

Prokaryotic and eukaryotic cells difference and similarities



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The similarities and differences between prokaryotic and eukaryotic cells

	<u>Prokaryotic cells</u>	<u>Eukaryotic cells</u>
	<p>The DNA floats within the nucleus of this cell. The division of the cell happens via mitosis. The nucleus is known as a nucleoid which isn't a true nucleus like eukaryotic cell.</p> <p>(John Wiley and Sons. (2014). <i>How Cells Work: Prokaryotes and Eukaryotes</i>. Available: http://www.dummies.com/how-to/content/how-cells-work-prokaryotes-and-eukaryotes. navId-403029. html. Last accessed 11/11/2014.)</p> <p>(Rene Fester Kratz & Donna Rae Siegfried (2010). <i>Biology for dummies</i> . 2nd ed. Canada: Wiley Publishing Inc. p49-52, p57-61.)</p>	<p>The DNA is more complex, the nucleolus situated in the middle of the cell, holds the DNA together and in a plant cell a nuclear envelope does this job.</p> <p>The division of the cell happens via meiosis.</p> <p>They are present and bigger than in a prokaryotic cell.</p>
Similarities	Available: http://www.dummies.com/how-to/content/how-cells-work-prokaryotes-and-eukaryotes . navId-403029. html. Last accessed 11/11/2014.)	
Nucleus		
Ribosomes	Responsible for making proteins in the cytoplasm, these are smaller than in a eukaryotic cell.	
Cytoplasm	This is a liquid material that contains the	The DNA is
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	DNA and other parts of the cell that allow it to function.	contained within the nucleus and the other organelles float in the cytoplasm outside the nucleus.
	(John Wiley and Sons. (2014). <i>How Cells Work: Prokaryotes and Eukaryotes</i> . Available: http://www.dummies.com/how-to/content/how-cells-work-prokaryotes-and-eukaryotes.navId-403029.html . Last accessed 11/11/2014)	
Differences	Only found in plant or algae cells which are eukaryotic.	Only found in plant or algae cells,
Chloroplasts	(s-cool youth marketing ltd. (2014). <i>Introduction to cells</i> . Available: http://www.s-cool.co.uk/a-level/biology/cells-and-organelles/reverse-it/introduction-to-cells . Last accessed 10/11/2014.)	responsible for extracting food from the sun and carbon dioxide.
Golgi apparatus	This organelle isn't present as the cell isn't as complex as a eukaryotic cell. This is found within the membrane of a eukaryotic cell and a prokaryotic cell doesn't have any membrane bound organelles.	Materials are transported via a vesicle through the cytoplasm.
Mitochondria	Respiration takes place in the mesosome.	Respiration

		takes place
		here, ATP is
	ATP isn't required in prokaryotic cells.	produced which
	ATP is used in active transport and	provides energy
	prokaryotic cells use passive transport.	for the cells
	(S-cool youth marketing ltd. (2014).	reactions.
	<i>Introduction to cells.</i> Available:	(S-cool youth
	http://www.s-cool.co.	marketing ltd.
	uk/a-level/biology/cells-and-organelles/re	(2014).
ria	vise-it/introduction-to-cells. Last accessed	<i>Introduction to</i>
	10/11/2014.)	<i>cells.</i> Available:
	(John Wiley and sons. (2014). <i>Biology</i>	http://www.s-
	<i>Basics: Important Components of</i>	cool.co.uk/a-
	<i>Eukaryotic Cells.</i> Available: http://www.	level/biology/cell
	dummies.com/how-to/content/biology-	s-and-
	basics-important-components-of-	organelles/revis
	eukaryotic-.html. Last accessed	e-it/introduction-
	10/11/2014.)	to-cells. Last
		accessed
		10/11/2014.)

Rough and	A prokaryotic cell doesn't produce lipids.	Smooth
smooth	A process where endocytosis takes place,	endoplasmic
endoplasm	this only occurs in eukaryotic cells.	adds
ic		carbohydrates
		to proteins and

reticulum produces lipids and rough is responsible for synthesising the proteins that are needed in the cell and the area around the cell.

John Wiley and sons. (2014). *Biology Basics: Important Components of Eukaryotic Cells*. Available: <http://www.dummies.com/how-to/content/biology-basics-important-components-of-eukaryotic-.html>. Last accessed 10/11/2014

Specialised structures that allow a sperm to carry out its role

A sperm cell consists of a head, middle and tail. The head contains the DNA which is in the nucleus, this contains the 23 chromosomes required to meet with an egg which has the other 23 chromosomes needed to create an embryo. The head also contains an acrosome which contains enzymes that allow the sperm to break through the egg membrane and penetrate. The middle of the sperm cell is a bit like an engine, the mitochondria creates the energy needed to move the tail. The tail is thin and uses a whipping motion to travel through bodily fluids. (BBC-GCSE Bitesize. (2014). *The menstrual cycle and fertilisation*. Available: http://www.bbc.co.uk/schools/gcsebitesize/science/triple_edexcel/control_systems/menstrual_cycle_fertilisation/revision/3/. Last accessed 10/11/2014)

Specialised structures that allow a red blood cell to carry out its role

A red blood cells shape, flexibility and size play a big part in its role. It is bi-concave which gives a big surface area to allow quick diffusion of oxygen. Its small size and flexibility helps it to travel unharmed through narrow capillaries and travel easily through the body. It doesn't require a nucleus <https://assignbuster.com/prokaryotic-and-eukaryotic-cells-difference-and-similarities/>

which means it has more room to carry oxygen, allowing it to carry out its role of transporting oxygen throughout the body. A pigment known as hemoglobin is responsible for its colour and also allows the cell to carry oxygen and carbon dioxide. (BBC Bitesize. (2014). *The circulatory system*.

Available: http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/living_growing/circulatoryr

[ev4.shtml](http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_gateway/living_growing/circulatoryr). Last accessed 10/11/2014)

(MedicineNet. (2014). *Definition of red blood cells*. Available: <http://www.medicinenet.com/script/main/art.asp?articlekey=5260>. Last accessed 10/11/2014.)

The importance of the major components of the fluid-mosaic model and of plasma membranes

There are four major components of the fluid mosaic model that demonstrate the structure of the plasma membrane. These are the phospholipid bilayer, proteins, carbohydrates and cholesterol. The phospholipid bilayer is the main foundation of the plasma membrane and is formed by two layers of phospholipids, the head section of the phospholipid which is known as the hydrophilic head, faces towards the water as it is water loving. The phospholipid tail known as a hydrophobic tail as it doesn't like water, faces inwards, which causes the phospholipids to group together in two rows known as a bilayer. The proteins are essential as they allow non-soluble substances to pass in and out of the phospholipid bilayer, they are nestled in between the phospholipid bilayer but are not stationary so they are able to move in the membrane. Carbohydrate and cholesterol are the less important parts of the plasma membranes but they still play an

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important role in supporting it. Carbohydrates are formed in a chain which is linked to the outer surface of the membrane, the reason for carbohydrates in the plasma membrane is so that the cell can interact with other cells which is essential for recognising hormones and foreign molecules. Cholesterol is the component which stabilises the membrane, it keeps the fluidity at a good level and stops it from solidifying, this is important in the human body for example, when we get too cold it will stop us from actually freezing. (Rene Fester Kratz & Donna Rae Siegfried (2010). *Biology for dummies* . 2nd ed. Canada: Wiley Publishing Inc. p54-Part 1-Biology basics paragraph 4).

The importance of active and passive transport mechanisms

The two forms of transport are active and passive transport and they both have different types of transport within them. Not all molecules require a transport method as they can travel through the plasma membrane easily by themselves as they are small, examples of these are hydrophobic molecules such as oxygen and carbon dioxide. They are compatible with the hydrophobic tails of the phospholipid bilayer as they both repel water. Molecules that need help travelling through the plasma membrane are ions and larger molecules such as hormones, they can't travel through the hydrophobic tails on their own and need help in the form of transport to get from A to B.

Smaller molecules can use passive transport to travel through the membrane as passive transport doesn't require energy and as the molecules are only small they don't need the energy to be pushed along. Ions and larger molecules need to use active transport to travel and this form of transport requires energy as the molecules are bigger and need help either

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by being given an opening that they can easily fit through or by being carried along.

Passive transport needs a semi permeable membrane for passive transport to take place, simple diffusion, facilitated diffusion and osmosis. Simple diffusion allows a substance to go from being highly concentrated to less concentrated, this is important for when oxygen is absorbed into a cell and carbon dioxide is pushed out. Osmosis is used for the diffusion of water across a membrane, it is similar to diffusion as it uses the method of moving from a highly concentrated area to a less concentrated area but it uses solutes which dissolve in the water to balance the concentration levels on each side of the cell so that they end up being even. Facilitated diffusion allows specific ions or molecules to travel from one place to another via a tunnel which is made from proteins, the ions or molecules diffuse through the membrane and the protein gives the molecule a helping hand to travel through the cell.

Active transport requires energy to enable the molecule to travel, this type of energy is called ATP. The reason energy is required is because bulkier molecules that need help to travel can't do it alone so they require a vesicle to help them. The two methods within active transport are endocytosis which is when a material wants to enter the cell, the plasma membrane pulls the material inwards in an envelope type movement and seals off to form a vesicle which then can move into the cell. When a bulkier material needs to leave the cell and this would be for removing waste from the cell or for the secretion of materials like hormones, it uses the process exocytosis and this is when a membrane forms around the material making a vesicle and this

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then attaches itself to the cell membrane allowing it to empty its contents.

(Rene Fester Kratz & Donna Rae Siegfried (2010). *Biology for dummies* . 2nd ed. Canada: Wiley Publishing Inc. p55-56.)

Mitosis and Meiosis

Mitosis and Meiosis are both the process in which cells are copied to create new cells in this way the two processes are very similar as they both involve the replication of a cell but they both carry out completely different roles.

Mitosis is the process in which a single cell is replicated to create another identical cell, this is known as asexual reproduction as the cell has replicated its own DNA. The process is broken down into 4 stages, these are prophase, metaphase, anaphase and telophase. Prophase is the stage in which the chromosomes are condensed, the nuclear membrane breaks down and mitotic spindles form and attach to the chromosomes. After this phase, the chromosomes are pulled by the mitotic spindles to the middle of the cell, this is called metaphase.

Once this has happened the chromosomes that have been replicated separate and go to opposite sides in two identical halves known as chromatids, this is so that each cell has one copy of each DNA molecule from the parent cell when the process has finished, this phase is known as anaphase and is a key factor as it is important for the DNA to replicated to create a cell that is identical to the original cell. The final stage is telophase and this is when the cell is just about to be divided to create two new identical cells, known as daughter cells. Nuclear membranes are formed around each set of chromosomes, the chromosomes then spread throughout

the nucleus, the spindles break down and the nucleoli reforms and becomes visible again. Once all four phases are completed the two new cells are ready to separate.

Meiosis follows a similar process to mitosis but instead of one division it requires two separate divisions to complete the process and instead of one copy of chromosomes it requires two copies of the chromosomes to be made so that you end up with four cells known as gametes with only half of the chromosomes needed to make a human, these cells are not genetically identical to the parent cell. (Rene Fester Kratz & Donna Rae Siegfried (2010). *Biology for dummies* . 2nd ed. Canada: Wiley Publishing Inc. p86. Table 6-1. A comparison of Mitosis & Meiosis). Gametes are human reproduction cells and they only require 23 chromosomes, this is because we only need to inherit half the DNA from each parent and it creates variety in our offspring.

There are two stages of meiosis and each stage follows the same phases as mitosis but for the first stage known as meiosis 1, the phases are known for example, prophase 1 and for the second stage, meiosis 2 the phases are known for example as prophase 2. In meiosis 1, the chromosomes are paired up and then separated in two daughter cells, a bit similar to what happens in mitosis but now the stage needs to carry on, this happens in meiosis 2. In meiosis 2 the replicated chromosomes separate into sister chromatids, they break up giving four daughter cells one piece of the chromosome pair, so now at the end of this process we are left with 4 daughter cells that have a piece of DNA each. Once the process is completed we are left with four gamete cells which are now ready to interact with another gamete cell, these cells are known as sperm and egg cells and are vital for human reproduction. <https://assignbuster.com/prokaryotic-and-eukaryotic-cells-difference-and-similarities/>

(Rene Fester Kratz & Donna Rae Siegfried (2010). *Biology for dummies* . 2nd ed. Canada: Wiley Publishing Inc. p88-95.)

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[uk/schools/gcsebitesize/science/triple_edexcel/control_systems/menstrual_cycle_fertilisation/revision/3/](http://www.bbc.co.uk/schools/gcsebitesize/science/triple_edexcel/control_systems/menstrual_cycle_fertilisation/revision/3/). Last accessed 10/11/2014)

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- Laura Robbins