#### Course

#### Rationale

Anatomy & Physiology

#### Unit III

Cellular Biology

Essential Question

How do cells work?

#### TEKS

130.206(c) 1A 2B,2C,2E,2F, 2G,2H 6A,6B 10A,10B,10C, 10D

#### Prior Student Learning

Basic understanding of body orientation terminology

#### Estimated time

3 – 5 hours

# The cell is the basic unit of structure and function. Each cell has a unique shape and function. Some examples of cells include eggs (ova), spermatozoa, muscle cells, nerve cells, and blood cells.

#### Objectives

Upon completion of this lesson, the student will be able to:

- list and describe the various parts of a cell and explain how their function and diseases are related;
- describe the process of cellular mitosis;
- define neoplasm, and distinguish between benign and malignant neoplasms;
- understand cancer growth and staging;
- describe the different transport systems within the cell; and
- explain cellular respiration and enzyme activity and dysfunction.

#### Engage

Put the following terms in order from largest to smallest:

Organism Tissue Organ Cell

### Organelle

#### Answer:

- 1. Organism
- 2. Organ
- 3. Tissue
- 4. Cell
- 5. Organelle

#### **Key Points**

- I. Cell Overview
  - A. Hierarchy of organization
    - 1. Atoms -- tiny building blocks of all matter
    - 2. Molecules -- carbohydrates, proteins, lipids, nucleic acids
    - 3. Organelles -- miniature systems carrying out functions within the cell
    - 4. Cells -- fundamental unit of living organisms

- II. Cell Structures
  - A. Cell Membrane -- a semi-permeable membrane acting to protect the internal cell structures and assist in cell transport
    - 1. Passive Transport -- requiring no extra energy to transport particles in or out of a cell as in the passively rafting using the current of the river to assist
      - a. Diffusion -- passive movement of a particle from a higher concentration to an area of lower concentration like perfume
      - b. Facilitated diffusion -- a substance that carries a molecule across; akin to passing a pail of rocks to a person who dumps it empty and returns for more
      - c. Osmosis -- the movement of water across a semipermeable membrane from an area of high low solute concentration to an area higher in solute concentration to balance out the water on both sides
      - d. Filtration -- different from osmosis in that pressure is applied to move water and its dissolved materials across a membrane, such as when you squeeze a water gun or the blood pressure forcing water and solutes through kidneys
    - 2. Active Transport -- a method of cell transport requiring extra energy in the form of ATP and a protein to carry molecules across an area already fully concentrated such as rafting against the current of the river
      - a. Endocytosis -- the physical movement of a particle into a cell resulting with an enclosed vesicle formed from the enveloping of the cell membrane
      - b. Phagocytosis -- cell eating such as white blood cells ingesting bacteria to prevent infections
      - c. Pinocytosis -- cell drinking
      - d. Exocytosis -- the physical movement of particles out of the cell such as secretion of insulin from pancreatic cells
    - 3. Diseases related to cell transport
      - a. Cystic Fibrosis -- a defect in the membrane channel carrier proteins affecting the simple diffusion of sodium and chloride causing thick mucus production and clogging organs
      - b. Diabetes mellitus (DM) -- a disorder of facilitated diffusion where insulin, the carrier molecule for glucose, is not enough or is ineffective to transport into cells; this results in hyperglycemia thus affecting the osmotic pressure of all cells resulting in dehydrating the cells of fluid as glucose concentration increases extracellularly and water is drawn from within the cell. This explains why diabetics frequently urinate with traces or high amounts of glucose in the urine.

- c. Familial Hypercholesterolemia -- A genetic disorder of endocytosis where a fatty-protein called Low-Density Lipoprotein (LDL-the "bad" cholesterol) is not transported across the cell membrane together with cholesterol to make other lipids for cell use but rather hangs out in the blood to accumulate and clog the blood vessels
- B. Cytoplasm -- the internal formative material needed for cell survival; likened to the egg-white needed for an embryo chick to survive
- C. Nucleus -- the brain of the cell that dictates the activities of the organelles within the cell; like "City Hall" controlling the activities of city departments
  - 1. Chromatin -- found in the nucleus, this material contains the DNA material or "blueprints" needed to make new cells
  - 2. Nucleolus -- an orbital structure located within the nucleus which synthesizes RNA and ribosomes, the organelles responsible for getting the materials needed to work on cellular infrastructure using our genetic blueprints
- D. Ribosomes -- an organelle composed of one-part RNA and one-part enzyme found singly in cytoplasm or on endoplasmic reticulum is the site of cell repair and reproduction; this is compared to a manufacturing company of the building materials used for cell remodel and repair
- E. Centrosomes -- the general area containing centrioles, the organelles needed to prepare for the construction of new cells, like building contractors making new buildings; centrioles prepare cell for mitosis
- F. Mitochondria -- a cellular power plant, this organelle generates the body's energy needs by supplying ATP for body processes through the process of cellular respiration:

C6H12O6 + 6O2 → 6CO2 + 6H2O + ATP

Glucose + Oxygen Carbon Dioxide + Water + Energy

- G. Endoplasmic Reticulum -- found with or without ribosomes on its surface, this organelle becomes the road system within a cell
  - 1. Rough ER -- contains ribosomes; is the site of protein synthesis
  - 2. Smooth ER -- has no ribosomes; synthesizes fats and steroids
- H. Golgi Apparatus -- this organelle, looking like a stack of flattened sacs, is the packing and shipping center of the cell; works by receiving all proteins produced by the ER and aids in transporting out of the cell

- I. Lysosomes -- organelles likened to an internal waste-management system maintaining cellular health by ingesting and destroying invading organisms
- J. Accessory structures
  - 1. Flagella -- structure used to propel entire cell
  - Cilia -- hair-like structure used to propel objects from the surface of certain specialized cells such as in the bronchi or in the fallopian tubes
  - 3. Diseases of Accessory structures
    - a. Tay-Sachs: Caused by lysosomal defect where there is an enzyme deficiency rendering the lysosome unable to digest and toxins accumulate especially in the lysosomes of neurons resulting in mental retardation and death
    - b. Cigarettes and paralyzed cilia -- a side-effect of smoking; lungs are left unable to clear particles
- III. Cellular Reproduction
  - A. Cell Cycle- the total life of a eukaryotic or normal cell comprised of two main stages:
    - 1. Interphase- period or no cellular duplication
    - 2. Mitosis -- period of cellular division through asexual reproduction resulting with 46 chromosomes or 23 pairs of chromosomes containing all the genetic blue print needed to duplicate an identical daughter cell through four stages:
      - a. Prophase (pro- before) -- nucleus disappears and spindle begins to gather all chromosomal material
      - b. Metaphase (meta- between) -- chromosomes move to center
      - c. Anaphase (ana- apart) -- chromosomes begin to move apart
      - d. Telophase (telo- end or across) chromosomes move to far end, spindle disappears, and nuclear membrane reappears
  - B. Meiosis -- the process of reproduction of gametes or sex cells containing one half of the chromosomes from each respective parent
  - C. Diseases of Cellular Reproduction
    - 1. Cancer or Neoplasms -- wild, uncontrolled mitotic formations leading to too many cells being formed into weird benign or malignant masses
    - 2. Benign tumors -- the proliferation of slow-growing cells kept within a confined space and not affecting surrounding tissues; they are not usually life-threatening
    - 3. Malignant tumors -- are cancerous tumors (cancer or crab-like) invading surrounding tissues or spreading through the lymphatic

system to distant parts of the body through metastasis

#### Activity

- I. Complete the Introduction to Cytology Key Term worksheet
- II. Complete the Cells Laboratory Investigation
- III. Complete the Differentiating Cells Laboratory Investigation
- IV. Complete the Cell Storybook Project
- V. Complete the Trash Cell Project

#### Assessment

Laboratory Investigation Rubric Introduction to Cytology Exam

#### Materials

Internet access microscope water slides coverslips cotton swabs iodine solution gloves laboratory coat or apron goggles biohazard containers surface disinfectant paper towels Prepared histology slides: hyperplasia, metaplasia, dysplasia and anaplasia Prepared histology slides of normal tissues and organs. (Note: these slides should correspond to the abnormal slides.) Prepared cytology slides: various structures showing cancerous tissues.(Provide at least two -- one benign and one malignant.)

#### **Accommodations for Learning Differences**

For reinforcement the student will draw a picture of a cell. See draw the cell activity.

For enrichment, the student will interview a cytologist or pathologist and report on their top five pathology cases and create a poster with examples of the diseased cells including a brief summary.

#### **National Health Science Cluster Standards**

National Health Science Cluster Standards *HLC01.01 Academic Foundations* Health care workers will know the academic subject matter required (in their area. They will use this knowledge as needed in their role.

HLC10.01 Technical Skills

Health Care Workers will apply technical skills required for all career specialties. They will demonstrate skills and knowledge as appropriate.

#### TEKS

130.206 (c)(1)(A) demonstrate safe practices during laboratory and field investigations;

130.206 (c)(2)(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;

130.206 (c)(2)(B) know that hypotheses are tentative and testable statements that must be capable of being supported, or not supported, by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;

130.206 (c)(2)(C) know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;

130.206 (c)(2)(D) distinguish between scientific hypotheses and scientific theories;

130.206 (c)(2)(E) plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;

130.206 (c)(2)(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;

130.206 (c)(3)(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

130.206 (c)(4)(C) analyze the effects of energy deficiencies in mal-absorption disorders such as diabetes, hypothyroidism, and Crohn's

Texas College and Career Readiness Standards English Language Arts

II. B. Understand new vocabulary and concepts and use them accurately in reading writing and speaking.

III. B. Develop effective speaking styles for both group and one on one

situations.

IV. A. Apply listening skills as an individual and as a member of a group in a variety of settings.

IV. B. 2. Listen actively and effectively in one-on-one communication situations.

#### Science

1.E.1. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

1.E.2. Use essential vocabulary of the discipline being studied.

3.A.1. Use correct applications of writing practices in scientific communication.

### Introduction to Cytology Terminology

Benign	
Capsid	
Chromatin	
Centrioles	
Centrosomes	
Cilia	
Cytoplasm	
Deoxyribonucleic acid	
Diabetes Mellitus	
Endocytosis	
Endoplasmic reticulum	
Exocytosis	
Flagella	
Fungi	
Golgi apparatus	
Hypercholesterolemia	

Lysosomes	
Malignant	
Metastasis	
Mitochondria	
Mycelia	
Organelles	
Organism	
Osmosis	
Phagocytosis	
Phenylketonuria	
Pinocytosis	
Protozoa	
Ribonucleic acid	
Ribosomes	
Vesicle	

### **KEY-** Introduction to Cytology Terminology

Benign	Not progressive; usually encapsulated with no changes in surrounding tissue	
Capsid	The protein coverage around virus particle	
Chromatin	Unraveled, loose genetic material found in cell nucleus	
Centrioles	Organelle that prepares for cell morphing preceding mitosis	
Centrosomes	Region in cytoplasm containing centrioles where spindling occurs prior to mitosis	
Cilia	Hair-like structures that rhythmically undulate to propel particles	
Cytoplasm	Formative material within the cell that suspends all organelles	
Deoxyribonucleic acid	Sequenced pairs of nucleotides forming double-helix that when segmented will make up a gene	
Diabetes Mellitus	A condition resulting from insufficient insulin production causing a high build-up of blood glucose	
Endocytosis	Process of cell ingestion	
Endoplasmic reticulum	An organelle with a network of channels that is the site of protein, fat and glycogen production	
Exocytosis	Process of transporting products outside of the cell	
Flagella	A hair-like structure used for motility	
Fungi	A plant-like organism including yeasts and molds that thrive on dead organic matter	
Golgi apparatus	The packaging center for the cell used for the process of transportation	
Hypercholesterolemia	A condition resulting with an increase of cholesterol in the blood	
Lysosomes An organelle with digestive enzymes that protects the organization		
Malignant	Cancerous; a mutation in cells and tissue aggressively imposing on surrounding structures	
Metastasis	The process by which cancerous cells travel through lymphatic system to invade distant structures	
Mitochondria	The organelle responsible for cellular respiration	
Neoplasm	New formative material causing either a benign or malignant change in tissue or organ	

Organelles	Small cellular structures with specialized functions akin to miniature body systems
Organism	An individual living thing
Osmosis	The movement of water or solvent across a semi-permeable membrane to create a balanced concentration
Phagocytosis	An example of endocytosis resulting in ingestion of solid particles into the cell; cell eating
Phenylketonuria	PKU; an inherited disease causing brain injury and death when phenylketones build-up in the body
Pinocytosis	An example of endocytosis resulting in ingestion of liquid particles into the cell; cell drinking
Protozoa	Unicellular organisms such as protozoa that thrive on decaying matter
Ribonucleic acid	Molecule contained in ribosomes and necessary for making proteins
Ribosomes	Organelles made of RNA and protein material found within the cytoplasm and on the surface of endoplasmic reticulum and is the main site of protein synthesis
Vesicle	A membrane-bound storage sac with a cell

### **Cells Laboratory Investigation**

#### Purpose

In this laboratory investigation, the student will observe cells and differentiate between normal and neoplastic tissues.

#### **Background Information**

#### Materials

microscope water slides coverslips cotton swabs iodine solution gloves laboratory coat or apron goggles biohazard containers surface disinfectant paper towels

#### Procedure

- 1. Wash hands and put on gloves and goggles.
- 2. Assemble equipment and materials.
- 3. Prepare work area.
- 4. Gently scrape inside of cheek with cotton swab.
- 5. Stir end of cotton swab in drop of water on a slide.
- 6. Add a drop of iodine solution to color cells.
- 7. Place the coverslip at a 45-degree angle on the edge of the water/saliva mix. Allow the liquid to spread down the edge of the coverslip. Once it has spread, carefully lower the coverslip over the liquid.
- 8. Look at slide under microscope to observe skin cells.
- 9. Clean work area with surface disinfectant. Remove goggles and gloves and wash hands.

#### Data

Draw a picture of your cheek cell. Label the cell membrane, cytoplasm, and nucleus.



#### **Conclusion:**

- 1. List the three parts of the Cell Theory in your own words.
- 2. Write a brief description of each of the following:
  - a. Organelle
  - b. Cell membrane
  - c. Cell wall
  - d. Nucleus
  - e. Eukaryote
- 3. Why is it necessary to use a stain in this lab exercise?

### **Differentiating Cells Laboratory Investigation**

#### Purpose

In this laboratory investigation, the student will observe cells and differentiate between normal and neoplastic tissues.

#### **Background Information**

#### **Materials**

Microscope

Prepared histology slides: hyperplasia, metaplasia, dysplasia and anaplasia Prepared histology slides of normal tissues and organs. (Note: these slides should correspond to the abnormal slides.)

Prepared cytology slides: various structures showing cancerous tissues.(Provide at least two – one benign and one malignant)

Gloves Laboratory coat or apron Goggles

Biohazard containers

Surface disinfectant

Paper towels

#### Procedure

- 1. Wash hands and put on gloves and goggles.
- 2. Assemble equipment and materials.
- 3. Prepare work area.
- 4. View the normal and abnormal slides.
- 5. Record data.
- 6. Clean work area with surface disinfectant. Remove goggles and gloves and wash hands.





#### **Conclusion:**

1. Compare and contrast the normal tissue from the non-neoplastic tissue slides.

2. Compare and contrast the normal tissue from the neoplastic tissues.

3. Explain what differentiates the neoplastic tissue from the non-neoplastic tissue. Why is the neoplastic tissue considered cancerous?

### Laboratory Investigation Rubric

Student:

Course: \_\_\_\_\_

Date:

Scoring Criteria	4.	3.	2.	1.	N/A
<b>J</b>	Excellent	Good	Needs Some	Needs Much	
			Improvement	Improvement	
Problem is					
appropriately					
identified					
Problem is					
precise, clear,					
and relevant					
Association					
between the					
problem and the					
predicted results					
is direct and					
relevant					
All variables are					
clearly					
operationalized					
Student					
demonstrates					
comprehension of					
the use of					
scientific					
concepts and					
vocabulary					
All significant					
data is measured.					
Data is recorded					
effectively and					
efficiently					
Data table is well-					
designed to the					
requirements of					
the task					
All graph forms					
are appropriate					

All data is			
accurately plotted			
Graph is visually			
compelling;			
highlights			
conclusions of the			
study			
Conclusion			
relates directly to			
the hypothesis			
Conclusion has			
relevancy in the			
resolution of the			
original problem			
Conclusion			
relates the study			
to general interest			

### **The Cell Storybook Project**

#### **Objective:**

Students will work in pairs or alone to neatly create a colored illustrated children's storybook about all the parts of a cell and their function. They will next read it aloud to an audience for an evaluation. Project Begins on: \_\_\_\_\_; Storybook due on: \_\_\_\_\_

#### Storybook Project Rubric

### Title of Story: \_\_\_\_\_

Scoring Criteria	Points	Worth	Points Earned
Creativity:	0-15	points	
Appropriate for children and fun to read			
Parts Labeled / Function Given:	0-120	points	
	<i>.</i>	<b>—</b>	
Cell Parts	✓ Labeled	<ul> <li>✓ Function Given</li> </ul>	0-10 points each
a. Nucleus			
b. Nucleolus			
c. Mitochondria			
d. Centrioles			
e. Golgi Apparatus			
f. Rough			
Endoplasmic Reticulum			
g. Smooth			
Endoplasmic Reticulum			
h. Lysosomes			
i. Pinocytic Vesicles			
j. Chromatin			
k. Cytoplasm			
I. Cell Membrane			
Illustrations:	0 -100	points	
Sketch and color the words and pictures			
to emphasize the functions of the parts			
Follows Instructions:	0-15 points		
<ul> <li>project submitted on time</li> </ul>			
<ul> <li>story appropriate for <i>children</i></li> </ul>			
Neat			
TOTAL POINTS:	Up to 25	50 points	
FINAL GRADE:	(earned / n	nax ) x 100	

### **Trash Cell Project**

#### DATE: \_\_\_\_\_

#### Objective:

Students will build a 3-D model of an animal cell using recycled or "trash" materials only. The items in your model should look like the structure it depicts and be as anatomically correct as possible. For example, the Golgi Apparatus has folded membranes, so it should look folded. Each structure must be neatly labeled. Your project can be no larger than 2x2x2. NO Food items or other material that will mold, rot, or smell may be used.

Project Begins On: \_\_\_\_\_ Cell Model Due On: \_\_\_\_\_

It must include the following structures:

	Scoring Criteria					
Α.	Cell Parts	Labeled	B. Presentation	C. Creativity	Total Max	
		0-10 points	0-20 points	0-20 points	(0-160)	
a.	Nucleus		(0-10 pts)	(0-10 pts)		
			Alphabet Label with	Cluttered cell, unable		
b.	Nucleolus		no Key provided,	to clearly distinguish		
			> 3 days late	organelles		
C.	Mitochondria					
			(11-15 pts)	(11-15 pts)		
d.	Centrioles		Key handwritten,	Creativity, slightly		
	_		labels sloppy,	cluttered / small cell,		
e.	Golgi Apparatus		1-2 days late	visualize organelles		
			(40.00 mts)	(40.00 mts)		
t.	Rough		(16-20 pts)	(16-20 pts)		
	Endoplasmic Reti	culum	Typed Key, heat	ineat creativity, all		
	Orea a stile		print, cleany labeled,	recycled materials,		
g.	Smooth			clearly designed		
	Endoplasmic Reti	cuium		clearly designed		
h	Lycocomoc		B Total	C Total		
11.	Lysusumes		<b>D.</b> 10tal			
i	Pinocytic Vesicles	2	Comments:			
1.						
i.	Chromatin					
J.						
k.	Cytoplasm					
	5 1					
I.	Cell Membrane					
Α.	Total (0-120 point	ts)				
	FINAL GRADE (earned / 160 ) x 100					
	Early Bird Points +10 =					

### **Draw a Cell**

#### NAME: DATE:

#### Draw a cell with all of the following structures; include the function of each.

Nucleus

Nucleolus

Mitochondria

Centrioles Pinocytic Vesicles Chromatin

Golgi Apparatus

Lysosomes Cytoplasm

Rough Endoplasmic Reticulum Smooth Endoplasmic Reticulum Cell membrane

### **INTRODUCTION TO CELLS QUIZ**

## NAME: \_\_\_\_\_\_ DATE: \_\_\_\_\_

#### *Instructions*: Choose the best answer choice and place answer in the space provided.

1	The rough endoplasmic reticulum is the a. chlorophyll formation b. protein synthesis	primary site for: c. photosynthesis d. osmosis
2	In a cell, proteins are broken down into: a. fatty acids b. glucose	c. nucleotides d. amino acids
3	This organelle contains a digestive enzy a. vacuoles b. cytoplasm	rme that acts to clean the cell. c. lysosomes d. mitochondria
4	At the site of cellular respiration, glucose a. O <sub>2</sub> + H <sub>2</sub> 0 + ATP b. CO <sub>2</sub> + H <sub>2</sub> 0 + ATP	e converts to: c. C6H6O6 + O2 d. NaOH + H2O + ATP
5	These organelles become paralyzed an a. Flagella b. Goblet cells	d make it difficult to clear particles. c. cilia d. mucous
6	The movement of water due to the conc primarily in this location: a. Cell wall b. Cell membrane	entration of solutes happens c. mitochondria d. none of the above
7	Mitosis and meiosis respectively will ger a. 46 pairs / 23 pairs of chromosomes b. 23 pairs / 23 pairs of chromosomes	nerate the following: c. 46 pair / 23 single chromosomes d. 23 pair / 23 single chromosomes
8	This human "blueprint" that coils during found within the nucleus Is called: a. Chlorophyll b. Chrome	mitosis contains all your DNA material c. nucleus d. chromatin
9	<ul> <li>The physical movement of particles out enzymes from salivary gland cells is:</li> <li>a. Exocytosis</li> <li>b. Phagocytosis</li> </ul>	of the cell such as secretion of a c. endocytosis d. pinocytosis

- 10. \_\_\_\_\_ Found singly in cytoplasm or on endoplasmic reticulum and is the site of cell repair and reproduction.
  - a. Mitochondria
  - b. Ribosomes

- c. rough ER
- d. smooth ER
- 11.\_\_\_\_\_The reason for polyuria and polydipsia (chronic thirst) in diabetics is due to lack of insulin resulting in a \_\_\_\_\_\_ environment that draws water from the cells.
  - a. Isotonic
  - b. Hypotonic

- c. hypertonic
- d. hypnotic
- 12. \_\_\_\_Place in the proper order:
  - a. Organelle, cell, molecule, atomc. atom, molecule, organelle, cellb. Cell, molecule, atom, organelled. molecule, atom, organelle, cell
- 13. The cell activity that is of biggest concern when creating therapeutic drugs for cancer patients is:
  - a. Osmosis
  - b. Meiosis

- c. lysosomal activity
- d. mitosis
- 14. Intercostal muscles as opposed to a visceral muscle would require more due to chronic use and increase activity.
  - a. Mitochondria c. nuclei
  - b. Cytoplasm d. lysosomes
- 15. Liver cells compared to salivary cells would require more due to increase use and activity requirements.
  - a. Mitochondria c. nuclei
  - b. Cytoplasm d. lysosomes

#### *Instructions*: Place the following types of cell activities in the correct category of:

- a. ACTIVE TRANSPORT **OR** b. PASSIVE TRANSPORT
- 16.\_\_\_\_\_osmosis
- 17.\_\_\_\_\_phagocytosis
- 18. filtration
- 19.\_\_\_\_\_diffusion
- 20.\_\_\_\_\_facilitated diffusion
- 21.\_\_\_\_\_exocytosis

#### INTRODUCTION TO CELLS QUIZ- KEY

*Instructions*: Choose the best answer choice and place answer on the space provided.

- 1. B
- 2. B
- 3. D
- 4. C
- 5. B
- 6. C
- 7. B
- 8. D
- 9. D
- 10. A
- 11. B
- 12. C
- 13. D
- 14. A
- 15. C

#### *Instructions*: Place the following types of cell activities in the correct category of:

a. ACTIVE TRANSPORT	OR	b. PASSIVE TRANSPORT
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- 16.PASSIVE TRANSPORT19.PASSIVE TRANSPORT
- 17. ACTIVE TRANSPORT20.PASSIVE TRANSPORT
- 18. PASSIVE TRANSPORT 21. ACTIVE TRANSPORT