

Review Packet 2: Cells

Vocabulary:

Organelle: the individual parts of the cell

Multicellular: organisms that are more than 1 cell big

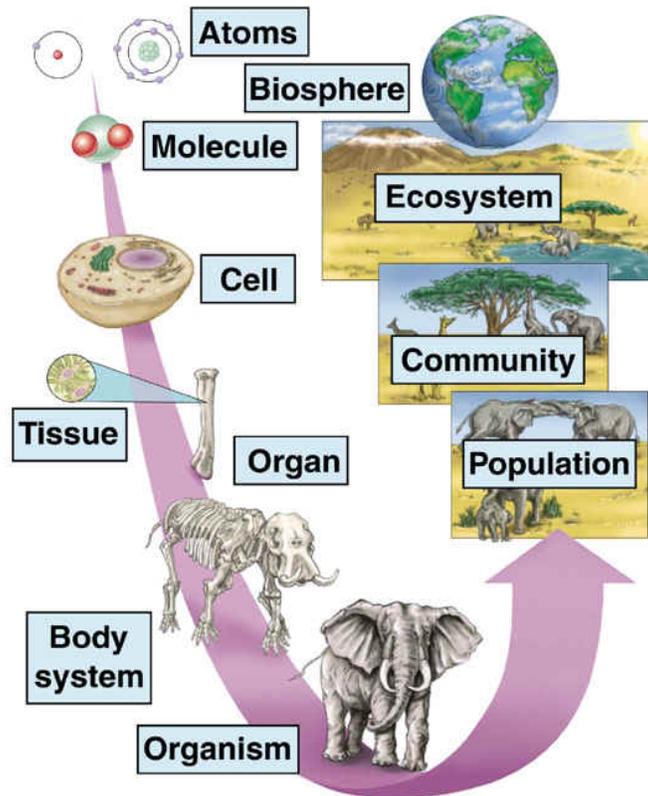
Unicellular: cells that are only 1 cell big (Euglena, Ameoba, Paramecium, Bacteria, etc.)

Structure: what it is or what it looks like

Function: the job that something does

Cellular Organization from smallest to biggest: organelles → cells → tissues → organs → organ systems → organisms. The other images in the picture deal with ecology and you will see it again (atom is the smallest and biosphere is the largest level)

Raven/Berg, Environment, 3/e
Figure 4.1



Organelle	Function	Process Associated With
Cell membrane In plant and animal cells	<ol style="list-style-type: none"> Lets things in and out of the cell Offers support and shape to the cell receives chemical messages through receptor molecules <p><i>**skin, liver, and lungs, excretory system</i></p>	<p>Osmosis (movement of water from high concentration to low concentration)</p> <p>Diffusion (movement of all other substances from high to low concentration)</p> <p>Active transport (movement of substances from low concentration to high concentration, requires energy)</p>
Nucleus In plant and animal cells	<p>Holds the DNA which controls all cell processes</p> <p>Comprised of nitrogenous bases (A, T, C, G)</p> <p><i>**nervous system, brain, nerves</i></p>	<p>Transcription (changing the DNA template into the mRNA so that proteins can be made)</p>
Ribosome In plant and animal cells	<p>Assembles the proteins</p> <p><i>** nervous system, brain nerves</i></p>	<p>Translation (changes mRNA into an amino acid sequence which makes the proteins)</p>
Mitochondria In plant and animal cells	<p>Turns chemical energy stored in food (sugar, most commonly glucose) into useable energy (ATP)</p> <p><i>**cardiovascular (or respiratory and circulatory) system, lungs, heart, blood, muscles, muscular system</i></p>	<p>Cellular respiration: Glucose (sugar) + oxygen → carbon dioxide + water + ATP</p> <p>*when there is not enough oxygen available to make energy, the cell will build up lactic acid which causes muscle fatigue (tiredness)...</p> <p>Anaerobic respiration</p>
Cytoplasm Both plants and animal cells	<p>Jelly like substance that acts as a shock absorber (cushions organelles) and is the site of chemical reactions</p>	<p>All cell processes in this list are either started or finished in the cytoplasm</p>
Chloroplasts In plant cells only	<p>Turns light energy into chemical energy (stored as glucose)</p>	<p>Photosynthesis: Carbon dioxide + water + sunlight → glucose (sugar) + oxygen</p>
Cell Wall In plant cells only	<p>Gives plant cells support and structure like the bones in an animal do</p> <p><i>**skeletal system, bones</i></p>	
Vacuole Large in plant cells, small or not there in animal cells	<p>Helps give support to plants and acts as a storage site for needed molecules</p> <p><i>** digestive system, fat layers under skin and in the brain</i></p>	

Hints:

- Regents exams RARELY ask about one single organelle (although it happens occasionally).... They will ask how one organelle works with another organelle OR they will ask what body system the

organelle most acts like (***in italic print under function column*). The easiest organelles to do are the nucleus and any other organelle in the cell

- Example: the nucleus provides the directions to the mitochondria to make energy and the mitochondria give energy to the nucleus to go its job OR the nucleus sends the message on the DNA to the ribosome to make proteins and the ribosome gives the nucleus directions on how to send the messages
- They LOVE pictures and graphic organizers that ask about cellular respiration and photosynthesis as well as pictures of cells and organelles to phrase their questions. (examples are in the practice regents questions)
- They will ask questions on the osmosis and diffusion lab that was done in class (fake cell membrane and movement of glucose and starch) There is a separate review guide for that lab attached to this one.
- If they ask how single celled organisms are able to live without body systems, it is because the organelles do the same jobs as body systems and that single-celled (unicellular) organisms are not big enough to need organs.

Vocabluary

Diffusion: movement from high to low concentration

Selectively permeable: some things are allowed in and out and other things are not. Based usually on size or shape

Indicators: something that shows us the presence of something else (usually a color change or bubbles)

Starch: large molecule, will NOT move through the membrane

Glucose: small molecule, WILL move through the membrane

Starch indicator: Iodine, turns purple in the presence of starch

Glucose indicator: Benedicts, turns orange in the presence of glucose and heat

Cell membrane

Cell wall

Osmosis: movement of water from high to low concentration

Wet mount: preparing a slide with a solution (usually water) to view under the microscope

Cover slip: placed on a wet mount slide, angled at 45 degrees to reduce number of air bubbles.

Can use a paper towel and a pipette to “pull a stain” or salt water solution without taking off the cover slip.

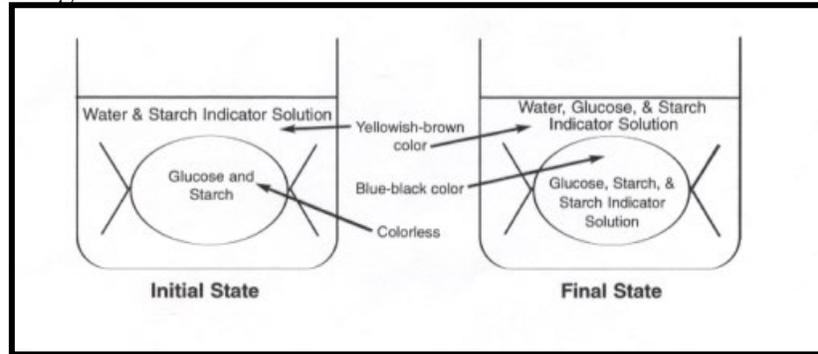
Key Points I

1. Molecules tend to move from high to low concentration without the use of energy (*diffusion*).
2. Membranes may allow some molecules to pass through while not allowing others (*selectively permeable*).
3. *Indicators* are used to show the presence of certain kinds of molecules.

Procedure I

1. A model cell is made using a plastic membrane (usually *dialysis tubing*) containing *starch* and *glucose*. The bag is sealed with string.
2. *Starch indicator* (iodine) is placed in solution outside the ‘cell’.

- Because of the differences in concentration, starch indicator diffuses in and glucose diffuses out. Starch 'wants' to diffuse out, but cannot because the molecule is too large to pass through the membrane.



- Starch (milky white) + starch indicator (brown) = blue-black color
- The inside of the bag turns blue-black while the outside stays brown, proving that indicator went in, but starch did not leave.
- Glucose indicator* (blue) + glucose (clear) + HEAT = green, brown, red, or orange
- Testing the fluid outside the 'cell' shows glucose has left. This is tested by placing fluid from outside into a test tube, adding indicator solution, and heating the mixture.
- You may prove that #6 is true by testing (heating) indicator alone and also testing indicator + starch. Both of these *controls* result in a blue color (no change).

Analysis I

- Glucose and starch indicator may pass through the membrane. Starch may not. This is because starch is a much larger molecule than glucose or starch indicator.
- This shows the importance of breaking down large molecules inside the digestive system in order for nutrients to enter the bloodstream.

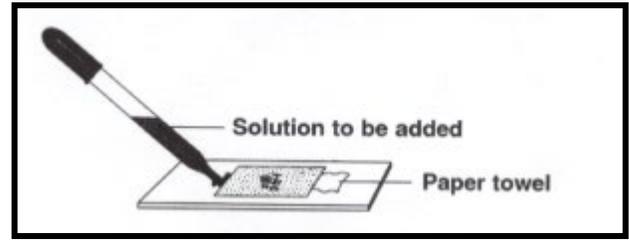
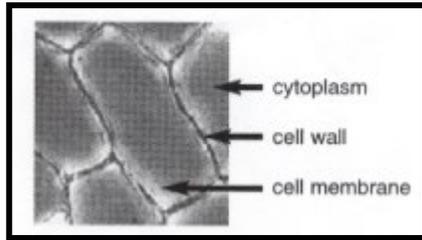
Key Points II

- Basic parts of the cell that are easily seen under the microscope are the *cytoplasm*, *cell membrane*, and *cell wall* (in plants).
- Molecules tend to move from high to low concentration without the use of energy (*diffusion*).
- Diffusion of water molecules is particularly important and has the special name of *osmosis*.
- The balance of water molecules inside and outside the cell is extremely important for the survival of all organisms, including humans.

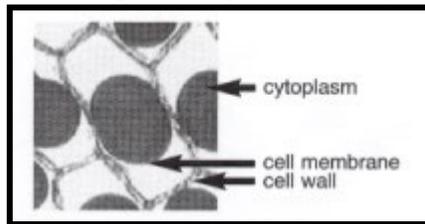
Procedure II

- Make a *wet mount* slide of a thin section of red onion cells. The cells are taken from the outer 'skin' of the onion bulb and a small piece is placed in a drop of water on a microscope slide. A *cover slip* is placed on top by touching it to the water at an angle, and then carefully placing it on the specimen, trying not to get air bubbles underneath.
- The cells are examined under the light (compound) microscope. You should be able to identify the cytoplasm, cell membrane, and cell wall.

- It is important to see that the cell membrane and cytoplasm completely fill the space within the cell wall.



- Place a 10% salt solution under the cover slip. This is done by putting a drop of salt solution next to one edge of the cover slip, then absorbing water from the opposite side of the slip using a paper towel.
- Observe the cells in the salt solution. It is important to see that the cytoplasm and cell membrane have shriveled up inside the cell wall. This is due to water molecules leaving the cell and entering the salty (low water) solution.



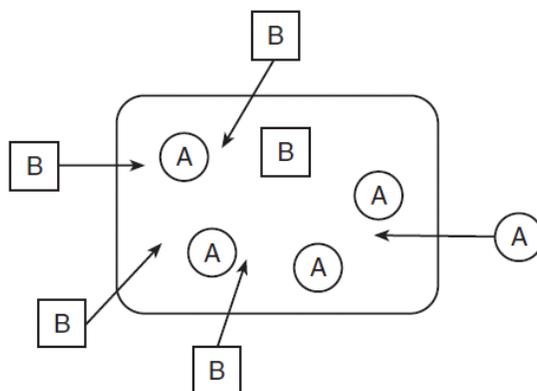
- Place distilled water under the cover slip using the technique described in #4 above.
- Observe the cells in distilled water. It is important to see that the cytoplasm and cell membrane have swollen back to fill the entire space available within the cell wall.

Analysis II

- Cells placed in very salty solutions will lose water, causing them to collapse and possibly lose the ability to complete life functions.
- Cells placed in very watery solutions will tend to gain water, which causes them to swell and might cause them to burst/break open, destroying the cell. Note that this did not happen in the plant cells because the cell wall prevents the cell membrane from easily expanding.
- Freshwater creatures, particularly single-celled organisms, must cope with too much water entering the cells. Saltwater organisms tend to have the opposite problem and must try to reclaim lost water.

Regents Questions for Review

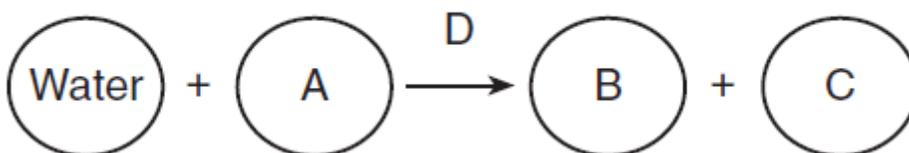
The diagram below shows two different kinds of substances, *A* and *B*, entering a cell.



ATP is most likely being used for

- (1) substance *A* to enter the cell
- (2) substance *B* to enter the cell
- (3) both substances to enter the cell
- (4) neither substance to enter the cell

A biological process that occurs in plants is represented below.



Which row in the chart below identifies the lettered substances in this process?

Row	A	B	C	D
(1)	enzymes	oxygen	carbon dioxide	glucose
(2)	carbon dioxide	glucose	oxygen	enzymes
(3)	glucose	enzymes	oxygen	carbon dioxide
(4)	oxygen	glucose	carbon dioxide	enzymes

A student prepared four different red blood cell suspensions, as shown in the chart below.

Suspension	Contents
A	red blood cells in normal blood serum (0.7% salt solution)
B	red blood cells in 10% salt solution
C	red blood cells in distilled water
D	red blood cells in tap water

Which suspension would contain red blood cells that would appear wrinkled and reduced in volume?

- (1) *A*
- (2) *B*
- (3) *C*
- (4) *D*

The change in red blood cell volume is principally due to the movement of

- (1) serum
- (2) oxygen
- (3) water
- (4) salt

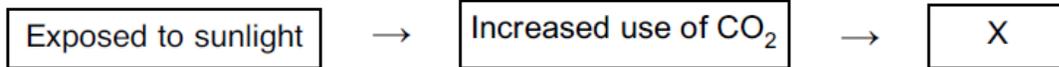
Which process is most likely involved in the change in red blood cell volume?

- (1) active transport
- (2) evaporation
- (3) replication
- (4) diffusion

Which set of functions is directly controlled by the cell membrane?

- (1) protein synthesis, respiration, digestion of food molecules
- (2) active transport, recognition of chemical messages, protection
- (3) enzyme production, elimination of large molecules, duplication of DNA codes
- (4) release of ATP molecules, regulation of cell reproduction, food production

Which phrase, if placed in box *X*, would correctly complete the flowchart shown below?



- (1) Increased use of starch in root cells
- (2) Increased concentration of glucose in leaf cells
- (3) Decreased ATP in root cells
- (4) Decreased concentration of oxygen in leaf cells

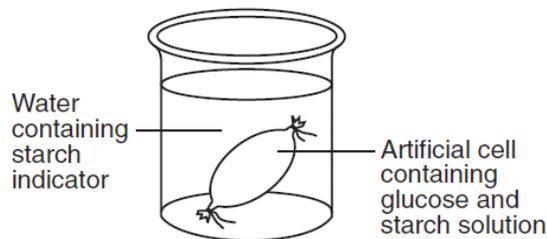
A biological process that occurs in both plants and animals is shown below.



Which row in the chart below identifies the lettered substances in this process?

Row	A	B	C	D
(1)	O ₂	CO ₂	glucose	enzymes
(2)	glucose	O ₂	enzymes	CO ₂
(3)	enzymes	O ₂	CO ₂	glucose
(4)	glucose	CO ₂	enzymes	O ₂

Base your answers to questions 73 through 75 on the laboratory setup illustrated below and on your knowledge of biology.



73 Identify the color of the contents of the artificial cell after two hours. [1]

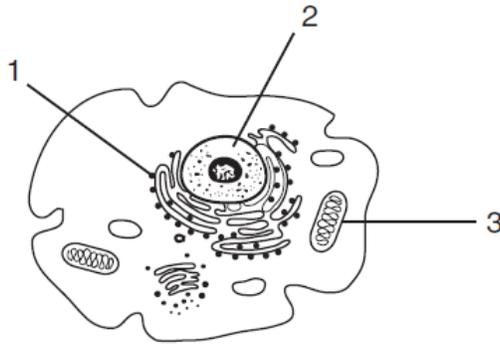
74 After two hours, the color of the liquid in the beaker did *not* change. This shows that

- (1) glucose moved from the artificial cell into the beaker
- (2) starch did not pass out of the artificial cell
- (3) starch was digested to glucose in the artificial cell
- (4) glucose molecules combined to produce starch in the artificial cell

75 This laboratory setup would most likely be used to demonstrate

- (1) carbohydrate synthesis
- (2) active transport
- (3) diffusion
- (4) dehydration

In a cell, a variety of structures perform specific functions and interact to maintain homeostasis. The diagram below represents a typical cell with three cell structures labeled 1, 2, and 3.



Select *one* cell structure labeled in the diagram and write its number in the space below. Explain how the cell structure you selected helps maintain homeostasis in a cell. In your answer, be sure to:

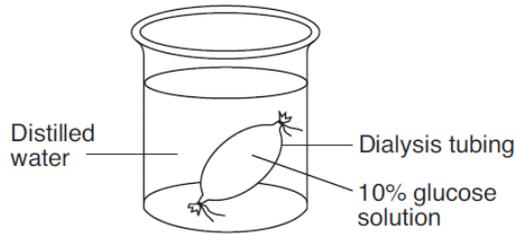
- identify the cell structure you selected [1]
- state *one* function of this cell structure [1]
- identify *one* substance that is often associated with the cell structure you selected and state how that substance is associated with the cell structure [1]
- identify *one* other cell structure and explain how it interacts with the cell structure you selected to maintain homeostasis in the cell [1]

Cell structure number: _____

Three days after an organism eats some meat, many of the organic molecules originally contained in the meat would be found in newly formed molecules of

- | | |
|-------------|------------|
| (1) glucose | (3) starch |
| (2) protein | (4) oxygen |

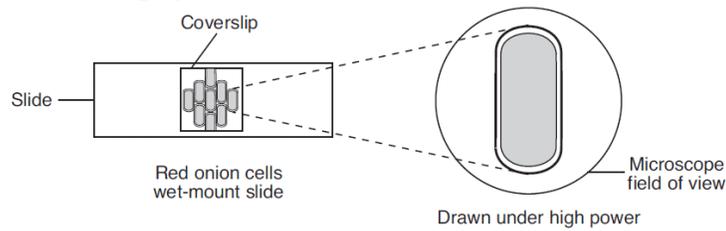
In the cell shown below, which lettered structure is responsible for the excretion of most cellular wastes?



Identify the process that would most likely be responsible for the movement of glucose from inside the artificial cell to the solution outside of the cell. [1]

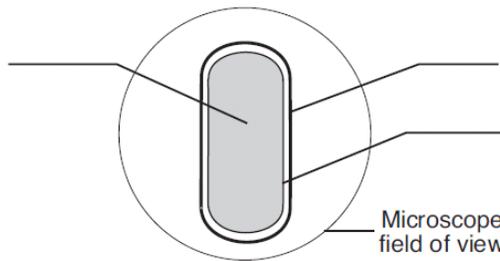
Base your answers to questions 72 through 74 on the information below and on your knowledge of biology.

A wet-mount slide of red onion cells is studied using a compound light microscope. A drawing of one of the cells as seen under high power is shown below.



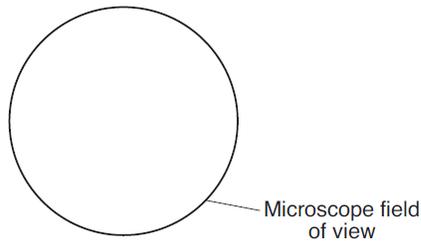
On the diagram below, label the location of each of the cell structures listed. [1]

- cell wall
- cytoplasm
- cell membrane



Describe the proper way to add a saltwater solution to the cells without removing the cover slip. [1]

In the space below, sketch how the cell would look after the saltwater solution is added to it. [1]



Which structures carry out life functions within cells?

- (1) tissues
- (2) organ systems
- (3) organelles
- (4) organs

The function of a cell depends primarily on its

- (1) life span
- (2) color
- (3) structure
- (4) movement

The ameba represented in the diagram below is a single-celled organism.



Which two processes are most closely associated with structure *A*?

- (1) insertion and deletion
- (2) nervous regulation and circulation
- (3) active transport and diffusion
- (4) replication and photosynthesis

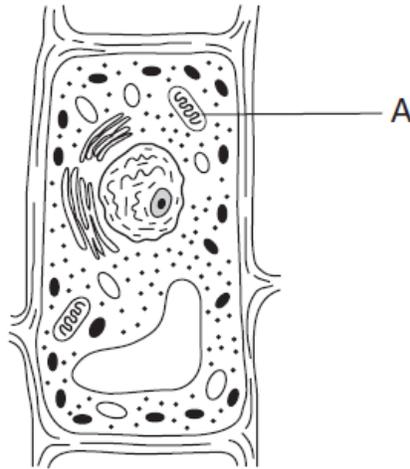
If the ribosomes of a cell were destroyed, what effect would this most likely have on the cell?

- (1) It would stimulate mitotic cell division.
- (2) The cell would be unable to synthesize proteins.
- (3) Development of abnormal hereditary features would occur in the cell.
- (4) Increased protein absorption would occur through the cell membrane.

If a chemical that interrupts cell division is added to a culture of human liver tissue, which process would stop?

- (1) meiosis
- (2) mitosis
- (3) breakdown of glucose
- (4) diffusion of nutrients

The diagram below represents a plant cell.



Which process takes place in structure *A*?

- (1) cellular respiration
- (2) heterotrophic nutrition
- (3) digestion of fats
- (4) protein synthesis

Organisms living in a bog environment must be able to tolerate nitrogen-poor, acidic conditions. Bog plants such as the Venus flytrap and sundew are able to obtain their nitrogen by attracting and consuming insects. These plants produce chemicals that break down the insects into usable compounds.

37 The chemicals present in the plants that break down the insects are most likely

- (1) fats (3) enzymes
- (2) hormones (4) carbohydrates

38 Which compounds present in insects are composed of the amino acids that provide the Venus flytrap and sundew with much of their nitrogen?

- (1) proteins (3) carbohydrates
- (2) sugars (4) fats