

# Workbook



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# Cell Structure and Function

## Cell Structure

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### Questions

- 1) All cells contain which of the following:
  - a. Endoplasmic reticulum
  - b. Plasma membrane
  - c. Nucleus
  - d. Mitochondria
  
- 2) Locomotion of Prokaryotes cells is made by
  - a. Ribosomes
  - b. Lysosomes
  - c. Cilia
  - d. Desmosomes
  
- 3) Which of the following has two phospholipid bilayers?
  - a. The lysosome
  - b. The nucleus
  - c. The Golgi apparatus
  - d. The vacuole
  
- 4) the Rough ER got its name from the \_\_\_ attached to it.
  - a. Nucleolus
  - b. Golgi apparatus
  - c. Ribosomes
  - d. Chromosomes
  
- 5) Which of the following exists only in animal cell?
  - a. Centrosome
  - b. Nucleoplasm
  - c. Envelope membrane
  - d. Golgi apparatus

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- 6) What is the dark zone in the nucleus that produces ribosomes?
- Rough ER
  - Nucleolus
  - Smooth ER
  - Chromosomes
- 7) Diseased animal cells may produce molecules that activate death cascades to kill the cells in a controlled manner. Why would neighboring healthy cells also die?
- The death molecule is passed through desmosomes.
  - The death molecule is passed through plasmodesmata.
  - The death molecule disrupts the extracellular matrix.
  - The death molecule passes through gap junctions.
- 8) Prokaryotes lack
- DNA or genetic material
  - A cell membrane
  - Cell wall
  - A nucleus
- 9) Which part of the cell makes the basic amino acid chain for proteins?
- Ribosomes
  - Endoplasmic reticulum
  - Golgi apparatus
  - Centriole

### Answer Key

- 1) b
- 2) c
- 3) b
- 4) c
- 5) a
- 6) b
- 7) d
- 8) d
- 9) a

## Metabolism

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### Questions

- 1) Energy is stored long-term in the bonds of \_\_\_\_ and used short-term to perform work from a(n) \_\_\_\_ molecule.
  - a. ATP: glucose
  - b. an anabolic molecule: catabolic molecule
  - c. glucose: ATP
  - d. a catabolic molecule: anabolic molecule
  
- 2) DNA replication involves unwinding two strands of parent DNA, copying each strand to synthesize complementary strands, and releasing the parent and daughter DNA. Which of the following accurately describes this process?
  - a. This is an anabolic process.
  - b. This is a catabolic process.
  - c. This is both anabolic and catabolic.
  - d. This is a metabolic process but is neither anabolic nor catabolic.
  
- 3) Consider a pendulum swinging. Which type(s) of energy is/are associated with the pendulum in the following instances: i. the moment at which it completes one cycle, just before it begins to fall back towards the other end, ii. the moment that it is in the middle between the two ends, and iii. just before it reaches the end of one cycle (just before instant i.).
  - a. i. potential and kinetic, ii. potential and kinetic, iii. kinetic
  - b. i. potential, ii. potential and kinetic, iii. potential and kinetic
  - c. i. potential, ii. kinetic, iii. potential and kinetic
  - d. i. potential and kinetic, ii. kinetic iii. Kinetic
  
- 4) Which of the following comparisons or contrasts between endergonic and exergonic reactions is false?
  - a. Endergonic reactions have a positive  $\Delta G$  and exergonic reactions have a negative  $\Delta G$ .
  - b. Endergonic reactions consume energy and exergonic reactions release energy.
  - c. Both endergonic and exergonic reactions require a small amount of energy to overcome an activation barrier.
  - d. Endergonic reactions take place slowly and exergonic reactions take place quickly.

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- 5) Which of the following is the best way to judge the relative activation energies between two given chemical reactions?
- Compare the  $\Delta G$  values between the two reactions.
  - Compare their reaction rates.
  - Compare their ideal environmental conditions.
  - Compare the spontaneity between the two reactions.
- 6) Which of the following is not an example of an energy transformation?
- turning on a light switch
  - solar panels at work
  - formation of static electricity
  - none of the above
- 7) In each of the three systems, determine the state of entropy (low or high) when comparing the first and second: i. the instant that a perfume bottle is sprayed compared with 30 seconds later, ii. an old 1950s car compared with a brand new car, and iii. a living cell compared with a dead cell.
- i. low, ii. high, iii. low
  - i. low, ii. high, iii. high
  - i. high, ii. low, iii. high
  - i. high, ii. low, iii. Low
- 8) The energy released by the hydrolysis of ATP is \_\_\_\_
- primarily stored between the alpha and beta phosphates
  - equal to  $-57$  kcal/mol
  - harnessed as heat energy by the cell to perform work
  - providing energy to coupled reactions
- 9) Which of the following molecules is likely to have the most potential energy?
- sucrose
  - ATP
  - glucose
  - ADP
- 10) Which of the following is not true about enzymes:
- They increase  $\Delta G$  of reactions.
  - They are usually made of amino acids.
  - They lower the activation energy of chemical reactions.
  - Each one is specific to the particular substrate(s) to which it binds.

- 11) An allosteric inhibitor does which of the following?
- Binds to an enzyme away from the active site and changes the conformation of the active site, increasing its affinity for substrate binding.
  - Binds to the active site and blocks it from binding substrate.
  - Binds to an enzyme away from the active site and changes the conformation of the active site, decreasing its affinity for the substrate.
  - Binds directly to the active site and mimics the substrate.



### Answer Key

- 1) c
- 2) a
- 3) c
- 4) d
- 5) b
- 6) a
- 7) a
- 8) d
- 9) a
- 10) a
- 11) c

## Respiration

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### Questions

- 1) The energy currency used by cells is .
  - a. **ATP**
  - b. ADP
  - c. AMP
  - d. Adenosine
  
- 2) A reducing chemical reaction .
  - a. **reduces the compound to a simpler form**
  - b. adds an electron to the substrate
  - c. removes a hydrogen atom from the substrate
  - d. is a catabolic reaction
  
- 3) During the second half of glycolysis, what occurs?
  - a. ATP is used up.
  - b. Fructose is split in two.
  - c. **ATP is made.**
  - d. Glucose becomes fructose.
  
- 4) What is removed from pyruvate during its conversion into an acetyl group?
  - a. oxygen
  - b. ATP
  - c. B vitamin
  - d. **carbon dioxide**
  
- 5) What do the electrons added to  $\text{NAD}^+$  do?
  - a. They become part of a fermentation pathway.
  - b. **They go to another pathway for ATP production.**
  - c. They energize the entry of the acetyl group into the citric acid cycle.
  - d. They are converted to NADP.
  
- 6) How many NADH molecules are produced on each turn of the citric acid cycle?
  - a. one
  - b. two
  - c. **three**
  - d. four

### Answer Key

- 1) a
- 2) a
- 3) c
- 4) b
- 5) d
- 6) c

## Photosynthesis

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### Questions

- 1) Which of the following components is *not* used by both plants and cyanobacteria to carry out photosynthesis?
  - a. chloroplasts
  - b. chlorophyll
  - c. carbon dioxide
  - d. water
  
- 2) What two main products result from photosynthesis?
  - a. oxygen and carbon dioxide
  - b. chlorophyll and oxygen
  - c. sugars/carbohydrates and oxygen
  - d. sugars/carbohydrates and carbon dioxide
  
- 3) In which compartment of the plant cell do the light- independent reactions of photosynthesis take place?
  - a. thylakoid
  - b. stroma
  - c. outer membrane
  - d. mesophyll
  
- 4) Which statement about thylakoids in eukaryotes is *not* correct?
  - a. Thylakoids are assembled into stacks.
  - b. Thylakoids exist as a maze of folded membranes.
  - c. The space surrounding thylakoids is called stroma.
  - d. Thylakoids contain chlorophyll.
  
- 5) Predict the end result if a chloroplast's light-independent enzymes developed a mutation that prevented them from activating in response to light.
  - a. GA3P accumulation
  - b. ATP and NADPH accumulation
  - c. Water accumulation
  - d. Carbon dioxide depletion

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- 6) How are the NADPH and GA3P molecules made during photosynthesis similar?
- They are both end products of photosynthesis.
  - They are both substrates for photosynthesis.
  - They are both produced from carbon dioxide.
  - They both store energy in chemical bonds.
- 7) Which of the following structures is *not* a component of a photosystem?
- ATP synthase
  - antenna molecule
  - reaction center
  - primary electron acceptor
- 8) From which component of the light-dependent reaction does NADPH form most directly?
- photosystem II
  - photosystem I
  - cytochrome complex
  - ATP synthase
- 9) Which molecule must enter the Calvin cycle continually for the light-independent reactions to take place?
- RuBisCO
  - RuBP
  - 3-PGA
  - CO<sub>2</sub>
- 10) Three of the same species of plant are each grown under a different colored light for the same amount of time. Plant A is grown under blue light, Plant B is grown under green light, and Plant C is grown under orange light. Assuming the plants use only chlorophyll a and chlorophyll b for photosynthesis, what would be the predicted order of the plants from most growth to least growth?
- A, C, B
  - A, B, C
  - C, A, B
  - B, A, C

### Answer Key

- 1) a
- 2) c
- 3) b
- 4) b
- 5) b
- 6) b
- 7) a
- 8) b
- 9) d
- 10) a

## Cell Communication

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### Questions

- 1) What property prevents the ligands of cell-surface receptors from entering the cell?
  - a. The molecules bind to the extracellular domain.
  - b. The molecules are hydrophilic and cannot penetrate the hydrophobic interior of the plasma membrane.**
  - c. The molecules are attached to transport proteins that deliver them through the bloodstream to target cells.
  - d. The ligands are able to penetrate the membrane and directly influence gene expression upon receptor binding.
  
- 2) The secretion of hormones by the pituitary gland is an example of \_\_\_\_ .
  - a. autocrine signaling
  - b. paracrine signaling
  - c. endocrine signaling**
  - d. direct signaling across gap junctions
  
- 3) Why are ion channels necessary to transport ions into or out of a cell?
  - a. Ions are too large to diffuse through the membrane.
  - b. Ions are charged particles and cannot diffuse through the hydrophobic interior of the membrane.**
  - c. Ions do not need ion channels to move through the membrane.
  - d. Ions bind to carrier proteins in the bloodstream, which must be removed before transport into the cell.
  
- 4) Endocrine signals are transmitted more slowly than paracrine signals because\_\_\_\_
  - a. the ligands are transported through the bloodstream and travel greater distances**
  - b. the target and signaling cells are close together
  - c. the ligands are degraded rapidly
  - d. the ligands don't bind to carrier proteins during transport.

### Answer Key

- 1) b
- 2) c
- 3) b
- 4) a