BIOLOGY 311C - Brand Spring 2010

NAME (printed very legibly) Key	UT-EID
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EXAMINATION I

Before beginning, check to be sure that this exam contains 8 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 42 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 43 - 47 directly on this exam, in the spaces provided with the questions. Write in complete sentences if an explanation is required and <u>Print</u> neatly if your handwriting is likely to be difficult to read. Turn in <u>both</u> 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. Which one of the atoms whose chemical symbol is shown here has a covalency of 2 when it occurs in biological molecules?
 - a. N
 - b. C
 - с. Н
 - <u>d.</u> S
- 2. A neutral atom is defined as an atom that does not:
 - a. have any electrons.
 - **b.** carry any net electric charge.
 - c. form any covalent bonds.
 - d. form any hydrogen bonds.
- 3. A molecule that is composed of two or more different kinds of atom is called a(n):
 - a. isotope.
 - b. isomer.
 - c. chemical substance.
 - <u>**d.**</u> compound.
- 4. How many electrons participate in a single covalent bond?
 - a. 1
 - <u>b.</u> 2
 - c. 3
 - d. 4
- 5. Which one of the following shows the most detailed information about a molecule?
 - a. Its structural formula
 - b. Its chemical formula
 - **<u>c.</u>** Its stereo formula
 - d. A listing of the elements it contains

- 6. Which one of the following is <u>not</u> an accurate description of the substance whose chemical structure can be shown as **HCO**₃?
 - **<u>a.</u>** It is a cation.
 - b. It is a compound.
 - c. It is inorganic.
 - d. It contains a total of 5 atoms.
- 7. The bond length of a typical covalent bond, given in units of nm, is:
 - <u>a.</u> 0.1.
 - b. 1.
 - c. 10.
 - d. 100.
- 8. Which one of the following is <u>not</u> a "black-box" property of all living cells?
 - a. A requirement for a continuous source of food
 - b. A requirement for continuous generation of waste
 - c. A requirement for a continuous source of organic molecules
 - d. A requirement for a continuous source of energy
- 9. The first person to have recorded the observation that single-celled and few-celled organisms are compartmentalized into discrete cells was:
 - a. Louis Pasteur.
 - **b.** Anton van Leeuwenhoek.
 - c. Charles Darwin.
 - d. Robert Hooke.
- 10. The outer-most living component of cells is considered to be the:
 - a. cytogel.
 - b. glycocalyx.
 - c. capsule.
 - **<u>d.</u>** plasma membrane.
- 11. The "central dogma" of molecular biology is a description of the:
 - a. packaging arrangement of chromatin.
 - b. events that regulate metabolic reactions.
 - **<u>c.</u>** mechanism of protein synthesis.
 - d. occlusions within cells.
- 12. The central molecules of cell function are:
 - <u>a.</u> proteins.
 - b. carbohydrates.
 - c. lipids.
 - d. nucleic acids.
- 13. When hydrogen atoms are added to an organic molecule, then the molecule is said to be:
 - a. protonated.
 - b. oxidized.
 - **<u>c.</u>** reduced.
 - d. hydrolyzed.

- 14. Cells that are approximately 0.2 µm in diameter are usually:
 - a. devoid of a plasma membrane.
 - b. animal cells.
 - c. very irregular in shape or else mostly filled with a central vacuole.
 - **<u>d.</u>** living within other cells.
- 15. Modern classification places all living organisms into three groups (bacteria, Archaea and eukaryotes) which are called:
 - a. phyla.
 - **<u>b.</u>** domains.
 - c. kingdoms.
 - d. classes.
- 16. A typical diameter of a prokaryotic cell is:
 - <u>a.</u> 1 μm.
 - b. 5 Å.
 - c. 20 nm.
 - d. 8 mm.
- 17. Streptobacillus bacteria are expected to appear as:
 - a. swimming spiral cells.
 - b. spherical cells.
 - c. 3-dimensional packets of cells.
 - **<u>d.</u>** chains of cells.
- 18. Which one of the following statements best describes a characteristic of plasmids?
 - a. They are membrane-bounded organelles surrounded by an envelope and containing DNA.
 - b. They are fibrous proteins that are inert to chemical degradation.
 - c. They are enzymes that are capable of acid hydrolysis.
 - **<u>d.</u>** They are small circular molecules of DNA.
- 19. Which one of the following is <u>not</u> a component of the cell envelope of gram negative bacteria?
 - <u>a.</u> Ribosomes
 - b. Plasma membrane
 - c. Outer membrane
 - d. Periplasmic space
- 20. Which one of the following is characteristic of a bacterial flagellum?
 - a. It is surrounded by plasma membrane.
 - b. It contains microtubules.
 - **<u>c.</u>** It spins on an axle.
 - d. It is anchored to the cell by attachment to intermediate filaments.
- 21. Which one of the following is not a widely used model organism for cell and molecular biology studies?
 - a. Arabidopsis (a weedy plant)
 - b. Drosophila (a fruit fly)
 - **<u>c.</u>** *Dugesia* (a flatworm)
 - d. E. coli (a bacterium)

- 22. The protoplasm of eukaryotic cells can be broadly divided into three components, which are plasma membrane, nucleus and ... :
 - a. cytoplasmic matrix.
 - **<u>b.</u>** cytoplasm.
 - c. cytosol.
 - d. cytogel.
- 23. Muscle contraction in animal cells and cyclosis in plant cells depend on the function of:
 - a. microfilaments.
 - b. microtubules.
 - c. intermediate filaments.
 - d. cellulose fibrils.
- 24. Which one of the following is considered to be an "occlusion" within a cell?
 - a. A microfilament
 - **b.** A ribosome
 - c. A cisterna
 - d. A vacuole
- 25. In eukaryotic cells, sorting of recently synthesized membrane and lumen contents for transport elsewhere occurs in:
 - a. food vacuoles.
 - b. the lysosome lumen.
 - <u>c.</u> golgi cisternae.
 - d. the glycocalyx.
- 26. The outer membrane of the nuclear envelope is continuous with:
 - a. golgi cisternae.
 - **b.** membrane of rough endoplasmic reticulum.
 - c. membrane of smooth endoplasmic reticulum.
 - d. the plasma membrane.
- 27. Ribosomes are constructed in eukaryote cells:
 - **a.** in the nucleolus.
 - b. within the periplasmic space of the nuclear envelope.
 - c. on the surface of endoplasmic reticulum.
 - d. within lysosomes.
- 28. Ribosomes attached to the endoplasmic reticulum (e.r.) differ from those which are unattached to a membrane surface in that attached ribosomes:
 - a. are smaller (e.g. are 70S).
 - b. are used to synthesize RNA rather than proteins.
 - **<u>c.</u>** facilitate protein insertion into the e.r. lumen.
 - d. are synthesized in plastids or mitochondria.
- 29. Lipids are synthesized in the cytoplasm of eukaryotic cells in:
 - a. the plasma membrane.
 - b. peroxysomes.
 - **<u>c.</u>** endoplasmic reticulum.
 - d. the intermembrane space of mitochondria.

- 30. The definition of vacuoles differs from the definition of vesicles in that vacuoles:
 - a. are much larger than vesicles.
 - **b.** do not have much chemical activity.
 - c. are surrounded by a double membrane.
 - d. detoxify hydrogen peroxide.
- 31. Acid hydrolysis of biological molecules is a principal function of:
 - **<u>a.</u>** lysosomes.
 - b. peroxysomes.
 - c. plastids.
 - d. the nucleolus.

32. Which one of the following is a component of the endomembrane system?

- a. Mitochondria
- **b.** Lysosomes
- c. Plastids
- d. Peroxysomes
- 33. Motor molecules attached to the cytoskeleton require which one of the following in order to function?
 - <u>a.</u> ATP
 - b. RNA
 - c. DNA
 - d. carbohydrate
- 34. The diameter of microfilaments, in nm, is:
 - <u>a.</u> 7.
 - b. 25.
 - c. 60.
 - d. approximately 400.
- 35. A "9x2 + 2" arrangement of microtubules occurs in:
 - a. basal bodies.
 - b. the spindle of cells undergoing mitosis.
 - <u>c.</u> cilia.
 - d. bacteria flagella.
- 36. Although not discovered until recently, it is now known that cell division in prokaryotes requires the function of:
 - **<u>a.</u>** cytoskeletal elements.
 - b. membrane bounded organelles.
 - c. cellulose.
 - d. acid hydrolases.
- 37. The region of eukaryotic cells with radiating microtubules, that is often called the "cell center", is the:
 - a. nucleus.
 - b. nuclear lamella.
 - c. golgi complex.
 - <u>**d.**</u> centrosome.

- 38. Non-dynamic components of the cytoskeleton of eukaryotic cells that are constructed of fibrous proteins are.
 - a. microfilaments.
 - b. microtubules.
 - c. microtubule-associated proteins (MAPs).
 - **<u>d.</u>** intermediate filaments.
- 39. Turgor pressure in plant cells requires the function of the cell wall and:
 - a. plastids.
 - b. the nucleus.
 - **<u>c.</u>** the central vacuole.
 - d. the cytogel.
- 40. Which one of the following is not a kind of mature plastid in a eukaryotic cell?
 - a. Chromoplast
 - **b.** Tonoplast
 - c. Chloroplast
 - d. Leucoplast
- 41. According to the endosymbiont theory, three of the four membrane-bounded components of eukaryotic cells listed below were believed to have arisen from a prokaryotic cell that was captured by another cell. Which one of the following is <u>not</u> one of those three?
 - a. The nucleus
 - b. Mitochondria
 - c. Lysosomes
 - d. Chloroplasts
- 42. When added to water, amines cause the water to become alkaline because amines:
 - a. remove electrons from water molecules.
 - **b.** accept protons from water molecules.
 - c. accept entire hydrogen atoms from water molecules
 - d. bond covalently to water molecules.

End of multiple choice questions

Answer the following questions directly on this exam

- 43. In the spaces provided, answer the following questions regarding the molecule whose abbreviated structure is shown at right.
 - a. <u>4</u> How many total carbon atoms does this molecule contain?
 - b. <u>15</u> How many total atoms does this molecule contain?
 - c. <u>14</u> How many covalent bonds does this molecule contain?



44. To the left of each functional group shown at right, write the name of the corresponding functional group in the space provided.



46. a. Use the space provided below to explain, in two sentences or less, what the word "targeting" means in cell biology.

Targeting refers to the production of a molecule that has features which cause it to be attracted to a specific location in the cell or on the surface of a cell.

b. Use the space provided below to describe, in two sentences or less, an example of targeting. You may use an example from cell biology or medicine.

For example: Vesicles derived from smooth endoplasmic reticulum are targeted to golgi bodies.

- 47. For each description listed below, select the <u>one</u> item from the list at right that best fits the description and place the corresponding number in the space provided. Items at right may be used more than once.
 - a. ___**E**_ Contains plasmodesmata.
 - b. **B** Greater than 5 μ m in diameter.
 - c. **___C** Chromosome DNA occurs in a single large circular molecule.
 - d. ____B_ Contains 80S (24 nm-diameter) ribosomes.
 - e. ____A_ Contains 70S (20 nm-diameter) ribosomes.
 - f. ___**B**_ Contains mitochondria.
 - g. ___**D**_ Contains flagella or cilia.
 - h. **___E** Contains a large central vacuole.
 - i. ____**A**__ Contains a plasma membrane.
 - j. ____D_ Contains centrioles.
 - k. ____**E**_ Contains plastids.

- A. Characteristic of all living cells.
- B. Characteristic of eukaryotic cells generally, but not prokaryotic cells.
- C. Characteristic of prokaryotic cells, but not eukaryotic cells.
- D. Characteristic of animal cells, but not plant cells.
- E. Characteristic of plant cells, but not animal cells.