Keystone Biology Remediation

A4: Homeostasis and Transport

Assessment Anchors:

- to describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for the cell (A.4.1.1)
- to compare the mechanisms that transport materials across the plasma membrane (i.e. passive transport – diffusion, osmosis, facilitated diffusion; and active transport – pumps, endocytosis, exocytosis) (A.4.1.2)
- to compare how membrane-bound cellular organelles (e.g. endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within the cell (A.4.1.3)
- to explain how organisms maintain homeostasis (e.g. thermoregulation, water regulation, oxygen regulation) (A.4.2.1)

Unit Vocabulary:

active transport
carrier (transport) proteins
concentration
concentration gradient
diffusion
endocytosis
endoplasmic reticulum
exocytosis
extracellular
facilitated diffusion
Golgi apparatus
homeostasis
homeostatic mechanism
impermeable
intracellular
marker protein
osmosis
passive transport
phospholipid bilayer
plasma membrane
pumps (ion or molecular)
transport protein (pump)

Assessment Anchor: Describe how the structure of the plasma membrane allows it to function as a regulatory structure and/or protective barrier for the cell (A.4.1.1)

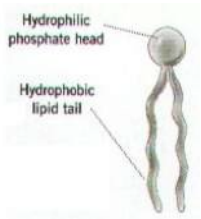
The Cell Membrane

(A.K.A. Plasma Membrane)

The main function is **to regulate what enters and leaves the cell.**

Is composed mainly of **phospholipids** that form a bilayer.

Individual phospholipid:



Selective permeability is the term that describes the fact that the membrane allows some materials to pass through while preventing others.

When molecules move through the phospholipids portion of the membrane it is called **simple diffusion.**

The special type of diffusion where water moves across the membrane is **osmosis.**

two other components

proteins

cholesterol to help the membrane maintain its fluidity

channel proteins

pumps

marker proteins

used for the process of **facilitated diffusion**

used the process of **active transport**

used for cell identification

Glucose is an example of a molecule transported this way.

Ions are examples of particles transported this way.

Molecules that pass freely through the membrane are **small** and/or **nonpolar**.

Molecules that don't pass freely through the membrane are **large** and/or **polar.**

Examples are **CO_2 & O_2 (small) and lipids (nonpolar)**

Examples are **proteins (large)**

Assessment Anchor: Compare the mechanisms that transport materials across the plasma membrane (i.e. passive transport – diffusion, osmosis, facilitated diffusion; and active transport – pumps, endocytosis, exocytosis) (A.4.1.2)

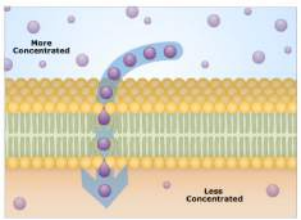
Moving Materials across the **Plasma Membrane**

can be **passive**

which does not require

and includes

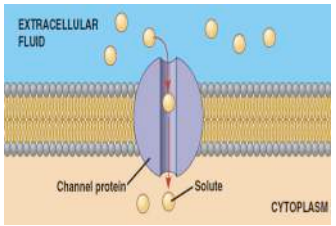
(simple) diffusion where particles move through the phospholipid part of the membrane



examples of substances transported in this manner are CO_2(small), O_2(small), and lipids (nonpolar)

osmosis, which is the diffusion of water

facilitated diffusion, which is diffusion through channel proteins



an example of a substance transported in this manner is glucose

energy in the form of **ATP**

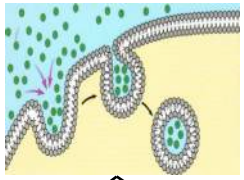
because molecules **move down** the **concentration gradient**

because particles are **being moved against** the **concentration gradient**

can be **active**

which does require

endocytosis

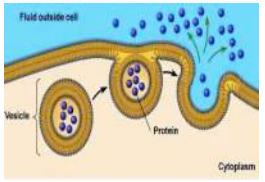


of solid particles is phagocytosis

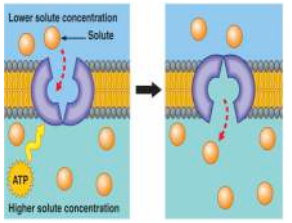
An example is a bacterial cell being engulfed by a white blood cell

of liquid droplets is pinocytosis

exocytosis



active transport (pumps)

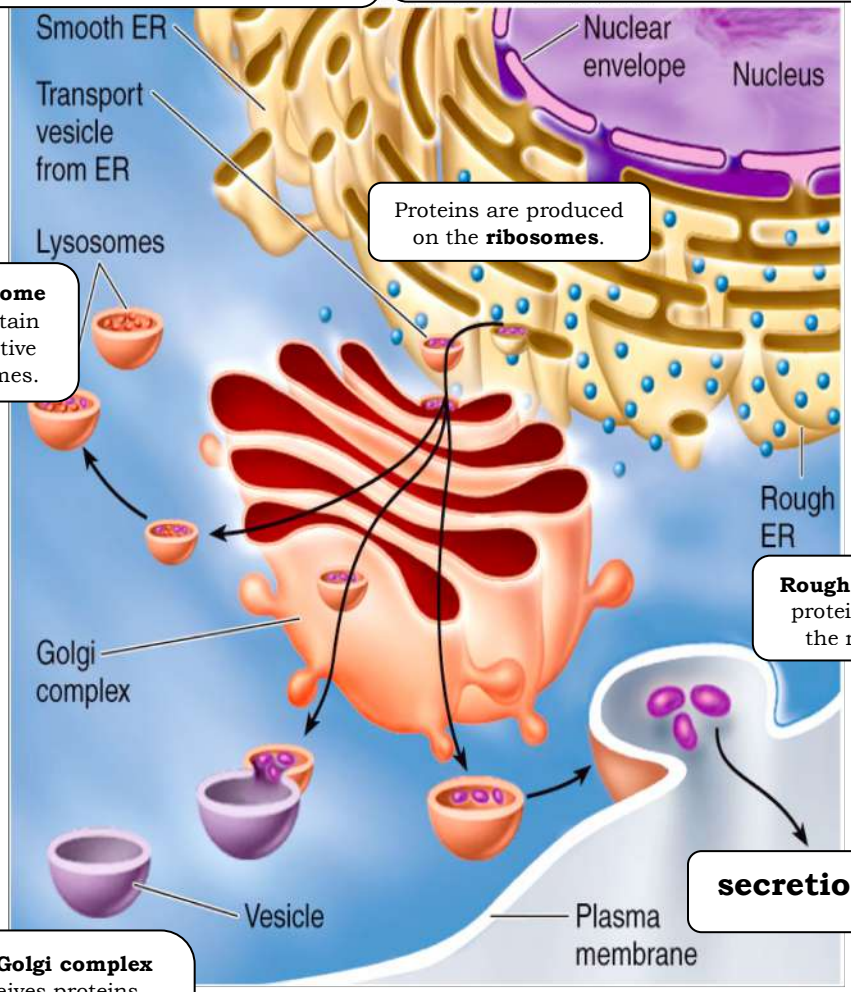


Ions are an example of a substance transported in this manner.

Assessment Anchor: Compare how membrane-bound cellular organelles (e.g. endoplasmic reticulum, Golgi apparatus) facilitate the transport of materials within the cell (A.4.1.3)

Smooth ER is involved in the production of lipids and the detoxification of poisons.

The **nucleus** contains chromosomes made of **DNA** and protein. The DNA contains the code that specifies the order that the amino acids should be placed in to make a particular protein.



Proteins are produced on the **ribosomes**.

Lysosomes contain digestive enzymes.

Rough ER modifies proteins made on the ribosomes.

secretion

The **Golgi complex** receives proteins from the rough ER and sorts and packages them into vesicles.

The code for the production of a particular protein is found in the chromosomes which are located in the **nucleus**.

↓

Proteins are produced on the **ribosomes**.

↓

The proteins are sent for further processing to the **rough endoplasmic reticulum**.

↓ Proteins are transported in **vesicles**.

The proteins are then packaged for their final destination in the **Golgi complex**.

Proteins are transported in **vesicles**.

If the proteins are to be **secreted** from the cell (such as hormones), the vesicle must fuse with the **plasma membrane**.

Some vesicles develop into organelles used for digestion within the cell and are called **lysosomes**

Some proteins will speed up chemical reactions within the cell. These are called **enzymes**.

Some proteins will be incorporated into the plasma membrane. Examples are:

- **marker proteins**
- **channel proteins**
- **transport proteins (pumps)**

Assessment Anchor: Explain how organisms maintain homeostasis (e.g. thermoregulation, water regulation, oxygen regulation) (A.4.2.1)

Homeostasis

maintaining constant internal conditions

Examples include:

Thermoregulation

Definition: maintaining constant body temperature

One way living things achieve this: sweating when hot or shivering when cold

Possible consequence of problem with regulatory process: Enzymes only function properly in a narrow temperature range.

Water regulation

Definition: maintaining the constant amount of water in the body

One way living things achieve this: urinating very little when dehydrated

Possible consequence of problem with regulatory process: If water is retained in the body, it can cause swelling.

Oxygen regulation

Definition: maintaining a consistent concentration of oxygen in your cells and bloodstream

One way living things achieve this: breathing faster when exercising

Possible consequence of problem with regulatory process: If cells can't get enough oxygen to carry out cellular respiration, they die.