01 Complete each sentence using the correct words from the box. **[4 marks]**

stunted	iron	nitrate	magnesium
bacteria	virus	fungi	infected

Plants can be _____ by a range of viral, bacterial and fungal pathogens as well as by insects.

Tobacco mosaic _____ damages leaves.

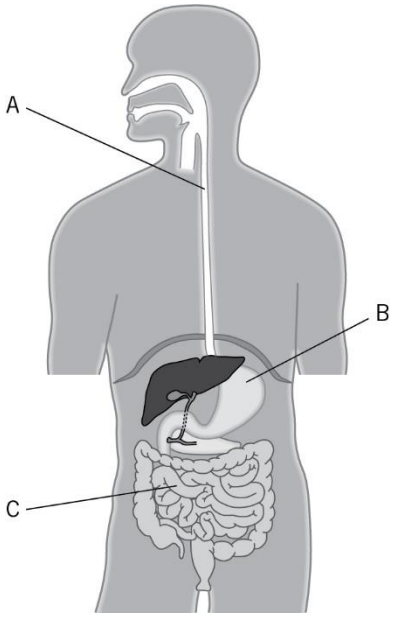
Rose black spot is caused by a _____.

However, chlorosis is caused by a lack of _____ ions.

02 This question is about the human digestive system.

02.1 **Figure 1** shows a diagram of the human digestive system.

Figure 1



Identify **A**, **B** and **C**. **[3 marks]**

A _____

B _____

C _____

02.2 What is a protease? **[1 mark]**

Tick **one** box.

- Amino acid ☐
- Carbohydrate ☐
- Enzyme ☐
- Hormone ☐

02.3 Which **two** organs secrete proteases? **[2 marks]**

Tick **two** boxes.

- Liver ☐
- Pancreas ☐
- Salivary glands ☐
- Stomach ☐

02.4 What organ secretes lipase? **[1 mark]**

Tick **one** box.

- Liver ☐
- Pancreas ☐
- Salivary glands ☐
- Stomach ☐

02.5 Why could a pH probe be used to measure lipase action? **[2 marks]**

_____

03.1 Complete each sentence used the correct words from the box. **[3 marks]**

differentiation	mitosis	genes	chromosome
DNA	gamete	fatty acids	

Many genes make up each _____.

Genes are made from _____.

Each time a cell divides by _____, it must copy each chromosome.

03.2 Which of the following structures found within cells is the smallest? **[1 mark]**

Tick **one** box.

- Glucose ☐
- Mitochondria ☐
- Nucleus ☐
- Ribosomes ☐

03.3 Root tips are often used to studying mitosis.

Suggest a reason why. **[1 mark]**

_____

_____

03.4 Root tips could be used to clone plants.

What is a benefit of this technique? **[1 mark]**

Tick **one** box.

- Crop species with disease resistance can be cloned ☐
- Crop species can be genetically engineered to have disease resistance ☐
- Rare species will continue to grow in the wild ☐
- Rare species will be disease resistant ☐

03.5 Human stem cells may be used to cure diseases.

Give a source of human stem cells. **[1 mark]**

_____

03.6 Give **one** reason why people might object to using human stem cells. **[1 mark]**

_____

03.7 Human stem cells can be cultured in a similar way to culturing bacteria.

Both require aseptic techniques.

Suggest why passing an inoculating loop through a flame is important before transferring bacteria to an agar plate. **[1 mark]**

_____

_____

03.8 A type of bacteria divides every 20 minutes.

A colony of the bacteria has 100 cells.

Calculate how many cells there would be after 1 hour. **[2 marks]**

_____ cells

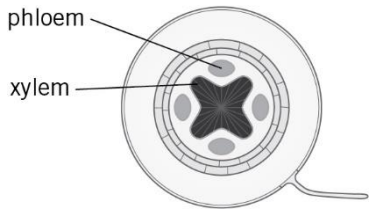
03.9 Name the process that allows bacterial cells to divide? **[1 mark]**

_____

04 Plants contain many organs with specific roles.

Figure 2 shows a cross-section of a carrot's root.

Figure 2



04.1 Which of the following organelles would **not** be found within cells from the carrot root? **[1 mark]**

Tick **one** box.

- Nucleus ☐
- Cell membrane ☐
- Cell wall ☐
- Chloroplasts ☐

04.2 Name the specialised cell responsible for absorbing mineral ions and water from the soil in the carrot. **[1 mark]**

_____

04.3 A student investigated the rate of chloride ion uptake from water by carrot root cells at different temperatures.

The student put carrot pieces into test tubes with 20 cm^3 salt solution and placed the test tubes in water baths.

Their results are shown in **Table 1**.

Table 1

Temperature in ºC	Rate of chloride ion uptake in mg/h
0	1
10	12
20	28
30	26
40	0

Give **two** control variables from the investigation. **[2 marks]**

1 _____

2 _____

04.4 Describe what happens to the rate of uptake as the temperature of the water increases.

Use the information from **Table 1**. **[2 marks]**

_____

_____

_____

04.5 The student concluded that chloride ions are absorbed into a carrot by active transport.

Do you agree with this conclusion? Give a reason for your answer. **[2 marks]**

_____

_____

_____

04.6 The student noticed that the water was more orange in the higher temperatures.

Explain why this occurred. **[2 marks]**

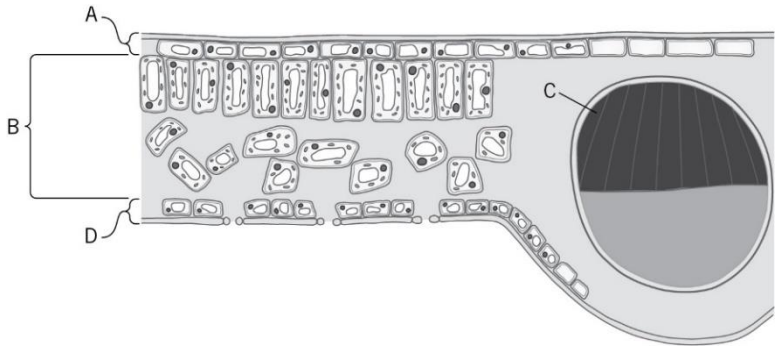
_____

_____

_____

05 **Figure 3** shows a cross-section of a leaf.

Figure 3



05.1 Identify the tissue where most photosynthesis occurs. **[1 mark]**

Circle **one** answer.

A **B** **C** **D**

05.2 Identify the organelle where photosynthesis occurs. **[1 mark]**

Tick **one** box.

Nucleus	☐
Chloroplast	☐
Ribosome	☐
Mitochondrion	☐

05.3 Which of the following are required for photosynthesis? **[2 marks]**

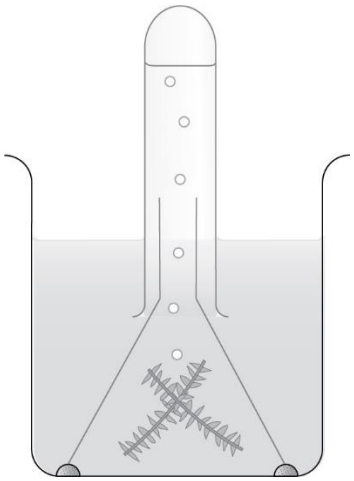
Tick **two** boxes.

Light	☐
Water	☐
Oxygen	☐
Glucose	☐

05.4 A student investigated how the carbon dioxide concentration affected the rate of photosynthesis in pondweed.

Figure 4 shows the apparatus they used.

Figure 4



Suggest how the student could have measured the rate of photosynthesis. **[2 marks]**

_____

_____

_____

05.5 Give **one** control variable for the investigation. **[1 mark]**

_____

05.6 The student collected the following results.

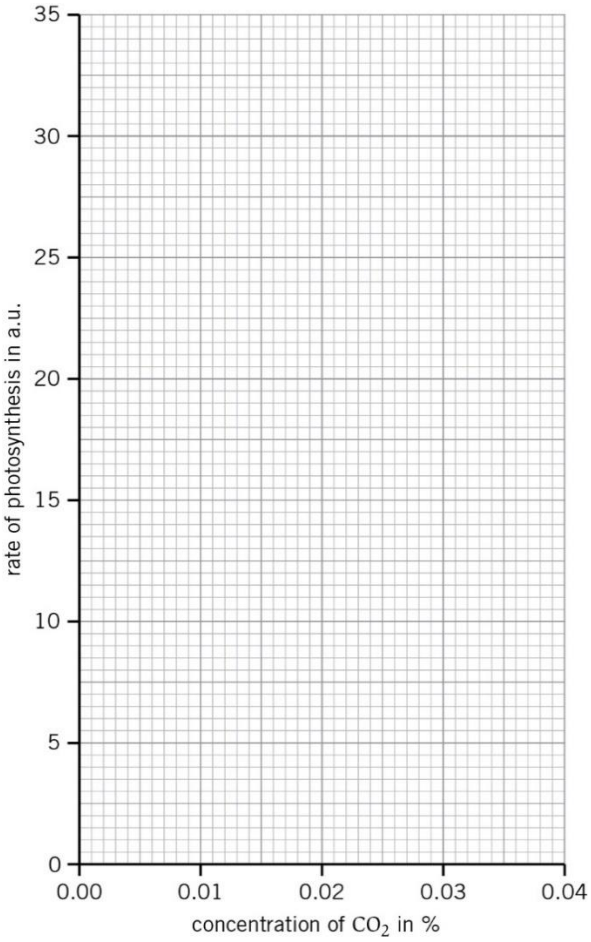
Table 2

Percentage concentration of carbon dioxide	Rate of photosynthesis
0.00	0.00
0.01	25.00
0.02	28.00
0.03	32.00

Plot the data from **Table 2** on the axes in **Figure 5**.

Draw a line of best fit. **[3 marks]**

Figure 5



05.7 The student stated that 0.03% was the best concentration for photosynthesis.

Do you agree with this conclusion?

Explain your answer. **[2 marks]**

_____

_____

_____

05.8 What is the term used to describe a resource, such as carbon dioxide, that prevents photosynthesis from occurring at a faster rate? **[1 mark]**

_____

05.9 Describe how gardeners may increase the concentration of carbon dioxide within a glasshouse. **[1 mark]**

_____

_____

06 The World Health Organization estimates that over 400 000 people died because of malaria in 2015.

06.1 What type of organism causes malaria? **[1 mark]**

Tick **one** box.

- Insect ☐
- Protist ☐
- Fungi ☐
- Bacteria ☐

06.2 Scientists have developed a vaccine against some forms of malaria.

Suggest what may be in the vaccine. **[1 mark]**

_____

06.3 Vaccines are tested on a small number of healthy people before being approved for use.

Suggest a reason for this trial. **[1 mark]**

_____

06.4 Vaccines can stimulate the body to produce antibodies.

Name the type of cell that produces antibodies.

Describe what antibodies do. **[2 marks]**

_____

_____

_____

06.5 The malaria pathogen destroys red blood cells.

Describe the effect this would have on an infected person. **[2 marks]**

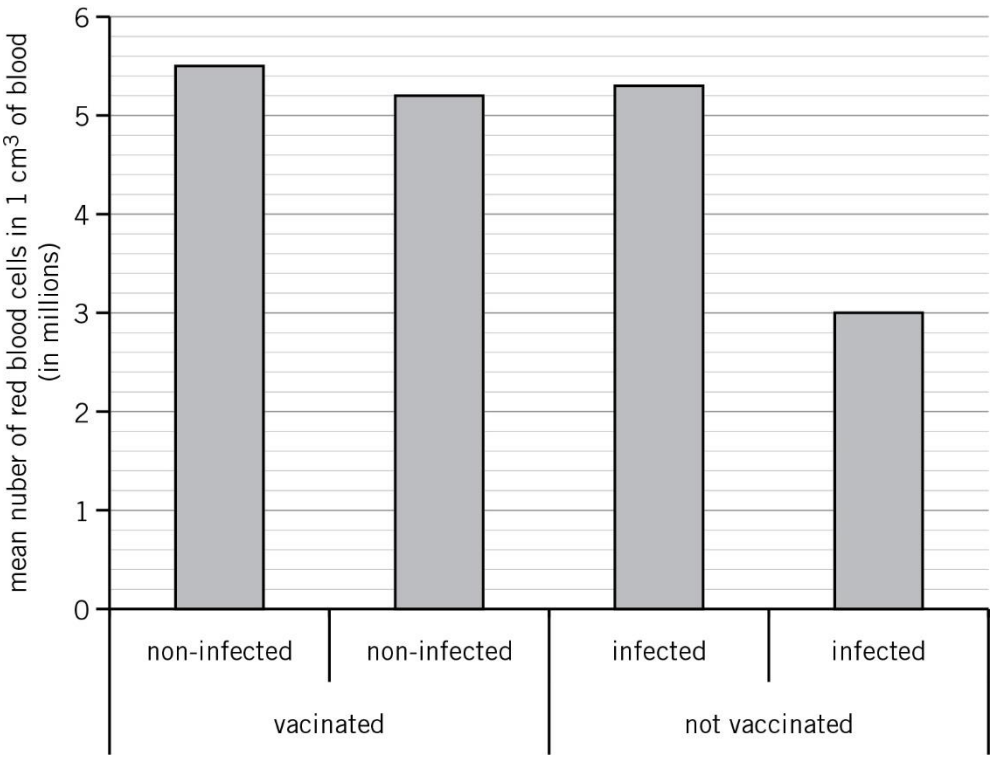
_____

_____

_____

06.6 **Figure 6** shows the number of red blood cells in people who had been vaccinated and those who had not received the vaccine in small area with a high rate of malaria infection.

Figure 6



Describe **two** trends shown by the data in **Figure 6**. **[2 marks]**

1 _____

_____

2 _____

_____

06.7 Give **two** factors scientists need to consider before deciding whether or not to vaccinate a population. **[2 marks]**

1 _____

_____

2 _____

_____

07.1 Skunk cabbage is a plant. In winter, it melts the snow around it due to the processes occurring in its mitochondria.

Give a valid conclusion that explains this observation. **[1 mark]**

Tick **one** box.

- Aerobic respiration releases heat energy ☐
- Aerobic respiration requires heat energy ☐
- Photosynthesis releases heat energy ☐
- Photosynthesis stores energy as heat ☐

07.2 What is required for aerobic respiration? **[2 marks]**

Tick **two** boxes.

- Carbon dioxide ☐
- Glucose ☐
- Oxygen ☐
- Water ☐

07.3 A student observes a diagram of a mitochondrion that has been magnified by ×25 000. They record the length of the image as 25 mm.

Calculate the actual length of the mitochondrion.

Give the unit. **[2 marks]**

Use the equation:

$$\text{actual length} = \frac{\text{image length}}{\text{magnification}}$$

Actual length:_____

Unit:_____

07.4 In the absence of oxygen, skunk cabbage produces the same substances as yeast when they respire.

Name the **two** substances produced by skunk cabbage during anaerobic respiration. **[2 marks]**

1 _____

_____

2 _____

_____

07.5 The products of anaerobic respiration are used in food production.

Name a food that is produced using yeast. **[1 mark]**

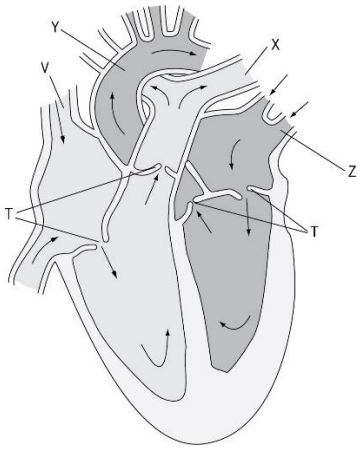
_____

07.6 Give **one** difference between a yeast cell and a plant cell. **[1 mark]**

_____

08 **Figure 7** shows a diagram of the mammalian heart.

Figure 7



08.1 Which blood vessel carries oxygenated blood coming from the lungs? **[1 mark]**

Circle **one** answer.

W **X** **Y** **Z**

08.2 The heart has a number of valves.

Describe the role of valve **T**. **[2 marks]**

_____

_____

_____

08.3 Describe how a student could investigate the effect of exercise on pulse rate, ensuring that they collect valid data. **[6 marks]**

_____

_____

_____

_____

_____

_____

_____

_____

08.4 A student investigated the effect of age on the resting pulse rate of adults.

They measured the resting heart rate of nine different people.

Their results are shown in **Table 3**.

Table 3

Age	Resting pulse rate (beats per minute)			
	Person 1	Person 2	Person 3	Mean
25–34	65	72	80	72.3
35–44	74	80	80	
45–54	96	88	92	92.0

Calculate the mean resting pulse rate for the 35-44 year old age group.

Write this value in **Table 3**. **[1 mark]**

_____

_____

_____

08.5 Describe the trend between resting pulse rate and age. **[2 marks]**

_____

_____

_____

08.6 Person **3** in the age group 25–34 did some light exercise and their pulse rate increased by 40% after 3 minutes.

Calculate their new pulse rate. **[2 marks]**

_____

_____

_____

_____

New pulse rate: _____beats per minute

08.7 Explain why this individual's pulse rate increased following exercise. **[3 marks]**

_____

_____

_____

09 A student investigated the effect of temperature on the rate of starch digestion by amylase.

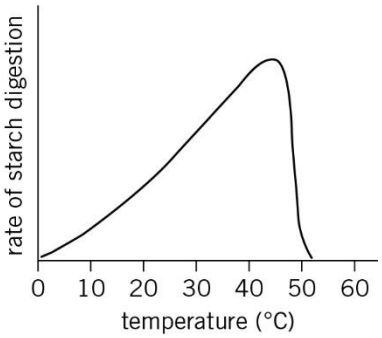
They used iodine solution to test for the presence of starch.

09.1 What colour would the iodine solution change to if starch was present? **[1 mark]**

_____

09.2 **Figure 8** shows a graph of their results.

Figure 8



Explain why the rate of starch digestion decreased at temperatures higher than 40 °C. **[2 marks]**

_____

_____

09.3 Explain why it is important that starch is digested. **[2 marks]**

_____

_____

_____

09.4 Starch is an example of a carbohydrate.

Carbohydrates are a source of energy.

Which of the following can be caused by a diet that is higher in energy than the person needs? **[1 mark]**

Tick **one** box.

Cervical cancer ☐

Obesity ☐

Tooth decay ☐

Type 1 diabetes ☐

09.5 Bile is another substance secreted by the digestive system.

Which organ produces bile? **[1 mark]**

Tick **one** box.

Pancreas ☐

Gall bladder ☐

Liver ☐

Stomach ☐

09.6 Give the property of bile that allows it to neutralise the stomach acid. **[1 mark]**

_____

09.7 Bile also emulsifies fats, increasing the rate of their digestion.

A slimming company claims to have made a drug that stops the gall bladder from secreting bile.

It states that 80% of the ten women lost weight whilst taking this drug for one month.

Evaluate the claim made by the company and decide whether the company should be allowed to sell this drug. **[6 marks]**

_____

_____

_____

_____

_____

_____

_____

_____

End of questions