Q1.
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.

<table>
<thead>
<tr>
<th>Type of respiration in human cells</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic respiration</td>
<td>Produces ethanol</td>
</tr>
<tr>
<td></td>
<td>Uses oxygen</td>
</tr>
<tr>
<td>Anaerobic respiration</td>
<td>Uses carbon dioxide</td>
</tr>
<tr>
<td></td>
<td>Produces lactic acid</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Energy in kJ transferred from 1 g of glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic respiration</td>
</tr>
<tr>
<td>Anaerobic respiration</td>
</tr>
</tbody>
</table>

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?
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)
Q2. Muscles need energy during exercise.

Draw a ring around the correct answer in parts (a) and (b) to complete each sentence.

(a) (i) The substance stored in the muscles and used during exercise is

- glycogen.
- lactic acid.
- protein.

(ii) The process that releases energy in muscles is

- digestion.
- respiration.
- transpiration.

(b) The table shows how much energy is used by two men of different masses when swimming at different speeds.

<table>
<thead>
<tr>
<th>Speed of swimming in metres per minute</th>
<th>Energy used in kJ per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>34 kg man</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>25</td>
<td>651</td>
</tr>
<tr>
<td>50</td>
<td>1134</td>
</tr>
</tbody>
</table>

(i) When the 34 kg man swims at 50 metres per minute instead of at 25 metres per minute,

the extra energy he uses each hour is

- 36 kJ.
- 483 kJ.
- 948 kJ.

(ii) When swimming at 50 metres per minute, each man’s heart rate is faster than
when swimming at 25 metres per minute.

A faster heart rate helps to supply the muscles with more oxygen.

carbon dioxide.
glycogen.
oxygen.

(iii) During the exercise the arteries supplying the muscles would constrict.
dilate.
pump harder.

(c) When a person starts to swim, the breathing rate increases.

Give one way in which this increase helps the swimmer.
___________________________________________________________________
___________________________________________________________________

(Total 6 marks)

Q3.
(a) Plants make their own food by photosynthesis.

Use the following words to fill in the gaps. You can use each word once or not at all.

<table>
<thead>
<tr>
<th>carbon</th>
<th>chlorophyll</th>
<th>cytoplasm</th>
<th>light</th>
<th>nitrogen</th>
<th>oxygen</th>
<th>sound</th>
<th>starch</th>
<th>water</th>
</tr>
</thead>
</table>

During photosynthesis _______________________ dioxide and _______________ are converted into glucose and ____________________. The energy needed to do
this is ____________________ energy which is trapped by a green pigment called ____________________ .

The plant can change the glucose into ____________________ which is insoluble so it can be stored.

(b) Which part of a plant is adapted for photosynthesis?

___________________________________________________________________

(c) How do the two raw materials for photosynthesis get into the plant?

1. _________________________________________________________________

___________________________________________________________________

2. _________________________________________________________________

___________________________________________________________________

(d) Describe one way you could speed up photosynthesis.

___________________________________________________________________

___________________________________________________________________

(Total 10 marks)

Q4.

The diagram shows the human breathing system.

(a) Complete the labels (i) and (ii).

Nose

Mouth

Ribs

(i) ____________________

(ii) ____________________ which is made up of millions of air sacs

Sheet of muscle called the diaphragm
(b) Complete the following sentence.

When we breathe out, the mixture of gases which leaves the air sacs contains

more __________________ and less __________________ than the mixture of
gases which enters the air sacs.

(Total 4 marks)

Q5.

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.

(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?

______________________________________________________________
(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.

(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 ________________________________

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

(Total 8 marks)

Q6.

Copepods are tiny animals which live in the sea.

During the day they live deep down near the sea bed. At night they move up to the surface where they feed on tiny plants. When the sun rises they move down to the bottom again.

(a) Suggest why the tiny **plants** live near the surface of the sea.

(b) Herring feed on copepods.

Where will herring be found during the day? Give a reason for your answer.
Q7. 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)

Q8. The diagram shows the mass of carbon dioxide released into and removed from the air each year in billions of tonnes.
(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)

Q9.  
(a) The air you breathe in and the air you breathe out are different.

Use the names of gases from this box to complete the **three** spaces.

| argon | carbon dioxide | nitrogen | oxygen | water vapour |

Compared to the air you breathe in, the air you breathe out contains:

- more ____________________________________________
- more ____________________________________________
- less ____________________________________________
(b) The process of aerobic respiration takes place in your cells.

(i) Complete the space in the word equation for this process.

\[ \underline{\text{____________}} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water} \]

(ii) Complete the space to give the main energy transfer which takes place in this process.

chemical energy \[ \rightarrow \underline{\text{____________}} \text{ energy} \]

(iii) What is the name of the organ where oxygen from the air passes to your blood?

______________________________________________________________

(c) The athlete is taking part in vigorous exercise.

Complete the two spaces in the passage.

The cells in our muscles respire anaerobically during vigorous exercise. This results in \[ \underline{\text{____________}} \text{ debt} \] and the production of \[ \underline{\text{____________}} \text{ acid} \].

(Total 8 marks)

Q10.

(a) Breathed-out air is different from breathed-in air.

The two pie-charts show the percentages of different gases in each.
Complete the second pie-chart, using the information from the table.

This air contains less than 1% carbon dioxide. (Too little to show)

<table>
<thead>
<tr>
<th>Gases</th>
<th>Air breathed in</th>
<th>Air breathed out</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbon dioxide</td>
<td>0.04%</td>
<td>4.0%</td>
</tr>
<tr>
<td>oxigen</td>
<td>20.0%</td>
<td>16.0%</td>
</tr>
<tr>
<td>water vapour</td>
<td>1.0%</td>
<td>6.0%</td>
</tr>
</tbody>
</table>

(b) Use the information above to complete the following sentences.

The air you breathe out contains more _____________________ than the air you breathe in.

The air you breathe out contains less _____________________ than the air you breathe in.

Q11.

The table shows the percentage of some gases in the air a boy breathed in and out.

<table>
<thead>
<tr>
<th>Gases</th>
<th>Air breathed in</th>
<th>Air breathed out</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbon dioxide</td>
<td>0.04%</td>
<td>4.0%</td>
</tr>
<tr>
<td>oxigen</td>
<td>20.0%</td>
<td>16.0%</td>
</tr>
<tr>
<td>water vapour</td>
<td>1.0%</td>
<td>6.0%</td>
</tr>
</tbody>
</table>

(a) What happens in the lungs to change the levels of oxygen and carbon dioxide in this way?

Oxygen __________________________________________________________

_______________________________________________________________

_______________________________________________________________

Carbon dioxide ________________________________________________
(b) Compare the percentage of water vapour in the air breathed out with the percentage in air breathed in.

Q12.
The diagram shows part of the breathing system in a human.

(a) Use words from the list to label the parts on the drawing.
   alveoli  bronchiole  bronchus  diaphragm  trachea (windpipe)

(b) Where in the lungs does oxygen enter the blood?

(c) Which process in cells produces carbon dioxide?

Q13.
(a) (i) Complete the word equation for the process of aerobic respiration.
Glucose $+$ _______________ $\rightarrow$ carbon dioxide $+$ water  

(ii) Which organ removes carbon dioxide from your body?

______________________________________________________________  

(b) Use names from the box to complete the two spaces in the passage.

| carbon dioxide | lactic acid | nitrogen | oxygen | water |

Anaerobic respiration can occur when an athlete does vigorous exercise.

This is because there is not enough ___________________________ in the body.

The product of anaerobic respiration is ________________________________ .  

(Total 4 marks)

Q14.

(a) The diagrams show cells containing and surrounded by oxygen molecules. Oxygen can move into cells or out of cells.

Into which cell, A, B, C or D, will oxygen move the fastest?

Write your answer, A, B, C or D, in the box.  

(1)
(b) Draw a ring around the correct word to complete each sentence.

(i) Oxygen is taken into cells by the process of

- diffusion
- osmosis
- respiration

(ii) Cells need oxygen for

- breathing
- photosynthesis
- respiration

(iii) The parts of cells that use up the most oxygen are the

- membranes
- mitochondria
- nuclei

(iv) Some cells produce oxygen in the process of

- diffusion
- photosynthesis
- respiration

(Total 5 marks)

Q15.
The diagram shows a plant leaf during photosynthesis.
Q16.

The diagram shows how a leaf of a green plant makes glucose.

(a) Use words from the box to complete the labels on the diagram. You may use each word once or not at all.

```markdown
<table>
<thead>
<tr>
<th>carbon dioxide</th>
<th>chlorophyll</th>
<th>glucose</th>
<th>heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>light</td>
<td>oxygen</td>
<td>water</td>
<td></td>
</tr>
</tbody>
</table>
```

(b) Why is sunlight necessary for photosynthesis?

___________________________________________________________________
___________________________________________________________________

(Total 3 marks)
Compete the following sentence.
Glucose in food is a type of _________. When we eat it, it gives us energy.

(ii) The plant turns some of the glucose into starch. Why is starch useful to the plant?

______________________________________________________________

______________________________________________________________

(iii) What does the plant do with the rest of the glucose?

______________________________________________________________

______________________________________________________________

(c) (i) What is the name of the process outlined in the diagram?

______________________________________________________________

______________________________________________________________

(ii) Give one way that leaves are adapted to do this process.

______________________________________________________________
Q17.
The diagram shows an enlargement of structure D.

The arrows show the direction of the gases exchanged in this structure. Name gas X and gas Y.

X ______________________________________________________________________

Y ______________________________________________________________________

(Total 2 marks)

Q18.
Photosynthesis takes place in green plants.

(a) Name the substance that combines with water in photosynthesis.

__________________________________________________________________________

(1)

(b) Where does water enter the plant?

__________________________________________________________________________

(1)

(c) Name two products of photosynthesis.

__________________________________________________________________________

(2)

(d) Variegated leaves have areas that are green and areas that are white. Some students used variegated leaves to investigate photosynthesis.

• They covered a variegated leaf with a black paper shape.
• The leaf was left in a sunny place.
They tested the leaf for starch.

The results were compared with a leaf that was not covered.

<table>
<thead>
<tr>
<th>Area of the leaf tested</th>
<th>Start present after test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>covered</td>
</tr>
<tr>
<td>Green area</td>
<td>no</td>
</tr>
<tr>
<td>White area</td>
<td>no</td>
</tr>
</tbody>
</table>

Explain why starch was present in only one of the tests.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

Q19.

Green plants are able to make their own food.

Complete each sentence by drawing a ring around the correct answer in the box.

(a) Green plants make their own food during the process of

- diffusion
- photosynthesis
- respiration
(b) This process can be summarised by the equation:

\[
\text{carbon dioxide } + \text{ water } \rightarrow \text{ glucose } + \text{ mineral salts + light + oxygen}
\]

\[\text{(1)}\]

(c) The energy needed for this process is trapped for the plant by

\[
\text{chlorophyll + glucose + light}
\]

\[\text{(1)}\]

(d) Some of the food made by plants is stored as insoluble

\[
\text{chlorophyll + glucose + starch}
\]

\[\text{(1)}\]

(Total 4 marks)

Q20.

The diagram shows bushes in a hedge growing near to a house.

The bushes were the same species and the same age.

(a) (i) The student said, “I have noticed that the short bushes grow next to the house. I think that the more light the bushes get, the faster they will grow.”

Draw lines to match each of the student’s statements to the correct term.
(ii) Complete the word equation for photosynthesis.

________________ + water (+ light energy) \rightarrow _______________ + oxygen

(b) The student decided to investigate the effect of light intensity on the rate of photosynthesis.

She used the apparatus shown in the diagram.

She measured the rate of photosynthesis by counting the number of gas bubbles given off each minute.

(i) Suggest how the student varied the intensity of the light received by the pondweed.

(ii) The student’s results are shown on the graph.
Describe the pattern shown on the graph.

______________________________________________________________

______________________________________________________________

______________________________________________________________

______________________________________________________________

(iii) This is what the student wrote for her conclusion.

“Increasing the light intensity increases the rate of photosynthesis of the pondweed.”

Why was her conclusion incomplete?

______________________________________________________________

______________________________________________________________

Q21.

Paula is training for a marathon. When she runs, her heart beats faster than it does when she is resting.

Complete the sentences, using words from the box.

<table>
<thead>
<tr>
<th>blood</th>
<th>breathe</th>
<th>carbon dioxide</th>
<th>glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>heat</td>
<td>nitrogen</td>
<td>oxygen</td>
<td>respires</td>
</tr>
</tbody>
</table>

When she is running, Paula’s muscle activity increases. To do this, her muscle cells ______________________ at a faster rate to give her more energy. Her muscles need to be supplied with ______________________ and ______________________.
more quickly. Her heart beats faster to increase the flow of ________________________ which carries the products ________________________ and ________________________ away from her muscles.

(Total 6 marks)

Q22.
Complete the table by writing the correct process next to its description.
Choose your answers from the list in the box

<table>
<thead>
<tr>
<th>breathing</th>
<th>diffusion</th>
<th>digestion</th>
<th>osmosis</th>
<th>respiration</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving air in and out of the lungs</td>
<td></td>
</tr>
<tr>
<td>The movement of particles of a substance from high to low concentration</td>
<td></td>
</tr>
<tr>
<td>The release of energy from glucose</td>
<td></td>
</tr>
</tbody>
</table>

(Total 3 marks)

Q23.
Some students investigated how exercise affects heart rate.
The figure below shows their results.

(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. _________________________________________________________________

_________________________________________________________________

2. _________________________________________________________________

_________________________________________________________________

(2)

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

Explain why these changes occur.

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

(4)
Q24.

The diagrams show four types of cell, A, B, C and D. Two of the cells are plant cells and two are animal cells.

(a) (i) Which two of the cells are plant cells?

Tick (√) one box.

- A and B
- A and D
- C and D

(ii) Which part is found only in plant cells?

Draw a ring around one answer.

- cell membrane
- cell wall
- nucleus

(1)
(b) (i) Which cell, A, B, C or D, is adapted for swimming? 

(ii) Which cell, A, B, C or D, can produce glucose by photosynthesis? 

(c) Cells A, B, C and D all use oxygen.
For what process do cells use oxygen?
Draw a ring around one answer.

osmosis  photosynthesis  respiration

Q25.
The diagram represents the human blood circulation system.

(a) A, B, C and D are blood vessels.

(i) Give the letter of one blood vessel that is an artery. 

(ii) Give the letter of one blood vessel that is a vein. 

(b) A student pedalled an exercise cycle at constant speed for 5 minutes. The student's heart rate was recorded at one-minute intervals during the exercise. The results are shown in the graph.
(i) What was the student’s heart rate before the exercise began?
________________________ per minute

(1)

(ii) How long was it before the student’s heart rate reached 124 beats per minute?
___________________________ minutes

(1)

(c) Which of the following parts of the blood carries most oxygen?
Draw a circle around one answer.

plasma     red blood cells     white blood cells

(1)

(Total 5 marks)

Q26.
A gardener grows tomatoes.

He wants to find out how to get the biggest mass of tomatoes.

He plants different varieties of tomato against different walls in his garden.
Use these results to answer the questions.

(a) The gardener wants his test to be fair.

Name **one** condition which he should keep the same for all his tomato plants.

___________________________________________________________________
___________________________________________________________________

(1)

(b) The table shows the gardener’s results.

<table>
<thead>
<tr>
<th>Variety of tomato plant</th>
<th>Sungold</th>
<th>Sungold</th>
<th>Sungold</th>
<th>Sungold</th>
<th>Nugget</th>
<th>Champion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall they were planted against</td>
<td>North</td>
<td>West</td>
<td>South</td>
<td>East</td>
<td>East</td>
<td>East</td>
</tr>
<tr>
<td>Mean mass of tomatoes produced in kilograms per plant</td>
<td>3.5</td>
<td>3.0</td>
<td>1.2</td>
<td>2.5</td>
<td>3.2</td>
<td>2.7</td>
</tr>
</tbody>
</table>

(i) To obtain the biggest mass of tomatoes, against which wall is it best to grow the tomato plants?

Tick (✓) **one** box.

North wall

South wall
East wall

West wall

(ii) To obtain the biggest mass of tomatoes, which variety of tomato plant would it be best to grow?

__________________________________________________________________________________________________

(c) From the information in the table, the gardener’s test was **not** fair.

Give **one** way in which the test was **not** fair.

__________________________________________________________________________________________________

__________________________________________________________________________________________________

(Total 4 marks)

Q27.

An athlete did a 6-month training programme.

The graph shows the effect of the same amount of exercise on his heart rate before and after the training programme.
What was the maximum heart rate of the athlete during exercise before the training programme?

_________________________ beats per minute

(ii) Give two differences between the heart rate of the athlete before and after the training programme.

After the training programme

Difference 1 ________________________________________________________________

Difference 2 ________________________________________________________________

Which two substances need to be supplied to the muscles in larger amounts during exercise?
Tick (✔) two boxes.

Carbon dioxide
Glucose
Lactic acid
Oxygen
Urea

(2)
(Total 5 marks)

Q28.
Pathogens cause infectious diseases in animals and plants.

(a) Draw one line from each disease to the type of pathogen that causes the disease.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Type of pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonorrhoea</td>
<td>Bacterium</td>
</tr>
<tr>
<td>Malaria</td>
<td>Fungus</td>
</tr>
<tr>
<td>Measles</td>
<td>Protist</td>
</tr>
<tr>
<td></td>
<td>Virus</td>
</tr>
</tbody>
</table>

(3)

(b) Some parts of the human body have adaptations to reduce the entry of live pathogens.

Look at Figure 1.

Figure 1
Explain how the trachea is adapted to reduce the entry of live pathogens.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(c) Malaria is a serious disease that can be fatal.

Malaria is spread to humans by infected mosquitoes.

Scientists investigated the behaviour of mosquitoes to understand how the spread of malaria could be controlled.

**Figure 2** shows the equipment the scientists used.

**Figure 2**

Container A: infected mosquitoes

30 mosquitoes **infected with malaria** were placed in Container A.

Container B: uninfected mosquitoes

30 **uninfected** mosquitoes were placed in Container B.

This is the method used.
3. The total number of times the mosquitoes landed on the socks was recorded. Name the dependent variable and suggest one control variable in this investigation.

Dependent variable ____________________________________________________________

Control variable ____________________________________________________________

(d) Infected mosquitoes landed on the socks three times more often than uninfected mosquitoes.

Explain how this information can be used to reduce the spread of malaria.

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

___________________________________________________________________________

(e) Tobacco mosaic virus (TMV) affects many species of plant.

Figure 3 shows a leaf infected with TMV.

Figure 3

© Nigel Cattlin/Getty Images

TMV destroys chloroplasts in the leaf.

Explain how this could affect the growth of the plant.
Q29.

The amount of carbon dioxide in the atmosphere is increasing.

The table shows the estimated mass of carbon dioxide exchanged with the atmosphere in one year.

<table>
<thead>
<tr>
<th>Mass of carbon dioxide exchanged with the atmosphere in millions of tonnes</th>
<th>Passed out into the atmosphere</th>
<th>Taken in from the atmosphere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants</td>
<td>30</td>
<td>64</td>
</tr>
<tr>
<td>Animals</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Microorganisms</td>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>Combustion</td>
<td>6</td>
<td>0</td>
</tr>
</tbody>
</table>

(a) (i) Calculate the total mass of carbon dioxide passed out into the atmosphere in one year.

Show clearly how you work out your answer.

Answer ______________________ million tonnes

(ii) Calculate the increase in the mass of carbon dioxide in the atmosphere in one year.

You should use your answer to part (a)(i) in your calculation.

Show clearly how you work out your answer.
(b) Draw a ring around the correct answer to complete the sentence.

Plants use carbon dioxide in the process of

- decomposition.
- photosynthesis.
- respiration.

Q30.

A gardener grows tomato plants.

The tomato plants develop yellow leaves.

(a) What would be the best way of improving the growth of these plants?

Tick (✓) one box.

- Add mineral ions to the soil
- Water the plants more
- Add glucose to the soil

(b) Most tomatoes are grown in greenhouses.
Tomato growers alter the conditions in greenhouses to make tomato plants grow faster.

Which changes in conditions will make tomato plants grow faster?

Tick (✓) two boxes.

- Increasing the temperature
- Increasing the oxygen concentration in the air
- Increasing the nitrogen concentration in the air
- Turning lights on at night

(Q31. Total 3 marks)

The diagram shows a plant cell from a leaf.

(a) List A gives the names of three parts of the cell.
List B gives the functions of parts of the cell.

Draw a line from each part of the cell in List A to its function in List B.

<table>
<thead>
<tr>
<th>List A Parts of the cell</th>
<th>List B Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nucleus</td>
<td>Where most of the chemical reactions take place</td>
</tr>
</tbody>
</table>
Absorbs light energy to make food

Cytoplasm

Strengthens the cell

Chloroplast

Controls the activities of the cell

(b) Respiration takes place in the cell.

Draw a ring around the correct answer to complete the sentence.

All cells use respiration to release energy oxygen. sugar.

(1) (Total 4 marks)

Q32.

The mould Penicillium can be grown in a fermenter. Penicillium produces the antibiotic penicillin.

The graph shows changes that occurred in a fermenter during the production of penicillin.
(a) During which time period was penicillin produced most quickly?

Draw a ring around one answer.

0 – 20 hours 40 – 60 hours 80 – 100 hours

(b) (i) Describe how the concentration of glucose in the fermenter changes between 0 and 30 hours.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

(ii) How does the change in the concentration of oxygen in the fermenter compare with the change in concentration of glucose between 0 and 30 hours?

Tick (✓) two boxes.

The oxygen concentration changes after the glucose concentration.

The oxygen concentration changes before the glucose concentration.
The oxygen concentration changes less than the glucose concentration.

The oxygen concentration changes more than the glucose concentration.

(iii) What is the name of the process that uses glucose?

Draw a ring around one answer.

- distillation
- filtration
- respiration

(Total 6 marks)

Q33.
(a) Complete the equation for photosynthesis.

Carbon dioxide + ______________ + light energy ______________ + oxygen

(b) A farmer grew tomato plants in a greenhouse.

The graph shows the effect of light intensity on the rate of photosynthesis in the tomato plants growing in the greenhouse.

(i) At which light intensity was light a limiting factor for photosynthesis?

Tick (✓) one box.
What was the highest rate of photosynthesis?

_________________________________ arbitrary units

(iii) The farmer wants to increase the rate of photosynthesis in his tomato plants. Apart from light intensity, name one factor that the farmer could change to increase the rate of photosynthesis in his tomato plants.

________________________________________________________

(Total 5 marks)

Q34.

(a) Complete the word equation for photosynthesis.

\[ \text{carbon dioxide} + \text{water} + \text{energy} \rightarrow \text{glucose} + \text{______} \]

(b) Draw a ring around the correct answer to complete each sentence.

(i) The energy needed for photosynthesis comes from

light. osmosis. respiration.

(ii) Energy is absorbed by a green pigment called

chloride. chloroplast. chlorophyll.
(iii) If the temperature is decreased the rate of photosynthesis will [decrease.][increase.][stay the same.]

(c) Give three ways in which plants use the glucose made in photosynthesis.
1. _________________________________________________________________
2. _________________________________________________________________
3. _________________________________________________________________

(Total 7 marks)

Q35.
(a) Complete the word equation for photosynthesis.
Use words from the box.

<table>
<thead>
<tr>
<th>chlorophyll</th>
<th>minerals</th>
<th>oxygen</th>
<th>water</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbon dioxide + __________ → glucose + __________</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Plants may grow faster if they have more carbon dioxide.

Indigestion tablets dissolve in water to form a solution. This solution slowly gives off carbon dioxide.

A student set up an investigation to see what concentration of carbon dioxide is best for increasing the growth of geranium plants.

The student:
- put a geranium plant in a clear plastic bag
- put a dish containing water and one tablet in the bag
- sealed the top of the bag.
The student:
- set up 5 more experiments each with water and a different number of tablets
- left all the plants in a well-lit place for four weeks.

The student used a clear plastic bag, not a black plastic bag.

Explain why.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(2)

(c) After four weeks, the student counted the number of new leaves on each plant.

The graph shows his results.

![Graph showing number of new leaves vs. number of tablets]

Describe the effect of increasing the number of tablets dissolved in water on the number of new leaves that grew in four weeks.

___________________________________________________________________
Q36.

The diagram shows a section through a plant leaf.

(a) Use words from the box to name two tissues in the leaf that transport substances around the plant.

<table>
<thead>
<tr>
<th>epidermis</th>
<th>mesophyll</th>
<th>phloem</th>
<th>xylem</th>
</tr>
</thead>
</table>

______________________________________________________________ and ________________________________________________  

(1)

(b) Gases diffuse between the leaf and the surrounding air.

(i) What is diffusion?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
(ii) Name **one** gas that will diffuse from point **A** to point **B** on the diagram on a sunny day.

Q37.

The diagrams show four types of cell, **A**, **B**, **C** and **D**. Two of the cells are plant cells and two are animal cells.

(a) (i) Which **two** of the cells are plant cells?

Tick (✓) **one** box.

- **A** and **B**
- **A** and **D**
- **C** and **D**

(ii) Give **one** reason for your answer.

______________________________________________________________
Q38.

Scientists investigated how exercise affects blood flow to different organs in the body.

The scientists made measurements of blood flow to different organs of:

- a person resting in a room at 20°C
- the same person, in the same room, doing vigorous exercise at constant speed on an exercise cycle.

The table shows the scientists' results.

<table>
<thead>
<tr>
<th>Organ</th>
<th>Blood flow in cm$^3$ per minute whilst …</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>resting</td>
</tr>
<tr>
<td>Brain</td>
<td>750</td>
</tr>
<tr>
<td>Heart</td>
<td>250</td>
</tr>
<tr>
<td>Muscles</td>
<td>1200</td>
</tr>
<tr>
<td>Skin</td>
<td>500</td>
</tr>
<tr>
<td>Other</td>
<td>3100</td>
</tr>
</tbody>
</table>

(a) In this investigation, it was better to do the exercise indoors on an exercise cycle than to go cycling outdoors on the road.
Suggest **two** reasons why.

Do **not** include safety reasons.

1. _________________________________________________________________
   ____________________________________________
   ____________________________________________

2. _________________________________________________________________
   ____________________________________________
   ____________________________________________

(b) Blood flow to **one** organ did **not** change between resting and vigorous exercise.

Which organ? ________________________________________________

(c) (i) How much more blood flowed to the muscles during vigorous exercise than when resting?

_________________________________________________________________
_________________________________________________________________

Answer = _________________ cm$^3$ per minute

(ii) Name **two** substances needed in larger amounts by the muscles during vigorous exercise than when resting.

1. ____________________________________________________________

2. ____________________________________________________________

(iii) Tick (✓) **one** box to complete the sentence.

The substances you named in part (c)(ii) helped the muscles to

- make more lactic acid. [ ]
- respire aerobically. [ ]
- make more glycogen. [ ]

(iv) The higher rate of blood flow to the muscles during exercise removed larger amounts of waste products made by the muscles.
Which two substances need to be removed from the muscles in larger amounts during vigorous exercise?

Tick (✓) two boxes.

- Amino acids
- Carbon dioxide
- Glycogen
- Lactic acid

(d) The total blood flow was much higher during exercise than when resting.

One way to increase the total blood flow is for the heart to pump out a larger volume of blood each beat.

Give one other way to increase the blood flow.

___________________________________________________________________
___________________________________________________________________

(Total 11 marks)

Q39.

(a) A student carried out the following investigation using a plant with variegated leaves. A variegated leaf has green and white stripes.

The student:
- left the plant in the dark for 3 days to remove the starch
- fixed two pieces of card to a leaf on the plant
- left the plant in the light for 2 days
- removed the leaf from the plant
- tested the leaf for starch.

Figure 1 shows how the two pieces of card were attached to the leaf.

Figure 1

Leaf without card          Leaf with card
Figure 2 shows the same leaf after 2 days in the light. The leaf has been tested for starch.

**Figure 2**

Give two conclusions from this investigation.

Tick (✓) two boxes.

- Carbon dioxide is needed for photosynthesis. [ ]
- Chlorophyll is needed for photosynthesis. [ ]
- Light is needed for photosynthesis. [ ]
- Water is needed for photosynthesis. [ ]

(2)

(b) Scientists investigated the effect of light intensity on the rate of photosynthesis.

Figure 3 shows the scientists’ results.

**Figure 3**
Describe the effect of increasing light intensity on the rate of photosynthesis. You should include numbers from Figure 3 in your description.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________

(c) At a light intensity of 250 arbitrary units, light is not a limiting factor of photosynthesis.

(i) What is the evidence for this in Figure 3?
___________________________________________________________________
___________________________________________________________________

(ii) Give two factors that could be limiting the rate of photosynthesis at a light intensity of 250 arbitrary units.
1. ________________________________________________________________
2. ________________________________________________________________

(Total 8 marks)

Q40.
The diagram below shows the parts of the body that digest and absorb food.

It also shows some details about the structure of the stomach.
(a) Complete the table to show whether each structure is an organ, an organ system or a tissue.

For each structure, tick (√) one box.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Organ</th>
<th>Organ system</th>
<th>Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cells lining the stomach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mouth, oesophagus, stomach, liver, pancreas, small and large intestine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) (i) The blood going to the stomach has a high concentration of oxygen. The cells lining the stomach have a low concentration of oxygen.

Complete the following sentence.

Oxygen moves from the blood to the cells lining the stomach by the process of ____________________________.

(ii) What other substance must move from the blood to the cells lining the stomach so that respiration can take place?

Draw a ring around the correct answer.

- glucose
- protein
- starch
(iii) In which part of a cell does aerobic respiration take place?

Draw a ring around the correct answer.

- cell membrane
- mitochondria
- nucleus

(1)

(Total 5 marks)

Q41.

Photosynthesis uses carbon dioxide to make glucose.

(a) (i) Complete the equation for photosynthesis.

\[
\text{carbon dioxide} + \text{energy} \rightarrow \text{glucose} + \text{___________}
\]

(2)

(ii) What type of energy does a plant use in photosynthesis?

______________________________________________________________

(1)

(iii) Which part of a plant cell absorbs the energy needed for photosynthesis?

______________________________________________________________

(1)

(b) The graph shows the effect of the concentration of carbon dioxide on the rate of photosynthesis in tomato plants at 20 °C.

(i) What is the maximum rate of photosynthesis of the tomato plants shown in the graph?

_______________ arbitrary units

(1)

(ii) At point X, carbon dioxide is not a limiting factor of photosynthesis.

Suggest one factor that is limiting the rate of photosynthesis at point X.

______________________________________________________________
(c) A farmer plans to grow tomatoes in a large greenhouse.

The concentration of carbon dioxide in the atmosphere is 0.04%.
The farmer adds carbon dioxide to the greenhouse so that its concentration is 0.08%.

(i) Why does the farmer use 0.08% carbon dioxide?

Tick (✓) one box.

- To increase the rate of growth of the tomato plants
- To increase the rate of respiration of the tomato plants
- To increase water uptake by the tomato plants

(ii) Why does the farmer not use a concentration of carbon dioxide higher than 0.08%?

Tick (✓) two boxes.

- Because it would cost more money than using 0.08%
- Because it would decrease the temperature of the greenhouse
- Because it would not increase the rate of photosynthesis of the tomato plants any further
- Because it would increase water loss from the tomato plants

(Total 9 marks)
Q1.

(a) 

An extra line from a LH box negates that mark

(b) any one from:

- not enough oxygen present (for aerobic respiration)
- more energy required for exercise (than can be transferred by aerobic respiration)

allow named example for exercise

(c) produces carbon dioxide

produces ethanol

plus any two from:

- (carbon dioxide) makes bread rise
- (carbon dioxide) makes beer / cider / (some) wines fizzy
  allow for alcoholic drinks / named drink
- (ethanol) is the alcohol in beer / cider / wine / spirits

Q2.

(a) (i) glycogen

(ii) respiration

(b) (i) 483 kJ
(ii) oxygen 1

(iii) dilate 1

(c) supplies more / a lot of oxygen or removes more carbon dioxide or release more energy / faster respiration 1

Q3.

(a) carbon water oxygen light chlorophyll starch 1 mark each 6

(b) leaf (or named part of leaf) or chloroplasts accept anywhere green do not credit chlorophyll unless qualified 1

(c) water through the roots or root hairs or by osmosis do not credit where the candidate is unclear about which is which 1

CO₂ through the leaf or stomata or by diffusion 1

(d) any one point:

increased CO₂ concentration increased water supply increased temperature (up to a point) increased light (intensity) accept altered light quality by less green or increasing other colours accept increased duration of exposure to light do not credit sun or sunshine accept CO₂ from respiration
Q4.
(a) (i) trachea
    accept windpipe

(ii) (left) lung or lungs
    do not credit right lung

(b) carbon dioxide or water vapour
    do not credit just ‘water’

oxxygen
    answers in terms of used air or fresh air or of temperature
differences are not acceptable

Q5.
(a) (temperature) thermometer or temperature probe / sensor

(oxygen concentration) oxygen probe / sensor / meter

(b) (i) 13 (arbitrary units)
    allow values in the range 12.5 – 13.5

(ii) the greater the concentration of oxygen the faster the rate of decay

(c) line drawn below line on graph following similar pattern
    line starts at 0% oxygen concentration and from 0 – 3
    arbitrary units

(d) microorganisms / bacteria / fungi
    accept any correct organism
    allow decomposers / detritivores or named example e.g.
worms

plants
    allow crops or named plants

respiration
Q6.
(a) idea that
- light doesn’t reach deeper parts
- plants need / absorb light
- to make food
  gain 1 mark each to maximum of 2
  
  but
  so they can photosynthesise
  gains 2 marks

(b) herring will be on the bottom
herring follow / will be feeding
independent marking points
on the copepods
  for 1 mark each
  
  [4]

Q7.
A – respiration
  ignore breathing
  
  1

B – feeding / eating
  allow consumption / ingestion / feeds
  ignore nutrition / food
  do not accept digestion
  
  1

C – photosynthesis
  
  1

D– combustion / burning
  
  1
  
  [4]

Q8.
(a) (i) photosynthesis
  allow phonetic spellings
  
  1

(ii) respiration
  allow phonetic spellings
  ignore breathing / decay
  
  1

(b) any two from:
- burn / use less fossil fuels
  or
  reduce industrial processes
  or
use cars less
  allow cycle / use buses / walk / trains / public transport
  allow stop for reduce in all cases
- reduce deforestation
  accept named example
  or
  plant more trees
  allow plants
- use alternative sources of energy
  accept solar / wind / nuclear / hydroelectric / wave / tidal / geothermal
  ignore renewable / biomass
- trap CO₂ in sedimentary rocks / underground / under sea
  or
  carbon capture / CCS
- rear less cattle / animals
  allow eat less meat
  allow reduce growth of human population
  ignore reduce the human population

Q9.
(a) more water vapour
  accept more water
  more carbon dioxide
  less oxygen

(b) (i) glucose
  accept carbohydrate(s)
  accept sugar(s)

(ii) heat
  or thermal
  or internal kinetic

(iii) lungs
  accept alveoli / alveolus
  do not credit air sacs
  do not credit capillaries
  both neutral if included with lungs

(c) oxygen
Q10.
(a) carbon dioxide in range 2.5-5%  
    gains 1 mark

    but carbon dioxide closer to 4% than to 3% or 5%  
    gains 2 marks

OR oxygen in range 15-17.5%  
    gains 1 mark

    but If 3 sectors drawn and two correctly labelled,  
    award marks and ignore remaining sector  
    Oxygen and carbon dioxide sectors labelled  
    for 1 mark

(b) carbon dioxide  
    oxygen  
    for 1 mark each

Do not allow water vapour.  
(Allow correct symbols/formulae)

Q11.
(a) oxygen passes from the air/lungs into the body  
    gains 1 mark

    but oxygen passes from the air/lungs into the blood  
    gains 2 marks

    carbon dioxide passes from the body into the air/lungs  
    gains 1 mark

    but carbon dioxide passes from the blood into the air/lungs  
    gains 2 marks

(b) increased/5% more  
    gains 1 mark
but
6 times more (in air breathed out)
gains 2 marks

Q12.
(a) trachea / windpipe
bronchus
alveoli
diaphragm

for 1 mark each

(b) alveoli / air sacs  (reject capillaries)

for one mark

(c) respiration

for one mark

Q13.
(a) (i) oxygen

do not credit air

(ii) lung(s)

do not credit blood or nose or windpipe alone but accept as
a neutral answer if included with lungs

(b) oxygen

lactic acid

both words required

Q14.
(a) A

(b) (i) diffusion

(ii) respiration

(iii) mitochondria
Q15.
(a) (i) carbon dioxide / CO₂ (reject CO)
(ii) oxygen / O₂ / O (reject water vapour)
   for 1 mark each
(b) (provides) energy
   for 1 mark

Q16.
(a)

(b) (i) sugar or carbohydrate
(ii) it can be stored or it is insoluble
     accept it has no osmotic effect
(iii) any one from:
     respires it or releases or transfers energy
     turns it or stores it as fructose or sucrose or lipid or protein or cellulose

(c) (i) photosynthesis
(ii) any one from:
     flat surface
     stomata
     thin
chloroplasts
veins
large surface area
air spaces

*do not accept chlorophyll*

Q17.

X – oxygen

accept $O_2$

Y – carbon dioxide

accept $CO_2$

Q18.

(a) carbon dioxide/$CO_2$

(b) through the roots/root hairs

*do not accept leaves*

(c) oxygen

sugar/glucose/other named sugar/starch/carbohydrate

(d) award one mark for each mark point

*n.b. accept chloroplast for chlorophyll*

*n.b. credit the candidate who answers in terms of the white areas of the leaf*

chlorophyll is green

*e.g. green areas have chlorophyll*

chlorophyll/green is needed for photosynthesis

*e.g. it is only in green areas that photosynthesis can take place*

*after this point do not penalise a candidate if they do not refer to photosynthesis*

light is needed

*e.g. it does not happen in the dark*

*do not accept sunshine/sun*

photosynthesis produces/makes starch

*e.g. starch is made*

so

*e.g. ‘you need light to make starch’ scores 3rd and 4th marking points*
'you need chlorophyll and light for photosynthesis' scores on the 2nd and 3rd marking points
'photosynthesis makes starch and you need green leaves and light for it to work' scores on the 2nd, 3rd and 4th marking points

Q19.
(a) photosynthesis
(b) oxygen
(c) chlorophyll
(d) starch

Q20.
(a) (i) 1st space: carbon dioxide
        allow CO_2 (ignore superscript)
        do not allow CO alone

        2nd space: glucose / sugar / starch / carbohydrate

(b) (i) any one from:
        • move lamp or change distance between lamp and plant
        ignore measure the distance
• change wattage / power of (light) bulb
  *do not accept just “change bulb”*
• change voltage / power supply to the (light) bulb
• change the number of lamps
• put translucent material between lamp and plant
  *accept examples, eg tracing paper / filters*
  *do not accept coloured filters*

(ii) rises
  
  levels off
  
  *ignore numbers*

(iii) idea that it levels off

  or
  
  does not increase at all light intensities

  or
  
  it only increases to a certain amount
  
  *answers should relate to photosynthesis and not to bubbling*

Q21.

(a) respire

  oxygen / glucose
  glucose / oxygen

  \( \{ \text{each once only} \)  

  blood

  carbon dioxide / heat
  heat / carbon dioxide

  \( \{ \text{each once only} \)  

  [6]

Q22.

  in correct sequence:

  breathing

  [1]
Q23.
(a) 66 (beats per minute)
(b) heart rate increased
(c) 4
(d) any two from:
   • resting heart rate was lower
   • heart rate did not increase as much
   • heart rate did not increase as fast
   • heart rate returned to normal sooner
(e) Level 2 (3–4 marks):
A detailed and coherent explanation is given, which logically links changes in the body during exercise to reasons for these changes.
Level 1 (1–2 marks):
Discrete relevant points made. Links may not be made.
0 marks:
No relevant content
Indicative content
Changes:
• breathing rate increases
• deeper breathing
• (body) temperature increases
• sweating occurs
• muscle fatigue
• vasodilation
Explanations linked to correct change:
• to provide more oxygen
• to remove carbon dioxide faster
• (as) more energy required
• (so) increased respiration
• (so) more energy transferred
• for movement or contraction of muscles
• some energy warms the body
• (sweating) cools the body down
• (by) evaporation of sweat

Q24.
(a)  (i)  C and D
   (ii)  cell wall

(b)  (i)  A
   (ii)  D

(c)  respiration

Q25.
   (a)  (i)  A or C

   allow lower case

   (ii)  B or D

   allow lower case

(b)  (i)  60
   (ii)  4

(c)  red blood cells

Q26.
   (a)  any one from:

   •  (type of / amount of) soil / minerals / nutrients / pH
   •  amount of water / time of watering
   •  space between plants / plants and wall
   •  time for growth

   list principle

   ignore carbon dioxide / same number of plants / food

   do not allow temperature / light / exposure to wind

(b)  (i)  North wall

   (ii)  nugget

   list principle

(c)  has not tested all varieties / nugget / champion against all walls
do not allow repeat experiment

Q27.
(a) (i) 150

(ii) any two from:
accept correct use of numbers
accept pulse rate
• lower resting rate
• lower rate during exercise
• recovers faster after exercise
allow a general statement about lower rate if neither of the first two points given

(b) glucose

oxygen

Q28.
(a)

(b) (trachea) has mucus
to trap pathogens

(trachea) has cilia
to move mucus out of trachea
(c) \textbf{dependent variable:}
number of times mosquitoes landed on socks

\textbf{control variable:}
any one from:

- number of mosquitoes in each container
- length of time socks worn
- dampness of socks
- same type of socks
- size of container
- time
- temperature
- species of mosquito
- age of mosquito

(d) use worn socks
   \textbf{or}
   use chemical from worn socks

to attract / trap infected mosquitoes

   \textit{or accept:}
   wear clean socks / change socks regularly (1)
   to reduce the chance of attracting mosquitoes (1)

(e) less chlorophyll present

   (so) less light absorbed

   (so) reduced photosynthesis
   \textbf{or}
   (so) less sugar / food made

[14]

\textbf{Q29.}

(a)  \(70\)

\textit{award 2 marks for correct answer irrespective of working}
allow 1 mark for \(30 + 10 + 24 + 6\) (with wrong answer or no answer), \textbf{do not award this sum if other figure(s) are included in the addition}

(ii)  \(6\)

\textit{award 2 marks for correct answer irrespective of working}
\textit{award 2 marks for correct answer to (a)(i) – 64 (ecf)}
\textit{award 1 mark either for \(70 – 64\) or answer to (a)(i) – 64 with no answer or incorrect answer}

(b) photosynthesis.
Q30.
(a) add mineral ions to the soil
   *extra box ticked cancels the mark*
   1
(b) increasing the temperature
   *each extra box ticked cancels 1 mark*
   1
turning lights on at night
   1

Q31.
(a)

Where most of the chemical reactions...
Nucleus
Absorbs light energy to make food
Cytoplasm
Strengthens the cell
Chloroplast
Controls the activities of the cell

*1 mark for each correct line*
*mark each line from left hand box*
*two lines from left hand box cancels mark for that box*
3
(b) energy
1

Q32.
(a) 40 – 60 hours
1
(b) (i) decrease
1
1st slowly then faster / appropriate detail from the graph – e.g. from 7.8 to 0 / faster after 4 – 10h

(ii) oxygen after glucose

*extra box ticked cancels 1 mark*

oxygen less than glucose

(iii) respiration

[6]

**Q33.**

(a) (LHS) water / H₂O

*allow H₂O*

*do not accept H₂O*

(RHS) glucose / sugar / C₆H₁₂O₆

*allow starch / carbohydrate*

*allow C₆H₁₂O₆*

*do not accept C₆H₁₂O₆*

(b) (i) 1 arbitrary unit

*extra box ticked – cancel*

(ii) 210

(iii) carbon dioxide / CO₂ / CO₂

*or*

temperature / heat / warmth

*do not accept CO²*

ignore mineral ions

ignore water

[5]

**Q34.**

(a) oxygen

*allow O₂ / O₂*

*do not accept O² or O*

(b) (i) light

(ii) chlorophyll

(iii) decrease
any three from:

- for respiration / energy
  
  do not accept use energy for photosynthesis

- to make cellulose / starch
  
  accept named carbohydrate other than glucose

- to make lipid / fat / oil
  
  accept fatty acid / glycerol

- to make protein
  
  accept named protein / amino acid / named amino acid

- to build big molecules from small molecules / metabolism
  
  if no other marks awarded for making molecules allow 1 mark for growth / repair / new cells

Q35.

(a) water

oxygen

in this order only

accept correct chemical symbols

allow $H_2O / OH_2$

(b) allow light (in / through) / need light

do not accept attracts light

ignore heat / moisture / carbon dioxide

ignore so the plants can be seen

accept the converse, ie the black plastic bag would not let light in (1)

for photosynthesis / make sugar / glucose

so there would be no photosynthesis (1)

do not allow make food unqualified

(c) Increase (in leaves / new leaves)

ignore growth unqualified

(then) level off or number of (new) leaves (then) stays the same

numerical statement eg max at 3 tablets / 5 (new) leaves

should refer to one of the first two marking points

for every extra tablet get 1 extra leaf = 2 marks

for every extra tablet get 1 extra leaf then it levels off = 3 marks
Q36.
(a) xylem and phloem
    either order
    allow words ringed in box
    allow mis-spelling if unambiguous

(b) (i) movement / spreading out of particles / molecules / ions / atoms
    ignore names of substances / ‘gases’
    from high to low concentration
    accept down concentration gradient
    ignore ‘along’ / ‘across’ gradient
    ignore ‘with’ gradient

(ii) oxygen / water (vapour)
    allow O₂ / O₂
    ignore O²⁻ / O
    allow H₂O / H₂O
    ignore H²O

Q37.
(a) (i) C and D
    no mark if more than one box is ticked

(ii) any one from:
    do not allow if other cell parts are given in a list
    • (have) cell wall(s)
    • (have) vacuole(s)

(b) (i) A
    apply list principle

(ii) D
    apply list principle

(c) respiration
    apply list principle

Q38.
(a) any two from:
    or allow converse for outdoors
• constant speed
  • variable speed

• constant effort
  • variable terrain

• constant temperature
  • traffic conditions
    • variable temperature
    • wind (resistance)
    • rain / snow
      allow weather

allow pollution only if qualified by effect on body function but ignore pollution unqualified
if no other marks obtained allow variable conditions outdoors 2

(b) Brain 1

(c) (i) 20 800
  correct answer with or without working gains 2 marks
  if answer incorrect, allow 1 mark for use of 1200 and 22 000 only 2

(ii) oxygen
  apply list principle
  do not accept other named substances eg CO₂ water glucose / sugar
    allow glycogen
    ignore food / carbohydrate 1

(iii) respire aerobically 1

(iv) carbon dioxide 1

lactic acid 1

(d) increased heart rate
  ignore adrenaline / drugs
  accept heart beats more but not heart pumps more 1

[11]

Q39.

(a) chlorophyll is needed for photosynthesis 1
light is needed for photosynthesis

(b) increases

levels off / reaches a maximum / remains constant / stays the same / plateaus
do not allow stops / stationary / peaks
allow stops increasing

goes up to / reaches a maximum / levels off at (a rate of) 200 (arbitrary units)
or
levels off at 225 – 240 (light units)
ignore references to other numerical values

(c) (i) higher light intensity does not increase rate of photosynthesis
accept the graph stays level (above this value)
allow stops increasing
allow the rate of photosynthesis stays the same (above this value)

(ii) any two from:
• carbon dioxide (concentration)
• temperature / heat
• (amount of) chlorophyll / chloroplasts
allow water
allow ions / nutrients
ignore ref to surface area of the leaf

Q40.
(a)

<table>
<thead>
<tr>
<th>Structure</th>
<th>Organ</th>
<th>Organ system</th>
<th>Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cells lining the stomach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mouth, oesophagus, stomach, liver,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pancreas, small and large intestine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

all 3 correct = 2 marks
2 correct = 1 mark
1 or 0 correct = 0 marks

(b) (i) diffusion
allow phonetic spelling

(ii) glucose

(iii) mitochondria

Q41.

(a) (i) LHS = water
    accept $H_2O$
    do not accept $H^2O / H2O$
    RHS = oxygen
    accept $O_2$
    do not accept $O / O^2 / O2$

(ii) light / sunlight
    ignore solar / sun / sunshine
    do not allow thermal / heat

(iii) chloroplasts
    allow chlorophyll

(b) (i) 20

(ii) any one from:
• light (intensity)
• temperature.

(c) (i) To increase the rate of growth of the tomato plants

(ii) Because it would cost more money than using 0.08%
    Because it would not increase the rate of photosynthesis of the tomato plants any further

[5]