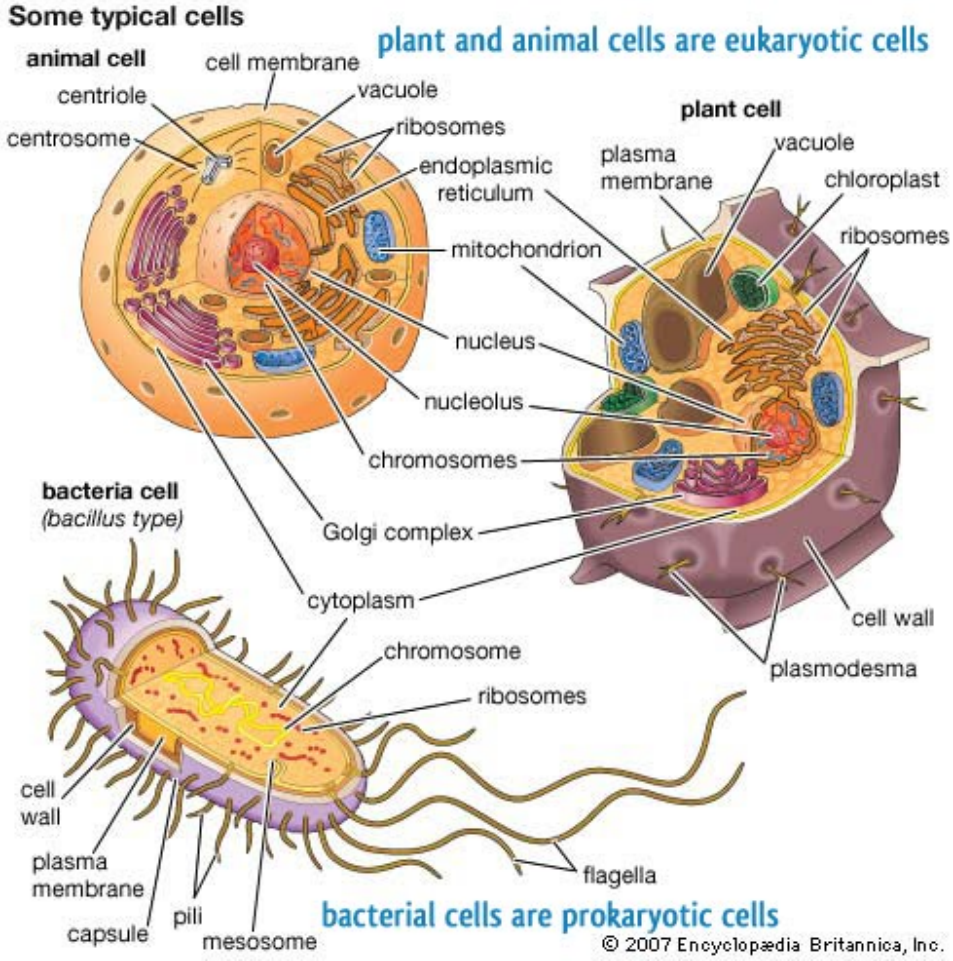
Prokaryotic & Eukaryotic Cells 4A

4. A compare and contrast prokaryotic and eukaryotic cells;

According to cell theory, the cell is the basic unit of life. All living organisms are composed of one or more cells. Based on the organization of their cellular structure, all living cells are divided into two groups: prokaryotic and eukaryotic. Animals, plants fungi, protozoans and algae all possess eukaryotic cell types. Only bacteria have prokaryotic cell types.



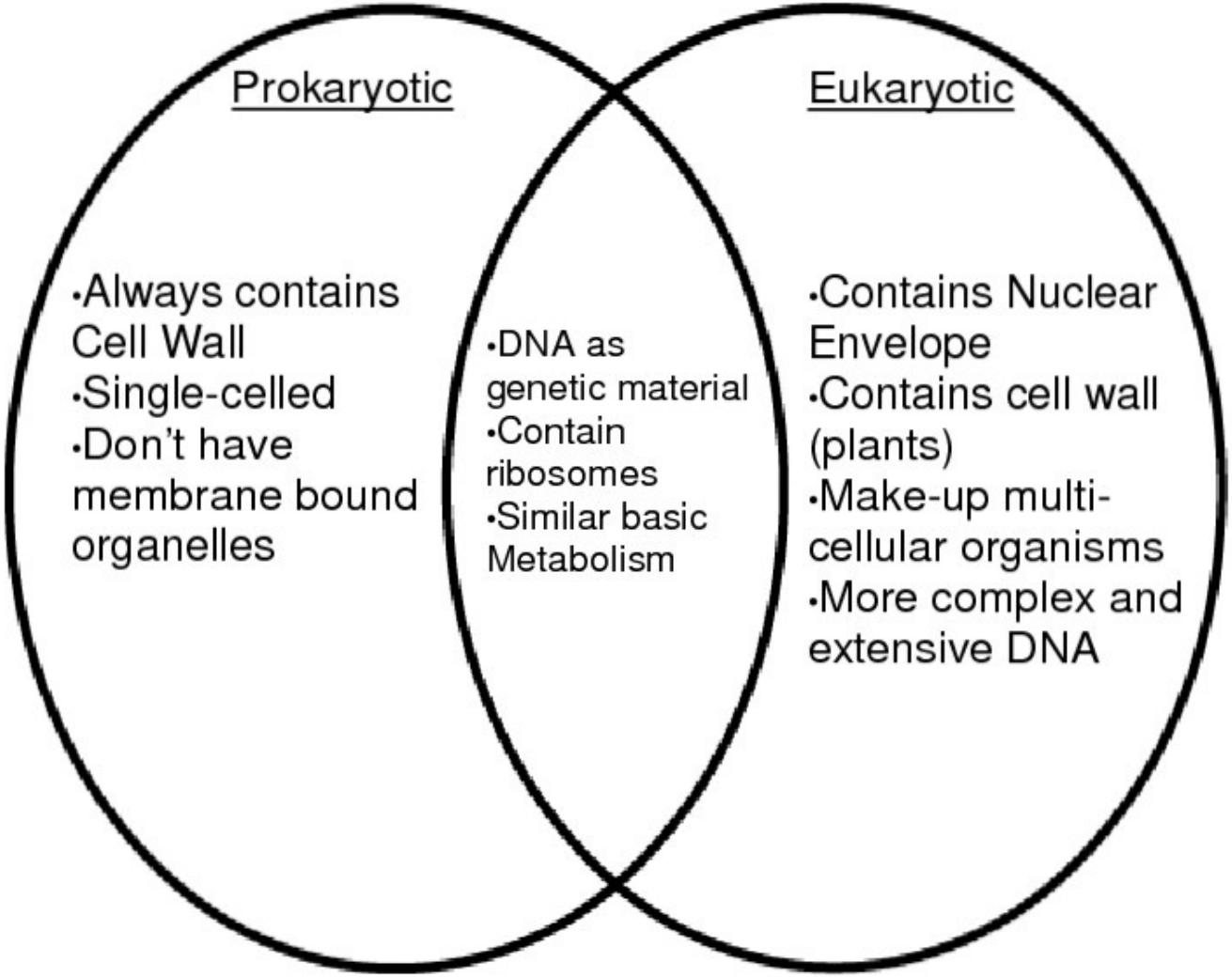
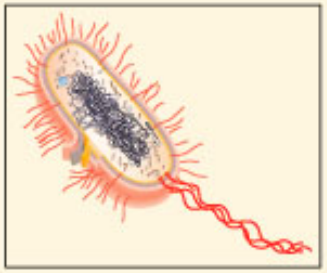
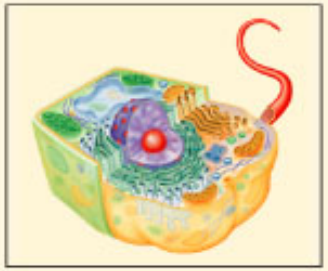
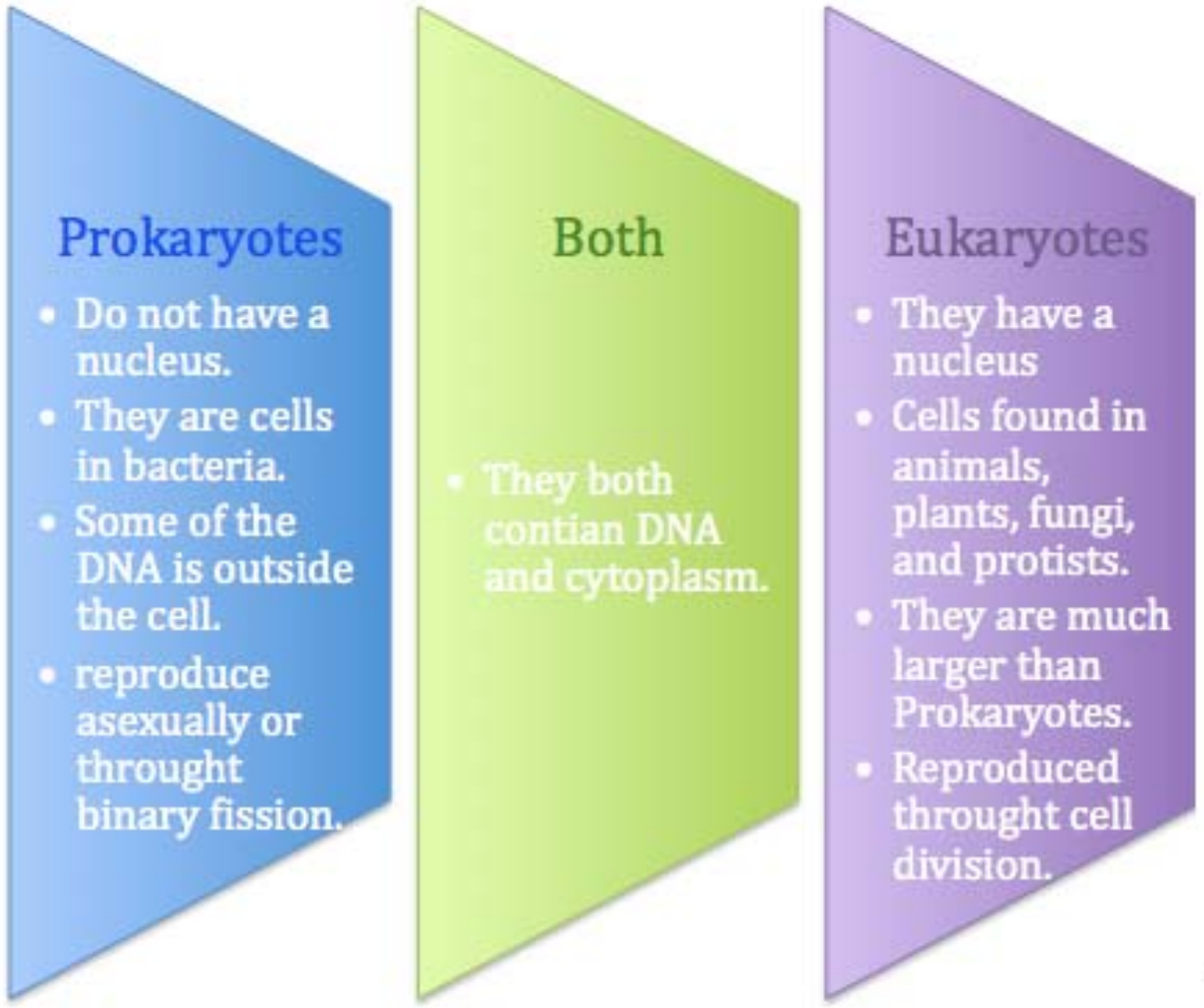
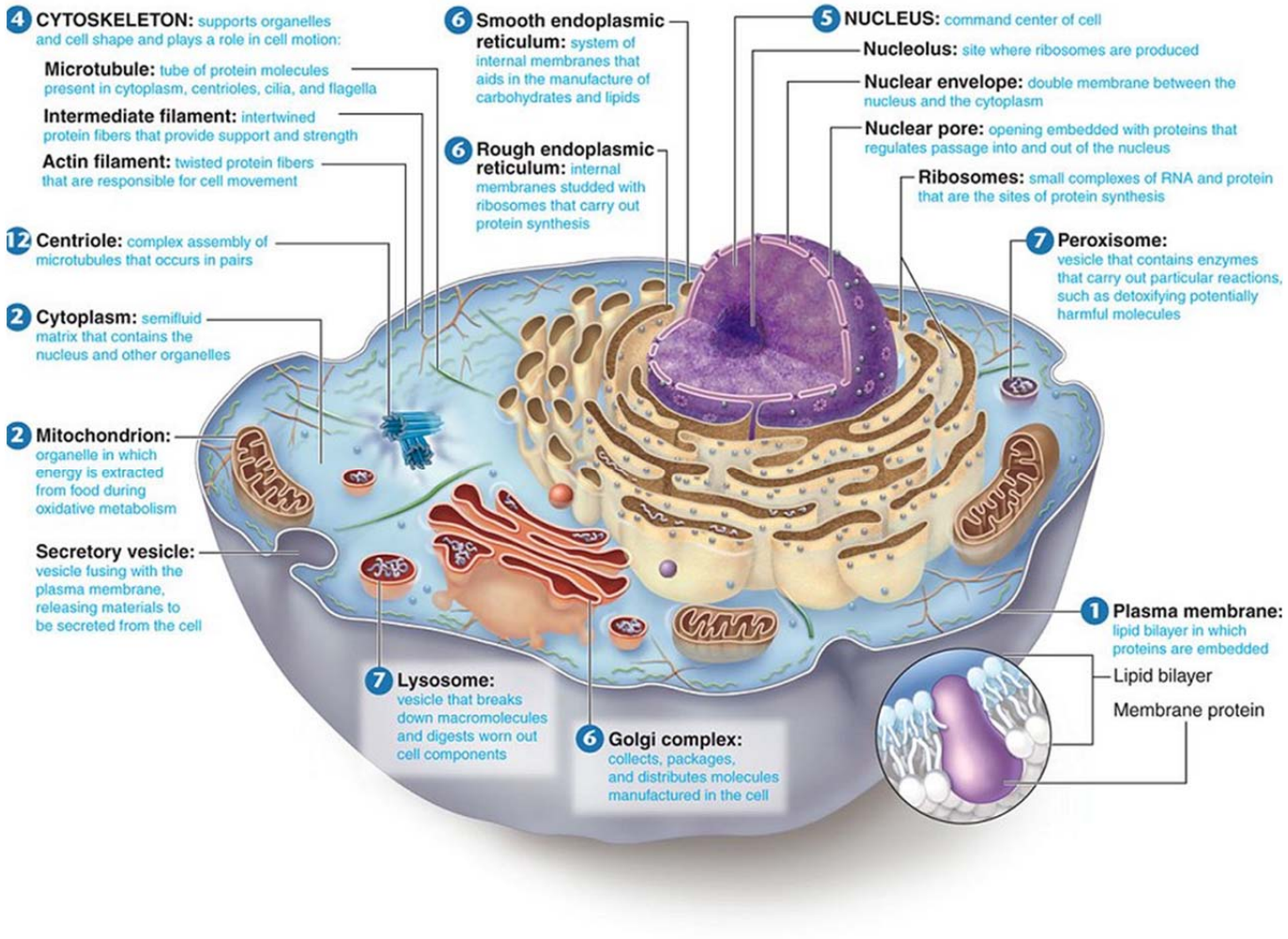

Prokaryotic
•Always contains Cell Wall
•Single-celled
•Don't have membrane bound organelles
•DNA as genetic material
•Contain ribosomes
•Similar basic Metabolism
Eukaryotic
•Contains Nuclear Envelope
•Contains cell wall (plants)
•Make-up multi-cellular organisms
•More complex and extensive DNA

TABLE 4.2 Principal Differences Between Prokaryotic and Eukaryotic Cells

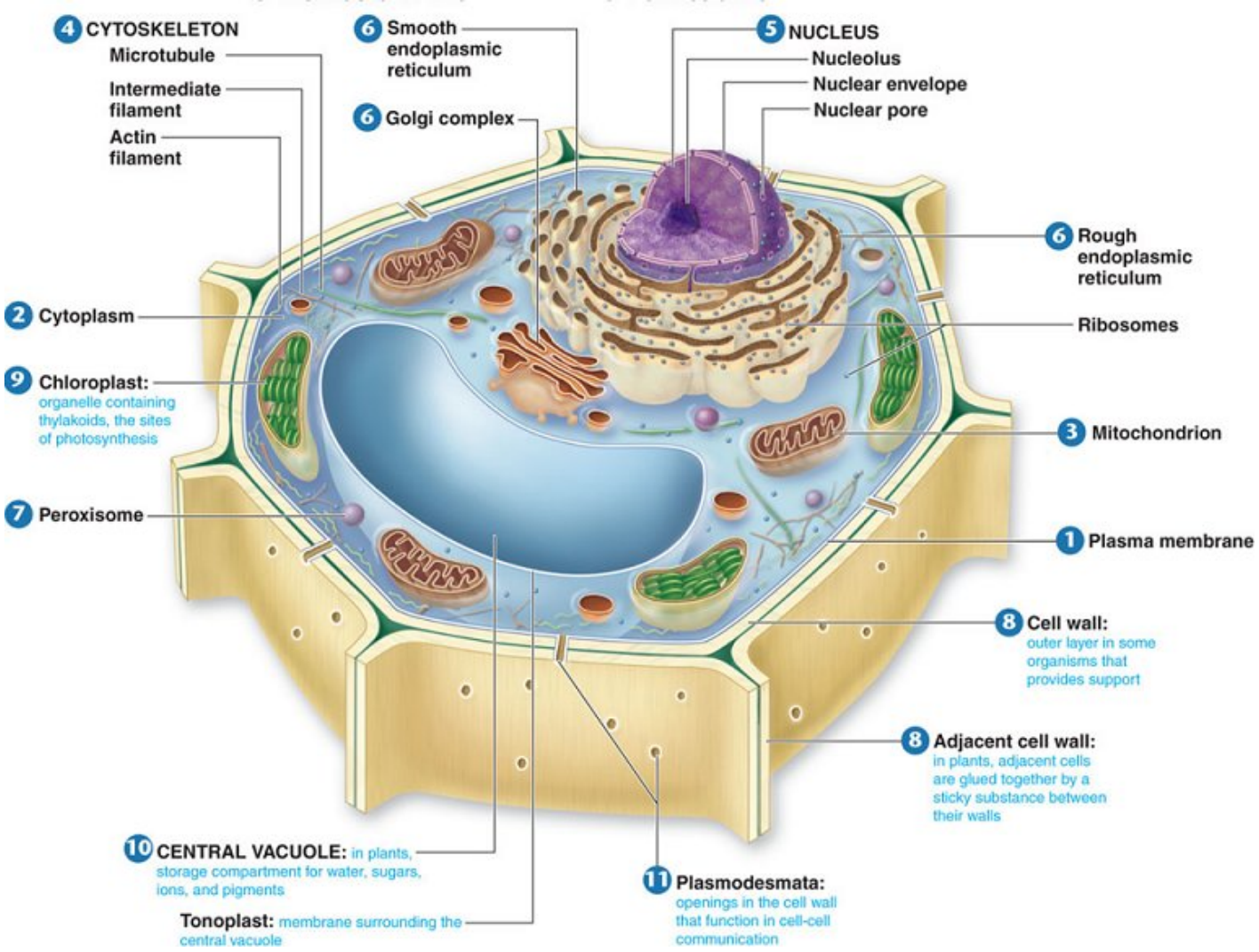
Characteristic	Prokaryotic	Eukaryotic
		
Size of cell	Typically 0.2–2.0 μm in diameter	Typically 10–100 μm in diameter
Nucleus	No nuclear membrane or nucleoli	True nucleus, consisting of nuclear membrane and nucleoli
Membrane-enclosed organelles	Absent	Present; examples include lysosomes, Golgi complex, endoplasmic reticulum, mitochondria, and chloroplasts
Flagella	Consist of two protein building blocks	Complex; consist of multiple microtubules
Glycocalyx	Present as a capsule or slime layer	Present in some cells that lack a cell wall
Cell wall	Usually present; chemically complex (typical bacterial cell wall includes peptidoglycan)	When present, chemically simple
Plasma membrane	No carbohydrates and generally lacks sterols	Sterols and carbohydrates that serve as receptors present
Cytoplasm	No cytoskeleton or cytoplasmic streaming	Cytoskeleton; cytoplasmic streaming
Ribosomes	Smaller size (70S)	Larger size (80S); smaller size (70S) in organelles
Chromosome (DNA)	Single circular chromosome; lacks histones	Multiple linear chromosomes with histones arrangement
Cell division	Binary fission	Mitosis
Sexual reproduction	No meiosis; transfer of DNA fragments only	Involves meiosis


Prokaryotes
Do not have a nucleus.
They are cells in bacteria.
Some of the DNA is outside the cell.
reproduce asexually or throught binary fission.
Both
They both contian DNA and cytoplasm.
Eukaryotes
They have a nucleus
Cells found in animals, plants, fungi, and protists.
They are much larger than Prokaryotes.
Reproduced throught cell division.

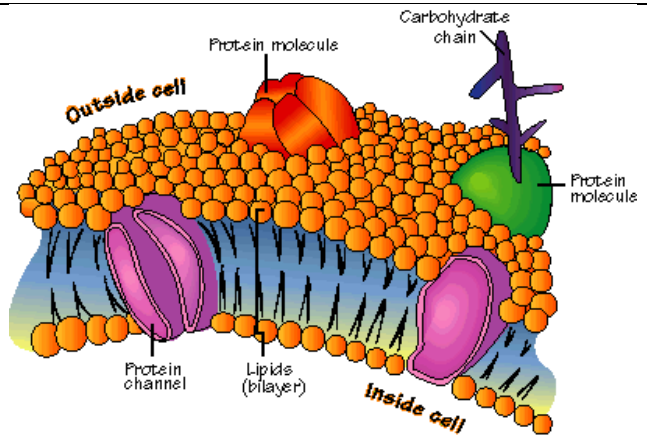
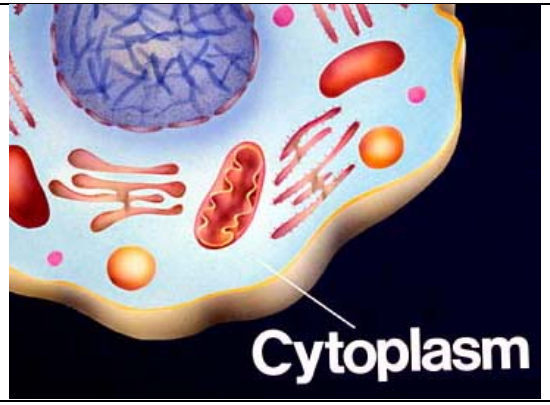
Organelles
Animal Cell

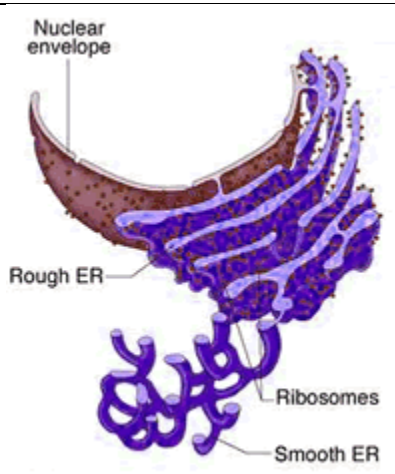
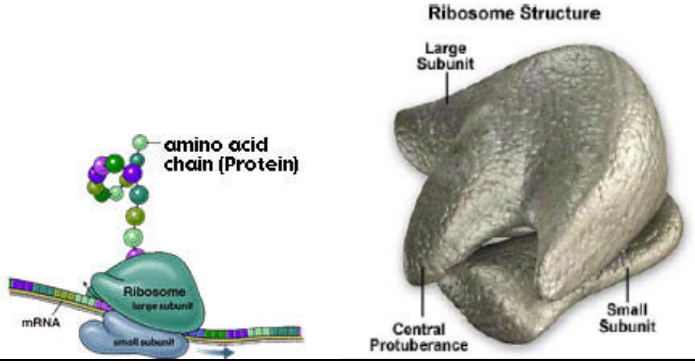


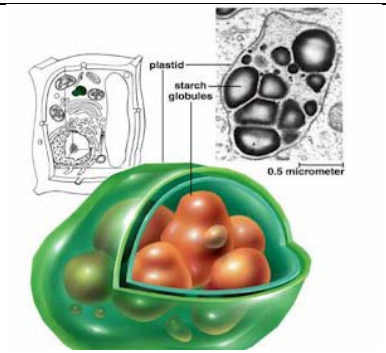
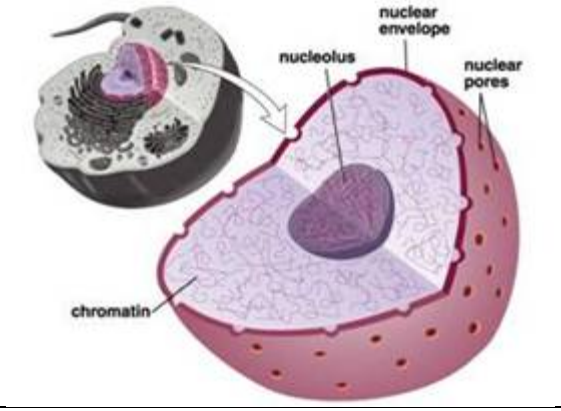
Organelles
Plant Cell

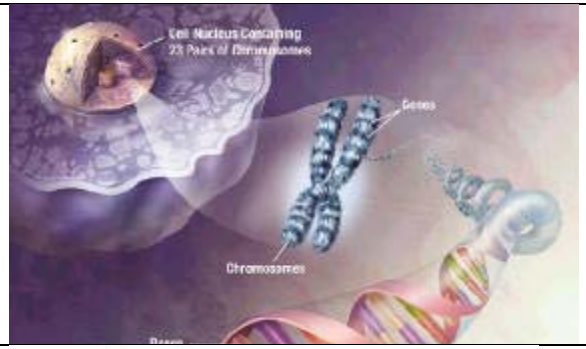
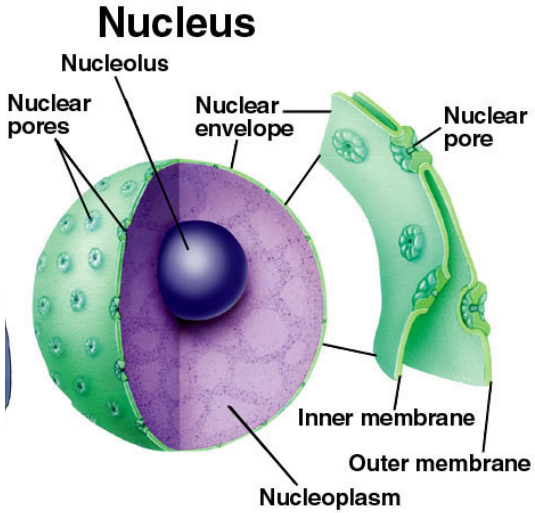
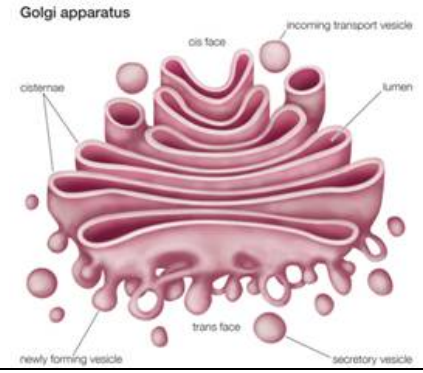


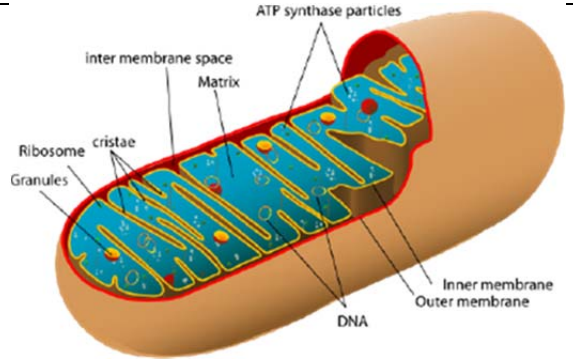
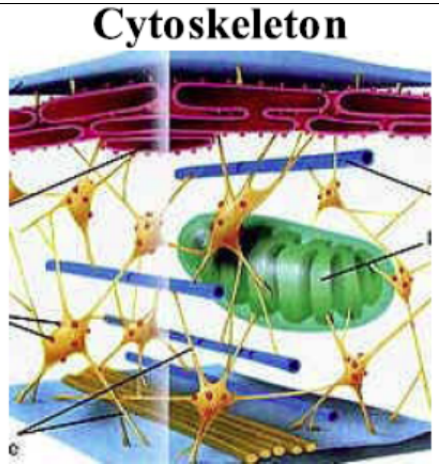
Getting ready for: B.4.B investigate and explain cellular processes, including homeostasis, energy conversions, transport of molecules, and synthesis of new Molecules

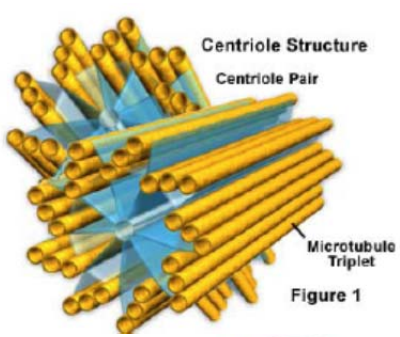
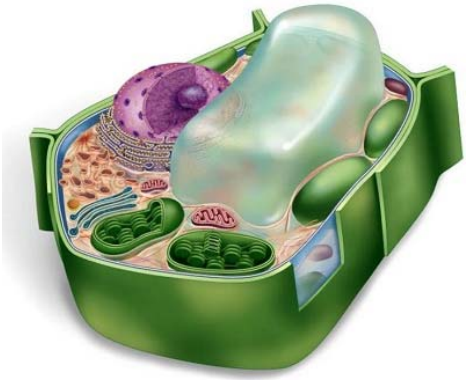
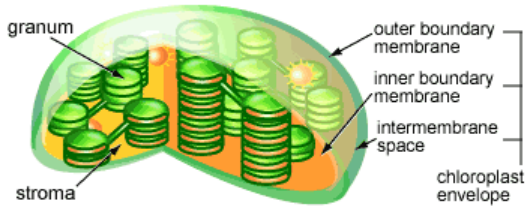
Cell Structure		Function
Plant & Animals		
Cell Membrane		Encloses cell and controls what enters and leaves the cell
Cytoplasm		Surrounds organelles; transports some materials

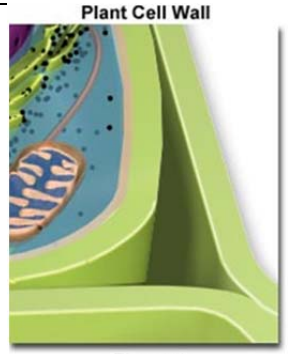
Endoplasmic reticulum		**Transports, and stores some substances, throughout the cell** 1. The ER is a system of membranous tubules and sacs. 2. The primary function of the ER is to act as an internal transport system, allowing molecules to move from one part of the cell to another. 3. The quantity of ER inside a cell fluctuates, depending on the cell's activity. Cells with a lot include secretory cells and liver cells. 4. The **rough ER** is studded with **ribosomes** and is the site of **protein synthesis**. It is an extension of the outer membrane of the nuclear envelope, so allowing mRNA to be transported swiftly to the ribosomes, where they are translated in protein synthesis. 5. The **smooth ER** is where polypeptides are converted into functional proteins and where proteins are prepared for secretion. **Smooth ER** has no 80s ribosomes and is also involved in the regulation of calcium levels in muscle cells, and the breakdown of toxins by liver cells.
Ribosome		**Builds proteins; (protein synthesis)** 1. Unlike most other organelles, ribosomes are not surrounded by a membrane. 2. Ribosomes are the site of **protein synthesis** in a cell. 3. They are the most common organelles in almost all cells. 4. Some are free in the cytoplasm (Prokaryotes); others line the membranes of **rough endoplasmic reticulum** (rough ER).

Lysosome		**Breaks down nutrients and foreign substances** 1. Lysosomes are small spherical organelles that enclose hydrolytic enzymes within a single membrane. 2. Lysosomes are the site of protein digestion – thus allowing enzymes to be re-cycled when they are no longer required. They are also the site of food digestion in the cell, and of bacterial digestion in **phagocytes**. 3. Lysosomes are formed from pieces of the Golgi apparatus that break off. 4. Lysosomes are common in the cells of Animals, Protoctista and even Fungi, but rare in plants.
Nucleus		**Center; contains DNA**

Chromosomes		**Genetic material The DNA**
Nuclear Membrane		**Encloses nucleus and controls what enters and leaves the nucleus**
Golgi apparatus		**Secretes and stores secretions for transport out of the cell** 1. The Golgi apparatus is the processing, packaging and secreting organelle of the cell, so it is much more common in glandular cells. 2. The Golgi apparatus is a system of membranes, made of flattened sac-like structures called **cisternae.** 3. It works closely with the smooth er, to modify proteins for export by the cell.

Mitochondria		**Site of cellular respiration, make ATP** 1. Mitochondria are the sites of **aerobic respiration,** in which energy from organic compounds is transferred to ATP. For this reason they are sometimes referred to as the 'powerhouse' of the cell. 2. ATP is the molecule that most cells use as their main energy 'currency'. 3. Mitochondria are more numerous in cells that have a high energy requirement - our muscle cells contain a large number of mitochondria, as do liver, heart and sperm cells.
Cytoskeleton		**maintain the cells shape and size** 1. In animal cells, which have no cell wall, an internal framework called the **cytoskeleton** maintains the shape of the cell, and helps the cell to move. 2. The cytoskeleton consists of **two** structures: a) **microfilaments** (contractile). They are made of actin, and are common in motile cells. b) **microtubules** (rigid, hollow tubes – made of tubulin). 3. Microtubules have **three functions:** a. To maintain the shape of the cell. b. To serve as tracks for organelles to move along within the cell. c. They form the **centriole.**

Centriole		1 At the start of mitosis and meiosis, the centriole divides, and one half moves to each end of the cell, forming the spindle. 2. The spindle fibers are later shortened to pull the chromosomes apart.
Vacuole		**Stores food, water, wastes and building materials large in plants** 1. The most prominent structure in plant cells is the **large vacuole**. 2. The vacuole is a large membrane-bound sac that fills up much of most plant cells. 3. The vacuole serves as a **storage area**, and may contain stored **organic molecules** as well as **inorganic ions**. 4. The vacuole is also used to store waste. Since plants have no kidney, they convert waste to an insoluble form and then store it in their vacuole - until autumn!
PLANT CELLS		
Chloroplast		**Manufactures food in green plants; photosynthesis** 1. A characteristic feature of plant cells is the presence of **plastids** that make or store food. 2. The most common of these (**some leaf cells only!)** are **chloroplasts** – the site of **photosynthesis.**

Cell wall	 Figure 1	**Protective out barrier of plant cells** The cell wall is **freely permeable (**porous), and so has no direct effect on the movement of molecules into or out of the cell. 4. The rigidity of their cell walls helps both to **support** and **protect** the plant.