Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Friday 7 June 2019

Afternoon (Time: 1 hour 45 minutes) | Paper Reference **1BI0/2H**

Biology

Paper 2

Higher Tier

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need*.
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question*.
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) Figure 1 shows a cross section of a leaf.

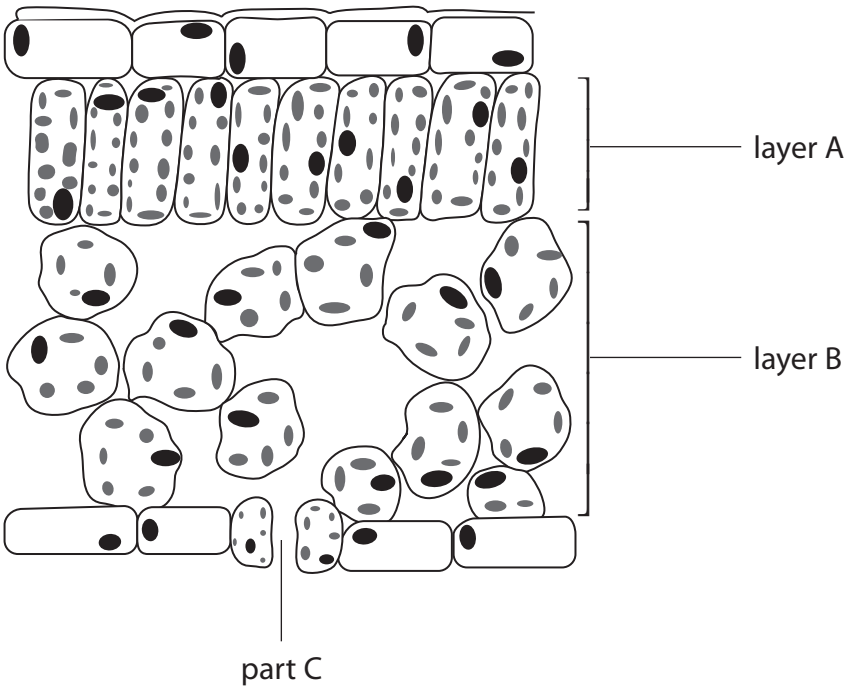

Figure 1

(i) What is the name of layer A?

(1)

☒ **A** spongy mesophyll

☒ **B** palisade mesophyll

☒ **C** upper epidermis

☒ **D** waxy cuticle

(ii) Explain the function of the spaces between the cells in layer B.

(2)

gas exchange / diffusion (1)

• so {carbon dioxide / oxygen} can enter the cells / so {carbon dioxide / oxygen / water} can leave the cells (1)

(iii) Explain the function of part C in Figure 1.

(2)

part C is stoma (1)

• allows gas exchange (1)

(b) Xerophytes are plants adapted to live in very dry conditions.

State **two** differences between the leaf structure of a xerophyte and the leaf structure shown in Figure 1.

(2)

1 leaf becomes a spine / reduced surface area (1)

2 • (waxy) cuticle is thicker (1)

(Total for Question 1 = 7 marks)

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2 (a) A student was investigating the populations of organisms in a garden.

Figure 2 shows the estimates of the number and biomass of some of the organisms in the garden.

organisms	number	mean biomass of each organism in grams	biomass of population in grams
cabbages (plants)	80	70	5600
earthworms	620	3.4	?
slugs	30	4.1	123
hedgehogs	1	620	620
squirrels	2	600	1200

Figure 2

(i) Calculate the biomass of the population of earthworms in the garden.

(1)

2108 (g)

(ii) Hedgehogs eat slugs and earthworms.
Slug pellets were used to kill the slugs.

Explain how killing the slugs would affect the population of earthworms in this garden.

(2)

population of earthworms will decrease (1)

• because more earthworms will be eaten by hedgehogs (1

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(iii) Describe a method that could be used to estimate the population of slugs in the garden.

(3)

• use of quadrat / belt transect (1)

• count the number of slugs in the sampled area (1)

• multiplication factor to make the estimate (1

(b) Explain how cabbages, earthworms and squirrels contribute to the carbon cycle.

(3)

{squirrels / earthworms / cabbages} release carbon dioxide (1)

• from respiration (1)

• cabbages take in carbon dioxide (1)

(Total for Question 2 = 9 marks)

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3 (a) A student investigated respiration in three different organisms.

Red hydrogencarbonate indicator was placed in each of three test tubes.

Gauze was placed in each test tube to hold the organisms.

In test tube 1 the student placed four germinating peas.

In test tube 2 the student placed four dried peas.

In test tube 3 the student placed four mealworms.

Bungs were added to each of the test tubes.

The three test tubes were left for one hour.

The equipment used is shown in Figure 3.

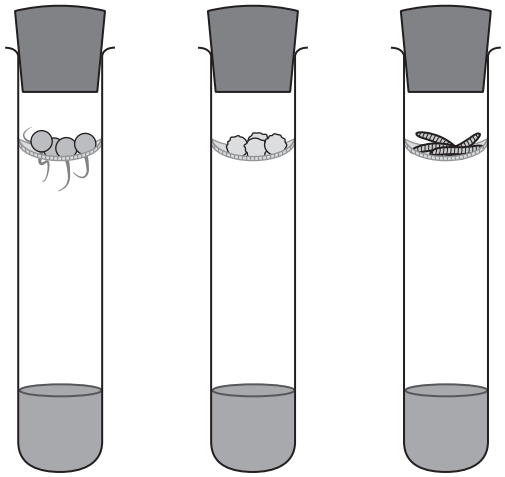

Figure 3

(i) State **two** ways this method could be improved to make the results for these three organisms more comparable.

(2)

1 same concentration of indicator (1)

2

• same mass of organisms (1)

(ii) Describe a suitable control for this investigation.

(2)

same test tube, gauze and bung
with (hydrogencarbonate) indicator (1)

• without any (live) organisms / with a mass of inert object

e.g.stones/dead peas/glass beads(1)

(b) Hydrogencarbonate indicator changes from red to yellow when more carbon dioxide is present.

The results for this investigation are shown in Figure 4.

organisms	colour of hydrogencarbonate indicator
germinating peas	yellow
dried peas	red
mealworms	yellow

Figure 4

(i) Explain why the result for the germinating peas is different from the result for the dried peas.

(2)

germinating peas produce carbon dioxide (1)

because germinating peas were respiring (aerobically) (1)

(ii) How was the carbon dioxide produced in this investigation?

(1)

☒ **A** by photosynthesis

☒ **B** when glucose is broken down in the presence of oxygen

☒ **C** when glucose is broken down in the absence of oxygen

☒ **D** by the reaction between oxygen and water

(c) Explain why cellular respiration is essential for living organisms.

(2)

to release energy (1)

• for metabolic processes / chemical reactions (1)

(Total for Question 3 = 9 marks)

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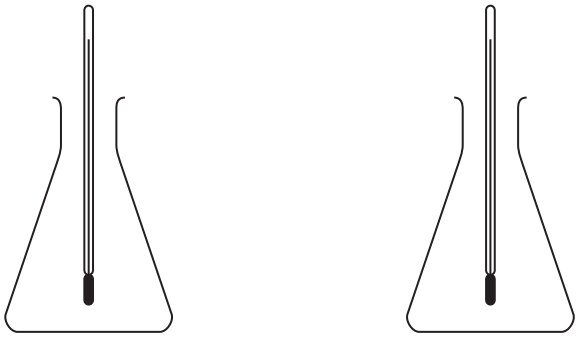
4 A student was investigating the effect of sweating.

The student set up two conical flasks each with a thermometer as shown in Figure 5.



flask 1 flask 2

Figure 5

Flask 1 was covered in wet tissue paper.

Flask 2 was covered with dry tissue paper.

Hot water was added to each of the flasks.

The temperature of the water in each flask was recorded every minute for 10 minutes.

(a) State **two** variables that would need to be controlled in this investigation.

(2)

1 starting temperature of water (1)

2

• volume of water (1)

(b) The results of this investigation are shown in Figure 6.

time in minutes	flask 1 (wet tissue paper) temperature in °C	flask 2 (dry tissue paper) temperature in °C
1	98	98
2	82	91
3	71	84
4	60	76
5	50	69
6	39	61
7	31	56
8	22	49
9	22	42
10	22	37

Figure 6

(i) Calculate the rate of temperature change in flask 1 from 1 to 8 minutes.

(2)

(98 – 22) = 76 (1)

rate calculated

(76÷8) = 9.5 (0C per minute)

.....°C per minute

(ii) Compare the trends shown in the data for flask 1 and flask 2.

(2)

flask 1 and 2 decrease in temperature (1)

.....

the temperature in flask 1

.....

decreases faster than in flask 2
(1)

.....

.....

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(c) Explain how sweating helps to cool the body.

(2)

sweat/water is released onto the skin (1)

• is evaporated (1)

(d) Which part of the brain controls internal body temperature?

(1)

☒ **A** cerebellum

☒ **B** medulla oblongata

☒ **C** hypothalamus

☒ **D** pituitary gland

(e) Explain why it is important to control the internal temperature of the human body.

(2)

(internal) temperature is kept at
the {optimum / best / 37°C} (1)

• for enzyme action / (chemical) reactions to take place (1)

(Total for Question 4 = 11 marks)

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5 (a) (i) Water enters a plant through root hair cells.

Root hair cells have

(1)

☒ **A** a small surface area and thin cell walls

☒ **B** a small surface area and thick cell walls

☒ **C** a large surface area and thin cell walls

☒ **D** a large surface area and thick cell walls

(ii) Explain how water in the root is transported to the leaves of the plant.

(2)

through the {root/cells} by osmosis
(1)

• (then up) the xylem (1)

(b) How is sucrose transported from the leaves to other parts of the plant?

(1)

☒ **A** by osmosis through the phloem

☒ **B** by osmosis through the xylem

☒ **C** by translocation through the phloem

☒ **D** by translocation through the xylem

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(c) Figure 7 shows the average size of stomata in a leaf during one day.

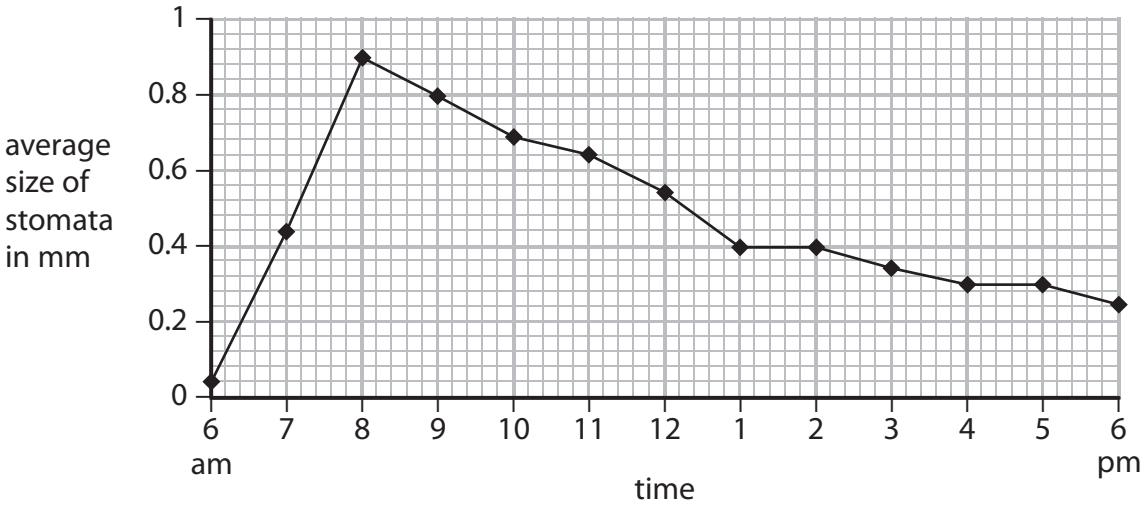

Figure 7

(i) Name the cells that change the size of stomata.

(1)

guard (cells)

(ii) Describe the trend shown in Figure 7.

(2)

the stomata openings increase in size until 8am (1)

• then decreases (until 6pm) (1)

(iii) The temperature increased from 8 am to 1 pm.

Explain why this affected the size of the stomata.

(2)

the stomata {get smaller / are closing} (1)

• because guard cells lost water (1)

(Total for Question 5 = 9 marks)

6 (a) A person had symptoms including difficulty passing urine, aching in the lower abdomen, constant thirst and fainting.

A sample of their urine was tested.
The results are shown in Figure 8.

test	result	acceptable range
Glucose	200 mg per dl	0 to 130 mg per dl
Albumin (protein)	16 mg per dl	0 to 3 mg per dl
pH	3	5 to 7
Leukocytes (white blood cells)	40	2 to 5

Figure 8

(i) A doctor analysed the results and asked the person to have further tests for type 2 diabetes.

Give a reason why the doctor came to this conclusion.

(1)

excess glucose (in the urine) / (symptom of) constant thirst / fainting

(ii) Explain why the doctor also concluded that the person had a kidney infection.

(2)

protein levels were above the normal range (1)

• indicating bacteria / pathogens present (1)

(b) Describe how a student could test a sample of urine for the presence of protein.

(2)

add Biuret {reagent / solution} / do the biuret test (1)

• colour change (from blue) to purple protein is present (1)

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(c) Describe the route taken by urine from the kidney until it leaves the body.

(3)

(travels from the kidneys) through the ureters (1)

• to the bladder (where it is stored)(1)

• (from the bladder) through the urethra (and out of the body)

(d) Urine contains urea.

State how urea is formed in the human body.

(2)

(breakdown of) amino acids (1)

• in the liver (1)

(Total for Question 6 = 10 marks)

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7 (a) (i) Women with the condition known as polycystic ovary syndrome (PCOS) do not ovulate regularly.

Women with PCOS can be treated using clomifene therapy.

Clomifene therapy stimulates the production of FSH.

Name the endocrine gland that produces FSH.

(1)

pituitary (gland)

(ii) During this therapy, a woman takes a clomifene tablet each day for the first five days of her menstrual cycle.

Describe the changes that would happen inside the ovaries during the first five days of this treatment.

(2)

one or more ova will start to mature (1)

• (inside the) follicles (1)

(iii) Which hormone causes ovulation?

(1)

☒ **A** LH

☒ **B** FSH

☒ **C** testosterone

☒ **D** progesterone

(iv) During clomifene therapy, the woman has a blood test on day 20 of the menstrual cycle.

The blood test shows a high level of progesterone.

Explain the cause of this high level of progesterone on day 20 of the menstrual cycle.

(2)

(day 20) is after ovulation / after the egg has been released (1)

• so the corpus luteum produces progesterone (1)

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(b) Hormones are also used as a method of contraception.

Explain why taking high levels of oestrogen and progesterone in the combined contraceptive pill reduces the chance of pregnancy.

(2)

to inhibit the production of FSH
(1)

• to prevent eggs maturing (1)

(c) The female population of Britain is 32.6 million.

The percentage of this population taking the combined contraceptive pill is 13.2%.

The combined pill is 98.8% effective.

Calculate the maximum number of females taking the combined contraceptive pill who could become pregnant.

(3)

(32 600 000 ÷ 100) x 13.2 / 4 303 200 /
4.3 million (1)
(100 – 98.8) = 1.2 (1)

51 638

(Total for Question 7 = 11 marks)

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8 (a) Figure 9 shows the stroke volume at different heart rates of a person who has trained for a marathon and of a person who has not trained for a marathon.

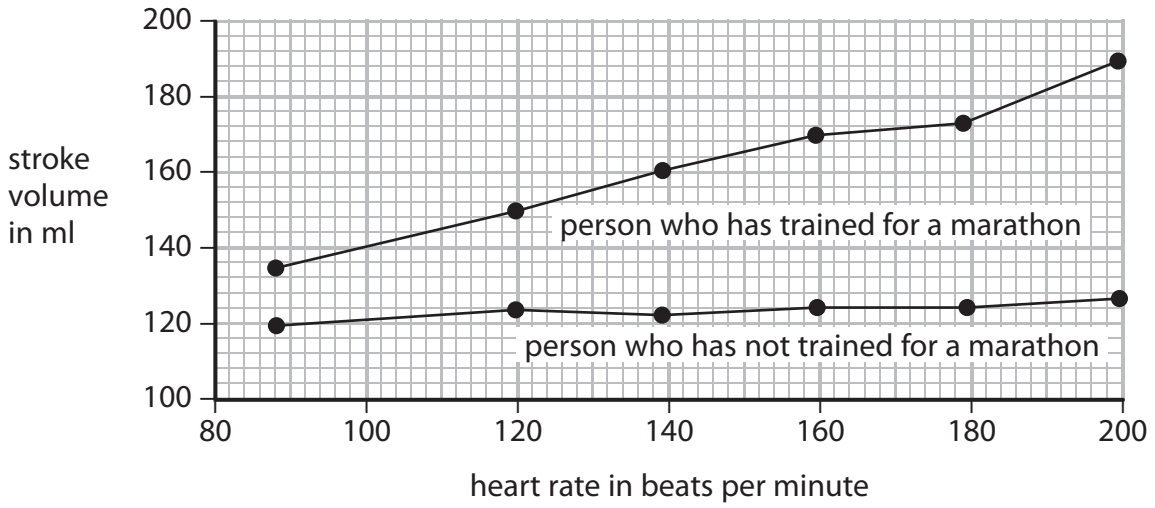

Figure 9

(i) Compare the effect of heart rate on stroke volume of the person who has trained for a marathon with the person who has not trained for a marathon.

(2)

the stroke volume of the person who has trained for the marathon is (always) higher / ORA (1)

• as heart rate increases for the person who has trained for the marathon stroke volume increases (1)

(ii) Calculate the cardiac output for the person who has trained for a marathon when the heart rate is 160 beats per minute.
Give the units in your answer.

(3)

cardiac output =
heart rate x stroke volume (1)

Substitution
160 x 170 = 27 200 (1)

unit ml per min/ ml.min-1

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*(b) Blood from the body enters the heart through the vena cava.

Describe how this blood flows through the heart and lungs to leave the heart through the aorta.

Include references to the chambers of the heart and the relevant valves in your answer.

(6)

Blood flows from vena cava into the right atrium
- Into the right ventricle
- Through valve
- And is pumped into the pulmonary artery
- Through valve to the lungs

- From the lungs back to the heart through the pulmonary vein
- Into the left atrium
- Into the left ventricle
- Through valve
- And is pumped into the aorta
- Through valve
- valves prevent backflow

(Total for Question 8 = 11 marks)

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9 (a) Figure 10 shows alveoli from a lung.

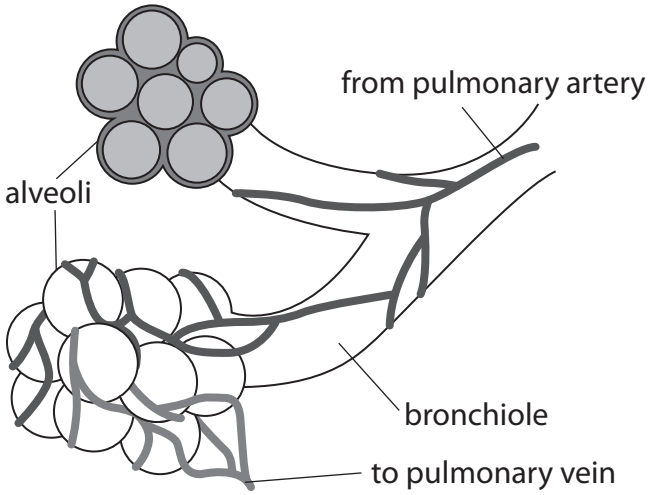

Figure 10

(i) Explain why these alveoli have the internal structure shown in Figure 10.

(3)

the structure shows many chambers/circles/alveoli (1)

• which increase the surface area (of the alveoli) (1)

• to maximise diffusion (from the alveoli into the capillaries) (1)

(ii) How does oxygen move across the alveolar membrane into the capillary?

(1)

☒ **A** by osmosis

☒ **B** by active transport

☒ **C** by diffusion

☒ **D** by respiration

(b) Figure 11 shows the movement of molecules across a membrane.

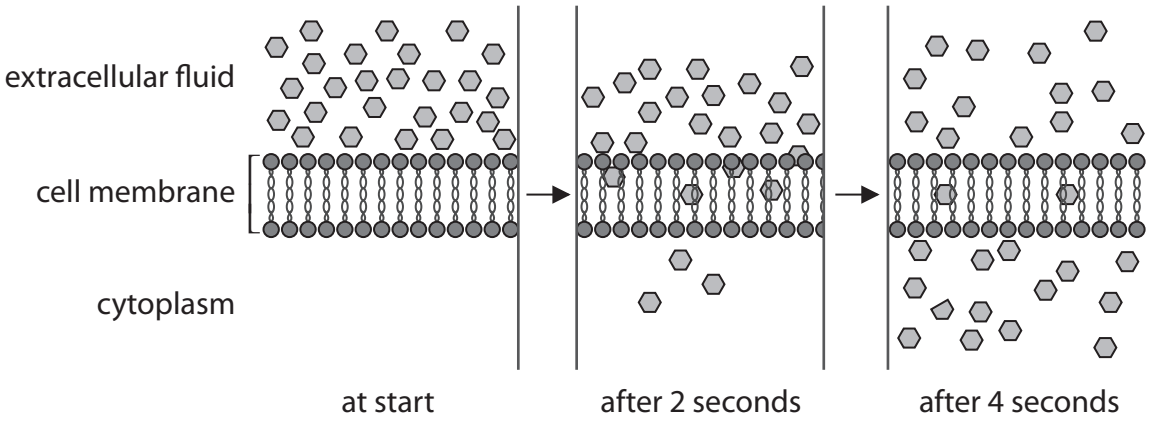

Figure 11

Describe how Figure 11 illustrates movement of molecules across a membrane.

(2)

the molecules are moving from where they are in high concentration (in the extracellular fluid) to a low concentration (in the cytoplasm) (1)

• until there are equal concentrations of molecules on either side (1)

*(c) Explain, using Fick's law, the factors that affect the diffusion rate of molecules into and out of cells.

(6)

Fick's law
• rate of diffusion is proportional to surface area and concentration difference
• and inversely proportional to the thickness of the membrane
Surface area
• as surface area increases the rate of diffusion also increases
• as there are more places for diffusion to happen faster
Concentration difference
• the larger the difference in concentration inside the cell to outside the cell
• the faster the rate of diffusion
Thickness of the membrane
• the thicker the membrane
• the slower the rate of diffusion
as the diffusion distance is greater

(Total for Question 9 = 12 marks)

10 (a) Figure 12 shows the global movement of carbon into or out of the atmosphere.

process	movement of carbon into or out of the atmosphere in gigatonnes per year
photosynthesis	120.1
respiration	119.6
ocean uptake	92.8
ocean loss	90.0
combustion of fossil fuels	6.4

Figure 12

Calculate the net mass of carbon added to the atmosphere each year.

(2)

carbon absorbed
120.1 + 92.8 or 212.9 (1)

OR

carbon released
119.6 + 90 + 6.4 or 216.0 (1)

Evaluation

3.1 (gigatonnes)

.....gigatonnes

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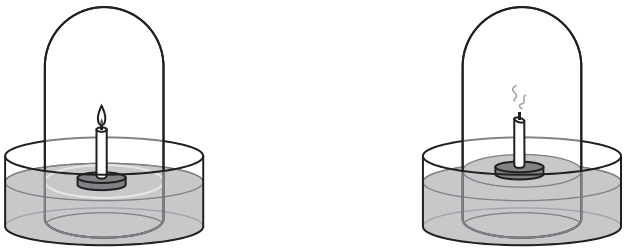
(b) Joseph Priestley was a scientist who investigated how green plants and combustion affected the carbon cycle.

Figure 13 shows his first experiment.



candle sealed in a bell jar

candle after 3 minutes

Figure 13

(i) State why the candle was not burning after three minutes.

(1)

all the oxygen had been used up / no oxygen left

(ii) Joseph Priestley continued the investigation but placed a plant inside the bell jar as shown in Figure 14.

Figure 14

He observed that the candle stayed alight for two minutes more than the candle in the bell jar in the first experiment.

Explain his observation.

(2)

the plant produced oxygen (1)

• through photosynthesis (1)

(iii) State **two** variables that would need to be controlled to compare these two experiments.

(2)

1 light intensity (1)

2 • temperature (1)

(c) Nitrogen is cycled through the environment.

Describe the roles of bacteria in the nitrogen cycle.

(4)

decomposers break down waste matter (into ammonia) (1)

• nitrifying bacteria convert ammonia / nitrifying bacteria make {nitrites / nitrates} (1)

• nitrogen fixing bacteria convert nitrogen into nitrates (1)

• denitrifying bacteria {convert nitrates / release nitrogen} (1)

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS

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