Relationships between certain organelles essay sample

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The nucleus is the most obvious organelle in a eukaryotic cell. Virtually all eukaryote cells have a nucleus (red blood cells lose theirs and so are enucleate for most of their life-span of 180 days). It is surrounded by the nuclear envelope, a double membrane with contains a large number of pores. Molecules enter and leave the nucleus by these pores. The two lipid bilayers of the double membrane are separated by a gap of 20 to 40 nm, called the perinuclear space.

The nucleus contains the cell’s DNA. This complex molecule carries the information, which the cell needs to divide and carry out all its cellular processes. Inside eukaryotic cells, the DNA is associated with histone proteins, and is called chromatin. When the DNA is transcribed into RNA the structure of the chromatin changes to allow the RNA polymerase enzyme to access the DNA strand. When the cell divides to form new cells, the chromosomes coil up more tightly than usual. The chromosomes are moved to opposite ends of the cell so that, when the cell splits, each daughter cell receives the correct amount of DNA. You can click to find out more about cell division.

Nuclei also have a nucleolius. These darkly staining, crescent-shaped structures produce ribosomes by producing ribosomal RNA and packaging it with ribosomal proteins. The nucleus and ribosomes work together in the cell to synthesise proteins. You can click to find out more about protein synthesis.

Mitochondria are large organelles, which are shaped a bit like fat sausages. Mitochondria are sometimes called the ‘ power stations’ of the cell because

they burn up food molecules, in the presence of oxygen, to release energy in a process called aerobic respiration. The inner membrane of the mitochondria is folded into cristae, which give a large surface area for attachment of some of the enzymes involved in respiration.

The endoplasmic reticulum (ER) is a series of interconnecting flattened tubular tunnels, which are continuous with the outer membrane of the nucleus. All eukaryotic cells contain endoplasmic reticulum. The ER of a cell often takes up more than a tenth of the total cell volume.

There are two sorts of endoplasmic reticulum – rough ER and smooth ER. The membrane structure of both is identical, but rough ER has lots of attached ribosomes and so looks ‘ spotty’. Smooth ER has no attached ribosomes and so looks ‘ smooth’. Rough ER takes in the proteins made on the ribosomes so that they cannot escape into the cytoplasm. Newly made proteins are threaded through pores in the membrane of the ER and accumulate in the cisternal space where they are free to fold into their normal three-dimensional shape. A mature cell, which makes and secretes substances (such as mucus) has ER, which occupies as much as 90 per cent of the total volume of the cytoplasm. Small vesicles containing newly synthesised proteins pinch off from the ends of the rough ER and either fuse with the Golgi complex or pass directly to the outer cell membrane.

Smooth ER is not involved in protein synthesis but is the site of steroid production (many hormones are steroids). It also contains enzymes, which detoxify (make harmless) a wide variety of organic molecules, and it acts as a storage site for calcium in skeletal muscle cells.

Most ribosomes are attached to the surface of rough ER but they can ‘ float’ free in the cytoplasm. Ribosomes are made from ribosomal RNA and protein.

Ribosomes synthesise the new proteins that the cell needs and also those, which are produced to send out of the cell. It does this by the process of translation. You can find out more about translation in the section on protein synthesis.

The Golgi body is a cell organelle found in eukaryotic cells. It is a stack of flattened, membranous sacs which is associated with the endoplasmic reticulum – the network of membranes in the cell that are the site of protein synthesis. The Golgi body modifies proteins and fats by, for example, sticking sugar molecules onto them to form glycoproteins and glycolipids.