Cardinal Newman Catholic School

Holy Cross Catholic Multi Academy Company

Year 10

Summer 2023

Separate Science practice question booklet

HIGHER TIER ONLY

AQA

BIOLOGY PAPER 1

Name:

"Knowledge through the light of faith"

CARDINAL NEWMAN CATHOLIC SCHOOL

For each Topic in Paper 1 there are three practice questions.

How to use this booklet:

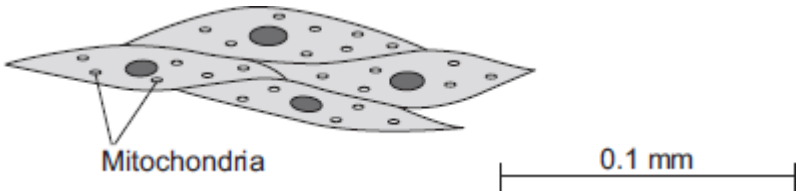
1. Complete revision for the topic first.
2. Put away your notes/resources and try to answer the questions.
3. Look at the mark scheme at the back of the booklet and compare it to your answer – add anything you have missed off in green pen.
4. Go back to the revision guide/your resources to go over anything you are unsure of.

Contents

B1 CELL BIOLOGY

Q1.

The image below shows some muscle cells from the wall of the stomach, as seen through a light microscope.



(a) Describe the function of muscle cells in the wall of the stomach.

_____

_____

_____

_____

(2)

(b) The figure above is highly magnified.

The scale bar in the figure above represents 0.1 mm.

Use a ruler to measure the length of the scale bar and then calculate the magnification of the figure above.

_____

_____

_____

_____

Magnification = _____ times

(2)

(c) The muscle cells in **Figure above** contain many mitochondria.

What is the function of mitochondria?

_____

_____

_____

_____

(2)

(d) The muscle cells also contain many ribosomes. The ribosomes cannot be seen in

the figure above.

(i) What is the function of a ribosome?

_____

_____

(1)

(ii) Suggest why the ribosomes **cannot** be seen through a light microscope.

_____

_____

(1)

(Total 8 marks)

Q2.

(a) The concentration of sulfate ions was measured in the roots of barley plants and in the water in the surrounding soil.

The table shows the results.

	Concentration of sulfate ions in mmol per dm^3
Roots of barley plants	1.4
Soil	0.15

Is it possible for the barley roots to take up sulfate ions from the soil by diffusion?

Draw a ring around your answer. **Yes / No**

Explain your answer.

_____

_____

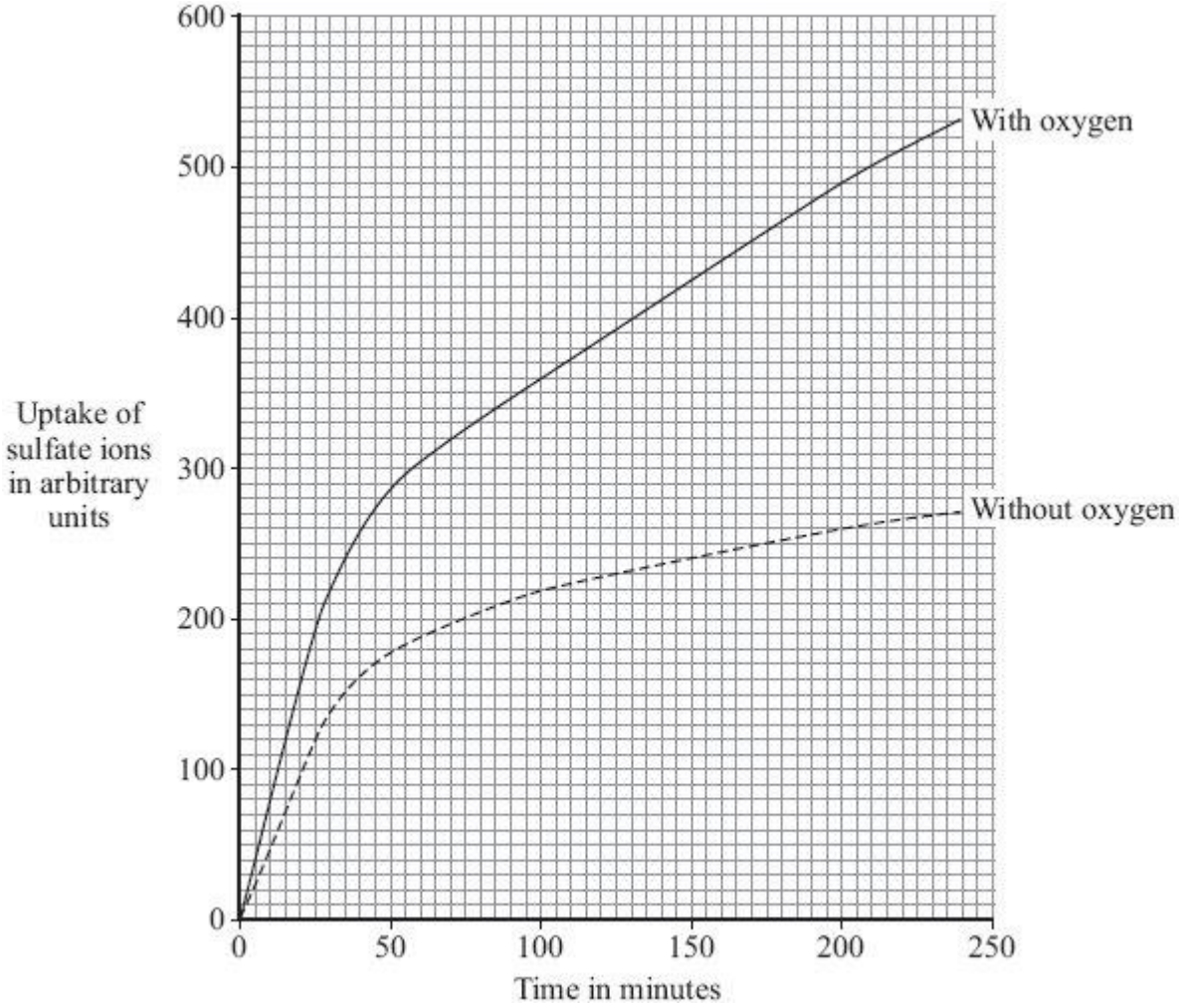
_____

_____

(2)

(b) Some scientists investigated the amounts of sulfate ions taken up by barley roots in the presence of oxygen and when no oxygen was present.

The graph below shows the results.



(i) The graph shows that the rate of sulfate ion uptake between 100 and 200 minutes, **without** oxygen, was 0.4 arbitrary units per minute.

The rate of sulfate ion uptake between 100 and 200 minutes, **with** oxygen, was greater.

How much greater was it? Show clearly how you work out your answer.

_____

_____

_____

Answer _____ arbitrary units

(2)

(ii) The barley roots were able to take up more sulfate ions with oxygen than without oxygen.

Explain how.

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q3.

(a) Some scientists investigated the rates of absorption of different sugars by the small intestine.

In one experiment they used a piece of normal intestine.
In a second experiment they used a piece of intestine poisoned by cyanide. Cyanide is poisonous because it prevents respiration.

The results are shown in the table.

	Relative rates of absorption	
Sugar	**Normal intestine**	**Intestine poisoned by cyanide**
Glucose	1.00	0.33
Galactose	1.10	0.53
Xylose	0.30	0.31
Arabinose	0.29	0.29

(i) Name **two** sugars from the table which can be absorbed by active transport.

1. _____

2. _____

(1)

(ii) Use evidence from the table to explain why you chose these sugars.

_____

_____

_____

_____

_____

_____

_____

(3)

(b) All of the sugars named in the table can be absorbed by diffusion.

Explain how information from the table provides evidence for this.

_____

_____

_____

_____

_____

(2)

(Total 6 marks)

B2 ORGANISATION

Q4.

Lipases break down lipids.

(a) Which **two** products are formed when lipids are broken down?

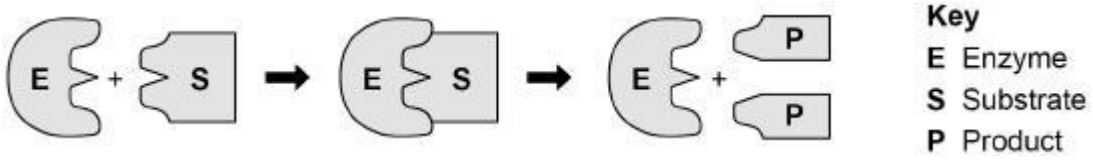
Tick (✓) **two** boxes.

Amino acids	☐
Fatty acids	☐
Glucose	☐
Glycerol	☐
Glycogen	☐

(2)

One model used to explain enzyme action is the 'lock and key theory'.

The diagram below shows a model of the theory.



(b) Explain the 'lock and key theory' of enzyme action.

Use information from the diagram above in your answer.

(3)

(c) There are many different types of lipase in the human body.

Why does each different type of lipase act on only **one** specific type of lipid molecule?

Students investigated the presence of starch and glucose in the leaves of geranium plants.

This is the method used.

1 Place two identical geranium plants on a bench near a sunny window for two days.

2 After two days:
- leave one plant near the window for two more days.
- place one plant in a cupboard with no light for two more days.

3 Remove one leaf from each plant.

4 Crush each leaf to extract the liquid from the cells.

5 Test the liquid from each leaf for glucose and for starch.

(1)

(d) Describe how the students would find out if the liquid from the leaf contained glucose.

(3)

(e) Describe how the students would find out if the liquid from the leaf contained starch.

(2)

The table below shows the students' results.

Test	**Leaf from plant kept in light for four days**	**Leaf from plant kept in light for two days and then no light for two days**
Glucose	Strong positive	Weak positive
Starch	Positive	Negative

(f) Explain why the leaf in the light for four days contained both glucose and starch.

(2)

(g) Explain why the leaf left in a cupboard with no light for two days did contain glucose but did **not** contain starch.

(3)

(h) Suggest **one** way the students could develop the investigation to find out more about glucose and starch production in plants.

_____

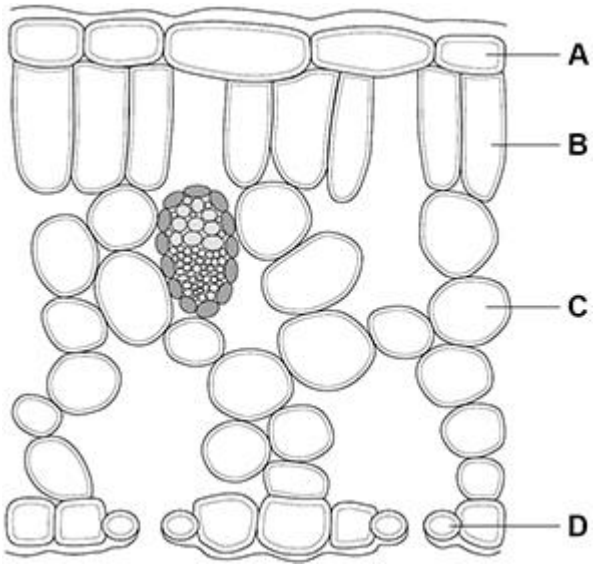
(1)

(Total 17 marks)

Q5.

Figure 1 shows a cross section of a leaf.

Figure 1



(a) Which cell is most transparent?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) Which cell structure in a leaf mesophyll cell is **not** found in a root hair cell?

_____

(1)

Plants lose water through their leaves.

(c) Name the cells in a leaf that control the rate of water loss.

_____

(1)

(d) Water is taken in by the roots, transported up the plant and lost from the leaves.

Which scientific term describes this movement of water?

_____

(1)

(e) Which change would decrease the rate of water loss from a plant's leaves?

Tick (✓) **one** box.

Increased humidity ☐

Increased light intensity ☐

Increased density of stomata ☐

Increased temperature ☐

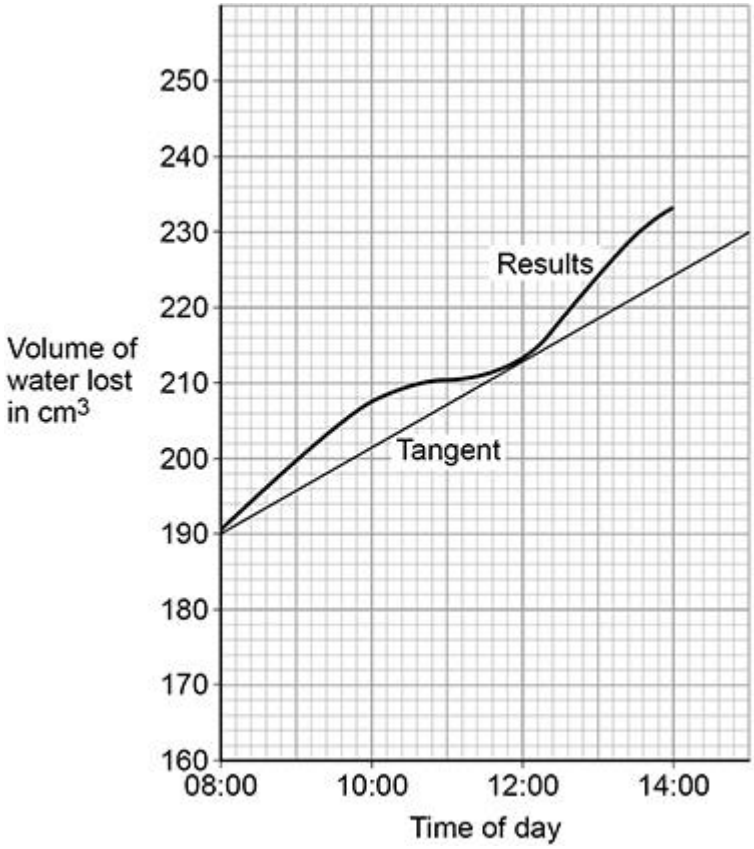
(1)

(f) Compare the structure and function of xylem tissue and phloem tissue.

(6)

Figure 2 shows the total volume of water lost from a plant over 6 hours.

Figure 2



(g) Determine the rate of water loss at 12:00

Use the tangent on the graph above.

Give your answer:

- in cm^3 per minute
- in standard form.

Rate of water loss = _____ cm^3 per minute

(4)

(h) The rate of water loss at midnight was much lower than at 12:00

Explain why.

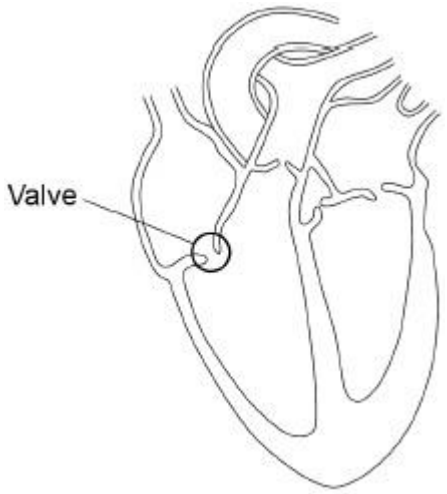
(2)

(Total 17 marks)

Q6.

The figure below shows the internal structure of the human heart.

One of the heart valves is labelled.



Sometimes a valve in the heart can start to leak.

(a) Explain why a person with a leaking heart valve has difficulty exercising.

(4)

A patient with a leaking heart valve may have the valve replaced.

A study compared two different types of replacement heart valve:

- mechanical valves
- biological valves from pigs.

The data used in the study was collected from female patients aged 50–69.

The following table shows the data.

	Type of replacement heart valve	
	Mechanical	**Biological**
Number of patients given the valve	2852	1754
Number of patients who died from heart-related problems after valve replacement	180	178
Percentage of patients alive after 5 years	91	89
Percentage of patients needing a second valve replacement within 6 years	2.2	5.2
Percentage of patients who had a blood clot on the brain after surgery	5.8	0.1

(b) Give **one** conclusion about the death of patients from heart-related problems after a valve replacement.

Include calculations to support your answer.

(3)

(c) One risk of mechanical valves is that blood clots can form on the surface of the valve.

Name the component of the blood that starts the process of blood clotting.

_____

(1)

(d) Evaluate the use of mechanical replacement heart valves and biological replacement heart valves.

Use information from the table above and your own knowledge.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 14 marks)

B3 INFECTION AND RESPONSE

Q7.

White blood cells protect the body against pathogens such as bacteria and viruses.

(a) (i) Pathogens make us feel ill.

Give **one** reason why.

_____

_____

(1)

(ii) White blood cells produce antibodies. This is one way white blood cells protect us against pathogens.

Give **two** other ways that white blood cells protect us against pathogens.

1. _____

_____

2. _____

_____

(2)

(b) Vaccination can protect us from the diseases pathogens cause.

(i) One type of virus causes measles.

A doctor vaccinates a child against measles.

What does the doctor inject into the child to make the child immune to measles?

_____

_____

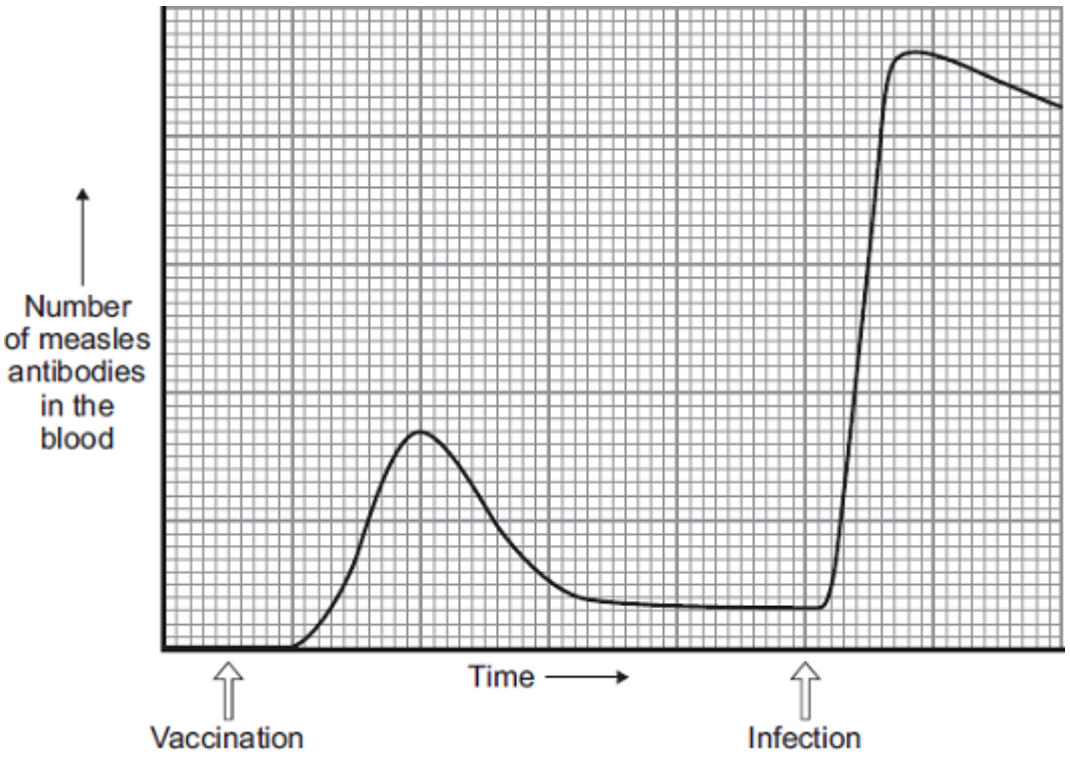
_____

_____

(2)

(ii) A few weeks after the vaccination, the child becomes infected with measles viruses from another person.

The graph shows the number of measles antibodies in the child's blood from before the vaccination until after the infection.



More measles antibodies are produced after the infection than after the vaccination.

Describe other differences in antibody production after infection compared with after vaccination.

_____

_____

_____

_____

_____

_____

(3)

(iii) Vaccination against the measles virus will **not** protect the child against the rubella virus.

Why?

_____

(1)

(c) What is the advantage of vaccinating a large proportion of the population against measles?

_____

(1)

(Total 10 marks)

Q8.

A virus called RSV causes severe respiratory disease.

(a) Suggest **two** precautions that a person with RSV could take to reduce the spread of the virus to other people.

1. _____

_____

2. _____

_____

(2)

(b) One treatment for RSV uses monoclonal antibodies which can be injected into the patient.

Scientists can produce monoclonal antibodies using mice.

The first step is to inject the virus into a mouse.

Describe the remaining steps in the procedure to produce monoclonal antibodies.

_____

(3)

(c) Describe how injecting a monoclonal antibody for RSV helps to treat a patient suffering with the disease.

(2)

A trial was carried out to assess the effectiveness of using monoclonal antibodies to treat patients with RSV.

Some patients were given a placebo.

(d) Why were some patients given a placebo?

(1)

A number of patients had to be admitted to hospital as they became so ill with RSV.

The results are shown in the table below.

Treatment received by patient	**% of patients within each group admitted to hospital with RSV**
Group **A**: Monoclonal antibody for RSV	4.8
Group **B**: Placebo	10.4

The trial involved 1 500 patients.

- Half of the patients (group **A**) were given the monoclonal antibodies.
- Half of the patients (group **B**) were given the placebo.

(e) Calculate the total number of patients admitted to hospital with RSV during the trial.

_____

_____

_____

Total number of patients admitted to hospital = _____

(2)

(f) Evaluate how well the data in the table above supports the conclusion:

'monoclonal antibodies are more effective at treating RSV than a placebo'.

_____

_____

_____

_____

(2)

(Total 12 marks)

Q9.

People may be immunised against diseases using vaccines.

(a) (i) Which part of the vaccine stimulates the body's defence system?

_____

_____

_____

_____

(2)

(ii) A person has been vaccinated against measles. The person comes in contact with the measles pathogen. The person does **not** catch measles.

Explain why.

_____

_____

_____

_____

_____

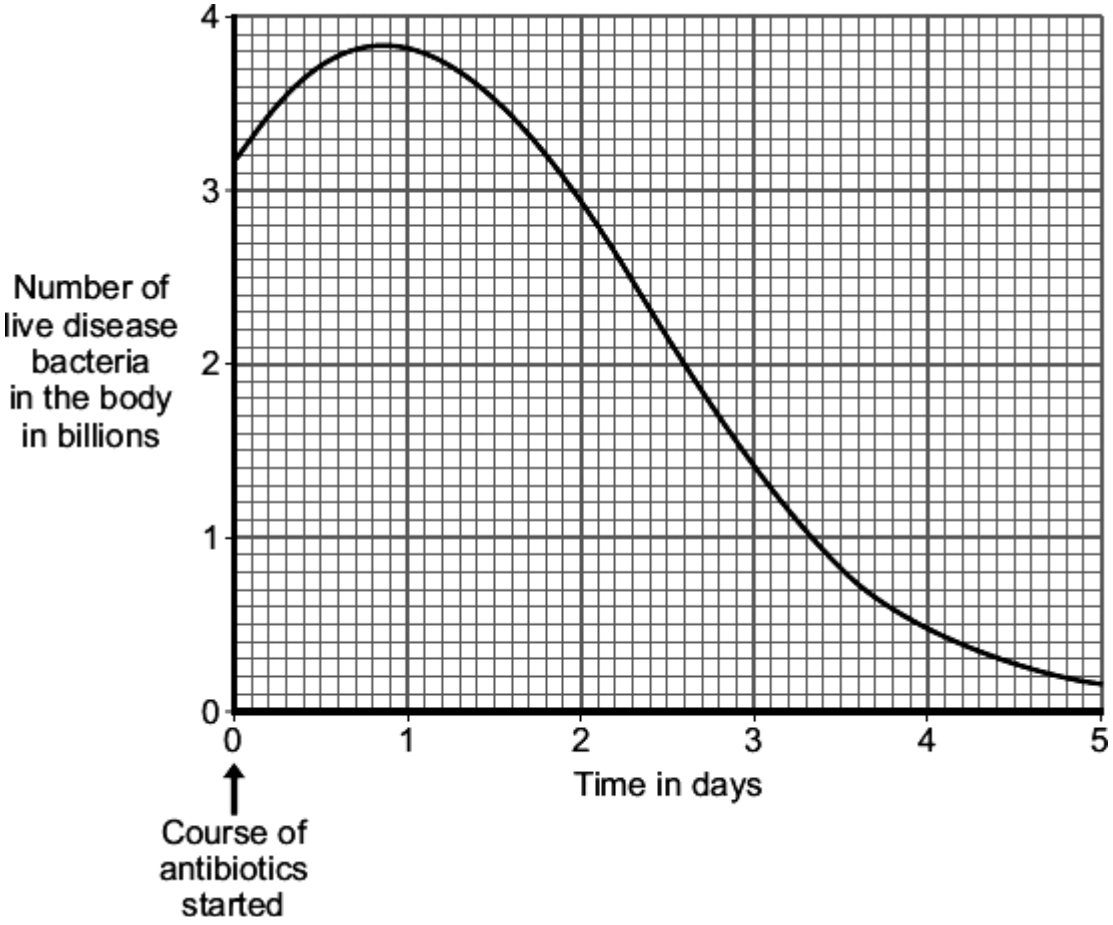
_____

(3)

(b) A man catches a disease. The man has **not** been immunised against this disease.

A doctor gives the man a course of antibiotics.

The graph shows how the number of live disease bacteria in the body changes when the man is taking the antibiotics.



(i) Four days after starting the course of antibiotics the man feels well again. It is important that the man does **not** stop taking the antibiotics.

Explain why.

Use information from the graph.

_____

_____

_____

_____

(2)

(ii) Occasionally a new, resistant strain of a pathogen appears.

The new strain may spread rapidly.

Explain why.

_____

_____

_____

_____

_____

_____

(3)

(Total 10 marks)

B4 BIOENERGETICS

Q10.

All living cells respire.

(a) Respiration transfers energy from glucose for muscle contraction.

Describe how glucose from the small intestine is moved to a muscle cell.

_____

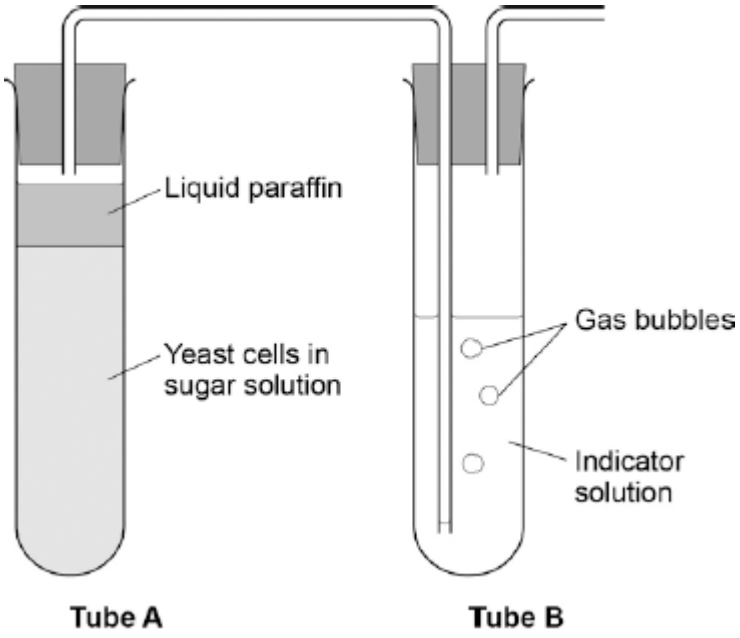
_____

_____

_____

(2)

(b) The diagram below shows an experiment to investigate **anaerobic** respiration in yeast cells.



What is the purpose of the liquid paraffin in Tube **A**?

Tick **one** box.

To prevent evaporation ☐

To stop air getting in ☐

To stop the temperature going up ☐

To stop water getting in ☐

(1)

(c) The indicator solution in Tube **B** shows changes in the concentration of carbon dioxide (CO_2).

The indicator is:

- **blue** when the concentration of CO_2 is very low
- **green** when the concentration of CO_2 is low
- **yellow** when the concentration of CO_2 is high.

What colour would you expect the indicator to be in Tube **B** during maximum rate of anaerobic respiration?

Tick **one** box.

Blue ☐

Green ☐

Yellow ☐

(1)

(d) Suggest how the experiment could be changed to give a reproducible way to measure the rate of the reaction.

Include any apparatus you would use.

_____

_____

_____

_____

(2)

(e) Compare anaerobic respiration in a yeast cell with anaerobic respiration in a muscle cell.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 9 marks)

Q11.

Low light intensity is one factor that limits the yield of a crop.

In Britain, many tomato growers use artificial lights to increase the yield of tomato crops.

The table shows the amount of natural daylight and artificial lamplight received by a tomato crop grown in a greenhouse.

Month	Natural daylight received by tomato plant		Artificial lamplight given to tomato plant		Total light energy received by plant per day in J/cm²	Percentage increase in growth resulting from artificial light
	Day length in hours	Light energy received by plant per day in J/cm²	Hours of light given per day	Light energy received by plant per day in J/cm²		
January	8.1	239	18	492	731	206
February	9.9	492	18	492	984	100
March	11.9	848	12	328	1176	39
April	13.9	1401	2	55	1456	4
May	15.5	1786	0	0	1786	0
June	16.6	1960	0	0	1960	0
July	16.2	1849	0	0	1849	0

August	14.7	1561	0	0	1561	0
September	12.8	1064	2	55	1119	5
October	10.6	614	11	301	915	49
November	8.8	288	18	492	780	171
December	7.6	183	18	492	675	269

(a) Describe the pattern for the amount of light energy received from natural daylight by a tomato plant during the day.

_____

_____

_____

_____

_____

_____

(3)

(b) A tomato plant needs 600 J of light energy per cm^2 each day to grow and produce tomatoes.

Use this information and data from the table to suggest an explanation for the pattern of the artificial light given to the tomato plants.

_____

_____

_____

_____

_____

_____

(2)

(Total 5 marks)

Q12.

(a) Complete the equation for photosynthesis.

_____ + _____ $\xrightarrow{\text{light energy}}$ _____ + oxygen

(2)

(b) Scientists investigated how temperature affects the rate of photosynthesis.

The scientists grew some orange trees in a greenhouse.
They used discs cut from the leaves of the young orange trees.

The scientists used the rate of oxygen production by the leaf discs to show the rate of photosynthesis.

(i) The leaf discs did not produce any oxygen in the dark.

Why?

_____

_____

(1)

(ii) The leaf discs took in oxygen in the dark.

Explain why.

_____

_____

_____

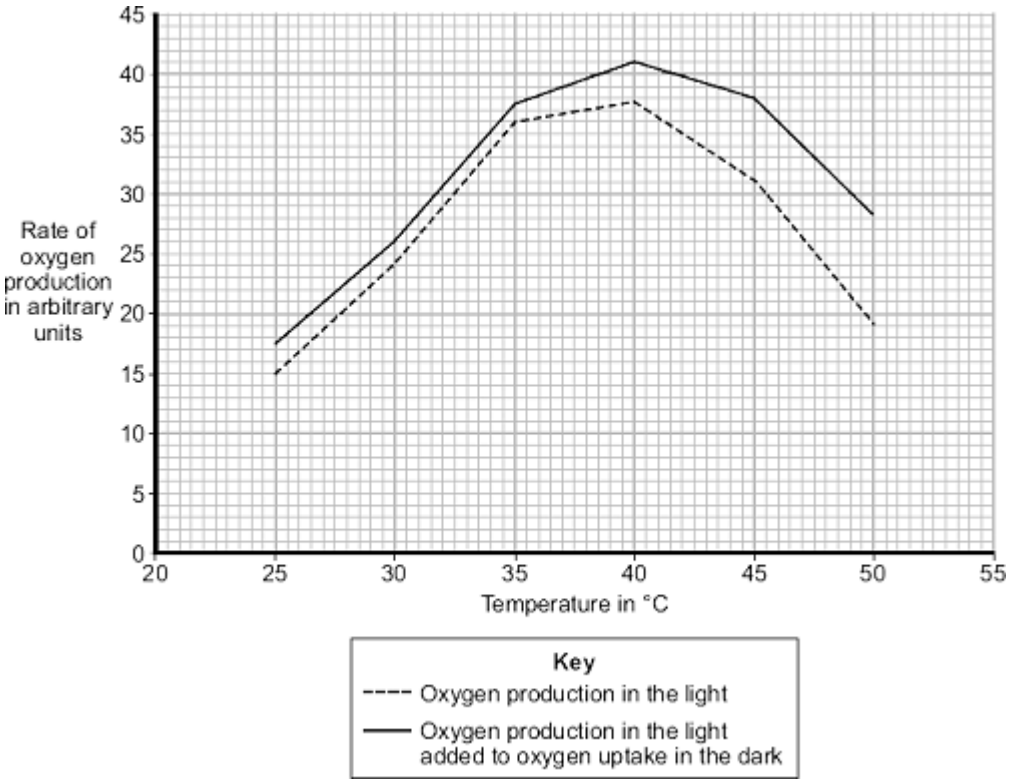
_____

(2)

(c) In their investigation, the scientists measured the rate of oxygen release by the leaf discs in the light. The scientists then measured the rate of oxygen uptake by the leaf discs in the dark.

The graph shows the effect of temperature on

- oxygen production in the light
- oxygen production in the light added to oxygen uptake in the dark.



Use the information from the graph to answer each of the following questions.

(i) Describe the effect of temperature on oxygen production in the light.

_____

_____

_____

_____

(2)

(ii) Explain the effect of temperature on oxygen production in the light when the temperature is increased:

from 25 °C to 35 °C

_____

_____

_____

from 40 °C to 50 °C.

_____

_____

_____

(2)

(d) A farmer in the UK wants to grow orange trees in a greenhouse. He wants to sell the oranges he produces at a local market.
He decides to heat the greenhouse to 35 °C.

Explain why he should **not** heat the greenhouse to a temperature higher than 35 °C.
Use information from the graph in your answer.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 12 marks)

Mark schemes

Q1.

(a) contract / shorten

ignore relax
*do **not** allow expand*

1

to churn / move / mix food

accept peristalsis / mechanical digestion
ignore movement unqualified

1

(b) 400

acceptable range 390-410
allow 1 mark for answer in range of 39 to 41
allow 1 mark for answer in range of 3900 to 4100

2

(c) to transfer energy for use

allow to release / give / supply / provide energy
*do **not** allow to 'make' / ?produce' / 'create' energy*
allow to make ATP
ignore to store energy

1

by (aerobic) respiration **or** from glucose

*do **not** allow anaerobic*
*energy released **for** respiration = max 1 mark*

1

(d) (i) to make protein / enzyme

ignore 'antibody' or other named protein

1

(ii) too small / very small

allow light microscope does not have sufficient magnification / resolution
allow ribosomes are smaller than mitochondria
ignore not sensitive enough
ignore ribosomes are transparent

1

[8]

Q2.

(a) No

no mark
if yes max 1 for correct statement

diffusion is down the concentration gradient

accept by diffusion ions would leave the root

1

to enter must go up / against the concentration gradient
or concentration higher in the root
or concentration lower in the soil

1

(b) (i) 0.9 **or** 3.25

for correct answer with or without working
*if answer incorrect 1.3 **or** their rate – 0.4 gains 1 mark*
***or** 130 – 40 **or** 90 gains 1 mark*

2

(ii) (uptake) by active transport

1

requires energy

more energy from aerobic respiration

1

or

more energy when oxygen is present

1

[7]

Q3.

(a) (i) glucose **and** galactose

1

(ii) any **three** from:

Evidence:

- absorption reduced by cyanide
  allow converse
- absorb faster (than other sugars)

Explanation:

- active transport needs energy
- less / no energy available / released if cyanide is there
  or less / no energy if no / less respiration
  allow energy produced
  ignore cyanide prevents respiration

3

(b) all / the sugars / they can be absorbed when gut poisoned / with cyanide **or** when no respiration

1

(diffusion) does not need an energy supply

1

[6]

Q4.

(a) fatty acids

1

glycerol

1

(b) enzyme binds to the substrate because they are complementary (shapes)

allow enzyme joins to the substrate because they fit together exactly

allow enzyme joins to the substrate because the substrate fits the active site

*ignore reference to specificity do **not** accept same shape*

1

(so) substrate is broken down (into products)

allow (so) substrate splits (into products)

ignore products are formed, unqualified

1

(so) products are released **or** enzyme is not changed

allow enzyme is not used up

*allow reference to activation energy for either marking point 2 **or** marking point 3*

1

(c) each <u>active site</u> has a specific shape (so only fits one type of lipid molecule)

allow each <u>active site</u> is a different shape

*do **not** accept reference to the substrate having an active site*

1

(d) add Benedict's (solution / reagent to the liquid)

1

boil / heat

allow any temperature of 65 °C or above

1

(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick) red

1

(e) add iodine solution / reagent (to the liquid)

allow add a drop of iodine

ignore iodine unqualified

1

(if starch is present) it changes colour to blue / black (from yellow / orange / brown)

1

(f) glucose from photosynthesis

*do **not** accept starch made in photosynthesis*

1

(excess) glucose converted to starch

allow (excess) glucose is stored as starch

1

(g) starch (stores) have been converted to glucose

ignore reference to residual glucose from previous photosynthesis

1

(so the glucose can be) used for respiration / (named) metabolic reactions
or (so the glucose can be) used to release energy

*do **not** accept idea of energy being produced / created / made*

1

(because) there is no light to make (new / more) glucose by photosynthesis

1

(h) any **one** from:

- test roots / stems of plants (in the light and dark)

  *do **not** accept reference to changing the independent variable*

  allow test other parts of the plants
- test other species of plant

  allow test other types of plant
- measure the concentrations of glucose **and** starch

  ignore mass / amount
- vary the time in the dark / light
- test variegated leaves

  allow any other valid extension ignore repeats

1

[17]

Q5.

(a) A

1

(b) chloroplast(s)

ignore chlorophyll

1

(c) guard (cells)

ignore stoma(ta)

1

(d) transpiration stream

ignore transpiration unqualified

1

(e) increased humidity

1

(f) **Level 2:** Scientifically relevant features are identified; the way(s) in which they

are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted.

4–6

Level 1: Relevant features are identified and differences noted. 1–3

1–3

No relevant content.

0

Indicative content:

Structure

- xylem is made of dead cells
  and
  phloem is made of living cells
- phloem cells have pores in their end walls
  and
  xylem cells do not have pores in their end walls
- xylem is hollow **or** xylem does not contain cytoplasm
  and
  phloem contains cytoplasm
- xylem contains lignin
  and
  phloem does not (contain lignin)

- both made of cells
- both tubular

Function

- xylem transports water / mineral ions
  and
  phloem transports (dissolved) sugars
- xylem is involved in transpiration
  and
  phloem is involved in translocation
- xylem transports unidirectionally
  and
  phloem transports bidirectionally

- both transport liquids / substances throughout the stem / leaves / roots / plant

For **Level 2**, students must refer to both structure and function of xylem and phloem tissue.

(g) *(correct division)*
40 ÷ 7 (in hours)
or
40 ÷ 420 (in minutes)

allow correct answer from student's readings throughout

1

5.71 (in hours)
or
0.0952…(in minutes)

allow correct division from incorrect reading(s) from the tangent

1

(correct conversion to minutes)
0.0952…

allow correct conversion at any point in the calculation

allow correct conversion of calculated value to minutes

1

(answer in standard form)
$9.5(238) \times 10^{-2}$

allow correct conversion of calculated value to standard form

1

(h) (less water loss at night)

allow converse if clearly describing 12:00

stomata are (almost completely) closed

1

(because) it's cooler / colder
or
(because) there's less / no light

ignore it's dark at night

1

[17]

Q6.

(a) **Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

3–4

Level 1: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

1–2

No relevant content

0

Indicative content:

- backflow can occur **or** some blood flows backwards
- less blood leaves the heart **or** less blood is pumped around the body **or** some blood stays in the heart (instead of being pumped out) **or** reduced blood pressure **or** reduced flow rate
- less oxygen supplied to muscles / cells
- (so) less aerobic respiration
- (so) less energy released
- (so) less (efficient) muscle contraction
- anaerobic respiration takes place
- less (efficient) removal of lactic acid **or** lactic acid builds up **or** oxygen debt occurs
- (lactic acid building up) causes muscle fatigue
- less (efficient) removal of carbon dioxide (from blood)

a **level 2** response should refer to both respiration **and** the effects on exercise

(b)

ignore raw numbers from the table

(deaths mechanical valve =) 6% / 6.31136%
allow correctly rounded value

1

(deaths biological valve =) 10% / 10.14823%
allow correctly rounded value

1

(therefore a) higher proportion / percentage of patients die with biological valve
or
patients are more likely to die with biological valve

*do **not** accept more patients die with a biological valve*

*allow **2** marks for ratio mechanical : biological = 1:1.6 **or** 1:1.7 **or** correctly calculated value*

*allow **3** marks for deaths with biological valves = 4% / 3.83687% higher **or** correctly rounded value*
or
patients are 1.6 / 1.7 times more likely to die with biological valves

*if **no** other marks awarded, allow for **1** mark chance of death after a valve replacement is 8% / 7.77247% **or** correctly rounded value*

1

(c) platelets

allow thrombocytes

1

(d) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5–6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3–4

Level 1: Relevant points are made. They are not logically linked.

1–2

No relevant content

0

Indicative content:

mechanical valves

- longer lasting **or** more durable **or** don't wear out as easily **or** less likely to need replacing (within 6 years)
- blood clots (on the brain) are more likely (after surgery)

- patient has to take anti-clotting medication (for the rest of their lives)
- if medication not taken (correctly), clots can lead to blood clots on brain / heart attack
- medication can lead to excessive bleeding (after injury)
- some patients say they can hear the valves opening and closing
- survival rate at 5 years is slightly higher for mechanical valve
- lower percentage of deaths due to heart-related problems

biological valves
- no additional medication required
- ethical issues surrounding use of animal tissue
- valve may harden
- more likely to need further operation **or** another new valve
- more likely to be rejected
- more likely to need (immuno-suppressant) medication

both valves
- both are readily available
- little wait time

a **level 2** response should contain comparisons of both valves **and** some reference to own knowledge

[14]

Q7.

(a) (i) any **one** from:

- (produce) toxins / poisons
- (cause) damage to cells
  kill / destroy cells
  allow kills white blood cells

1

(ii) produce antitoxins

1

engulf / ingest / digest pathogens / viruses / bacteria / microorganisms
accept phagocytosis or description
ignore eat / consume / absorb for engulf
ignore references to memory cells

1

(b) (i) dead / inactive / weakened
accept idea of antigen / protein

1

(measles) pathogen / virus
ignore bacteria

1

(ii) (after infection)
accept converse if clearly referring to before vaccination

1

rise begins sooner / less lag time

steeper / faster rise (in number)

1

longer lasting **or** doesn't drop so quickly

idea of staying high for longer

ignore reference to higher starting point

1

(iii) antibodies are specific or needs different antibodies

*accept antigens are different **or** white blood cells do not recognise virus*

1

(c) reduces spread of infection / less likely to get an epidemic

accept idea of eradicating measles

1

[10]

Q8.

(a) any **two** from:

- regular hand washing
  or
  use hand sanitiser / alcohol gel
- cover nose / mouth when coughing / sneezing

  allow wear a face mask
- put used tissues (straight) in the bin
- don't kiss uninfected people

  allow isolate patient from others

  or

  don't share cutlery / cups / drinks with uninfected people
- clean / disinfect / sterilise surfaces regularly

  ignore responses referring to infected people

2

(b) any **three** from:

- stimulate (mouse) lymphocytes to produce antibody

  for marking points 1 and 2 lymphocyte must be used at least once
- combine (mouse) lymphocyte with tumour cell
  or
  (create a) hybridoma
- clone (hybridoma) cell
- (hybridoma) divides rapidly **and** produces the antibody

3

(c) any **two** from:

- (monoclonal) antibody binds to virus **or** antibody binds to antigen on surface of virus
- (monoclonal) antibody is complementary (in shape) / specific to antigen (on surface of virus)
- white blood cells / phagocytes kill / engulf the virus(es)

2

(d) as a control
or
to see / compare the effects of the treatment (vs. no treatment)

1

(e) (4.8 + 10.4) ÷ 2 ÷ 100 × 1500
or
(4.8 ÷ 100 × 750) + (10.4 ÷ 100 × 750)

1

114

*an answer of 114 scores **2** marks*
*allow 228 for **1** mark*

1

(f) **(supports the conclusion because)**
over double the number / % of patients (in the trial) were hospitalised with the placebo (compared to MAB)

1

(does not support the conclusion because)
no information on patients not hospitalised / still unwell at home
or
other factors may have affected those admitted to hospital
allow correct named factor e.g. age / gender / other illness
or
don't know if it was a double blind trial

1

[12]

Q9.

(a) (i) dead / inactive / weakened
allow antigen / protein
ignore ref to other components
ignore small amount

1

pathogen / bacterium / virus / microorganism
ignore germs / disease

1

(ii) *antigen / antibiotic instead of antibody = max 2*

white blood cells produce / release antibodies
accept lymphocytes / leucocytes / memory cells produce antibodies
*do **not** accept phagocytes*

1

antibodies produced quickly

1

(these) antibodies destroy the pathogen
allow kill
*do **not** accept antibodies engulf pathogens*

1

(b) (i) (live) bacteria still in body
ignore numbers
1

would reproduce
ignore mutation / growth
1

(ii) antibiotics / treatment ineffective **or** resistant pathogens survive
accept resistant out compete non-resistant
1

these reproduce
1

population of resistant pathogens increases
allow (resistant pathogens reproduce) rapidly
1

[10]

Q10.

(a) glucose is absorbed by diffusion into the bloodstream
1

then blood delivers glucose to muscles in capillaries
1

(b) to stop air getting in
1

(c) yellow
1

(d) collect the CO_2 / gas with a measuring cylinder / gas syringe
1

(volume collected) in a certain time using a timer / watch
1

(e) yeast produces ethanol but muscles produce lactic acid
marks can be awarded from correct word or balanced symbol equations
1

yeast produces CO_2 but muscles do not
answers must be comparative
1

both release small amounts of energy
1

ignore both occur without oxygen

[9]

Q11.

(a) low in winter / named months /when the days are short
accept increases in spring / Dec – June

1

high in summer / named month(s) / (when days are long

decreases in autumn / June – December

1

reasonable quantitative statement

accept any reasonable calculated / translated quantitative statement

higher in summer than in winter for 2 marks
comparative statements may be worth 2 marks
but
8/11 times higher in summer than in winter for 3 marks

1

(b) no artificial light given in summer / light only given in winter

since natural light greatly exceeds minimum / 600 J (required to produce tomatoes)

accept day length if linked to light energy

OR

light only given in winter

as natural light less than the minimum needed (to grow them) or 600 J

OR

for 2 marks:
percentage increase in growth from artificial] light only significant in winter

2

[5]

Q12.

(a) LHS: carbon dioxide **AND** water

in either order

*accept CO_2 **and** H_2O*
allow CO2 and H2O
if names given ignore symbols
*do **not** accept CO^2 / H^2O / Co / CO*
ignore balancing

1

RHS: sugar(s) / glucose / starch / carbohydrate(s)

accept $C_6H_{12}O_6$
allow C6H12O6
*do **not** accept $C^6H^{12}O^6$*

1

(b) (i) light is needed for photosynthesis

or

no photosynthesis occurred (so no oxygen produced)

1

(ii) oxygen is needed / used for (aerobic) respiration

full statement

*respiration occurs **or** oxygen is needed for anaerobic respiration gains **1** mark*

2

(c) (i) (with increasing temperature) rise then fall in rate

1

use of figures, ie

max. production at 40 °C
or maximum rate of 37.5 to 38

1

(ii) <u>25 – 35 °C</u>

either faster movement of particles / molecules / more collisions
or particles have more energy / enzymes have more energy

1

or temperature is a limiting factor over this range

<u>40 – 50 °C</u>

denaturation of proteins / enzymes

ignore denaturation of cells
ignore stomata

1

(d) above 35 °C (to 40 °C) – little increase in rate
or > 40 °C – causes decrease in rate

1

so waste of money **or** less profit / expensive

1

because respiration rate is higher at > 35 °C
or
respiration reduces the effect of photosynthesis

1

[12]