

# Edexcel (B) Biology A-level

## Topic 2 - Cells, Viruses and Reproduction

### Definitions and Concepts

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## **2.1 - Eukaryotic and prokaryotic cell structure**

**Cell theory** - A concept that defines cells as a fundamental unit of structure, function and organisation in all living organisms. †

**Cell wall** - A tough outer layer which surrounds some cell types and is made of peptidoglycan in bacteria and cellulose in plants.

**Centrioles** - Structures found in the cytoplasm made of microtubules that produce the spindle fibres during mitosis.

**Chloroplasts** - Organelles found in plants and algae which are the site of photosynthesis.

**Differential staining** - Using multiple different stains to distinguish different parts of a specimen.

**Eukaryotic cell** - A type of cell that contains a nucleus along with membrane bound organelles.

**Golgi apparatus** - An organelle found in eukaryotic cells that is involved in the modification and packaging of proteins.

**Gram-negative bacteria** - A type of bacteria with an outer membrane and a thin inner peptidoglycan cell wall which does not retain the crystal violet stain during gram staining.

**Gram-positive bacteria** - A type of bacteria with thick outer peptidoglycan cell walls which retain the crystal violet stain during gram staining.

**Light microscope** - A type of microscope that uses a series of lenses to magnify the visible light reflecting off a specimen.

**Lysosomes** - Membrane-bound vesicles found in the cytoplasm that contain a hydrolytic enzyme called lysozyme.

**Magnification** - How much bigger an image appears compared to the original object calculated using the following formula:

$$\text{Image size} = \text{Actual size} \times \text{Magnification}$$

**Mitochondria** - The organelles found in eukaryotic cells which are the sites of aerobic respiration.

**Nucleoid** - The area in prokaryotic cells where the chromosomes are found.

**Nucleolus** - A dense region found inside the nucleus that contains proteins and RNA and is involved in synthesizing new ribosomes.

**Nucleus** - An organelle found in eukaryotic cells that stores the genetic information of the cell

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as chromosomes and is surrounded by a membrane called the nuclear envelope.

**Organ** - A group of specialised tissues working together to carry out a specific function.

**Organ system** - A group of specialised organs working together to carry out a specific function.

**Permanent vacuole** - A membrane bound structure found in plant and fungal cells that contains cell sap.

**Plasmids** - Circular loops of DNA found in the cytoplasm of prokaryotic cells separate from the nucleoid.

**Prokaryotic cell** - A type of cell that does not contain any membrane bound organelles or a nucleus.

**Resolution** - The ability to distinguish two different nearby points in a specimen.

**Ribosomes** - Organelles which are the site of protein production in the process of translation.

**Rough endoplasmic reticulum (RER)** - A membrane-bound organelle that is involved in the synthesis and packaging of proteins.

**Scanning electron microscope (SEM)** - A type of electron microscope that passes a beam of electrons over the surface of a specimen to produce an image.

**Smooth endoplasmic reticulum (SER)** - A membrane-bound organelle involved in lipid synthesis.

**Tissue** - A group of specialised cells working together to carry out a specific function.

**Tonoplast** - The membrane which surrounds the permanent vacuole.

**Transmission electron microscope (TEM)** - A type of electron microscope that passes a beam of electrons through a sample to produce an image.

## 2.2 - Viruses

**Acquired Immunodeficiency Syndrome (AIDS)** - A condition caused by HIV which is characterised by a large decrease in proper immune function.

**Antivirals** - A class of drugs which work to inhibit viral replication to stop or suppress the infection caused by a virus.

**Ebola virus** - An RNA virus which causes major internal bleeding and is spread through contact with bodily fluids of an infected person.

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**Epidemic** - An infectious disease which has spread to many individuals within a community or region concurrently.

**Human Immunodeficiency Virus (HIV)** - An RNA retrovirus which is transmitted through certain bodily fluids like blood or semen and attacks the immune system which can lead to the development of AIDS (acquired immunodeficiency syndrome).

**λ (lambda) phage virus** - A type of DNA virus which infects the bacterium E. coli.

**Latency** - The amount of time between exposure to a pathogen and the presentation of symptoms caused by the pathogen.

**Lytic cycle** - The replication of a virus within a host cell which ultimately leads to the rupture and death of the host cell.

**Pandemic** - An epidemic which has spread over a wider geographical area (typically internationally).

**Tobacco mosaic virus (TMV)** - A type of single stranded RNA virus which infects plant cells and causes discolouration of the leaves in a mosaic-like pattern and hinders their growth.

### **2.3 - Eukaryotic cell cycle and division**

**Anaphase** - The third stage in mitosis where the chromosomes are pulled apart to the poles of the cell by the spindle fibres.

**Asexual reproduction** - The production of genetically identical offspring from one parent through the process of mitosis.

**Cell cycle** - The series of stages preparing the cell for division consisting of 3 main phases (interphase, mitosis and cytokinesis).

**Chromosome non-disjunction** - Failure of homologous chromosome separation during meiosis which leads to daughter cells which have an abnormal amount of chromosomes.

**Chromosome translocation** - A mutation which is caused when part of a chromosome breaks off and then rejoins to a different chromosome.

**Crossing over** - The exchange of genetic material between two chromosomes in a bivalent.

**Diploid** - Cells with two copies of each chromosome.

**Down's syndrome** - A genetic condition which causes intellectual disability and physical birth defects and is caused by the presence of an extra chromosome (a third copy of chromosome 21).

  
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**G1 (Gap 1) phase** - The first growth phase in interphase where the cell synthesises proteins and RNA, duplicates its organelles and increases in size before DNA replication in S phase.

**G2 (Gap 2) phase** - The second growth phase of interphase where the cell continues to increase in size and synthesise biomolecules.

**Haploid** - Cells with only one copy of each chromosome.

**Homologous chromosomes** - Two chromosomes with similar gene loci but different alleles, one inherited from each parent.

**Independent assortment** - A source of variation in meiosis where the bivalent chromosomes can line up either way around on the metaphase plate.

**Interphase** - The largest part of the cell cycle where cells spend most of their time growing, synthesising biomolecules and preparing for mitosis.

**Meiosis** - A type of cell division used to produce gametes that produces four genetically different haploid daughter cells from one parent cell.

**Metaphase** - The second stage in mitosis where the chromosomes attach to the spindle fibres and align in the centre of the cell along the metaphase plate.

**Mitosis** - The division of a cell to produce two genetically identical daughter cells.

**Monosomy** - A condition where an organism has only one copy of a chromosome.

**Polysomy** - A condition where an organism has at least one extra chromosome than normal.

**Prophase** - The first stage in mitosis where the nuclear envelope breaks down, the centrosomes move to opposite poles of the cell, the mitotic spindle begins to form and the chromosomes condense.

**Recombinant chromosomes** - The chromosomes produced by the crossing over and exchange of genes during metaphase 1.

**S (synthesis) phase** - The second phase in the cell cycle where the DNA in the cell is replicated.

**Telophase** - The final stage of mitosis where new nuclear envelopes begin to form around the separated sets of chromosomes.

**Turner's syndrome** - A genetic condition where the second X chromosome in females is either partially or fully missing.

## **2.4 - Sexual reproduction in mammals**

**Acrosome** - The head portion of a sperm cell which contains digestive enzymes to break down the outer membrane of an egg cell during fertilisation.

**Blastocyst** - A fluid filled mass of cells which contains the inner cell mass (ICM) which later becomes the embryo.

**Blastomere** - The cells which result from the immediate divisions of a fertilised ovum.

**Capacitation** - Maturation of sperm cells which happens after ejaculation and allows them to fertilise the oocyte.

**Cortical reaction** - The reaction that occurs in a fertilised oocyte to harden the zona pellucida and prevent multiple sperm from fertilising the oocyte.

**Fertilisation** - The fusion of a sperm cell nucleus and an egg cell nucleus to produce a diploid zygote.

**Gametes** - Mature haploid sex cells (sperm and egg cells) which can fuse during fertilisation to create a diploid zygote.

**Germ cells** - Diploid cells which give rise to gametes through meiosis.

**Oogenesis** - The formation of a mature haploid ovum from the differentiation of immature diploid Oogonium.

**Polyspermy** - The fertilisation of an oocyte by multiple sperm.

**Somatic cells** - All diploid body cells except gametes.

**Spermatogenesis** - The formation of mature haploid sperm cells from diploid germ cells.

**Zona pellucida** - The outer layer surrounding oocytes made of glycoproteins.

**Zygote** - A diploid fertilised egg cell formed from the fusion of a sperm and ovum.


## **2.5 - Sexual reproduction in plants**

**Anther** - The part of a flower which contains pollen grains.

**Diploid** - Cells with two copies of each chromosome.

**Double fertilisation** - The fertilisation event occurring in seed plants where one sperm cell fertilises the egg cell to produce a diploid zygote and the other fuses with the two polar nuclei to form a triploid endosperm.

**Embryo sac** - A sac which contains the female ovule of a flowering plant.

  
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**Endosperm** - A mass of tissue formed from the fusion of a sperm cell with the two polar nuclei (and subsequent division) which provides energy and nutrition for the growing seed.

**Generative nucleus** - The haploid nucleus found in the pollen grains of flowering plants which divides by mitosis to form the two sperm nuclei.

**Haploid** - Cells with only one copy of each chromosome.

**Micropyle** - A small opening in the ovule which the pollen tube grows towards. It allows for the entry of sperm nuclei into the ovule.

**Ovule** - The structure in seed plants which contains the embryo sac and becomes the seed after it has been fertilised.

**Pollen** - Grains produced by flowers which contain the male gametes from the plant.

**Pollen tube digestive enzymes** - Enzymes found in the tip of the pollen tube which break down the style to create a path for tube growth from the pollen grain to the embryo sac.

**Pollen tube** - The tube used to transport the sperm nuclei from the pollen grain to the micropyle on the embryo sac for fertilisation of the ovule.

**Triploid** - Cells with three copies of each chromosome.

**Tube nucleus** - The nucleus found in the pollen grains of flowering plants which controls the growth of the pollen tube.