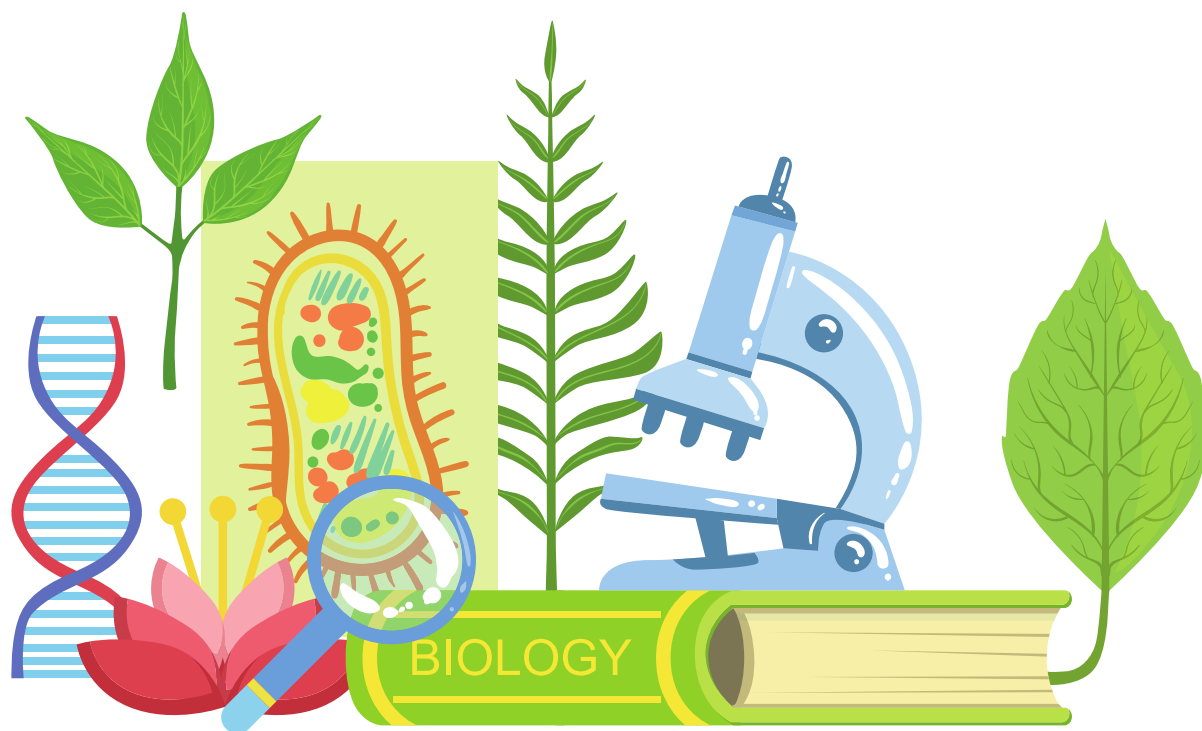




IB Biology SL Paper 2 Question Bank



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1. Compare Plant and Animal Cells

Animal	Plant
Do not have plastids	Have plastids (chloroplasts)
Do not have a cell wall	Have a cell wall made of cellulose
Have small temporary vacuoles (if any)	Have a large, central vacuole
Do not have plasmodesmata	May have plasmodesmata
Have paired centrioles within centrosomes	Do not have centrioles
Have cholesterol in the cell membrane	Do not have cholesterol in cell membrane
Store excess glucose as glycogen	Stores excess glucose as starch
Generally have an amorphous shape	Generally have a fixed regular shape

2. Outline the cellular components of a prokaryotic cell.

Prokaryotic cells will typically contain the following cellular components:

- Cytoplasm: internal fluid component of the cell
- Nucleoid: region of the cytoplasm where the DNA is located (DNA strand is circular and called a genophore)
- Plasmids: autonomous circular DNA molecules that may be transferred between bacteria (horizontal gene transfer)
- Ribosomes: complexes of RNA and protein that are responsible for polypeptide synthesis (prokaryote ribosome = 70S)
- Cell membrane: Semi-permeable and selective barrier surrounding the cell
- Cell wall: a rigid outer covering made of peptidoglycan; maintains shape and prevents bursting (lysis)
- Slime capsule: a thick polysaccharide layer used for protection against desiccation (drying out) and phagocytosis
- Flagella: Long, slender projections containing a motor protein that enables movement (singular: flagellum)
- Pili: Hair-like extensions that enable adherence to surfaces (attachment pili) or mediate bacterial conjugation (sex pili)

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3. The allele for tall plants (T) is dominant over the allele for dwarf plants (t). State the possible genotypes and phenotypes of a plant for this trait.

Genotype	Phenotype
TT	Tall
Tt	Tall
tt	Dwarf

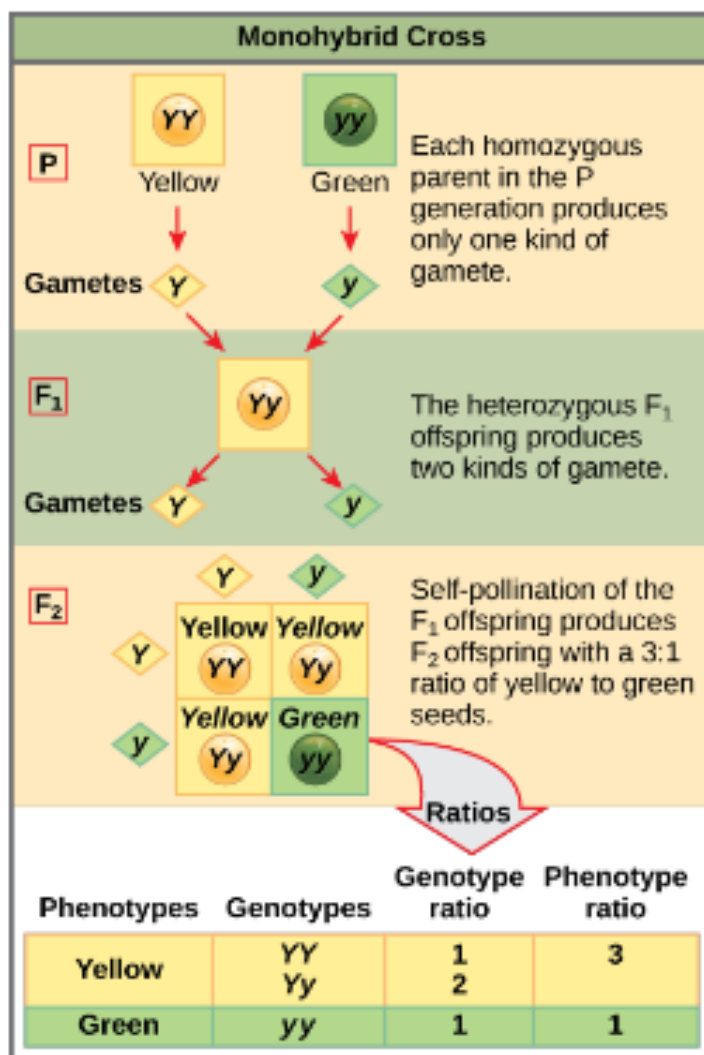
- The genotype is the set of genes in our DNA which is responsible for a particular trait. Genotype contains all the hereditary information of an individual, even if those genes are not expressed, Genotype refers to the pairs of alleles
- The phenotype is the physical expression, or characteristics, visible trait. (expressed genes only), the observation of the individual.
- The phenotype depends upon the genotype but can also be influenced by environmental factors. For example, two organisms that have even the minutest difference in their genes are said to have different genotypes.

4. Explain how a base pair substitution in DNA can cause sickle-cell anaemia.

- Point/gene mutation by changing one base to another causes the base pair substitution
- GAG has mutated to GTG, from A to T (in a sense strand of DNA)
- CTC has mutated from CAC/T to A (in the antisense strand of DNA)
- One codon in the mRNA differs, instead of GAG, GUG appears (in the mRNA and is read during translation)
- GUG of mRNA binds with the anticodon of different tRNA (to the tRNA usually used)
- The new tRNA is attached to valine instead of glutamic acid
- Causing replacement of glutamic acid by valine in the growing polypeptide
- The replacement alters the properties of haemoglobin
- The deformed haemoglobin causes red blood cells to take up crescent/sickle shape
- Sickled red blood cell carries less oxygen to cells and can cause anaemia
- Sickle cell anaemia is an autosomal co-dominant characteristic

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5. Mendel is known as the father of genetics for his extensive experimental work with peas and different types of crosses. In a classic example of Mendel's work, he determined that the gene for pea colour had two alleles. The allele for yellow colour was dominant and the allele for green colour is recessive. Draw a Punnett square to cross two heterozygous yellow peas and determine the predicted genotype and phenotype ratios of the possible offspring.



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6. Explain antibody production.

The antigen causes an immune response to produce antibodies that are specific for that antigen. The antibodies are produced in lymphocytes from the bone marrow. Lymphocytes carried in the blood, and helper T-cells are needed for antibody production.

7. Explain how the skin and mucous membranes prevent the entry of pathogens into the body.

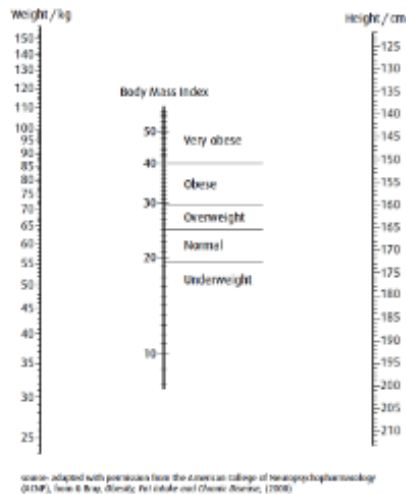
The skin and mucous membranes act as a physical barrier. The skin has several layers of tough cells. The skin is dry discouraging the growth and reproduction of pathogens. Skin membranes host natural flora and fauna that compete with pathogens. The enzyme lysozyme is present on the skin's surface to break down pathogens. The pH of skin and mucous membranes is unfavourable to many pathogens. Skin is a continuous layer. Mucus traps pathogens/sticky.

8. Explain how blood glucose concentration is controlled in humans.

Pancreatic cells monitor blood glucose. Insulin and glucagon are hormones. Low glucose level induces the production of glucagon. α cells of pancreatic islets produce glucagon. Glucagon stimulates the liver to break down glycogen into glucose. Glucagon leads to an increase in blood glucose levels absorption of glucose from the digestive tract causes glucose levels to rise (after meals). A high level of blood glucose induces the production of insulin. β cells of pancreatic islets produce insulin. Insulin stimulates the uptake of glucose into cells (muscles). Insulin stimulates the uptake of glucose into the liver and the storage of glucose as glycogen in the liver. Insulin leads to a decrease in blood glucose levels. Homeostatic monitoring of blood glucose levels is constantly happening. Blood glucose regulation is an example of negative feedback.

9. The body mass index (BMI) takes into account the weight and height of a person and can be used to determine if a person is overweight or obese. The nomogram shows the body mass index for a range of weights and heights.

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A. State the weight description of a 75 kg man who is 145 cm tall.

Obese

B. A woman of height 150 cm has a BMI of 40. Calculate the minimum weight she must lose to be considered 'normal'.

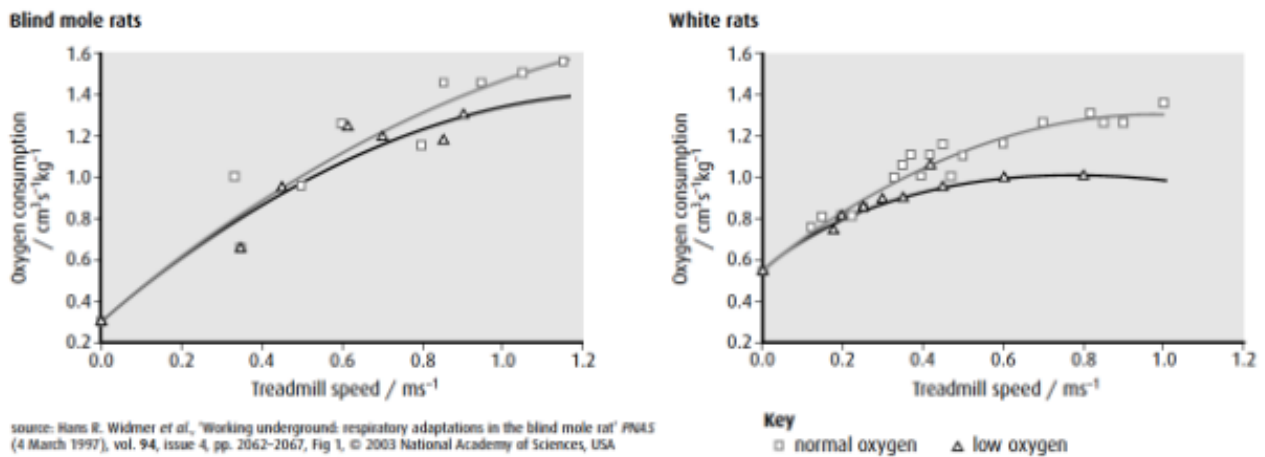
35kg (± 2)

C. Outline the relationship between height and BMI for a fixed weight.

As height increases, body mass index decreases or vice versa.

10. Blind mole rats (*Spalax ehrenbergi*) are adapted to live in underground burrows with very low oxygen conditions. Scientists compared blind mole rats and white rats in order to determine whether these adaptations are due to changes in their ventilation system. Both types of rats were placed on a treadmill and the amount of oxygen consumed was measured at different speeds. This study was done under normal oxygen conditions and under low oxygen conditions.

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The results are shown in the scatter graphs below.

A. Compare the oxygen consumption of blind mole rats and white rats when the treadmill is not moving.

Blind mole rats have a lower oxygen consumption than white rats

B. Compare the effect of increasing the treadmill speed on the oxygen consumption in both types of rats

Both graphs show greater speed correlated to greater consumption; positively correlated. Blind mole rats consume less oxygen at lower speeds than white rats. But white rats consume less oxygen at higher speeds

C. Evaluate the effect of reducing the amount of oxygen available on both types of rats.

There is a lower oxygen consumption in both types of rats. There is a smaller effect on blind mole rats than on white rats. A plateau is reached in white rats at a lower speed;



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