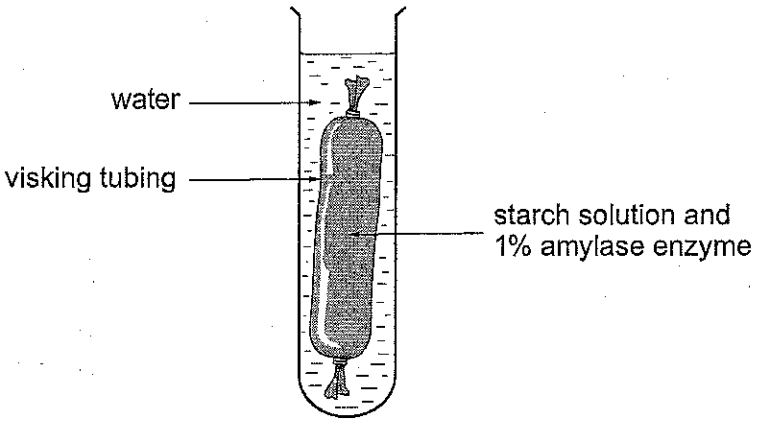
Examiner only

4. An experiment was set up using visking tubing as a model gut. This is shown in the following diagram. The visking tubing was filled with a starch solution and 1% amylase enzyme. After 30 minutes the water surrounding the visking tubing was tested and found to contain glucose but no starch.



Explain why glucose appeared in the water surrounding the visking tubing but no starch was found. Include in your account a description of how the water was tested for glucose using Benedict's solution and for starch using iodine solution giving the expected observations.

[6 QWC]

Amylase digests / breaks down starch into glucose.
The pores in the visking tubing are selectively permeable.
(Partially permeable).
These pores are too small for starch molecules to pass through. However they are big enough to allow glucose molecules to diffuse through.
The water is heated strongly with Benedict's reagent and there was a positive colour change. (From blue – red)
Iodine solution was added to the water and it remained brown.

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11. Describe the process of photosynthesis with reference to the production of materials in plant cells. In your account, identify relevant limiting factors. [6 QWC]

Plants use chlorophyll to absorb light energy. They also convert carbon dioxide and water into glucose and oxygen.

Glucose can be stored as /changed into starch and stored. It can be used in this form to make cellulose (cell walls) or proteins.

The limiting factors are light, temperature, carbon dioxide.

6

END OF PAPER

Examiner only

9. A student used red blood cells to carry out an investigation into cell membranes. Red blood cells were placed in salt solutions at three different concentrations. A sample of red blood cells was then removed from each concentration and placed on a microscope slide. The cells were viewed using a microscope for a period of time. The observations were recorded in a table:

concentration of salt solution (%)	observation of red blood cells
0.0	swell and burst
0.9	remain the same size
3.0	smaller and shrivelled

Explain the observations shown in the table. [6 QWC]

0·0 % - water passes in from where it is in high concentration / water potential to where it is in low concentration / water potential via a semi-permeable membrane.

0·9 % - water passes in and out at the same rate.

3·0 % - water passes out from where it is in a high concentration to where it is in a low concentration. The red blood cell would shrivel.

* At extreme concentrations the membrane is ajected.

6

END OF PAPER

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4. Describe the method involved in testing a leaf for the presence of starch.
Each of the stages involved in the method should be described in sequence and the reason for carrying out each stage should be included.
Your description must include reference to the colour changes shown by the leaf and what these changes indicate. [6 QWC]

• Put the leaf in boiling water to kill the leaf / burst / destroy the chloroplasts. This also gets rid of a waxy cuticle.
• Boil the leaf in ethanol / alcohol to remove the chlorophyll.
• Place the leaf in water to soften it.
• Spread the leaf on a white tile.
• Add iodine solution to the leaf surface to test for starch.
• If the leaf turns blue/black then starch is present.

6

Examiner only

10. Write an account of the similarities and differences between aerobic and anaerobic respiration in muscle cells. In your account, explain why aerobic respiration is more efficient than anaerobic respiration. [6 QWC]

Similarities : both break down glucose and release energy. ✓(1)

Differences : muscle cells produce lactic acid ✓(1) and no carbon dioxide during anaerobic respiration. ✓(1)

Aerobic respiration produces water and carbon dioxide. Aerobic uses oxygen whereas anaerobic does not. ✓(1)

Anaerobic creates oxygen debt whereas aerobic does not. ✓(1)

Aerobic is more efficient because it releases more energy per glucose molecule than anaerobic because it completely breaks down glucose. ✓(1)

6

END OF PAPER

Examiner only

(b) Explain how gas exchange takes place between the alveolus and blood capillary. Include in your answer a description of how the alveolus is adapted to help this gas exchange. [6 QWC]

- Air breathed in contains more oxygen than blood arriving at the alveolus.
- Oxygen dissolves in moisture (accept water) lining the alveolus.
- Oxygen diffuses into the blood through the thin alveolus wall.
- Blood in the capillary arriving at the alveolus contains more carbon dioxide than air in alveolus.
- Carbon dioxide diffuses into the alveolus.
- They have a large surface area of alveolus which means an increased gas exchange.

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7

Examiner only

10. In 2010, an accident happened at an offshore oil well in Louisiana. Many thousands of tonnes of oil leaked out and caused massive pollution to oyster fisheries.
Oysters live in sea water with a salt concentration of 2%.
In order to flush away the oil, fresh water was pumped over the oysters. This lowered the salt concentration to almost zero and caused most of the oysters to die.

(a) Explain why most of the oysters died. [6 QWC]

Fresh water has decreased the concentration of salt to below the level in which oysters live. Osmosis has caused water to pass into the oysters from where it was in high concentration to where it is in low concentration / down a concentration gradient.

Or from a high/low solute concentration to a high solute concentration through a selectively permeable membrane

This diluted the body fluids / blood resulting in death of the oysters ☹

(b) Oysters need copper to make a chemical that carries oxygen around their bodies. The oysters concentrate the copper in their bodies from sea water where it is in a very low concentration.

(i) Name the process by which oysters concentrate the copper in their bodies. [1]

Active transport

(ii) State **two** ways in which this process differs from diffusion. [2]

I. Can carry salts/ions against a concentration gradient.

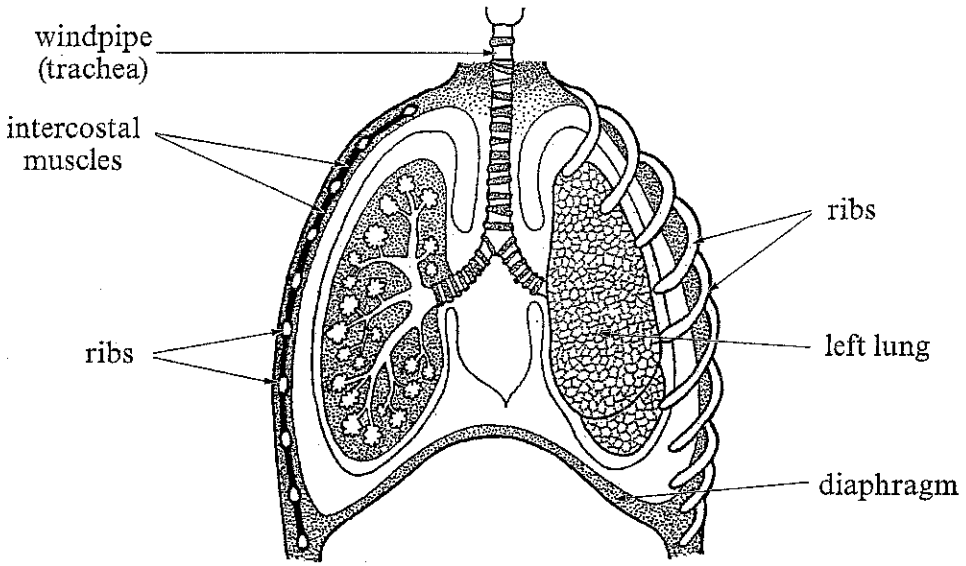
II. Requires energy

END OF PAPER

9

Examiner only

5. The diagram below shows a section through the chest.



Use the above diagram **and your own knowledge** to explain how air is drawn into the lungs during inspiration (breathing in). [6 QWC]

Diaphragm contracts
Diaphragm flattens/moves down
Intercostal muscles contract
Rib cages moves up and out/raised.
Thoracic volume of the lungs increases
The pressure decreases.
lungs inflate
Air is drawn into the lungs through nose/ nasal passages/trachea/windpipe.

internal volume of lungs

6

Examiner only

10. In order to find out the effect of a weedkiller on dandelions, a sample of the weedkiller was sprayed on a $10m^2$ lawn. The number of plants was counted in a $1m^2$ quadrat.
Describe how you would use the quadrat to estimate the total number of living dandelions on the whole lawn before and after treatment with the weedkiller. [6 QWC]

A $1m^2$ quadrat is thrown randomly and the number of living dandelions in the quadrat is counted. This is repeated twice or until the number in the quadrat is constant / not increasing or even a stated number of times.
An average is calculated of the numbers counted.
The number is multiplied to calculate the total number in the whole lawn.
This is done before treatment and 1 week / stated time after treatment.

THERE ARE NO MORE QUESTIONS IN THIS EXAMINATION.

Examiner only

(a) Label **A** and **B** on the diagram opposite. [2]

(b) Describe fully the processes involved in the chemical breakdown of food containing **fat** from the time it leaves the stomach. [6 QWC]

- Food enters small intestine
- Mixes with bile from the gall bladder / liver
- Fat emulsifies - large goblets / globules into small globules. * NOT molecules.
- Lipase comes from the pancreas.
- Lipase enters the small intestine.
- Lipase breaks down / digests fats.

Fats ⟶ fatty acids and glycerol.

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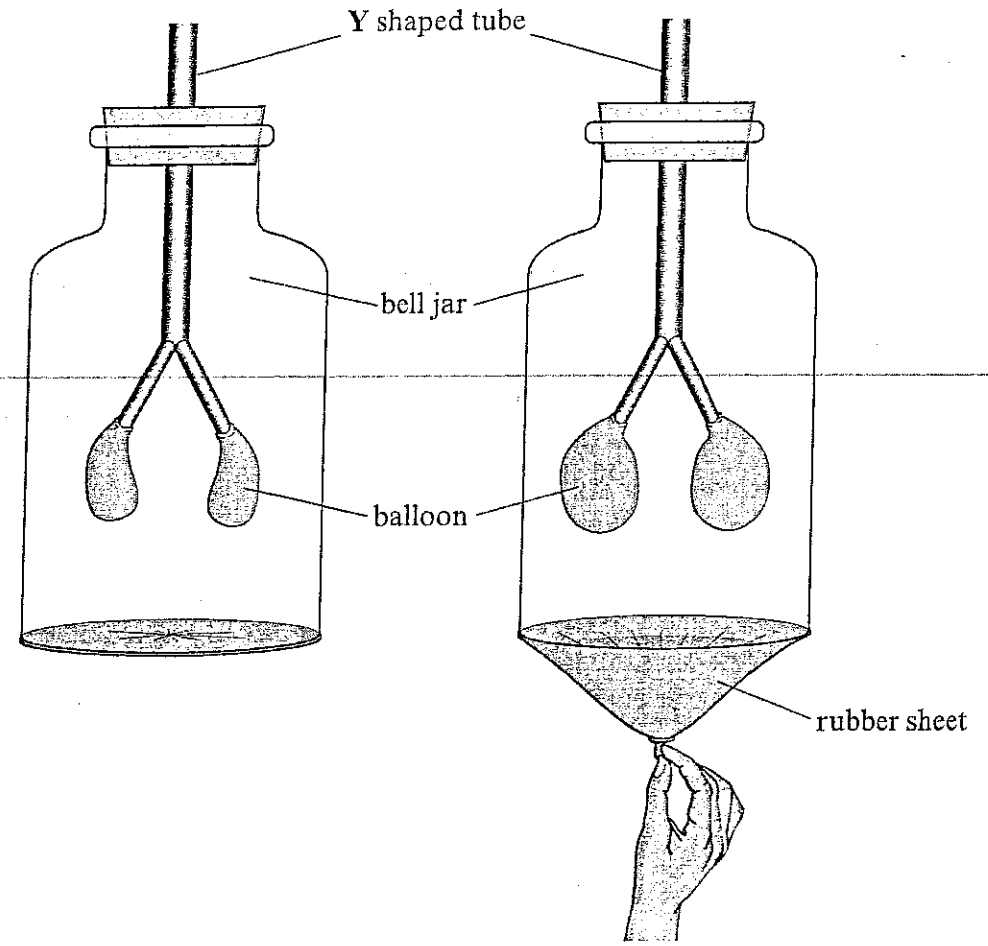
8

Examiner only

4. Explain how the bell jar model shown below can be used to illustrate **inspiration** (breathing in). In your explanation you must state which organs in the body are represented by the balloons and rubber sheet in the model. [6 QWC]



- The balloon represents lungs. ✓(1)
- The rubber sheet represents the diaphragm. ✓(1) When the rubber sheet is pulled down, ✓(1) the volume of air tight space around the balloon increases. ✓(1)
- The pressure decreases. ✓(1)
- The balloon inflates as air is drawn in. ✓(1)

Q) Use your knowledge of the harmful effects of pollution to explain why some chemicals in fertilisers can harm fish in their natural habitats (6 marks).

A) The fertiliser runs off into the water. The fertiliser causes an overgrowth of plants and forms an algal bloom. The top layers of plants grow and this prevents the light reaching the lower layers. The plants on the lower layers die and decay. The bacteria causing the decay use up the oxygen for respiration which causes the fish to die because of the lack of oxygen.