

Langholm Academy



National Biology



Extended Response Homework Package

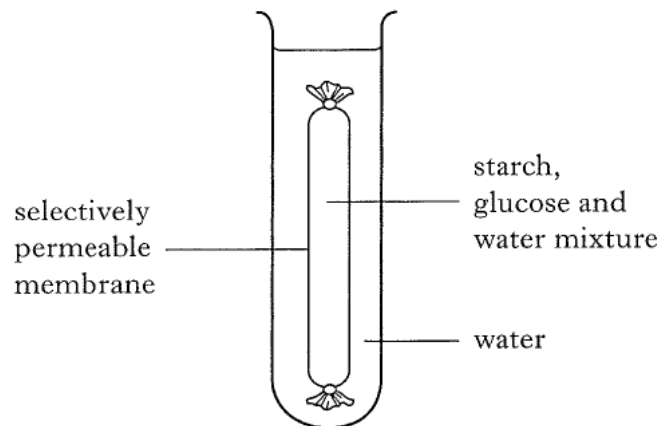
Unit 1 – Cell Biology

Key Area 1 – Cell Structure

a. Describe the similarities and differences in structure between a green plant cell and a bacterial cell. (3)

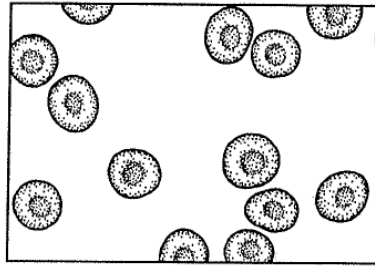
Key Area 2 – Transport Across Cell Membranes

a. The diagram below represents an experiment set up as shown then left for 1 hour.



Name and describe the **two** processes by which molecules will have moved. (5)

b. The diagram below shows the appearance of human red blood cells in a isotonic solution.



Describe and explain the events which would take place if these red blood cells were transferred to pure water. (5)

c. With reference to the water concentrations involved, explain why a red blood cell bursts when placed in water yet an onion epidermal cell does not. (4)

Key Area 3 – DNA

a. The genetic information is encoded in DNA molecules. Describe the structure of a DNA molecule. (3)

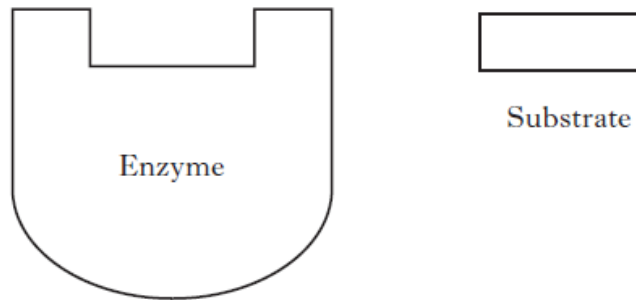
b. Describe the structure of chromosomes. Explain how chromosomes determine the characteristics of an organism. (5)

c. Describe the role of mRNA in protein synthesis. (3)

Key Area 4 – Proteins and Enzymes

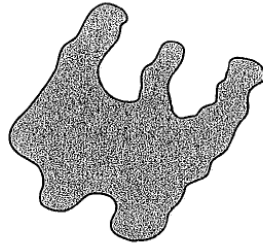
a. Give an account of the properties of enzymes. (5)

b. The diagram below shows an enzyme and its substrate.



Using a named example, describe what happens to this enzyme and its substrate in a degradation reaction. (5)

c. The diagram below represents an amylase molecule.

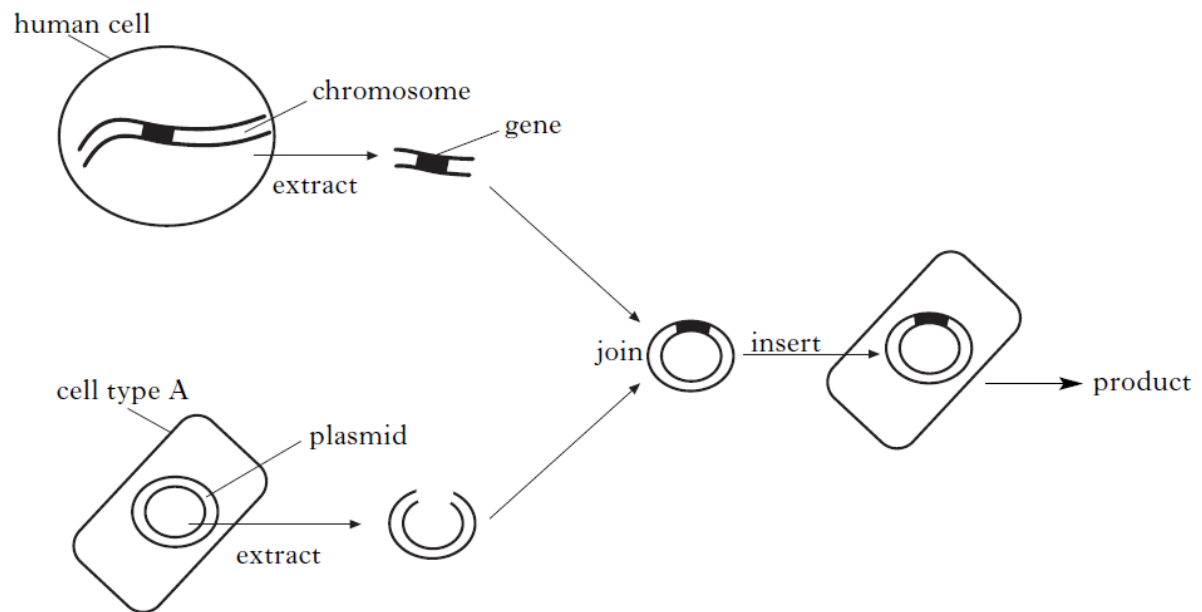


Describe and explain the events that take place when the enzyme is added to a starch suspension.

(5)

Key Area 5 – Genetic Engineering

a. The diagram below summarises a form of genetic engineering.



Identify cell type A and name a product of genetic engineering.

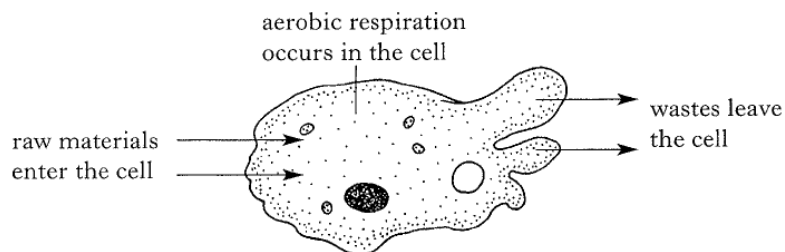
Describe the advantages and disadvantages of this process. (5)

b. Genetic engineering uses bacteria to produce human insulin. Describe the stages involved in this process. (5)

Key Area 6 – Respiration

a. Describe the **two** stages of aerobic respiration **including** the names of the raw materials and products for **each** stage. (5)

b. The diagram below represents an animal cell that is respiring aerobically.



Describe the **two** stages of aerobic respiration. Include the names of the raw materials and the products of the two stages. (5)

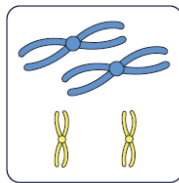
c. Compare aerobic respiration and fermentation in plant cells. (3)

Unit 2 – Multicellular Organisms

Key Area 1 – Producing New Cells

a. Explain the importance of mitosis to multicellular organisms. (3)

b. The diagram shows an animal cell about to undergo mitosis.



Describe the sequence of events of mitosis that would lead to this cell producing two daughter cells. (3)

c. Describe the similarities and differences between embryonic and adult stem cells. (3)

d. Describe the ethical issues surrounding research into human embryonic stem cells. (3)

Key Area 2 – Communication and Control

a. Describe the functions of the cerebrum, cerebellum and medulla. (5)

b. Describe what happens when an electrical signal arrives at a synapse. (3)

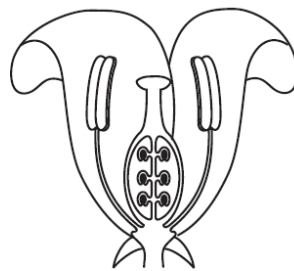
c. Touching a hot object produces a reflex action. Describe the pathway of a nerve impulse through a reflex arc and the functions of this reflex action. (5)

d. Describe the control of blood glucose concentration in humans. (3)

Key Area 3 – Reproduction

a. Describe the structural differences between a mammalian sperm and an egg. (3)

b. The diagram below shows a section through a flower.



Name the sites of production of pollen grains and ovules in a flower.

Describe how these gametes are formed and describe the process of fertilisation. (5)

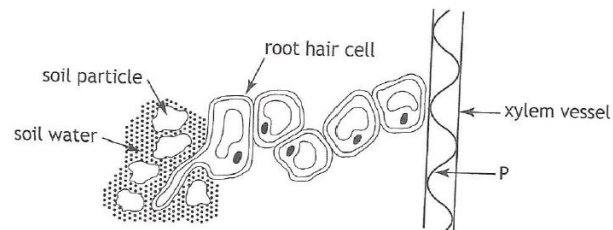
c. Describe how fertilisation is achieved in a flowering plant. (3)

Key Area 4 – Variation and Inheritance

There are no extended response questions for this section

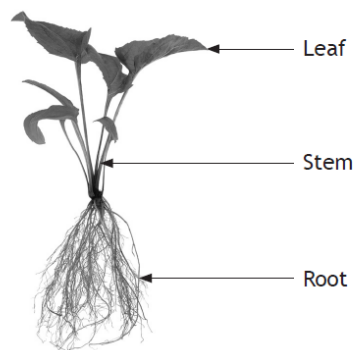
Key Area 5 – Plant Transport

a. The diagram below shows cells from a plant root.



Describe the uptake of water from soil by plant roots and the role of the root hair cells in this process. (3)

b. The diagram below shows three parts of a plant.



Describe the structures and processes involved as water moves through the plant from the soil to the air. (3)

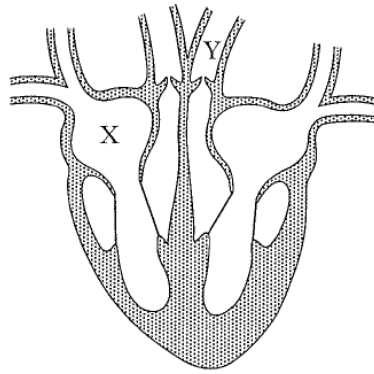
i. type of substance transported

iii. state of tissue (dead or alive). (6)

[illegible]

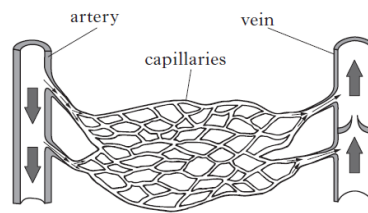
Key Area 6 – Animal Transport

a. The diagram below shows a section through the human heart.



Describe the pathway of blood through the heart and associated structures starting at X and finishing at Y. There is no need to mention valves. (5)

b. The diagram below shows three types of blood vessel in the human body.



For each of the three types of blood vessel shown, describe their

- i. Structure
- ii. Function. (5)

c. The following are types of mammalian blood vessels

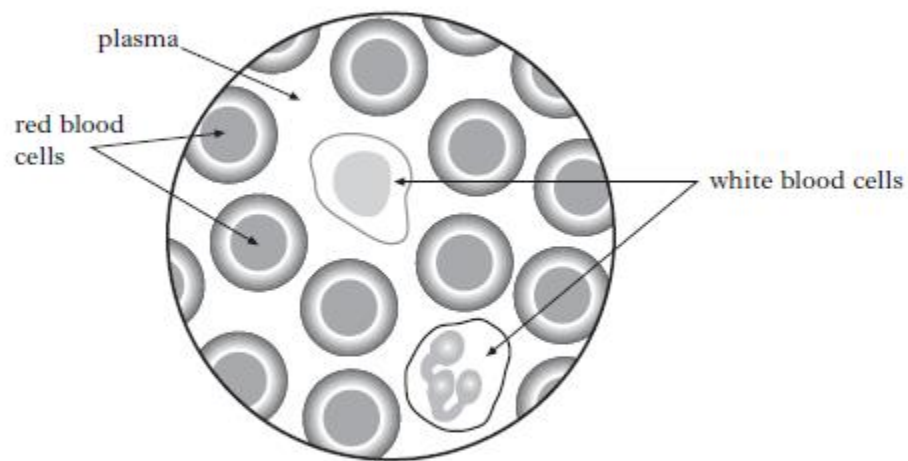
artery vein capillary

Choose one of these vessels and describe its structure and function. (3)

Choice _____

d. Explain how the structure of red blood cells helps them carry out their function. (3)

e. The diagram below shows human blood as seen through a microscope.



- i. Name the **two** parts of the blood involved in the transport of substances around the body.
- ii. Describe how named substances are transported by each part of the blood. (5)

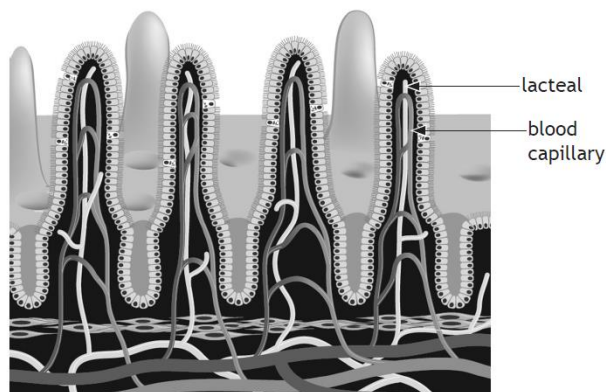
f. Describe the role of antibodies and phagocytosis in defence. Name the cells involved in each of these defence mechanisms. (5)

Key Area 7 – Absorption of materials

a. Gas exchange takes place in the lungs and body cells due to diffusion.

Describe these gas exchanges and explain the importance of these exchanges in the body. (5)

b. The following diagram shows a cross-section of some villi in the small intestine.



Explain why the structure and number of villi make absorption an efficient process in the small intestine. (3)

Unit 3 – Life on Earth

Key Area 1 – Ecosystems

a. Give an account of what is meant by an organism's niche. (3)

Key Area 2 – Distribution of organisms

a. Describe how to use a light/moisture meter to measure

i. light intensity

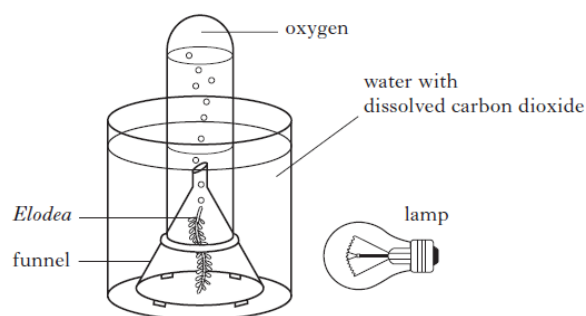
ii soil moisture content.

Identify a precaution that should be adopted in each case. (6)

Key Area 3 – Photosynthesis

a. Describe the **two** stages of photosynthesis **including** the names of the raw materials and products for **each** stage. (5)

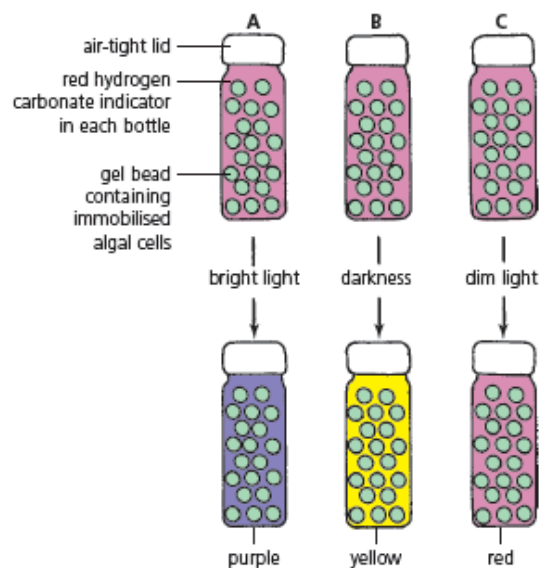
b. The diagram below shows the green plant *Elodea* used in an experiment to investigate photosynthesis.



Describe how the requirements for photosynthesis shown in the diagram are used in photolysis and carbon fixation to produce oxygen and starch. (5)

c. Describe the transfer of energy from light arriving at the leaf to the formation of sugar. (3)

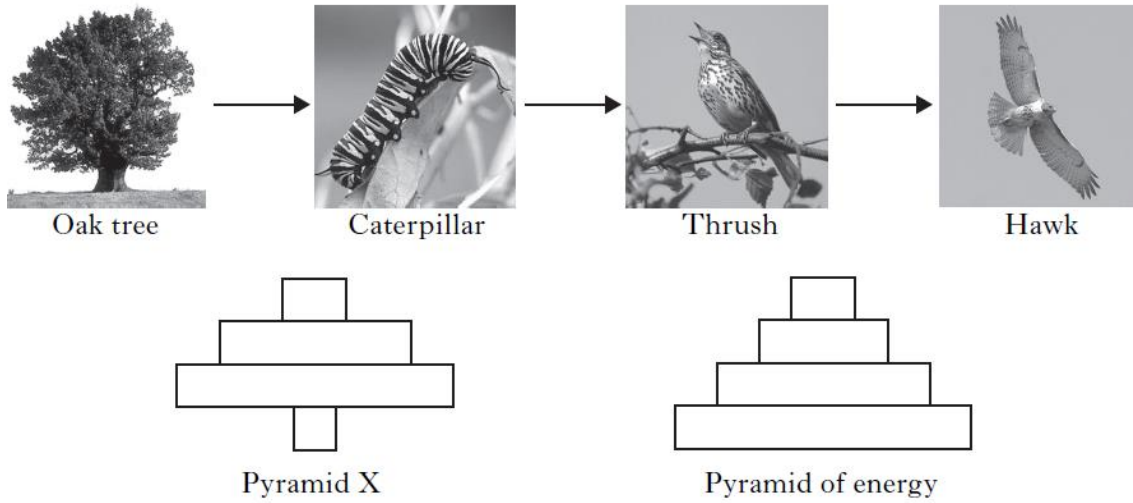
d. The photosynthesis experiment below was run for 24 hours using green cells of a fast-growing alga.



Account fully for the final colour of the indicator in each of bottles A, B and C. (6).

Key Area 4 – Energy in Ecosystems

a. The pictures below show a food chain which is also represented by two types of pyramid.



Name the type of pyramid X. Explain why both pyramids are correct for this food chain. (5)

Key Area 5 – Food production

a. Fertiliser added to farmland can sometimes have an impact on biodiversity in ponds and rivers close by.

Explain this effect. (3)

Key Area 6 – Evolution of species

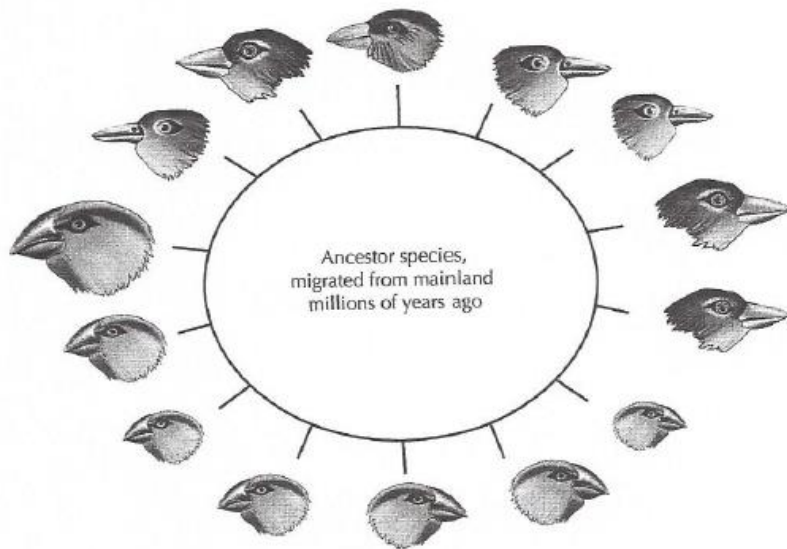
a. The picture below shows a cactus plant growing in a desert.



Describe desert plant adaptations which allow them to obtain water and prevent water loss. Explain how each adaptation helps the plants survive desert conditions. (5)

b. Explain why numbers of the **light form** of the peppered moth (*Biston betularia*) changed over a number of generations when air pollution in their environment was reduced. (5)

c. On the Galapagos Islands of the Pacific Ocean, speciation has produced a group of similar finches, as shown in the diagram below. The group arose from a single ancestor species, which reached the islands from the South American mainland millions of years ago.



The list below shows processes involved in speciation.

mutation

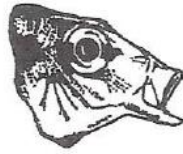
isolation

natural selection

Describe how these processes have led to the production of the group of finch species in the diagram above. (3)

d. Describe how natural selection is involved in the evolution of new species. (3)

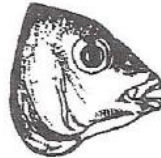
e. Many species of Cichlid fish are found in Lake Malawi in Africa. These species have evolved from a single species. The diagram below shows the heads and mouthparts of three different Cichlid fish species and gives information on their food and feeding methods.



Sucks in microscopic organisms from the water



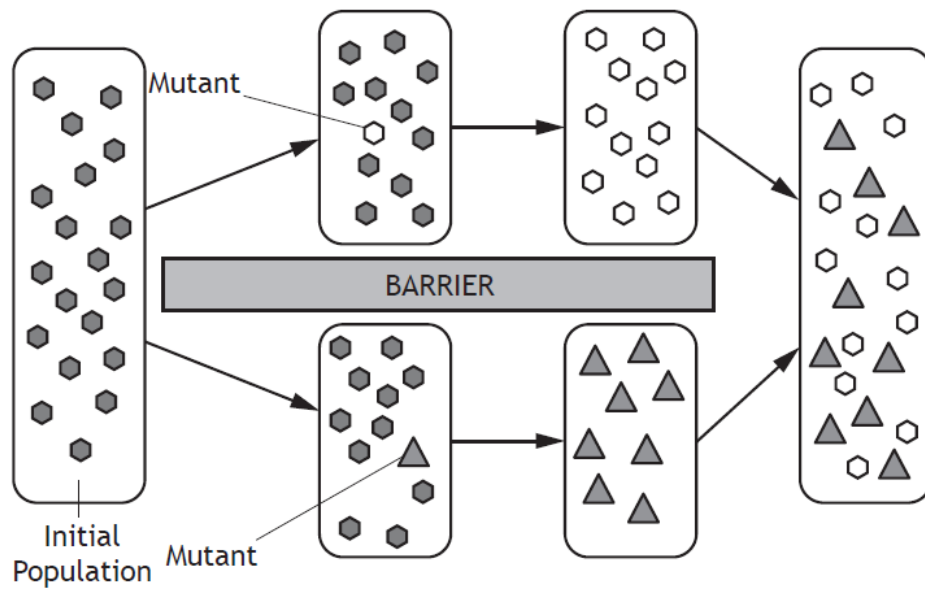
Scrapes algae from the surfaces of rocks



Crushes snail shells and extracts flesh

Describe the part played by mutations and natural selection in the evolution of species. (3)

f. The following diagram shows the stages in the formation of a new species.



Using the information in the diagram, describe how new species are formed. (4)
