MCC Biological Principles
Exam 2 (Ch 6–9) THURS
Take home exam. Due in class on or before March 31, 2011

Name_____

ANSWER ALL QUESTIONS ON SCAN–TRON SHEET

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following are prokaryotic cells? 1) _____
   A) plants
   B) fungi
   C) animals
   D) bacteria
   E) B and C only

2) All of the following are part of a prokaryotic cell *except* 2) _____
   A) a cell wall.
   B) DNA.
   C) ribosomes.
   D) a plasma membrane.
   E) an endoplasmic reticulum.

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

For the following questions, use the lettered answers to match the structure to its proper cell type. Choose the most inclusive category. Each answer may be used once, more than once, or not at all.

A. a feature of all cells
B. found in prokaryotic cells only
C. found in eukaryotic cells only
D. found in plant cells only
E. found in animal cells only

3) plasma membrane 3) _____

4) tonoplast 4) _____

5) nucleoid 5) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

6) Large numbers of ribosomes are present in cells that specialize in producing which of the following molecules? 6) _____
   A) glucose
   B) lipids
   C) proteins
   D) starches
   E) steroids

7) Which type of organelle is primarily involved in the synthesis of oils, phospholipids, and steroids? 7) _____
   A) lysosome
   B) smooth endoplasmic reticulum
   C) mitochondrion
   D) contractile vacuole
   E) ribosome

8) Which structure is the site of the synthesis of proteins that may be exported from the cell? 8) _____
   A) rough ER
   B) tight junctions
   C) lysosomes
   D) Golgi vesicles
   E) plasmodesmata

9) Which of the following cell components is *not* directly involved in synthesis or secretion? 9) _____
   A) Golgi body
   B) smooth endoplasmic reticulum
   C) lysosome
   D) rough endoplasmic reticulum
   E) ribosome

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Refer to the following five terms to answer the following questions. Choose the most appropriate term for each phrase. Each term may be used once, more than once, or not at all.

A. lysosome
B. vacuole
C. mitochondrion
D. Golgi apparatus
E. peroxisome

10) produces and modifies polysaccharides that will be secreted 10) _____

11) contains hydrolytic enzymes 11) _____

12) helps to recycle the cell's organic material 12) _____

13) one of the main energy transformers of cells 13) _____

14) contains its own DNA and ribosomes 14) _____

15) a compartment that often takes up much of the volume of a plant cell 15) _____

16) contains enzymes that transfer hydrogen from various substrates to oxygen, producing H_2O_2 16) _____

17) a versatile plant compartment that may hold reserves of organic compounds or inorganic ions 17) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

18) Grana, thylakoids, and stroma are all components found in 18) _____
A) chloroplasts.
B) nuclei.
C) lysosomes.
D) vacuoles.
E) mitochondria.

19) Organelles other than the nucleus that contain DNA include 19) _____
A) ribosomes.
B) chloroplasts.
C) mitochondria.
D) B and C only
E) A, B, and C

20) Which of the following are capable of converting light energy to chemical energy? 20) _____
A) chloroplasts
B) Golgi bodies
C) peroxisomes
D) mitochondria
E) leucoplasts

21) A cell has the following molecules and structures: enzymes, DNA, ribosomes, plasma membrane, and mitochondria. It could be a cell from 21) _____
A) a plant or an animal.
B) an animal, but not a plant.
C) any kind of organism.
D) a plant, but not an animal.
E) a bacterium.

22) Which of the following types of molecules are the major structural components of the cell membrane? 22) _____
A) nucleic acids and proteins
B) glycoproteins and cholesterol
C) phospholipids and proteins
D) proteins and cellulose
E) phospholipids and cellulose

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

For the following questions, match the labeled component of the cell membrane (Figure 7.1) with its description.

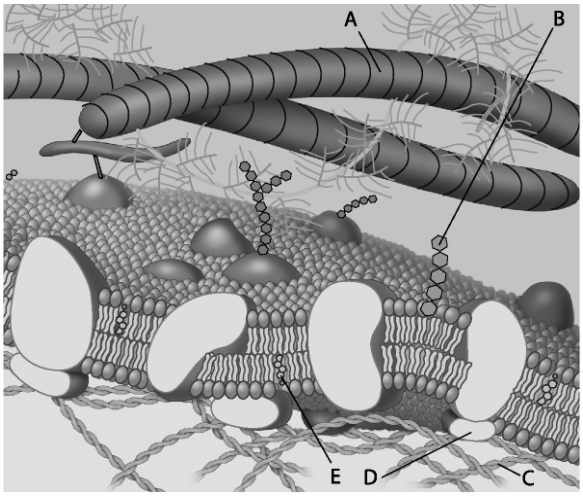

Figure 7.1

23) peripheral protein 23) _____

24) cholesterol 24) _____

25) glycolipid 25) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

26) All of the following molecules are part of the cell membrane *except* 26) _____
A) phosphate groups.
B) nucleic acids.
C) lipids.
D) proteins.
E) steroids.

27) The presence of cholesterol in the plasma membranes of some animals 27) _____
A) enables the animal to remove hydrogen atoms from saturated phospholipids.
B) makes the membrane less flexible, allowing it to sustain greater pressure from within the cell.
C) enables the membrane to stay fluid more easily when cell temperature drops.
D) makes the animal more susceptible to circulatory disorders.
E) enables the animal to add hydrogen atoms to unsaturated phospholipids.

28) Of the following functions, which is most important for the glycoproteins and glycolipids of animal cell membranes? 28) _____
A) maintaining the integrity of a fluid mosaic membrane
B) maintaining membrane fluidity at low temperatures
C) active transport of molecules against their concentration gradients
D) facilitated diffusion of molecules down their concentration gradients
E) a cell's ability to distinguish one type of neighboring cell from another

29) What kinds of molecules pass through a cell membrane most easily? 29) _____
A) ionic
B) large and hydrophobic
C) monosaccharides such as glucose
D) small and hydrophobic
E) large polar

30) Which of the following would likely move through the lipid bilayer of a plasma membrane most rapidly? 30) _____

A) an amino acid
B) starch
C) K^+
D) glucose
E) CO_2

31) Which of the following statements is *correct* about diffusion? 31) _____

A) It requires an expenditure of energy by the cell.
B) It is a passive process in which molecules move from a region of higher concentration to a region of lower concentration.
C) It is very rapid over long distances.
D) It is an active process in which molecules move from a region of lower concentration to one of higher concentration.
E) It requires integral proteins in the cell membrane.

Use the diagram of the U–tube in Figure 7.2 to answer the questions that follow.

The solutions in the two arms of this U–tube are separated by a membrane that is permeable to water and glucose but not to sucrose. Side A is half filled with a solution of 2 *M* sucrose and 1 *M* glucose. Side B is half filled with 1 *M* sucrose and 2 *M* glucose. Initially, the liquid levels on both sides are equal.

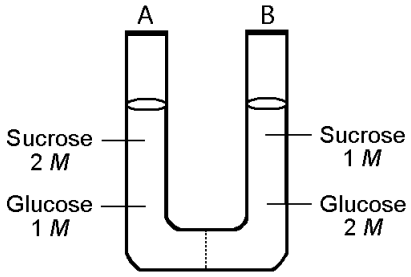

Figure 7.2

32) Initially, in terms of tonicity, the solution in side A with respect to that in side B is 32) _____

A) saturated.
B) hypotonic.
C) plasmolyzed.
D) isotonic.
E) hypertonic.

33) After the system reaches equilibrium, what changes are observed? 33) _____

A) The water level is higher in side B than in side A.
B) The molarity of glucose is higher in side A than in side B.
C) The water level is higher in side A than in side B.
D) The water level is unchanged.
E) The molarity of sucrose and glucose are equal on both sides.

34) A patient has had a serious accident and lost a lot of blood. In an attempt to replenish body fluids, distilled water, equal to the volume of blood lost, is transferred directly into one of his veins. What will be the most probable result of this transfusion? 34) _____
A) The patient's red blood cells will burst because the blood fluid is hypertonic compared to the cells.
B) The patient's red blood cells will swell because the blood fluid is hypotonic compared to the cells.
C) The patient's red blood cells will shrivel up because the blood fluid is hypertonic compared to the cells.
D) The patient's red blood cells will shrivel up because the blood fluid is hypotonic compared to the cells.
E) It will have no unfavorable effect as long as the water is free of viruses and bacteria.

35) Celery stalks that are immersed in fresh water for several hours become stiff and hard. Similar stalks left in a salt solution become limp and soft. From this we can deduce that the cells of the celery stalks are 35) _____
A) hypertonic to fresh water but hypotonic to the salt solution.
B) isotonic with fresh water but hypotonic to the salt solution.
C) hypertonic to both fresh water and the salt solution.
D) hypotonic to both fresh water and the salt solution.
E) hypotonic to fresh water but hypertonic to the salt solution.

36) A cell whose cytoplasm has a concentration of 0.02 molar glucose is placed in a test tube of water containing 0.02 molar glucose. Assuming that glucose is not actively transported into the cell, which of the following terms describes the tonicity of the external solution relative to the cytoplasm of the cell? 36) _____
A) flaccid
B) turgid
C) isotonic
D) hypertonic
E) hypotonic

37) The movement of a substance across a biological membrane against its concentration gradient with the help of energy input is 37) _____
A) diffusion.
B) facilitated diffusion.
C) osmosis.
D) exocytosis.
E) active transport.

38) Sucrose is a disaccharide, composed of the monosaccharides glucose and fructose. The hydrolysis of sucrose by the enzyme sucrase results in 38) _____
A) the release of water from sucrose as the bond between glucose and fructose is broken.
B) breaking the bond between glucose and fructose and forming new bonds from the atoms of water.
C) utilization of water as a covalent bond is formed between glucose and fructose to form sucrase.
D) production of water from the sugar as bonds are broken between the glucose monomers.
E) bringing glucose and fructose together to form sucrose.

39) Which of the following statements regarding enzymes is *true*? 39) _____
A) Enzymes change the direction of chemical reactions.
B) Enzymes are permanently altered by the reactions they catalyze.
C) Enzymes increase the rate of a reaction.
D) Enzymes decrease the free energy change of a reaction.
E) Enzymes prevent changes in substrate concentrations.

40) An enzyme catalyzes a reaction by 40) _____
A) lowering the energy of activation of a reaction.
B) increasing the amount of free energy of a reaction.
C) supplying the energy to speed up a reaction.
D) lowering the ΔG of a reaction.
E) changing the equilibrium of a spontaneous reaction.

41) The active site of an enzyme is the region that 41) _____
A) is involved in the catalytic reaction of the enzyme.
B) binds the products of the catalytic reaction.
C) is inhibited by the presence of a coenzyme or a cofactor.
D) binds allosteric regulators of the enzyme.
E) both A and B

42) What is the term used for the metabolic pathway in which glucose ($C_6O_{12}H_6$) is degraded to carbon dioxide (CO_2) and water? 42) _____
A) cellular respiration
B) citric acid cycle
C) fermentation
D) glycolysis
E) oxidative phosphorylation

43) All of the following are functions of the citric acid cycle *except* 43) _____
A) production of NADH.
B) adding electrons and protons to oxygen, forming water.
C) release of carbon dioxide.
D) production of $FADH_2$.
E) production of ATP.

44) During aerobic respiration, electrons travel downhill in which sequence? 44) _____
A) food → citric acid cycle → ATP → NAD^+
B) glucose → pyruvate → ATP → oxygen
C) food → glycolysis → citric acid cycle → NADH → ATP
D) food → NADH → electron transport chain → oxygen
E) glucose → ATP → electron transport chain → NADH

45) The primary role of oxygen in cellular respiration is to 45) _____
A) combine with lactate, forming pyruvate.
B) yield energy in the form of ATP as it is passed down the respiratory chain.
C) catalyze the reactions of glycolysis.
D) act as an acceptor for electrons and hydrogen, forming water.
E) combine with carbon, forming CO_2.

46) During oxidative phosphorylation, H_2O is formed. Where does the oxygen for the synthesis of the water come from? 46) _____
A) pyruvate ($C_3H_3O_3$–)
B) lactate ($C_3H_5O_3$–)
C) glucose ($C_6H_{12}O_6$)
D) carbon dioxide (CO_2)
E) molecular oxygen (O_2)

47) During aerobic cellular respiration, a proton gradient in mitochondria is generated by _____ and used primarily for _____. 47) _____

A) the electron transport chain; ATP synthesis
B) diffusion of protons; ATP synthesis
C) fermentation; NAD^+ reduction
D) the electron transport chain; substrate–level phosphorylation
E) glycolysis; production of H_2O

48) The direct energy source that drives ATP synthesis during respiratory oxidative phosphorylation is 48) _____

A) the thermodynamically favorable flow of electrons from NADH to the mitochondrial electron transport carriers.
B) the thermodynamically favorable transfer of phosphate from glycolysis and the citric acid cycle intermediate molecules of ADP.
C) the difference in H^+ concentrations on opposite sides of the inner mitochondrial membrane.
D) the final transfer of electrons to oxygen.
E) oxidation of glucose to CO_2 and water.

49) Where is ATP synthase located in the mitochondrion? 49) _____

A) inner membrane
B) cytosol
C) mitochondrial matrix
D) electron transport chain
E) outer membrane

50) You have a friend who lost 7 kg (about 15 pounds) of fat on a "low carb" diet. How did the fat leave her body? 50) _____

A) Chemical energy was converted to heat and then released.
B) It was broken down to amino acids and eliminated from the body.
C) It was released as CO_2 and H_2O.
D) It was converted to urine and eliminated from the body.
E) It was converted to ATP, which weighs much less than fat.