BIOLOGY 311C - Brand
Spring 2008

NAME (printed very legibly) _____ **Key** _____

EXAMINATION I

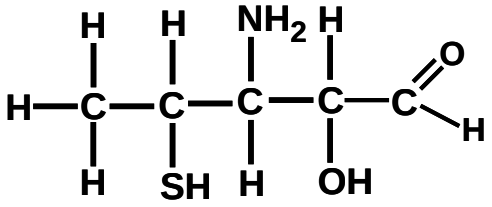
Before beginning, check to be sure that this exam contains 7 pages (including front and back) numbered consecutively, and that you have been provided with a clean Answer Sheet. Then immediately print your name and UT-EID legibly at the top of this page. Also print and bubble in your name and your UT-EID (not your social security number) on the front of the Answer Sheet in the spaces provided. The first 39 questions are "multiple choice", with only one correct answer. Mark the letter corresponding to the correct answer to each of these questions in the appropriate location on the Answer Sheet, using a No. 2 pencil. Write answers to Questions 40 – 42 directly on this exam, in the spaces provided with the questions. Write in complete sentences if an explanation or a description is required. Print neatly if your handwriting is likely to be difficult to read. Turn in both this exam and the Answer Sheet after checking to be sure that your name is clearly written in both places and all questions have been answered in the appropriate locations. You must turn in your exam on or before 9:55 a.m.

1. The chemical symbol of the un-ionized form of the smallest element, which contains only one proton per atom, is:
   a. He.
   b. H_2.
   c. H.
   d. H^+.

2. An atom or molecule that carries one or more negative charges is called a(n):
   a. isotope.
   b. isomer.
   c. cation.
   d. anion.

3. Which one of the molecular species whose chemical symbol is shown below is defined as an organic molecule?
   a. CH_4
   b. CO_2
   c. H_2CO_3
   d. CO_3^{2-}

4. Which one of the following is not a functional group of the molecule whose structural formula is shown at right?
   a. Aldehyde
   b. Carboxylic acid
   c. Alcohol
   d. Sulfhydryl



5. A typical bond strength of a covalent bond is approximately 400 kJ/mole. A typical bond strength of a hydrogen bond (in kJ/mole) is approximately:
   a. 40.
   b. 400.
   c. 4,000.
   d. 4×10^4.

6. Which one of the following functional groups would not be expected to form a hydrogen bond with water?
   a. Sulfhydryl
   b. Aldehyde
   c. Phosphoric acid
   d. Amine

7. If, in a eukaryotic cell, a signal recognition particle (SRP) is bound to the end of a polypeptide chain (protein) while it is being synthesized, then the polypeptide chain is targeted to:
   a. the plasma membrane.
   b. nuclear pores.
   c. the nucleolus.
   d. endoplasmic reticulum.

8. The endosyombiont theory accounts for the origin of:
   a. prokaryotic cells.
   b. the cytoskeleton.
   c. lysosomes.
   d. mitochondria.

9. Which one of the following does not demonstrate the "black-box" properties of the living state?
   a. A forest
   b. A frog
   c. An individual cell of an insect
   d. A peroxysome

10. The steady-state condition of an individual living cell is called:
    a. dynamic equilibrium.
    b. metabolism.
    c. homeostasis.
    d. respiration.

11. In cross-sectional view, cilia appear identical to:
    a. basal bodies.
    b. centrioles.
    c. a spindle that supports chromosome movement.
    d. flagella.

12. The central dogma of molecular biology describes:
    a. the importance of organic molecules in explaining the cell doctrine.
    b. the intracellular locations of different classes of organic molecules that occur in all cells.
    c. how ATP is made, distributed and used up during cellular processes.
    d. the relationships among kinds of molecules used for protein synthesis.

13. A molecule that loses a pair of hydrogen atoms is said to be:
    a. reduced.
    b. oxidized.
    c. protonated.
    d. de-protonated.

14. The diameters of the smallest living cells that don't occur as parasites within other living cells are generally not less than:
    a. 0.5 nm.
    b. 20 nm.
    c. 0.5 µm.
    d. 20 µm.

15. The maximum size of an actively metabolizing cell is limited by:
    a. its surface-to-volume ratio.
    b. its ability to pack in enough cellular machinery.
    c. the physical strength of its plasma membrane.
    d. the amount of genetic information that can fit within it.

16. The diameter, in µm, of a microtubule is approximately:
    a. 0.025
    b. 0.5
    c. 5
    d. 25

17. An example of communication among prokaryotic cells is:
    a. the mechanism of bacteria flageller movement.
    b. the expression of a plasmid.
    c. assembly and disassembly of microfilaments.
    d. quorum sensing.

18. Which one of the following processes in prokaryotes requires internal membranes (or membrane-bounded organelles)?
    a. DNA replication
    b. Respiration
    c. Flagellar movement
    d. Protein synthesis

19. If only the membrane-bounded organelles are removed from the cytoplasm of a eukaryotic cell, then the remainder of the cytoplasm is called the:
    a. nucleus.
    b. cytoskeleton.
    c. cytoplasmic matrix.
    d. cytosol.

20. "Motor" molecules of eukaryotic cells are components of:
    a. the cytoskeleton.
    b. the endomembrane system.
    c. nucleoplasm.
    d. ribosomes.

21. Which one of the following is not a component of the endomembrane system of eukaryotic cells?
    a. The plasma membrane
    b. Transport vesicles
    c. An amyloplast
    d. A golgi body

22. Which one of the following is not a location of oligosaccharide (small carbohydrate) molecules bound to the surfaces of membranes of endomembrane system?
    a. The lumen face of transport vesicles
    b. The lumen face of smooth endoplasmic reticulum
    c. The cytoplasmic face of the plasma membrane
    d. The lumen face of lysosomes

23. Acid hydrolase enzymes that are capable of destroying most large biomolecules of cells occur within:
    a. peroxysomes.
    b. lysosomes.
    c. ribosomes.
    d. the matrix of mitochondria.

24. The two primary processes in mitochondrial respiration are oxidation and:
    a. ATP synthesis.
    b. protein synthesis.
    c. assembly or ribosomes.
    d. assembly of microtubules.

25. Which one of the following is composed of fibrous proteins?
    a. Microtubules
    b. Microfilaments
    c. Intermediate filaments
    d. Histones

26. Basal bodies contain:
    a. microtubules.
    b. microfilaments.
    c. intermediate filaments.
    d. histones.

27. Muscle movement depends on the function of:
    a. microtubules.
    b. microfilaments.
    c. intermediate filaments.
    d. histones.

28. A component of animal cells, but not found in plant cells, is:
    a. plasmids.
    b. centrioles.
    c. mitochondria.
    d. 80S ribosomes.

29. Which one of the following is not a kind of intermediate filament?
    a. Lamin
    b. Keratin
    c. Actin
    d. Neurofilaments.

30. In the three-domain system of classification of living organisms, how many domains contain eukaryotes?
    a. 0
    b. 1
    c. 2
    d. 3

31. Which one of the following is not a dynamic (frequently changing) component of eukaryotic cells?
    a. Microtubules
    b. Microfilaments
    c. Intermediate filaments
    d. Components of the endomembrane system

32. Typical plant cells do not contain:
    a. plasmodesmata.
    b. mitochondria.
    c. lysosomes.
    d. plastids.

33. Proplastids are surrounded by:
    a. a single membrane.
    b. an envelope consisting of two membranes.
    c. a glycocalys.
    d. a tonoplast.

34. The outer-most layer of a plant cell (considering both the living and the non-living components) is the:
    a. tonoplast.
    b. glycocalyx.
    c. primary cell wall.
    d. secondary cell wall.

35. The two components that together provide for turgor pressure in plant cells are:
    a. the central vacuole and the cell wall.
    b. plasmodesmata and plastids.
    c. plastids and the cell wall.
    d. plastids and the central vacuole.

36. Primary energy production in plants occurs in:
    a. proplastids.
    b. chloroplasts.
    c. mitochondria.
    d. the central vacuole.

37. Morphine and heroin can mimic the effect of natural endorphin in humans because these different molecules:
    a. all hydrogen bond to water.
    b. have very similar shapes.
    c. do not dissolve in water.
    d. have virtually identical chemical activity.

38. A hydrophobic liquid:
    a. contains several electrical charges.
    b. is acidic because it readily loses protons.
    c. forms hydrogen bonds only with water.
    d. does not dissolve in water.

39. Which of the following substances occurs primarily in the extracellular matrix (the glycocalyx) of animal cells?
a. Collagen and fibronectin
b. Dynein and kinesin
c. Flagellar roots
d. Cisternae

40. Select from the list at right the organelle or occlusion that best describes each item listed below, and write the corresponding letter in the space provided with each item. Items at right may be used more than once. Select all correct answers if more than one answer is called for.

A nuclear envelope
B nucleolus
C lysosome
D plastid
E golgi body
F mitochondrion
G plasma membrane
H endoplasmic reticulum
I prokaryotic cell envelope
J ribosome
K plasmid
L peroxysome

a. __**G**___ Completely surrounds a cilium or flagellum

b. __**D**___ Often green in color.

c. __**C**___ Site of intracellular digestion in eukaryotes.

d. _**D, F, K**_ Contains DNA (more than one answer). ***B also correct***

e. __**A**___ Contains pores that allow ribosome to pass through.

f. __**F**___ Site of respiration in eukaryotic cells.

g. __**L**___ Site of Destruction of hydrogen peroxide (H_2O_2).

h. **A, D, F, I** Consists of more than one membrane (more than one answer). ***May also count E***

i. __**H**___ Site of synthesis of new membrane in eukaryotes.

j. __**G**___ The outer-most living component of a eukaryotic cell.

k. __**H**___ Site of detoxification of organic compounds in human liver cells.

l. __**B**___ Site of assembly of ribosome subunits.

m. __**J**___ The occlusion that is the site of protein synthesis.

n. **G**, **I, J, K** A component of bacteria (more than one answer).

o. __**E**___ Site in eukaryotic cells where vesicles are sorted and transported to various places.

p. __**D**___ Occurs only in plant cells.

41. The DNA in the chromatin of a eukaryotic cell is very long and very thin. Describe, in no more than two sentences each, two different ways that the long molecules are organized to so they don't become hopelessly tangled.

a.

The DNA is wrapped around histones into nucleosomes, then folded in various ways to make it more compact

b.

Specific sites along the chromatin are attached to the laminar network.

[*The chromatin may also be attached directly to the inner membrane of the nuclear envelope.*]

42. In the space provided below, draw the structural formula of an organic molecule that contains a total of three carbon atoms, and that includes a ketone functional group and an alcohol functional group. Show all atoms and covalent bonds in your molecule, and be sure the covalency of each atom is satisfied.

For example: