AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.4.2 RESPIRATION (PACK 4)

SCORE	PERCENTAGE
/161	%

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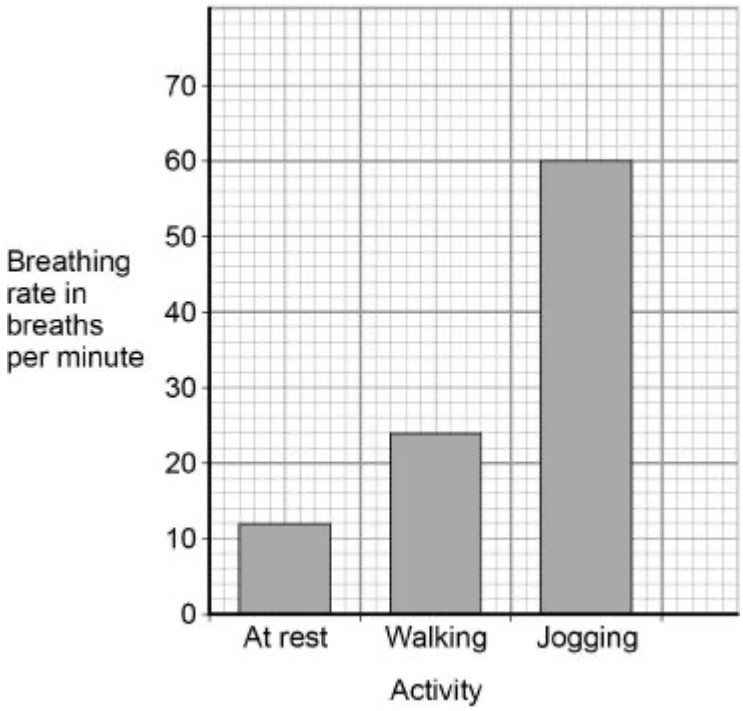
Q1.

Exercise can improve health.

A student measured her breathing rate at rest, when walking and when jogging.

Figure 1 shows her results.

Figure 1



(a) Compare the breathing rates when doing the **three** different activities.

Use values from **Figure 1** in your answer.

(3)

(b) Explain why the breathing rate changes when doing different activities.

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_____

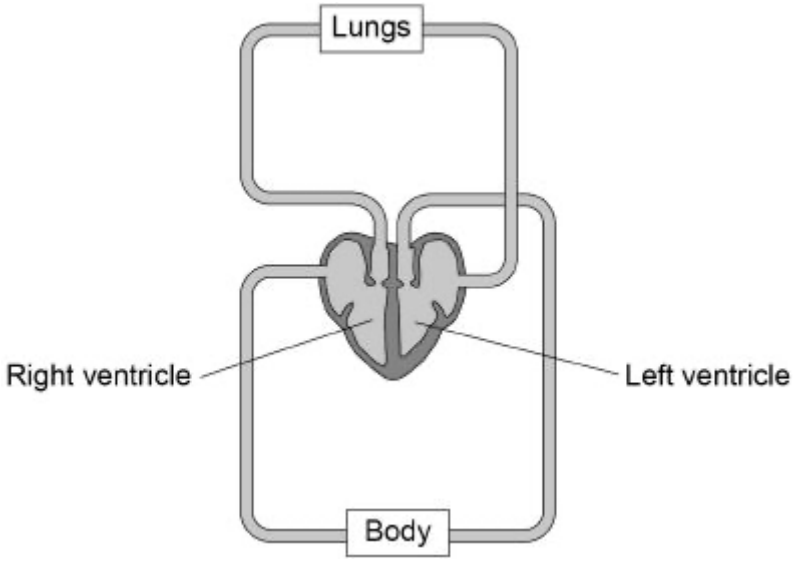
_____

_____

(3)

Figure 2 shows the heart in the circulatory system.

Figure 2



(c) The heart is a double pump.

Describe what this means.

Use **Figure 2** to help you.

_____

_____

_____

_____

(2)

(d) The wall of the left ventricle is much thicker than the wall of the right ventricle.

Suggest **one** reason for this.

_____

_____

_____

(1)

(e) People are encouraged to exercise after recovering from a heart attack.

Suggest **one** reason why.

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_____

_____

(1)

(Total 10 marks)

Q2.

Many people eat shellfish called oysters.

An oyster has 20 chromosomes in each body cell.

(a) Which arrangement of chromosomes will a male oyster have in each body cell?

Tick **one** box.

One X and one Y chromosome and 8 pairs of other chromosomes	☐
Two X and two Y chromosomes and 8 pairs of other chromosomes	☐
One X and one Y chromosome and 9 pairs of other chromosomes	☐
Two X chromosomes and 9 pairs of other chromosomes	☐

(1)

(b) Oyster gametes only contain half the amount of DNA compared to a normal oyster body cell.

Describe the type of cell division that produces gametes.

_____

_____

_____

_____

_____

_____

(3)

Biologists have discovered a way to produce oysters that have three sets of chromosomes (triploid) instead of the usual two sets (diploid).

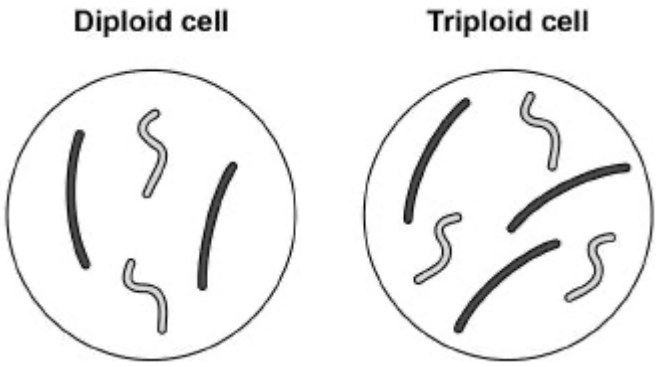
The triploid oysters cannot reproduce and so they grow more quickly.

Diploid oysters do not taste good in the reproductive season. Triploid oysters taste good all year.

The diagram below shows the chromosomes in a diploid cell and in a triploid cell.

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Only two sets of chromosomes are shown.



(c) Suggest why the triploid oysters are **not** able to reproduce.

_____

_____

_____

(1)

(d) Explain why the triploid oysters grow more quickly than the diploid oysters.

_____

_____

_____

_____

_____

_____

(2)

(e) The population of diploid oysters growing in the wild has reduced by over 80% in the last 20 years.

Suggest **two** environmental factors which may be causing this reduction.

Give a reason why each factor may be causing the reduction in the population.

1. _____

_____

2. _____

_____

(2)

(f) Oyster farmers grow the triploid oysters from young seed oysters.

The production of seed oysters involves the use of a chemical called cytochalasin B. Cytochalasin B has been shown to cause cancer in mice.

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Evaluate the production of triploid oysters for supermarkets and restaurants.

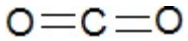
(6)

(Total 15 marks)

Q3.

This question is about gases in the air.

The diagram below represents a molecule found in air.



(a) What is the formula of the molecule shown in the diagram above?

Tick **one** box.

- Co2 ☐
- 2CO ☐
- CO_2 ☐
- CO^2 ☐

(1)

(b) What is the name of the molecule shown in the diagram above?

You may use the periodic table to help you.

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_____

(1)

(c) The percentage of oxygen in air is 21%.

The mass of air in a classroom was 220 kg

Calculate the mass of oxygen in the classroom.

_____

_____

Mass of oxygen = _____ kg

(1)

Carbon monoxide is an air pollutant.

(d) Describe how carbon monoxide is produced from fuels.

_____

_____

_____

_____

(2)

(e) Carbon monoxide can decrease the concentration of oxygen in the blood.

Which part of the blood would be most affected by carbon monoxide?

Tick **one** box.

Red blood cells ☐

Plasma ☐

Platelets ☐

White blood cells ☐

(1)

(f) What **two** effects could a decreased concentration of oxygen in the blood have on body cells?

Tick **two** boxes.

Cell death ☐

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Decreased respiration rate ☐

Faster cell division ☐

Faster cell growth ☐

More energy released ☐

(2)

(g) Some air pollutants cause acid rain.

Give **one** problem caused by acid rain.

_____

_____

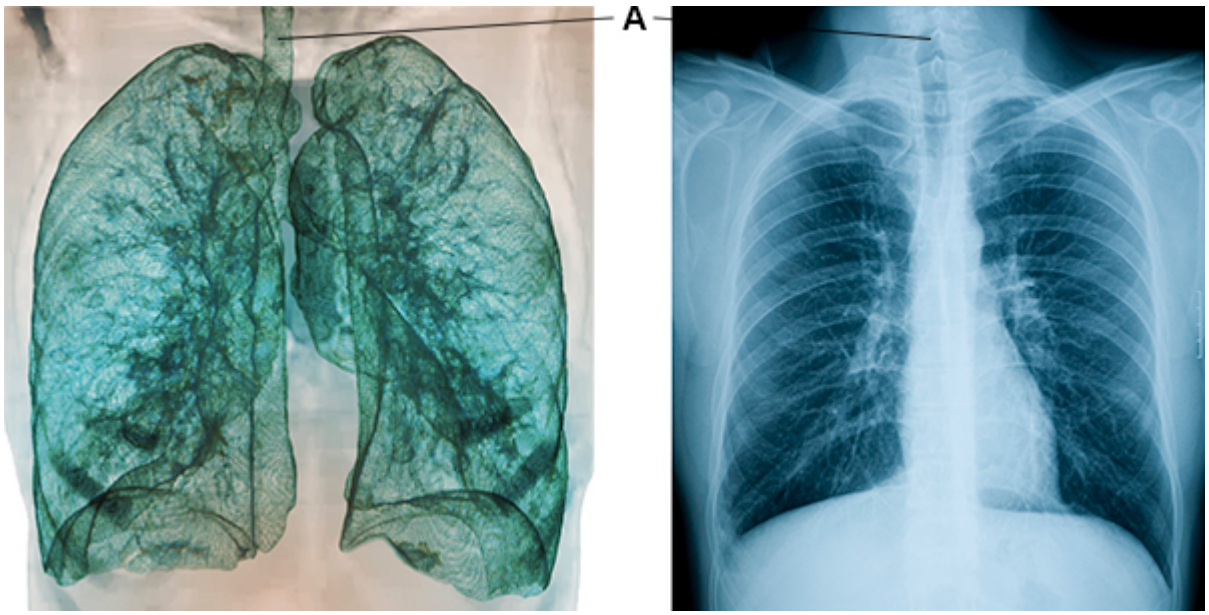
(1)

(Total 9 marks)

Q4.

A man with breathing difficulties goes to hospital.

The photographs below show his lung scan and chest X-ray.



(a) What is part **A**?

Tick **one** box.

Bronchus ☐

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Capillary ☐

Trachea ☐

Vein ☐

(1)

(b) Give **one** advantage of using the **lung scan**, rather than the chest X-ray, to diagnose problems with the man's breathing system.

_____

_____

(1)

(c) Give **one** advantage of using the **chest X-ray**, rather than the lung scan, to diagnose problems with the man's breathing system.

_____

_____

(1)

(d) Aerobic respiration and anaerobic respiration are the two types of cell respiration.

Give **three** differences between aerobic and anaerobic respiration.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(e) A health website contains the following advice:

Stop smoking and you will be healthier and live longer.

Explain why stopping smoking will improve a person's health.

_____

_____

_____

_____

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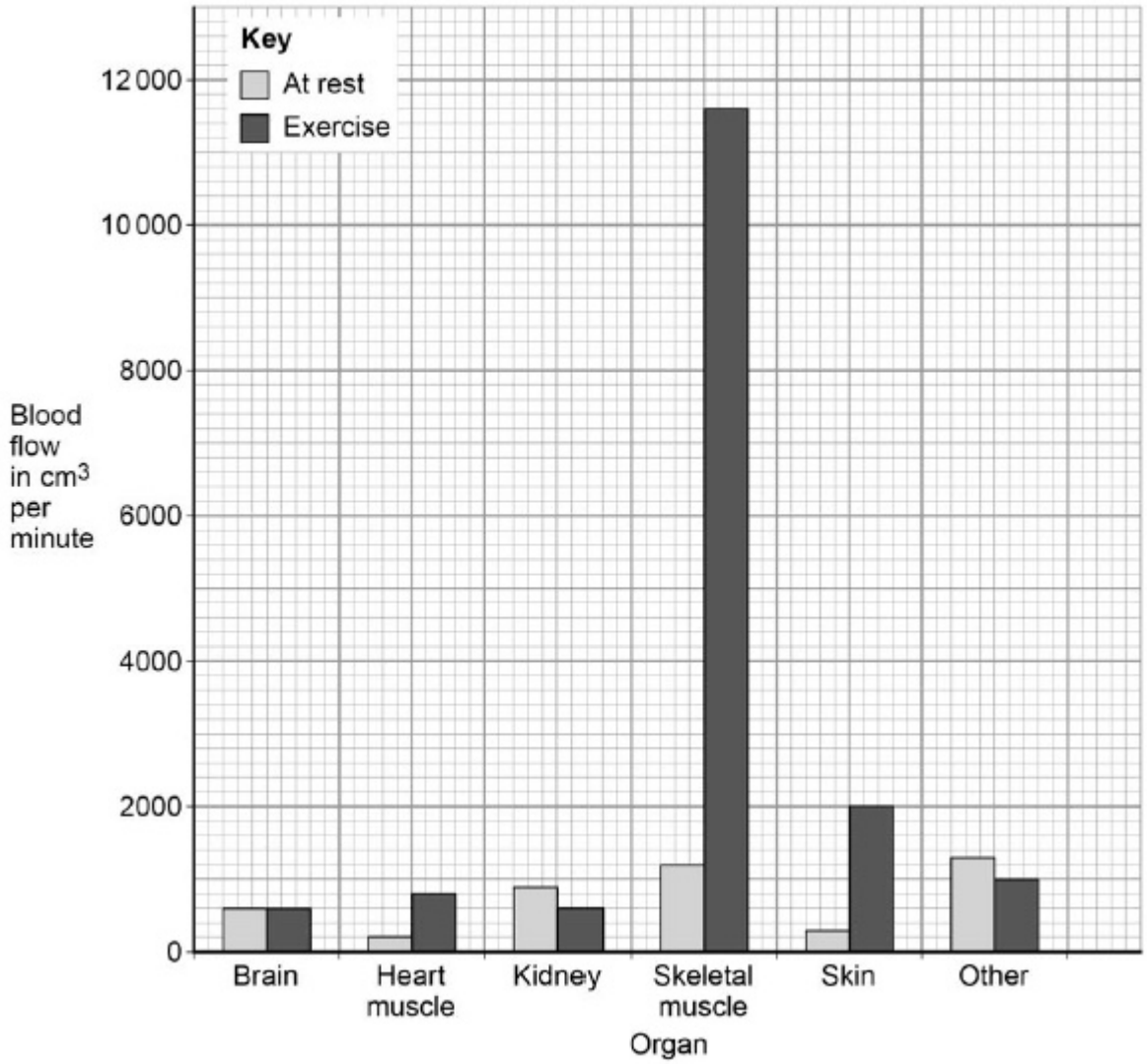
(6)

(Total 12 marks)

Q5.

The graph shows the rate of blood flow through different organs at rest and during exercise.

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(a) Determine the total volume of blood that flows through the brain in 1 hour.

Volume = _____ cm^3

(1)

(b) Look at the blood flow through the skeletal muscle.

Calculate how many times the blood flow increases by during exercise compared to at rest.

Answer = _____

(2)

(c) Explain why the blood flow to the skeletal muscles increases during exercise.

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(3)

(d) Arteries and veins have different structures and different functions.

Explain how the different structure of arteries and veins relates to their different functions.

(6)

(Total 12 marks)

Q6.

Eukaryotic cells respire continuously to transfer energy.

(a) Give **two** uses of energy transferred by respiration in eukaryotes.

1. _____

2. _____

(2)

(b) Name the cell structure in a eukaryotic cell where aerobic respiration occurs.

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_____

(1)

(c) Muscle cells and plant cells can respire anaerobically.

Compare the processes of anaerobic respiration in muscle and plant cells.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(d) Anaerobic respiration in muscle cells creates an oxygen debt.

What does oxygen debt mean?

_____

_____

(1)

(Total 8 marks)

Q7.

Respiration can happen aerobically or anaerobically.

Respiration transfers energy from glucose.

(a) Draw **one** line from each type of respiration in human cells to the correct information.

Type of respiration in human cells	**Information**
	Produces ethanol
Aerobic respiration	Uses oxygen
Anaerobic respiration	Uses carbon dioxide

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Produces lactic acid

(2)

(b) The table below shows the amount of energy released by aerobic and anaerobic respiration.

	Energy in kJ transferred from 1 g of glucose
Aerobic respiration	16.1
Anaerobic respiration	1.2

Suggest why human cells might respire anaerobically, even though only a small amount of energy is transferred.

_____

_____

(1)

(c) Yeast is used in the brewing and baking industries.

Why is yeast used in these industries?

_____

_____

_____

_____

_____

_____

_____

_____

(4)

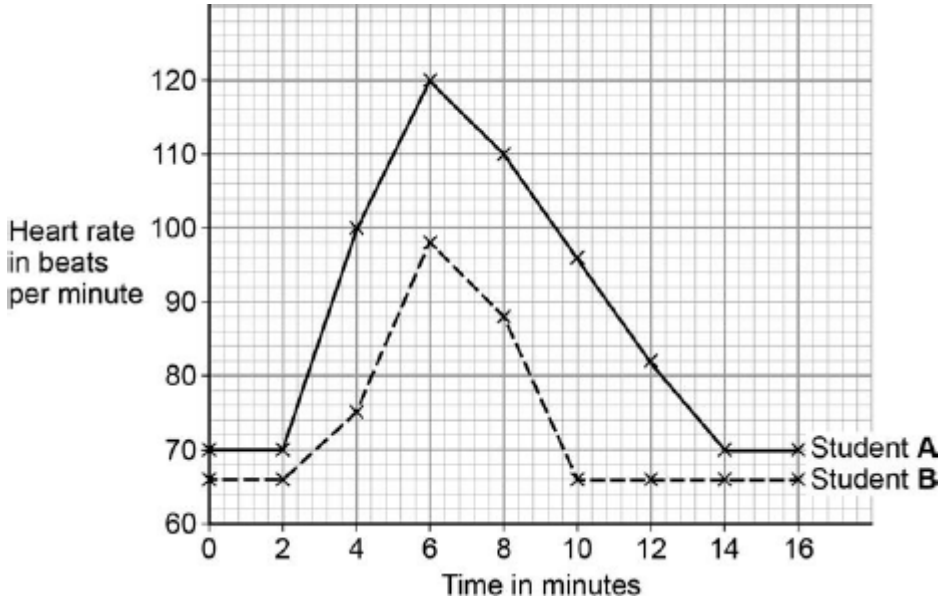
(Total 7 marks)

Q8.

Some students investigated how exercise affects heart rate.

The figure below shows their results.

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(a) What was Student **B**'s resting heart rate?

Resting heart rate = _____ beats per minute

(1)

(b) The students started running at 2 minutes.

What evidence for this is in the figure above?

_____

_____

(1)

(c) For how many minutes did the students run?

Tick **one** box.

2 ☐

4 ☐

6 ☐

14 ☐

(1)

(d) Student **B** is fitter than Student **A**.

Use the figure above to give **two** pieces of evidence that support this statement.

1. _____

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2. _____

_____

(2)

(e) There are other changes in the body during exercise.

Explain why these changes occur.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 9 marks)

Q9.

A student investigated the effect of pond organisms on the amount of carbon dioxide in their surroundings.

The student set up six boiling tubes as shown in the figure below.

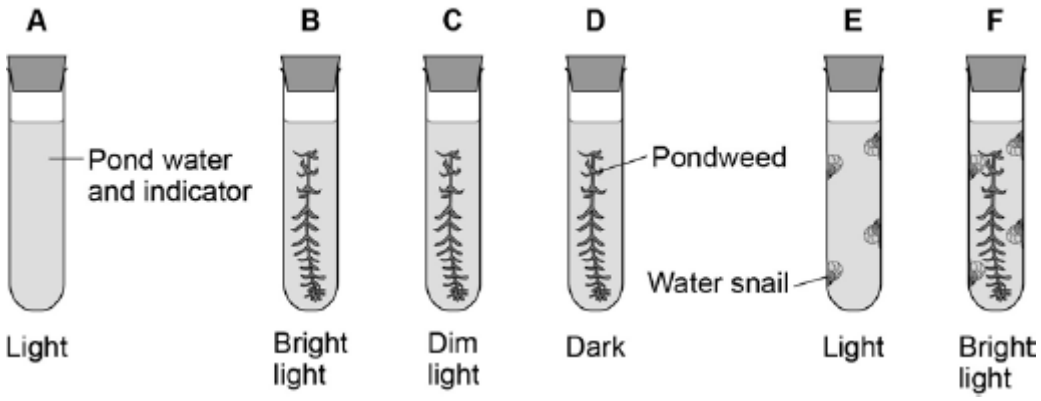
They were left for 2 days.

Each boiling tube contained pond water with an indicator.

The indicator was pink at the start of the investigation.

- If the amount of carbon dioxide in the water increased the indicator turned yellow.
- If the amount of carbon dioxide in the water decreased the indicator turned purple.

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(a) What is the purpose of boiling tube **A**?

_____

_____

_____

_____

(2)

(b) In which boiling tube would the indicator be the **most yellow** after 2 days?

Explain your answer.

Boiling tube _____

Explanation _____

_____

_____

(3)

(c) The colour of the indicator in boiling tube **C** had not changed after 2 days.

Suggest why.

_____

_____

(1)

(Total 6 marks)

Q10.

Plants need nitrate ions in order to make proteins.

A plant is growing in soil flooded with water.

Explain why the plant cannot absorb enough nitrate ions.

_____

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(Total 5 marks)

Q11.

The UK contains large areas of peat bogs that have been present for thousands of years.

(a) Peat is removed from peat bogs.

The peat can be mixed with air and added to garden compost.

The release of carbon dioxide from peat is a problem.

Give **two other** reasons why gardeners should use less peat-based compost in the future.

1. _____

2. _____

(2)

(b) Explain why mixing peat with air leads to the release of carbon dioxide.

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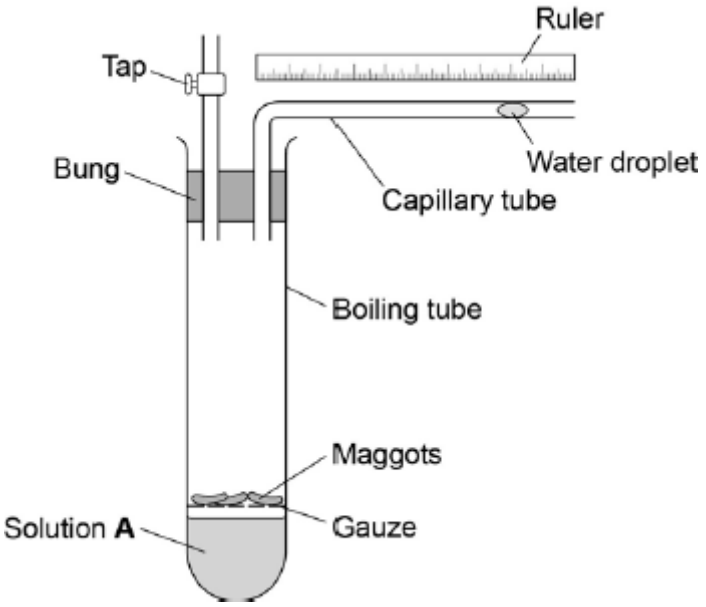
(4)
(Total 6 marks)

Q12.

A student investigates the rate of respiration in maggots.

Figure 1 shows the equipment he uses.

Figure 1



(a) Why does the student put the maggots on gauze?

_____

_____

(1)

(b) When maggots respire they take in a gas from the air and release a different gas.

Solution **A** absorbs the gas released.

At the start of the investigation the student records the distance of the water droplet from the bend in the capillary tube.

Explain what happens to the water droplet as the maggots respire.

_____

_____

_____

_____

_____

_____

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(4)

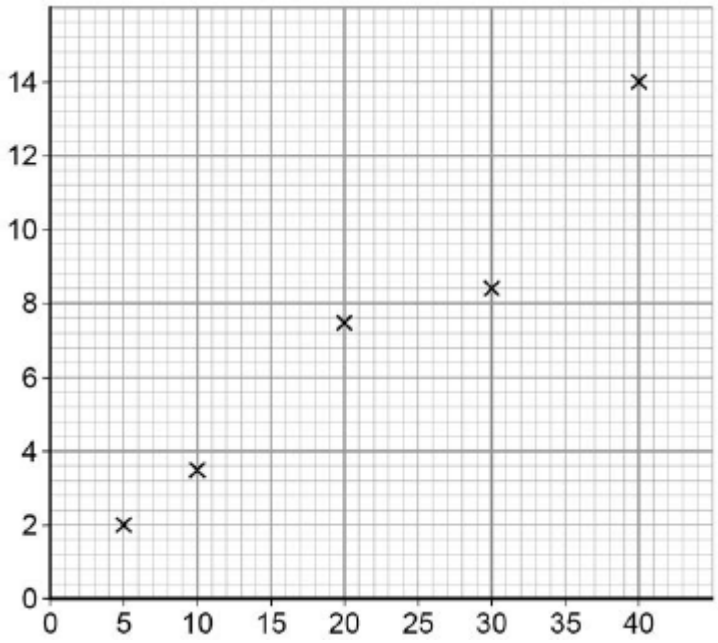
(c) The table below shows the results the student calculated.

Temperature in °C	Rate of respiration in units
5	2.2
10	3.5
20	7.5
30	8.4
40	14.0

The student uses his results to plot the graph in **Figure 2**.

Label the *x* and *y* axis.

Figure 2



(1)

(d) How could the student find out if the result at 30 °C is anomalous?

(1)

(e) Suggest what the value at 30 °C should be to fit the pattern of the graph.

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_____

_____

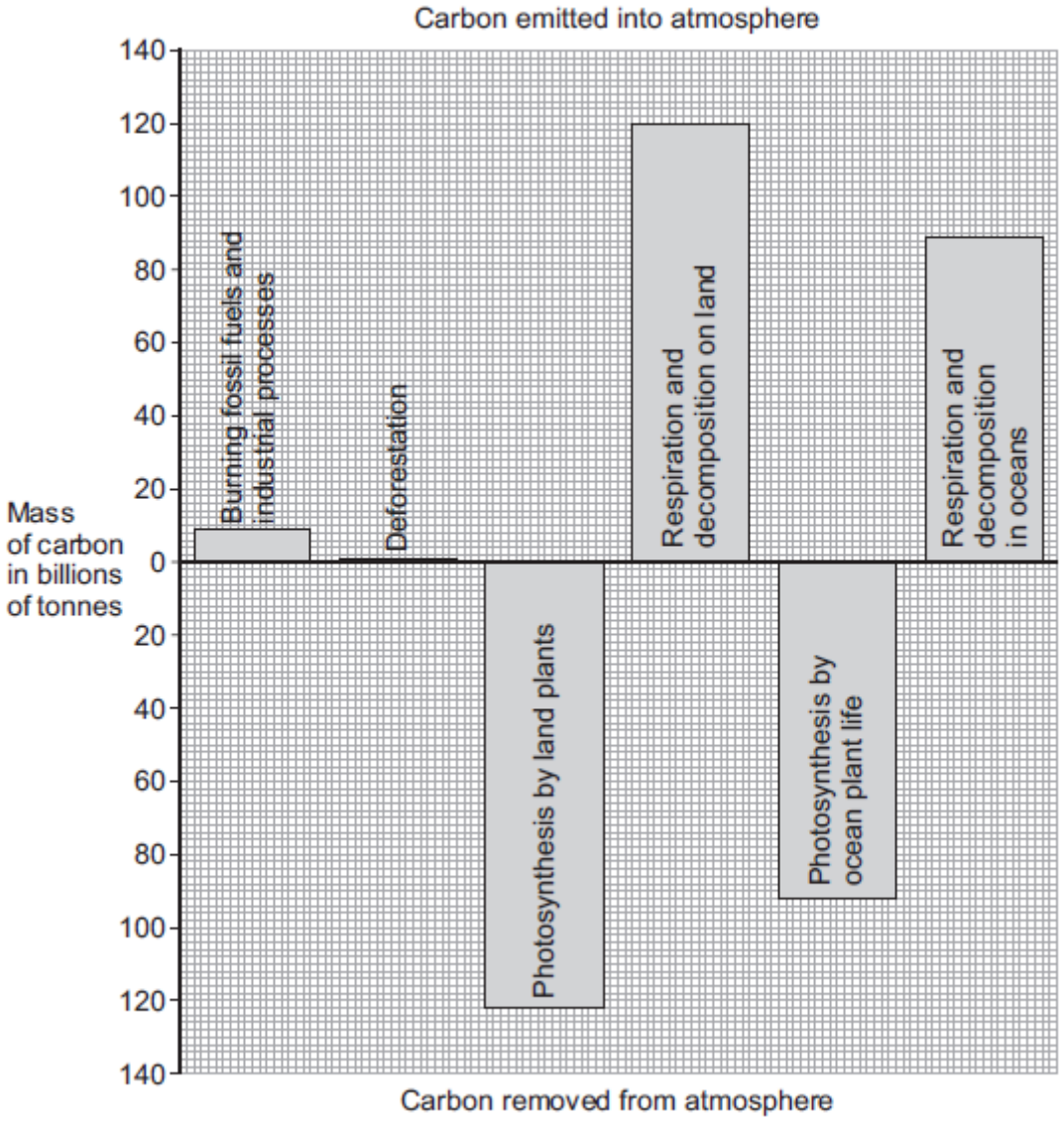
(1)

(Total 8 marks)

Q82.

The amount of carbon in the atmosphere is increasing.

The graph shows the mass of carbon in billions of tonnes involved in some processes in the carbon cycle each year.



(a) (i) Use information from the graph to calculate the total mass of carbon removed from the atmosphere each year.

_____

_____

_____ billions of tonnes

(2)

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(ii) The mass of carbon in the atmosphere is increasing by 5 billion tonnes each year.

One tonne of carbon is equivalent to 3.67 tonnes of carbon dioxide.

Calculate the increase in the mass of carbon dioxide in the atmosphere each year.

_____

_____

_____ billion tonnes

(1)

(b) (i) Many scientists think the burning of fuels is the main cause of the increasing amount of carbon dioxide in the atmosphere. Other scientists disagree.

Use information from the graph to suggest why some scientists do **not** think that burning fuels is the main cause of the increase in carbon dioxide in the atmosphere.

_____

_____

_____

(1)

(ii) Some scientists think we should eat less meat and eat more food from plants.

Suggest how eating less meat and eating more food from plants could reduce the amount of carbon dioxide in the atmosphere.

_____

_____

_____

_____

(2)

(Total 6 marks)

Q83.

This question is about ethanol. The boiling point of ethanol is 78 °C.

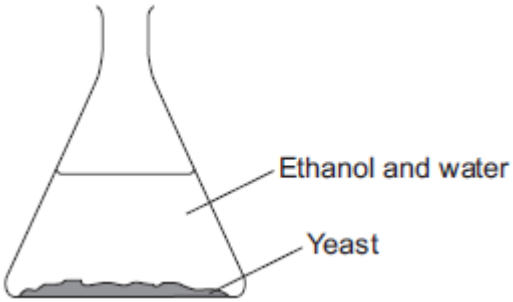
Ethanol can be produced by fermentation of sugar with yeast.

A student:

- put yeast and water in a conical flask
- added sugar to the yeast and water
- left the mixture for a few days to ferment.

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The diagram shows the conical flask after the mixture had fermented to produce ethanol and carbon dioxide.



.

(a) Write the word equation for the reaction taking place to produce ethanol.

_____

(1)

(b) (i) Suggest how the student could separate yeast from the mixture of ethanol and water.

_____

_____

(1)

(ii) Suggest how the student could separate ethanol from the mixture of ethanol and water.

_____

_____

(1)

(Total 3 marks)

Q84.

In a stable community, the processes that remove carbon are balanced by processes that return carbon.

The figure below shows a woodland community.

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Describe how carbon is recycled in a woodland community.

(Total 6 marks)

Q85.

A food chain is shown below.

corn → chicken → human

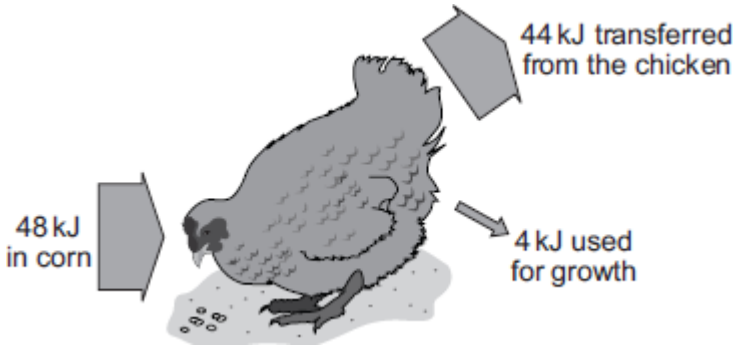
(a) What energy transfer takes place when corn plants photosynthesise?

_____ energy $\xrightarrow{\text{Photosynthesis}}$ _____ energy

(1)

(b) The diagram shows what happens to the energy in the corn eaten by the chicken.

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(i) What percentage of the energy in the corn eaten by the chicken is used for growth?

_____

_____

Percentage of energy eaten that is used for growth = _____

(2)

(ii) Give **three** ways the rest of the energy is transferred from the chicken.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(Total 6 marks)

Q86.

A scientist investigated the effect of oxygen concentration and temperature on the rate of decay of leaves in a container.

(a) Name equipment that could be used to measure the temperature and the concentration of oxygen in the container of leaves.

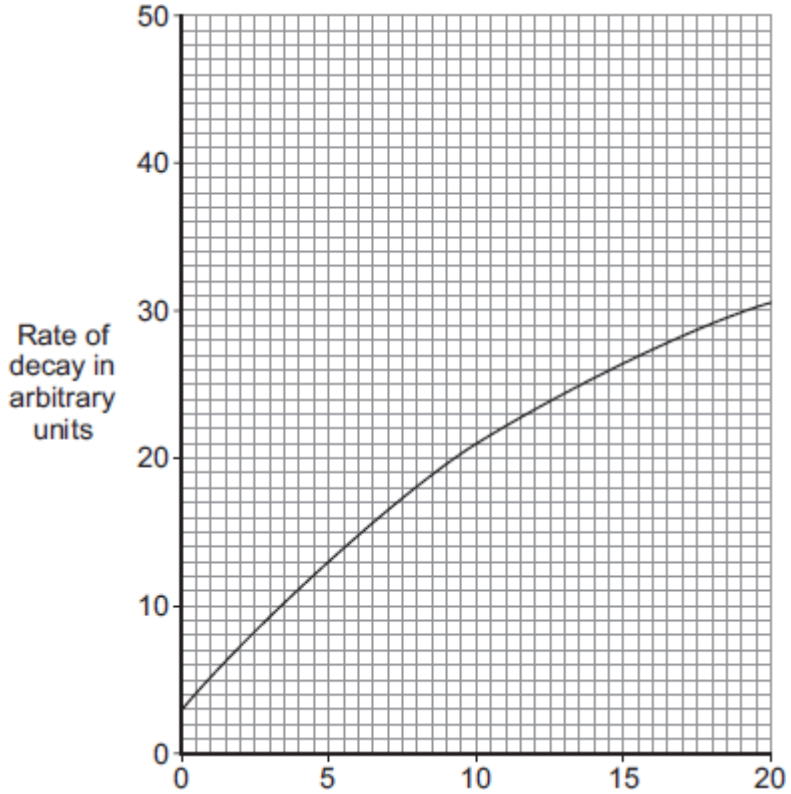
Temperature: _____

Concentration of oxygen: _____

(2)

(b) The results for oxygen concentration are shown in the graph.

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(i) What was the rate of decay at an oxygen concentration of 5%?

_____ arbitrary units

(1)

(ii) What conclusion can be made from the results shown in the graph?

_____

_____

(1)

(c) Temperature can affect the rate of decay.

The graph shows the rate of decay at different oxygen concentrations when the temperature was 20 °C.

Draw a line on the graph to show the results you would expect at a temperature of 15 °C.

(1)

(d) Complete the following sentences about decay processes.

Materials are constantly cycled.

Dead organisms decay because they are broken down and digested by

_____

The decay process releases substances. These substances help the growth of

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Carbon dioxide is also released when dead organisms decay. Carbon dioxide is a waste product of _____ .

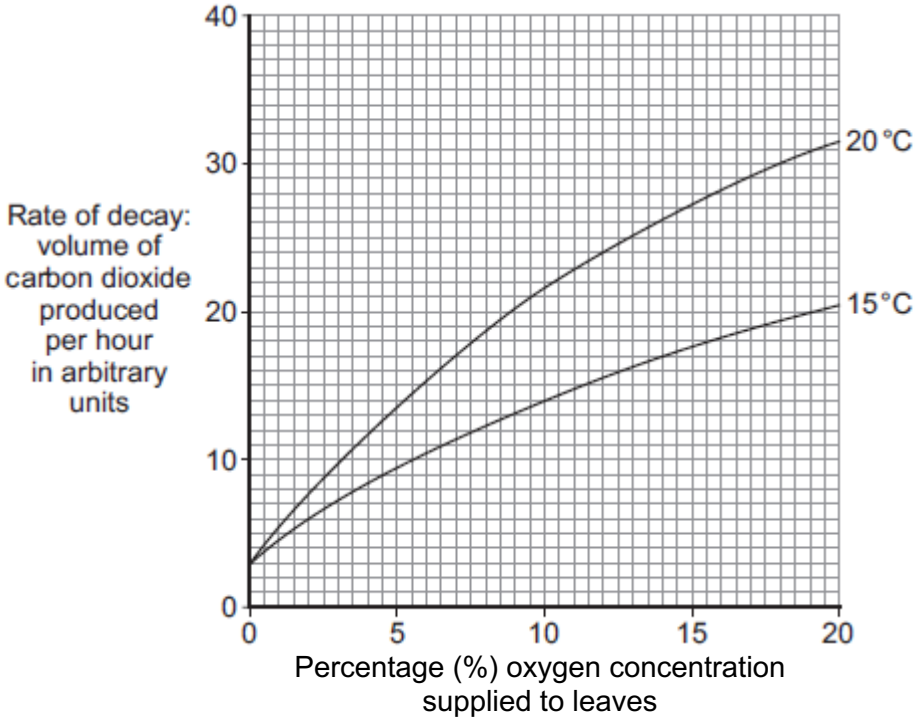
(3)

(Total 8 marks)

Q87.

A scientist investigated the effect of oxygen concentration and temperature on the rate of decay of leaves in a container.

The scientist's results are shown in the graph.



(a) The rate of decay is measured as the volume of carbon dioxide produced per hour.

Explain why carbon dioxide is produced during the process of decay.

_____

_____

_____

_____

_____

_____

_____

(3)

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(b) Give **two** conclusions that can be made from the results shown in the graph.

_____

_____

_____

_____

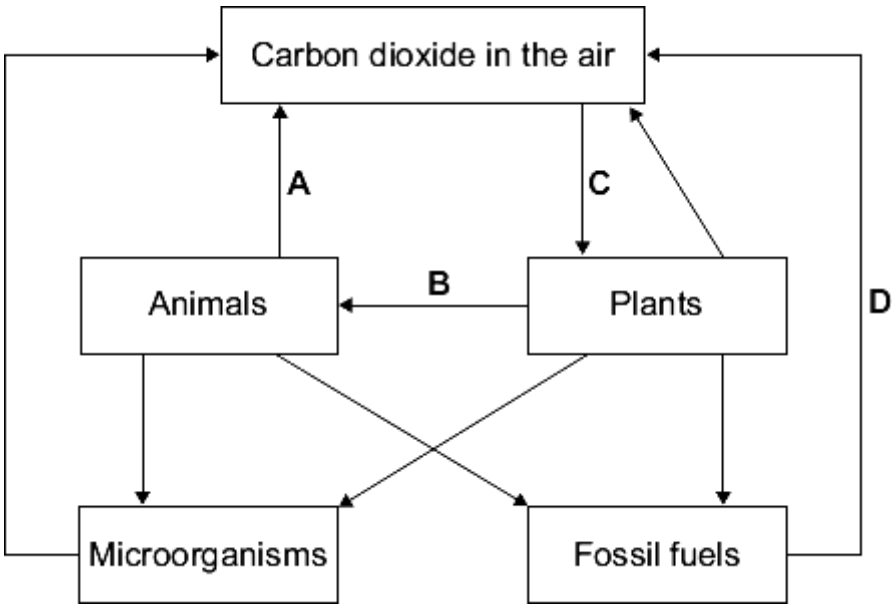
_____

(2)

(Total 5 marks)

Q88.

The diagram shows part of the carbon cycle.



Name the processes labelled **A**, **B**, **C** and **D**, on the diagram.

A _____

B _____

C _____

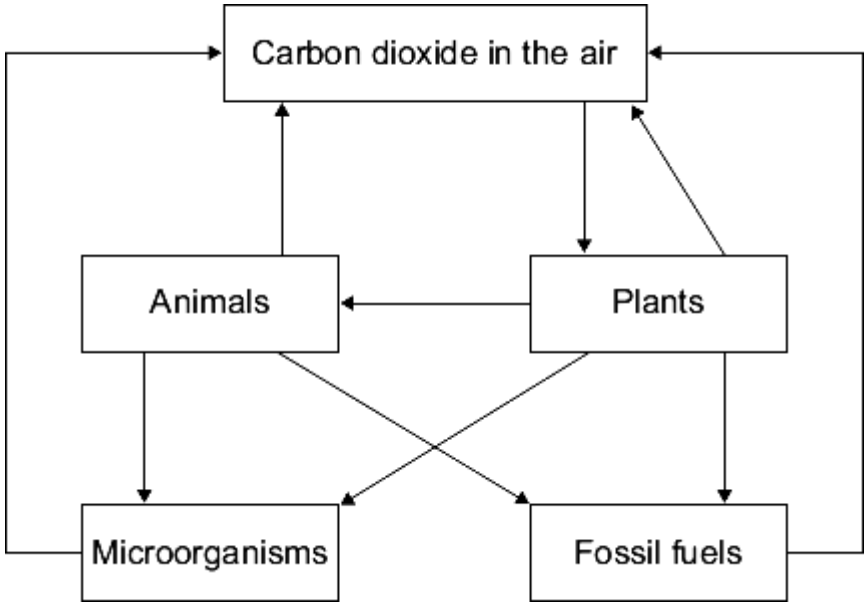
D _____

(Total 4 marks)

Q89.

The diagram shows part of the carbon cycle.

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Use the information in the diagram and your own knowledge to describe in detail how carbon is cycled between living organisms and the air.

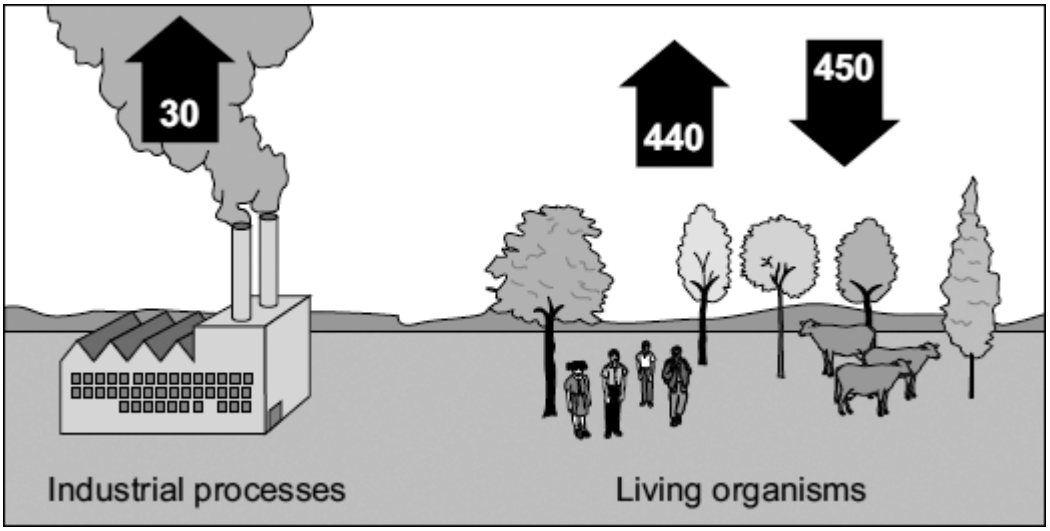
Your answer should include the names of any processes involved.

(Total 6 marks)

Q90.

The diagram shows the mass of carbon dioxide released into and removed from the air each year in billions of tonnes.

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(a) Complete the following sentences.

(i) Plants remove carbon dioxide from the air by a process

called _____

(1)

(ii) All organisms produce carbon dioxide during a process

called _____

(1)

(b) Too much carbon dioxide in the atmosphere can harm the environment.

Suggest **two different** ways of reducing the amount of carbon dioxide in the atmosphere.

_____

_____

_____

_____

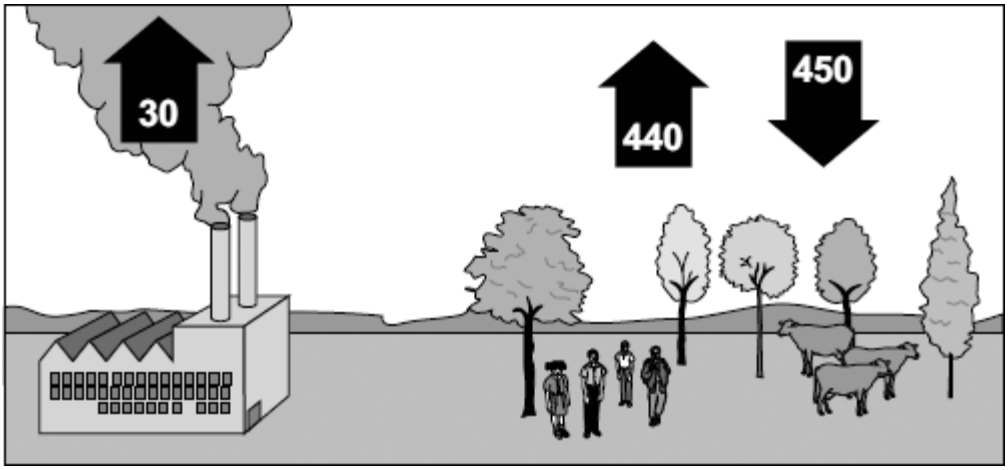
(2)

(Total 4 marks)

Q91.

The diagram shows the mass of carbon dioxide released into and removed from the air each year in billions of tonnes.

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Describe the processes **shown on the diagram** that exchange carbon dioxide with the air.

Explain the overall effect of these processes on the mass of the carbon dioxide in the air.

(Total 6 marks)

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