

Organisation part 4

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Name: _____

Class: _____

Date: _____

Time: **84 minutes**

Marks: **78 marks**

Comments:


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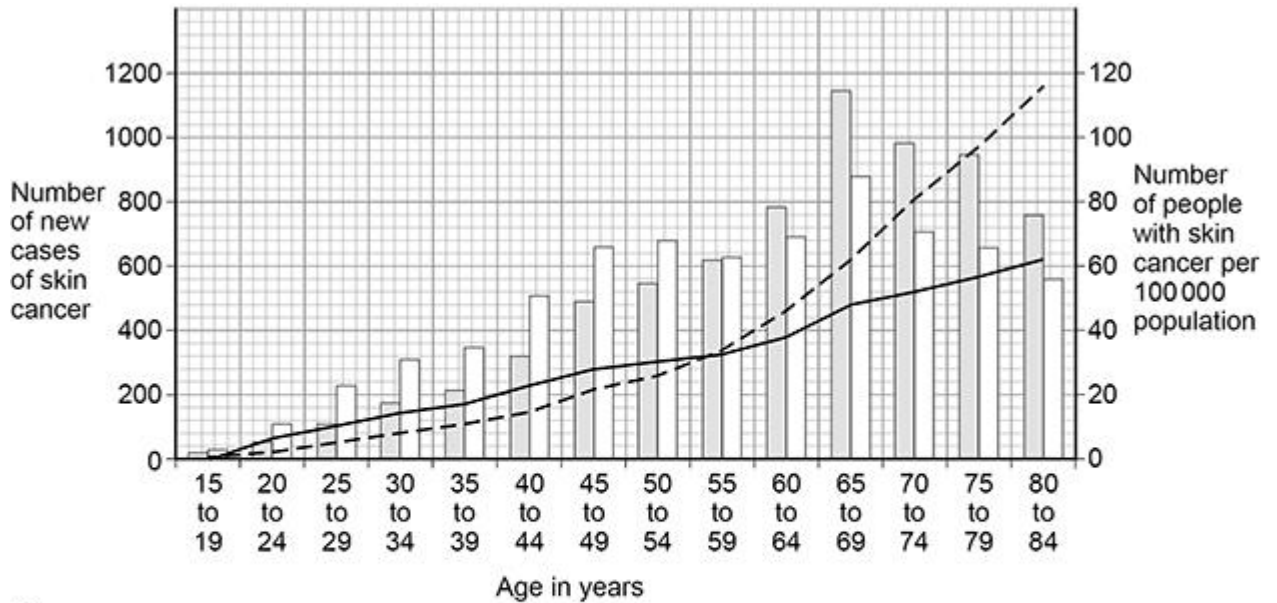
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The figure below shows data about skin cancer in males and females for different age groups in the UK.

It shows:

- the number of new cases of skin cancer in 1 year
- the number of people with skin cancer per 100 000 population in 1 year.



Key

- New male cases
- New female cases
- Number of males with skin cancer per 100 000
- Number of females with skin cancer per 100 000

(b) There are no new cases of skin cancer diagnosed in people younger than 15 years of age.

Explain why.

(2)

(c) Give **two** conclusions about the number of **new cases** of skin cancer.

Use the figure above.

1 _____

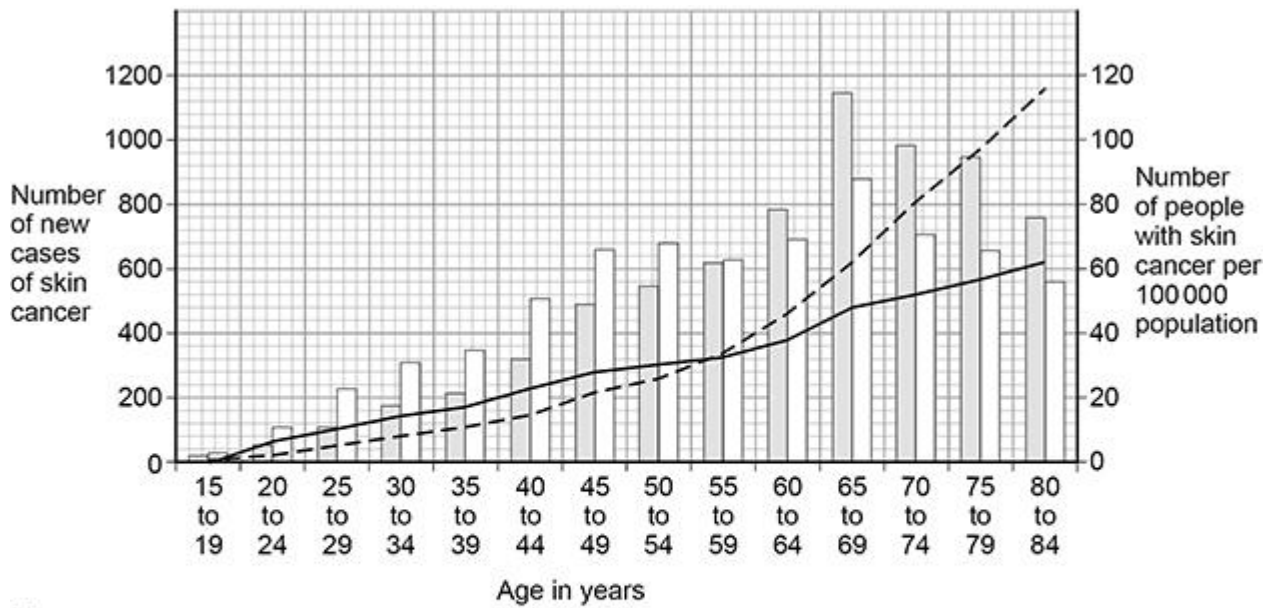
2 _____

(2)

(d) The data for the number of people with skin cancer is given per 100 000 population.
Suggest why the data is **not** given as the total number of people.

(1)

The figure above is repeated below.



Key

- New male cases
- New female cases
- Number of males with skin cancer per 100 000
- Number of females with skin cancer per 100 000

(e) Describe **two** trends shown in the figure above.

Use **only** the data for the number of people with skin cancer per 100 000 population.

1 _____

2 _____

(2)

- (f) The estimated population of males aged 80 to 84 years was 694 000
Calculate the number of males aged 80 to 84 years with skin cancer in that year.
Use the figure above.

Give your answer to 3 significant figures.

Number of males with skin cancer (3 significant figures) = _____

(3)

(Total 14 marks)

Q2.

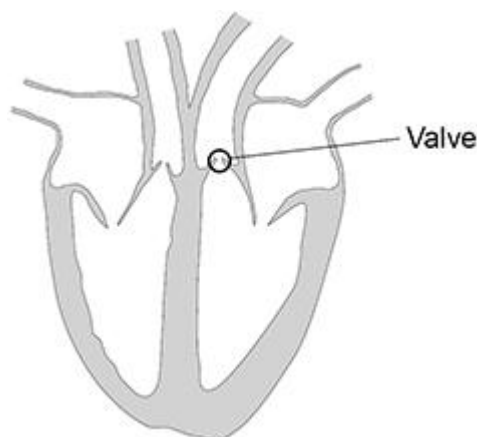
This question is about the heart.

- (a) Why is the heart described as an organ?

(1)

- (b) Valves in the heart keep the blood flowing through the heart in one direction.

The diagram below shows the heart with one of the valves labelled.



Explain the effects on a person if the valve labelled in the figure above developed a leak.

(4)

(c) Faulty heart valves can be replaced using biological or mechanical valves.

The faulty valve is replaced during an operation.

Biological valves:

- are from animals or human donors
- allow blood to flow through them normally
- wear out and stiffen over time, so may need to be replaced.

Mechanical valves:

- are made from synthetic materials
- may cause blood clots on the surface of the valve
- require anti-clotting drugs to be taken for the rest of the patient's life
- can last for a very long time in ideal conditions.

A young woman enjoys extreme sports and would like to start a family.

The woman needs a heart valve replacing.

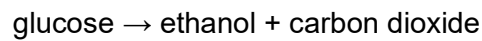
Describe the advantages and disadvantages for this young woman of having a biological heart valve instead of a mechanical heart valve.

(4)
(Total 9 marks)

Q3.

Anaerobic respiration in yeast is called fermentation.

The equation for fermentation is:



- (a) How does the equation show that fermentation is an **anaerobic** reaction?

(1)

Fermentation in yeast is used in the manufacture of beer, wine and bread.

- (b) Why is fermentation used when making beer and wine?

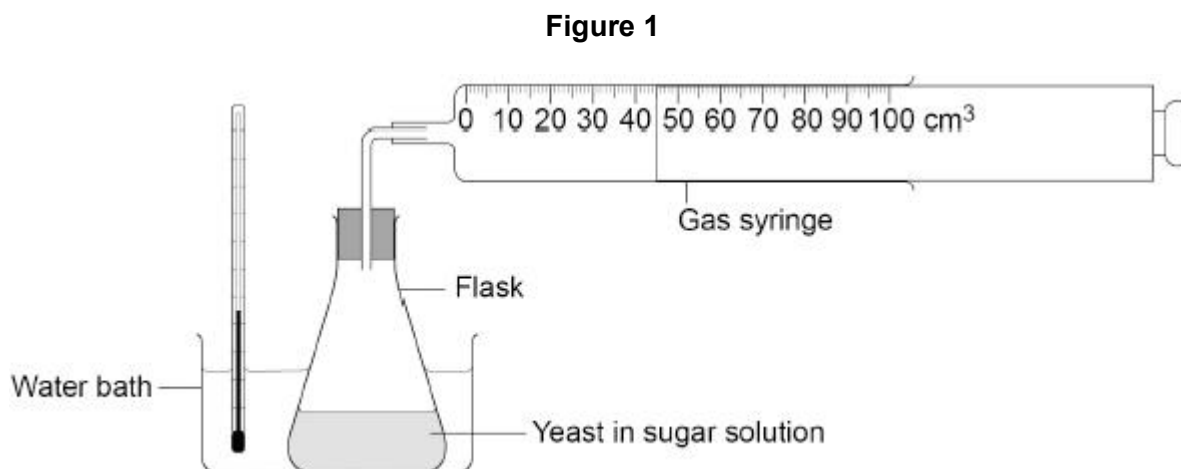
(1)

- (c) Explain why fermentation is used when making bread.

(2)

A student investigated fermentation in yeast.

Figure 1 shows the apparatus.



This is the method used.

1. Mix yeast with sugar solution in a flask.
2. Put the flask in a water bath at 35 °C.
3. After 10 minutes attach a gas syringe to the flask.
4. Record the volume of carbon dioxide collected every 5 minutes for 1 hour.

(d) What volume of carbon dioxide has been collected in the gas syringe in the figure above?

Volume of carbon dioxide = _____ cm³

(1)

(e) Why did the student wait 10 minutes before attaching the gas syringe?

Tick (✓) **one** box.

To allow time for the mixture to reach 35 °C

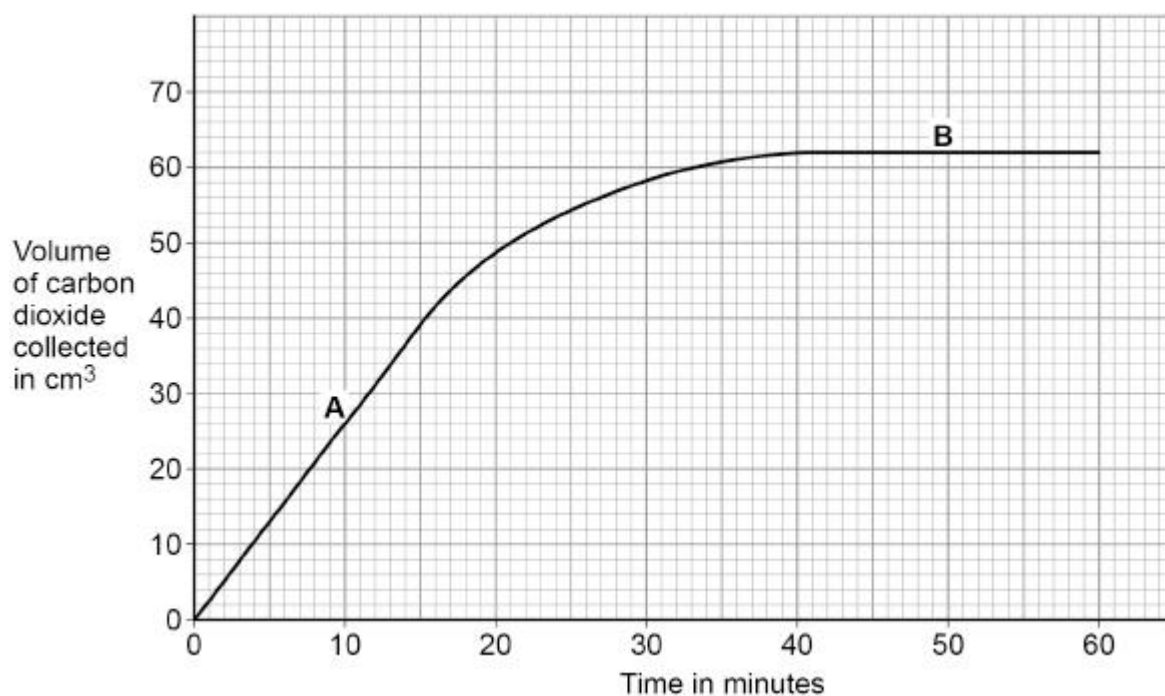
To allow time for the sugar to dissolve

To allow time to draw a results table

(1)

Figure 2 shows the results.

Figure 2



(f) **A** and **B** are different parts of the graph in **Figure 2**.

Draw **one** line from each part of the graph to the description of the reaction.

Part of the graph

Description of the reaction

A

Carbon dioxide is **not** being produced

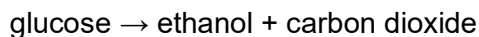
Carbon dioxide production is **fastest**

B

Carbon dioxide production is **slowing down**

(2)

The equation for fermentation is repeated here.



(g) Suggest **one** reason why fermentation in the flask stopped.

(1)

(h) Fermentation is controlled by enzymes.

The investigation was repeated at 2 °C and at 75 °C.

No carbon dioxide was produced at either of these temperatures.

Suggest why **no** carbon dioxide was produced at 2 °C or at 75 °C.

Reason at 2 °C _____

Reason at 75 °C _____

(2)

(i) Anaerobic respiration also happens in animal cells.

Complete the equation for anaerobic respiration in animal cells.

Choose answers from the box.

carbon dioxide	ethanol	glucose	lactic acid	water
-----------------------	----------------	----------------	--------------------	--------------

_____ → _____

(2)

(Total 13 marks)

Q4.

This question is about plant transport systems.

- (a) Which **organ** in a plant absorbs water from the soil?

_____ (1)

- (b) The concentration of nitrate ions in the soil is lower than the concentration of nitrate ions inside a plant.

How would the nitrate ions move from the soil into the cells of this plant?

Tick (✓) **one** box.

- | | |
|---------------------|--------------------------|
| By active transport | <input type="checkbox"/> |
| By diffusion | <input type="checkbox"/> |
| By osmosis | <input type="checkbox"/> |

(1)

Dissolved sugars are transported in the phloem.

- (c) What is the name of the process that moves dissolved sugars through the phloem?

Tick (✓) **one** box.

- | | |
|---------------|--------------------------|
| Evaporation | <input type="checkbox"/> |
| Osmosis | <input type="checkbox"/> |
| Translocation | <input type="checkbox"/> |

(1)

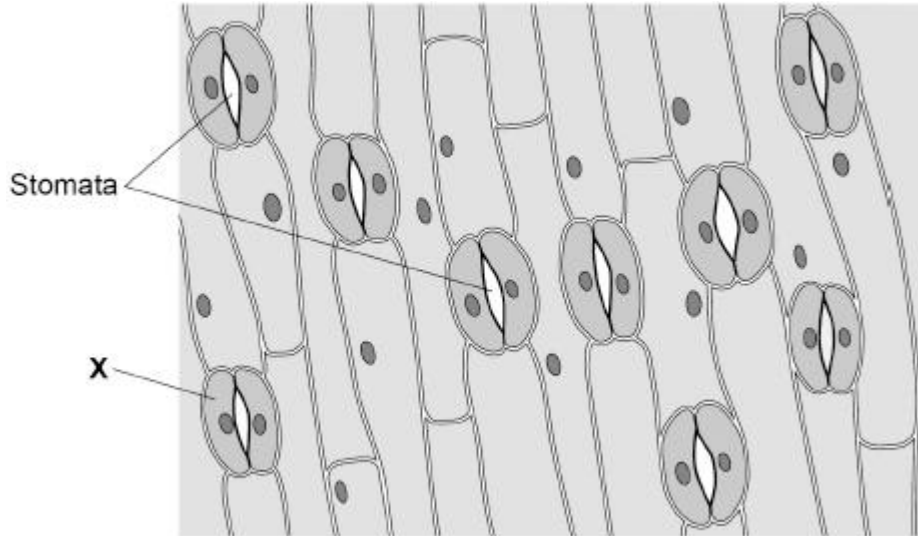
- (d) Give **one** use of sugars in a plant.

_____ (1)

Stomata are openings on the surface of a leaf.

Stomata allow gases to move into and out of a leaf.

The figure below shows the surface of a leaf.



(e) What is cell **X**?

Tick (✓) **one** box.

Guard cell

Meristem cell

Palisade cell

(1)

(f) Why do the stomata open during the day?

Tick (✓) **one** box.

To allow carbon dioxide in

To allow nitrogen in

To allow oxygen in

(1)

(g) The area of the leaf shown in the figure above is 0.25 mm².

Calculate the number of stomata per mm² for the leaf in the figure above.

Use the equation:

$$\text{number of stomata per mm}^2 = \frac{\text{number of stomata}}{\text{area in mm}^2}$$

Number of stomata per mm² = _____

(2)

A student investigated the number of stomata per mm² on the upper and lower surfaces of leaves.

The leaves were taken from the same plant.

The table below shows the results.

Leaf	Number of stomata per mm ²	
	Upper surface	Lower surface
1	0	37
2	1	36
3	2	30
4	1	32
5	1	35
Mean	1	X

(h) Calculate mean value **X** in the table above.

X = _____

(2)

(i) Water vapour is lost through stomata.

Explain the difference in the number of stomata on the upper and lower surfaces of the leaves.

Use the table above.

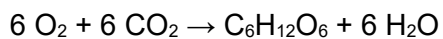
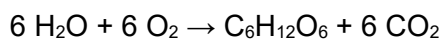
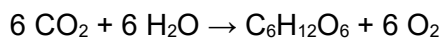
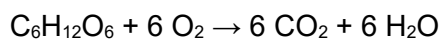
(3)
(Total 13 marks)

Q5.

Plants absorb light for photosynthesis.

(a) Which is the equation for photosynthesis?

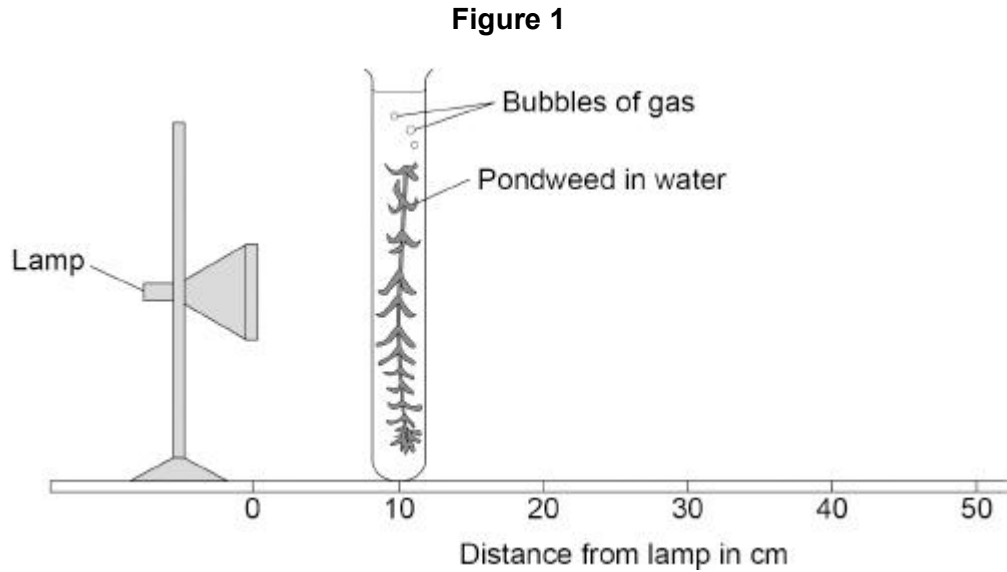
Tick (✓) **one** box.



(1)

A student investigated the effect of light intensity on the rate of photosynthesis.

Figure 1 shows the apparatus.



This is the method used.

1. Set up the apparatus as shown in **Figure 1**.
2. Place the pondweed 10 cm away from the lamp.
3. Switch on the lamp.
4. Record the number of bubbles of gas produced in 5 minutes.
5. Repeat steps 2 to 4 with the pondweed at different distances from the lamp.

(b) What was the independent variable in this investigation?

Tick (✓) **one** box.

Distance of the pondweed from the lamp

Length of the piece of pondweed

Number of bubbles of gas produced

Time taken to collect the gas

(1)

The lamp gets warm when it is on. This causes the temperature of the water to increase.

(c) Explain how an increase in temperature would affect the results of this investigation.

(2)

(d) Suggest **one** way the investigation could be improved so the temperature of the water does **not** increase.

(1)

(e) Suggest **two** improvements to the investigation so the results would be more valid.

Do **not** refer to controlling the temperature of the water.

1 _____

2 _____

(2)

The table below shows the results.

Distance of pondweed from the lamp in cm	Number of bubbles of gas produced in 5 minutes
10	120
20	56
30	31
40	16
50	10

(f) Calculate the rate of photosynthesis when the pondweed was 40 cm from the lamp.

Give the rate of photosynthesis as the number of bubbles of gas produced per minute.

Rate = _____ bubbles of gas produced per minute

(1)

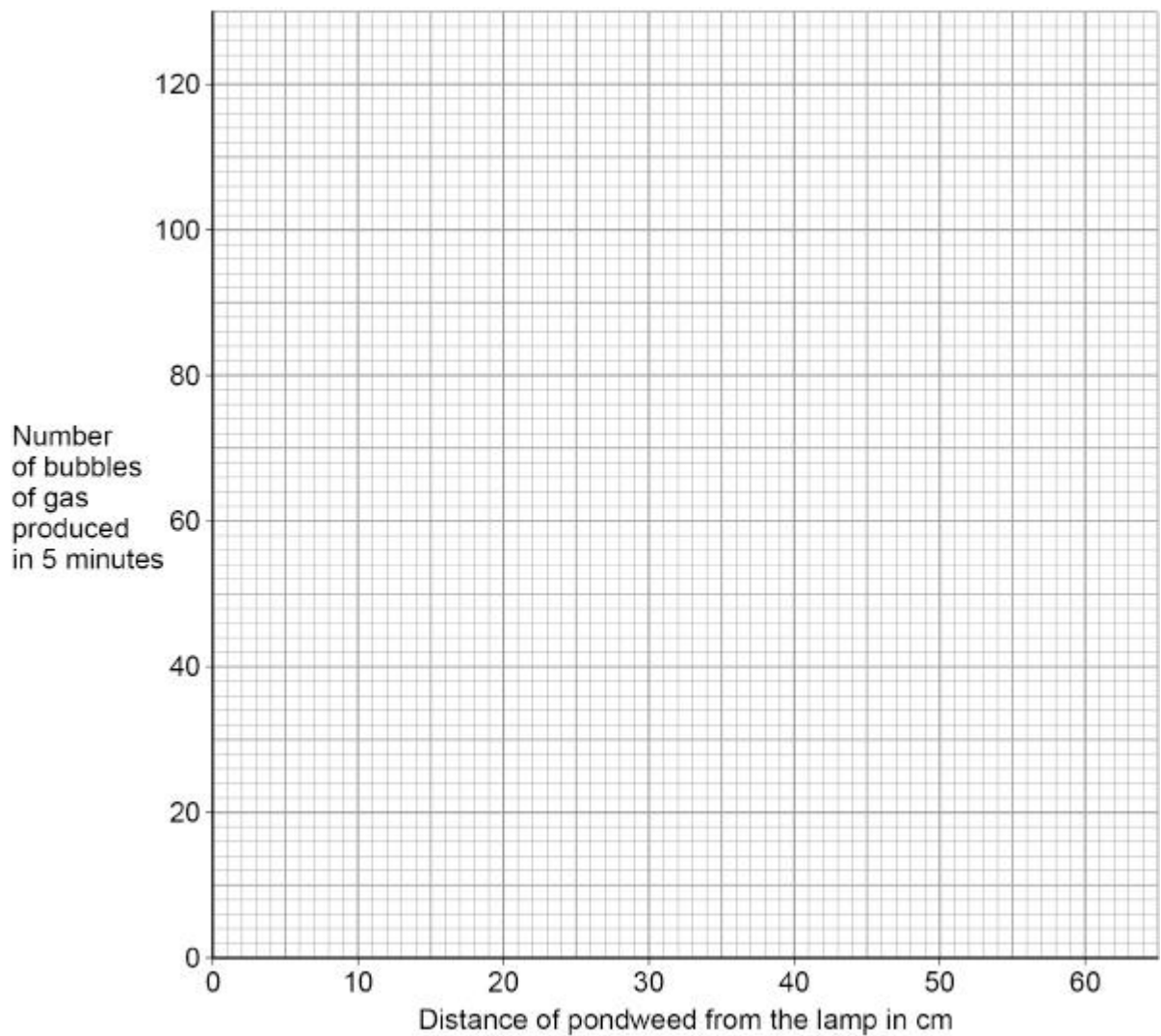
(g) Give **one** conclusion that can be made from the table above.

(1)

(h) Plot the data from the table above on **Figure 2**.

Draw a line of best fit.

Figure 2



(3)

(i) Predict the number of bubbles that would be produced in 5 minutes if the pondweed was 60 cm from the lamp.

Use **Figure 2**.

Number of bubbles produced in 5 minutes = _____

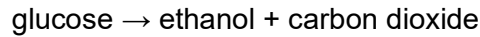
(1)

(Total 13 marks)

Q7.

Fermentation in yeast is used in the manufacture of bread and alcoholic drinks.

The equation for fermentation is:



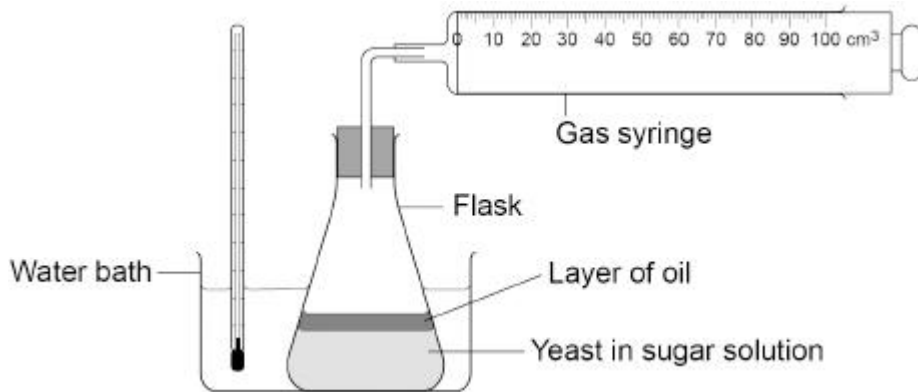
- (a) Fermentation is an exothermic reaction.

What does exothermic mean?

(1)

A student investigated the effect of temperature on fermentation in yeast.

The figure below shows the apparatus.



This is the method used.

1. Mix yeast with sugar solution in a flask.
2. Pour a layer of oil over the surface of the mixture.
3. Put the flask in a water bath at 2 °C and leave for 20 minutes.
4. Attach a gas syringe.
5. Record the volume of gas collected every 5 minutes for 30 minutes.
6. After 30 minutes move the flask to a water bath at 35 °C.
7. Continue to record the volume of gas collected every 5 minutes.

- (b) Suggest why a layer of oil was needed on the surface of the mixture.

(1)

- (c) Suggest why the mixture was left for 20 minutes before the gas syringe was attached.

(1)

Steps 1 to 4 of the method were repeated at 35 °C.

The volume of gas collected was recorded every 5 minutes for 45 minutes.

Table 1 shows the results for both flasks for the first 30 minutes.

Table 2 shows the results for the last 15 minutes, when both flasks were at 35 °C.

Table 1

Time in minutes	Volume of gas collected in cm ³	
	Flask at 2 °C	Flask at 35 °C
0	0	0
5	0	26
10	0	52
15	0	78
20	0	98
25	0	108
30	0	115

Table 2

Time in minutes	Volume of gas collected in cm ³	
	Flask at 2 °C moved to 35 °C	Flask kept at 35 °C
35	2	120
40	7	123
45	22	124

- (d) Explain the results from 0 minutes to 45 minutes for the flask that was at 2 °C and was then moved to 35 °C.

Use **Table 1** and **Table 2**.

(3)

(e) Explain the results from 0 minutes to 45 minutes for the flask kept at 35 °C.

Use **Table 1** and **Table 2**.

(4)

(Total 10 marks)

Mark schemes

Q1.

(a) any **four** from:

Similarities:

- result from changes in the cell / DNA / genes
allow result from mutations
- uncontrolled cell growth / division
- can form a lump of cells
- made up of abnormal cells

Differences:

Malignant tumours:

- are made of cancer cells, benign tumours are not
or
benign tumours are made up of cells that are more similar to normal cells
- (usually) grow faster than benign tumours
- invade neighbouring tissues, but benign tumours do not
- can spread (to other parts of the body) but benign tumours stay in one place
or
cells can travel in the blood, but benign tumours do not
- can form secondary tumours, benign tumours do not
*max **three** marks if only similarities or differences given*
allow benign tumours (often) have a layer of covering cells,
malignant tumours (usually) do not
ignore references to level of harm

4

(b) little exposure to ionising radiation

allow little exposure to UV (light)
allow little exposure to sunlight
ignore little exposure Sun unqualified
allow use sunscreen
allow do not use sunbeds

or

little exposure to carcinogens

allow named carcinogen e.g. smoking

1

(so) less cell / DNA / gene damage

allow (so) fewer mutations
allow older people's (skin) cells are more susceptible to DNA damage
if no other marks awarded allow 1 mark for skin cancer takes a long time to develop

1

(c) any **two** from:

- more females than males diagnosed each year up to age 59 (years)

- more new cases in males than in females from 60 (years)
- greatest number of people / males / females diagnosed in age group 65-69 (years)
- number of new cases increases in **males** up to age group 65–69 (years) after which they decrease / fall
ignore the number of cases of skin cancer increases with age

2

- (d) to account for the different group sizes
allow there are different numbers of people / males / females of different ages
allow so the different group sizes can be compared
allow so it can be compared to populations in other countries
ignore to compare unqualified

1

- (e) any **two** from:
- number (of males / female per 100 000 population) increases with age
 - in females the number (per 100 000 population) increases at a steady rate
 - number (per 100 000 population) in males increases at a similar **or** at a slightly lower rate as in females up to age 55
allow number (per 100 000 population) in males increases at a steady rate up to 55–59 (years)
 - number (per 100 000 population) increases at a much higher rate in males than females above age 59
allow number (per 100 000 population) in males increases more rapidly above age 59
*do **not** accept if referring to number of new cases*

2

- (f) $\frac{116 \times 694\,000}{100\,000}$
allow values in the range 114 to 118

1

= 805.04

1

= 805

allow an incorrectly calculated number of males correctly rounded to 3 significant figures
if no other marks awarded allow 1 mark only for an answer of 5270

1

[14]

Q2.

- (a) it is made up of (different) tissues (that perform specific functions)

(b) some blood would flow back into the ventricle / heart

allow not all the blood would leave the ventricle / heart allow blood clot (may form in the heart)

*do **not** accept blood would flow back into the right ventricle*

1

(so) less oxygenated blood would be pumped to the body

ignore references to glucose

1

cells require oxygen for respiration

or

less aerobic respiration

allow more anaerobic respiration

1

(so) person would become out of breath

(so) lactic acid will build up

or

(so) less energy transferred

allow the idea of lacking energy

*do **not** accept less energy produced / made / created*

or

(so) person would be tired

1

(c) any **four** from:

(advantages of biological valve):

- reduced risk of blood clots which could cause heart attack or stroke
- reduced risk of blood clots during pregnancy / birth
- reduced risk of bleeding during pregnancy / birth
- do not need to take anti (blood) clotting drugs

ignore do not need to take blood thinners

allow do not need to take drugs for life

- no risk to foetus / baby from drugs
- reduced risk of serious bleeds if in an accident
- do not need to carry (anti-blood clotting) drugs when travelling

allow problems related to losing / obtaining drugs abroad

- low risk of rejection / immune reaction

*do **not** credit reference to rejection twice*

allow no risk of side effects from drugs

(disadvantages of biological valve):

- may be rejected

*do **not** credit reference to rejection twice*

- may have to go through surgery more than once

ignore risks from surgery unqualified

- may have to take immunosuppressant drugs
allow an animal might be killed
- have to wait for (suitable) donor
*max **three** marks if only advantages or disadvantages of biological valve given*

4

[9]

Q3.

- (a) no oxygen (reacting with the glucose)
ignore there is no air

1

- (b) produces ethanol / alcohol

1

- (c) produces carbon dioxide / gas

1

(which) makes the bread / dough rise

allow idea related to making the bread lighter or affecting its texture

1

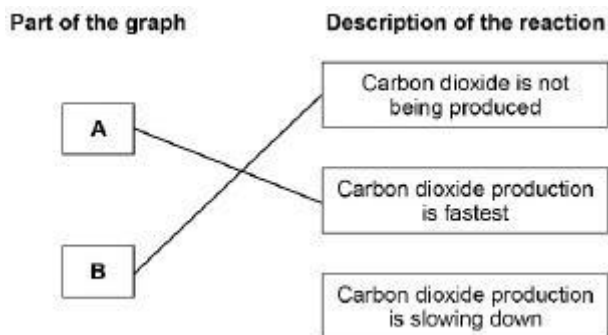
- (d) 45 (cm³)

1

- (e) to allow time for the mixture to reach 35 °C

1

- (f)



do **not** accept more than one line from a box on the left

1

1

- (g) any **one** from:

- glucose / sugar / food ran out
- ethanol / alcohol killed the cells / yeast
ignore yeast / cells died unqualified
ignore produced ethanol / alcohol unqualified

1

- (h) (2 °C) too cold (for enzymes / yeast to work)

allow yeast / enzyme was inactive

ignore yeast killed
allow no / few successful collisions
*do **not** accept enzymes are denatured*

1

(75 °C) enzymes denatured

allow enzymes destroyed
allow description eg change in shape of active site or of enzyme
allow yeast killed
*do **not** accept enzymes killed ignore references to collisions unqualified*

1

(i) glucose → lactic acid

***1** mark for each chemical must be in this order*
ignore formulae

2

[13]

Q4.

(a) root

*do **not** accept root hair (cells)*

1

(b) by active transport

1

(c) translocation

1

(d) any **one** from:

- respiration

allow to release energy

*do **not** accept to produce / make / create energy*

allow for growth

- (used) to produce starch
- (used) to produce fat / oil
- (used) to produce cellulose
- (used) to produce amino acids / protein

1

(e) guard cell

1

(f) to allow carbon dioxide in

1

(g) $\frac{9}{0.25}$

1

36

*do **not** accept if a unit is given allow correct calculation using*

$$\frac{9}{25}$$

1

(h)
$$\frac{37 + 36 + 30 + 32 + 35}{5}$$

allow $\frac{170}{5}$

1

34

1

- (i) there are fewer stomata on the upper surface of the leaves
allow converse statements a comparative term is required

1

(conditions on upper surface will:) any **one** from:

- be warmer
- be drier
- be more exposed to wind
- have more light

1

(so) less water will be lost

1

[13]

Q5.



1

- (b) distance of the pondweed from the lamp

1

- (c) bubbles (of gas) would be produced faster
allow more / bigger bubbles of gas would be produced (in a given time)

1

(because) enzymes work faster

allow (because) photosynthesis is controlled by enzymes

allow (because) photosynthesis would be faster

1

- (d) any **one** from:

- use an LED (lamp)
allow use a light that does not emit (a lot of) infrared / thermal radiation
- place a tank / beaker of water between the lamp and tube / pondweed
- put the tube in a beaker of water
- put the tube in a (thermostatically controlled) water bath
- place a piece of glass between the lamp and tube / pondweed
allow place a heat shield between the lamp and

- (e) any **two** from:
- measure the volume of gas produced
allow amount for volume allow use a cylinder / gas syringe to collect the gas
 - allow the pondweed time to equilibrate
allow a description of this
 - repeat **and** calculate a mean
or
repeat **and** remove anomalies
ignore repeat unqualified
 - control the concentration of carbon dioxide (in the water)
*allow put the pondweed in sodium hydrogen carbonate (solution) **or** sodium bicarbonate (solution)*
 - use the same bulb / lamp
allow use the same type / size / age / piece of pondweed
allow record the number of bubbles of gas produced in a longer period of time

2

- (f) 3 (bubbles of gas produced per minute)
allow 3.2 (bubbles of gas produced per minute)
*do **not** accept 3.0 (bubbles of gas produced per minute)*

1

- (g) as light intensity decreases the rate of photosynthesis decreases
allow as distance from lamp increases rate of photosynthesis decreases
allow as distance from lamp increases number of bubbles produced decreases

1

- (h) all points plotted correctly
allow tolerance of $\pm \frac{1}{2}$ a small square
*allow **1** mark for four points plotted correctly*

2

line of best fit through their points
*do **not** accept line extended to 0, 0*
ignore extrapolations of line

1

- (i) 8
allow correct value from their line $\pm \frac{1}{2}$ a small square
allow value in range 6 to 9 if a curved line of best

Q6.

Level 3: The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.

5-6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3-4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1-2

No relevant content

0

Indicative content**Protein**

- grind up food
- add Biuret (reagent / solution)

or

add copper sulfate (solution) **and** sodium hydroxide (solution)

or

add Biuret 1 and Biuret 2

- turns purple / lilac

Starch

- add iodine (solution)
- turns black / blue-black / dark blue
- ignore blue / purple

Sugar

- grind up food
- mix with water
- add Benedict's (reagent / solution)
- heat mixture (≥ 65 °C)
- in a water bath
- turns (brick) red / orange / brown / green / yellow

For Level 3 correct references to all three tests are needed.

[6]

Q7.

- (a) releases energy (to the surroundings)
allow transfers (thermal) energy to the surroundings
ignore transfers energy unqualified

1

- (b) to keep oxygen out

allow to keep air out
allow (because) fermentation is an anaerobic reaction
allow to prevent aerobic respiration

1

- (c) to allow the mixture / yeast / cells to reach the temperature

allow to reach 2 °C
allow so yeast can equilibrate
allow idea that contraction of gas (on cooling) would hinder results collection

1

- (d) (2 °C is) too cold for enzymes / yeast to work

allow (at 2 °C) few / no collisions (between sugar and enzymes)

1

(so) no carbon dioxide / gas produced

or

(so) fermentation did not occur

or

fermentation was very slow

do not accept an incorrect gas

1

enzymes become active at 35 °C so carbon dioxide / gas was produced

allow at 35 °C the enzymes started to work so carbon dioxide / gas was produced

1

- (e) ideal / suitable temperature for enzymes / yeast to work

1

(so) carbon dioxide / gas produced (rapidly)

do not accept an incorrect gas

1

(after time / ≥ 15 minutes) rate / fermentation slowed

1

(because) sugar / glucose / food began to run out

or

(because) increased concentration of ethanol / alcohol started to kill the cells

allow (after time / ≥ 15 minutes) less gas produced per minute

1

[10]