen
fibronectin

26. Describe the "unit membrane model" of the cell membrane. (2)

phospholipid bilayer sandwiched between two layers of protein

bilayer  protein

27. What membrane component lends fluidity to animal cell membranes? (1)

cholesterol

28. Name and describe the function of the major ion pump of animal cells. How is it electrogenic? (2)

Sodium potassium pump - uses ATP energy to push Na^+ out of the cell and K^+ in

- It generates a voltage by moving 3Na^+ out for every 2K^+ in

29. Name and describe the two ways channels are gated. (2)

① Voltage gated - increasing or decreasing voltage across the membrane opens or closes the channel

② Ligand gated - binding of a specific molecule causes opening

Bonus questions:

1) How is motility different from mobility? (1)

motility - is the ability of an organism (cell) to move using its own metabolic energy

mobility - is the ability to be moved.

2) Why is Mg^{++} required for enzymatic hydrolysis by myosin? (1)

Mg^{++} binds the phosphates of ATP, bending or straining the bonds making hydrolysis easier

3) Some commercially available "ice packs" are activated by striking them with the palm of the hand.

This force ruptures a thin membrane separating water from ammonium nitrate (NH_4NO_3) or ammonium chloride (NH_4Cl). The resulting reaction ($\text{NH}_4\text{NO}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{NO}_3^-$) turns the ice pack cold. For the reaction ($\text{NH}_4\text{NO}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{NO}_3^-$), which of the following are negative and which positive?

ΔG negative, ΔH positive, and ΔS positive (1) (1)