

## Organisation part 10

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Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

Time: **73 minutes**

Marks: **73 marks**

Comments:

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**Q1.**

The circulatory system contains arteries and veins.

- (a) (i) Describe how the structure of an artery is different from the structure of a vein.

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(2)

- (ii) A comparison is made between blood taken from an artery in the leg and blood taken from a vein in the leg.

Give **two** differences in the composition of the blood.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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(2)

- (b) During operations patients can lose a lot of blood. Patients often need blood transfusions to keep them alive.

The text shows information about a new artificial blood product.

**Sea worms give hope for people in need of blood transfusions**

Scientists have carried out a five-year trial using a new artificial blood product. The scientists have used a protein from sea worms to create the new artificial blood and the results from the trial are very positive. Thousands of sea worms can be grown and collected.

During the trial, mice were given blood transfusions of the artificial blood. The bodies of the mice tolerated the artificial blood and the artificial blood did not cause any side effects.

Suggest **two** possible advantages of using the new artificial blood, instead of using human blood for a transfusion in humans.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(2)

(Total 6 marks)

**Q2.**

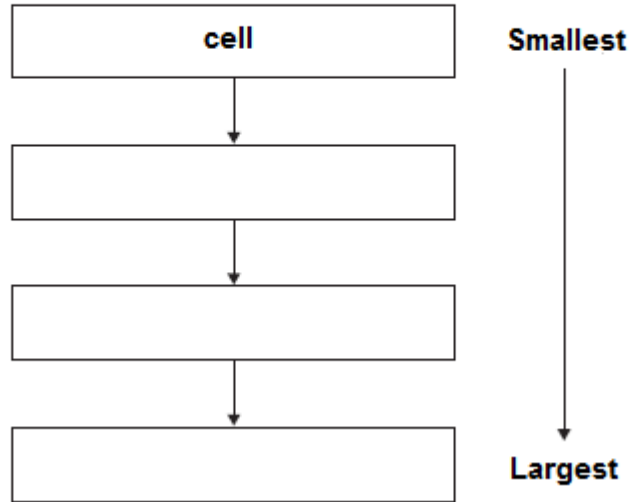
The human body is organised to carry out many different functions.

- (a) Use words from the box to complete **Figure 1** by putting the parts of the body in order of size from smallest to largest.

The smallest one has been done for you.

<b>cell</b>	<b>organ system</b>	<b>organ</b>	<b>tissue</b>
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**Figure 1**



(2)

- (b) The stomach is made of different types of tissue.

Draw **one** line from each type of stomach tissue to the correct description.

Epithelial tissue	Allows food to be churned around the stomach
Glandular tissue	Covers the outside and the inside of the stomach
Muscular tissue	Produces digestive juices
	Coordinates nerve impulses

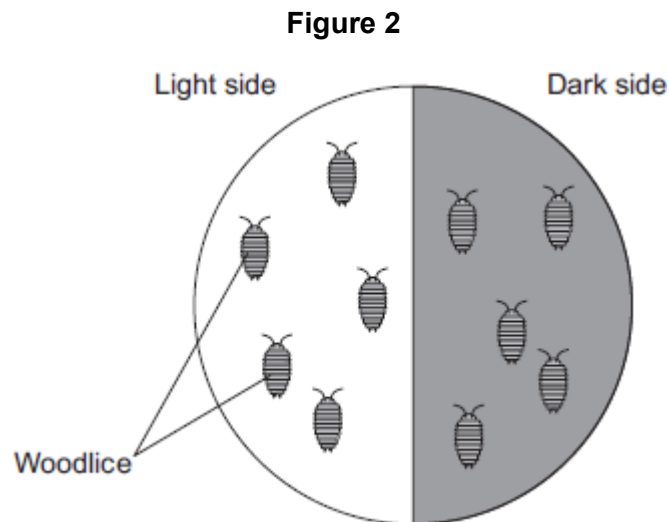
(3)

- (c) Animals can react to their surroundings because they have nervous systems.

A student investigated the behaviour of small animals called woodlice.

The student set up the investigation as shown in **Figure 2**.

- The student covered one half of a Petri dish with black paper to make that side of the Petri dish dark.
- The other side had no cover.
- The student put five woodlice into each side of the dish and then put the clear Petri dish lid back on the dish.



After 30 minutes, all the woodlice had moved to the dark side of the Petri dish.

- (i) In this investigation, what is the **stimulus** that the woodlice responded to?

\_\_\_\_\_ (1)

- (ii) In this investigation, what is the **response** that the woodlice made?

\_\_\_\_\_ (1)

- (iii) The student concluded that woodlice prefer dark conditions.

Give **two** ways in which the student could improve the investigation to be sure that his conclusion was correct.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

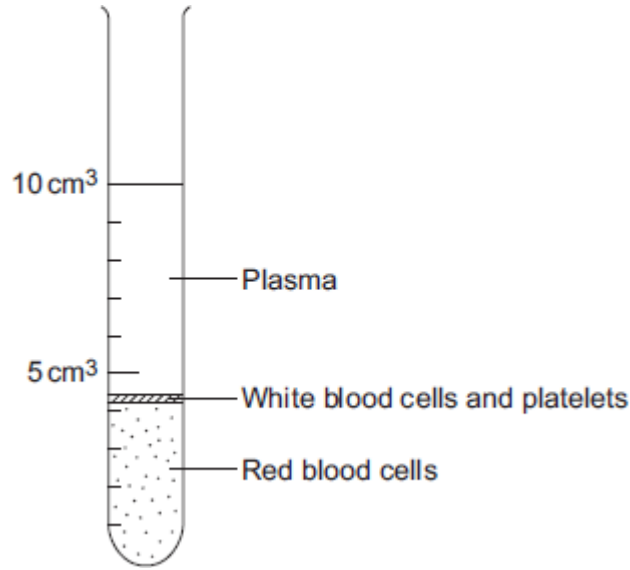
\_\_\_\_\_

(2)  
(Total 9 marks)

**Q3.**

The parts of the blood can be separated from each other by spinning the blood in a centrifuge.

The image below shows the separated parts of a 10 cm<sup>3</sup> blood sample.



(a) Calculate the percentage of the blood that is made up of plasma.

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Answer = \_\_\_\_\_ %

(2)

(b) Name **three** chemical substances transported by the plasma.

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

(3)

(c) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

White blood cells are part of the immune system. White blood cells help the body to defend itself against pathogens.

Describe how pathogens cause infections **and** describe how the immune system defends the body against these pathogens.

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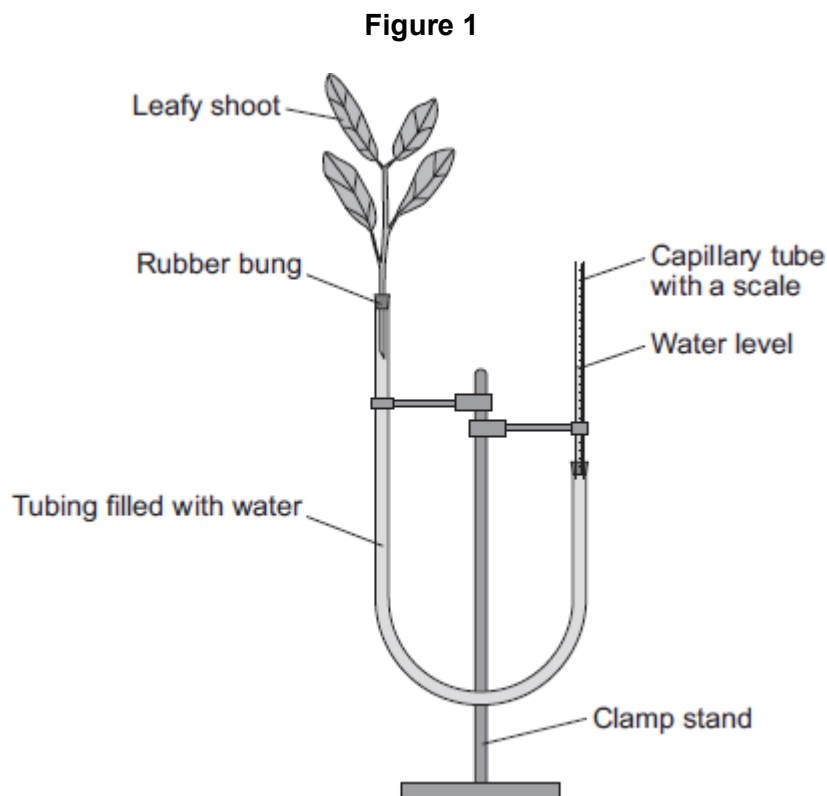
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(6)  
(Total 11 marks)

**Q4.**

A potometer is a piece of apparatus that can be used to measure water uptake by a leafy shoot.

**Figure 1** shows a potometer.



Some students used a potometer like the one shown in **Figure 1**.

- They measured the water taken up by a shoot in normal conditions in a classroom.
- As the water was taken up by the shoot, the level of water in the capillary tube went down.
- The students recorded the level of the water in the capillary tube at 2-minute intervals for 10 minutes.

**Table 1** shows the students' results.

**Table 1**

Time in minutes	0	2	4	6	8	10
Level of water (on scale) in capillary tube in mm	2.5	3.6	4.4	5.4	6.5	7.5

The area of the cross section of the capillary tube was  $0.8 \text{ mm}^2$ .

- (a) (i) Complete the following calculation to find the volume of water taken up by the shoot in  $\text{mm}^3$  per minute.

Distance water moved along the scale in 10 minutes = \_\_\_\_\_ mm

Volume of water taken up by the shoot in 10 minutes = \_\_\_\_\_  $\text{mm}^3$

Therefore, volume of water taken up by the shoot in 1 minute = \_\_\_\_\_  $\text{mm}^3$

(3)

- (ii) The students repeated the investigation but this time placed the potometer next to a fan blowing air over the leafy shoot.

Suggest how the results would be different. Give a reason for your answer.

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(2)

- (b) The students repeated the investigation at different temperatures.

The results are shown in **Table 2**.

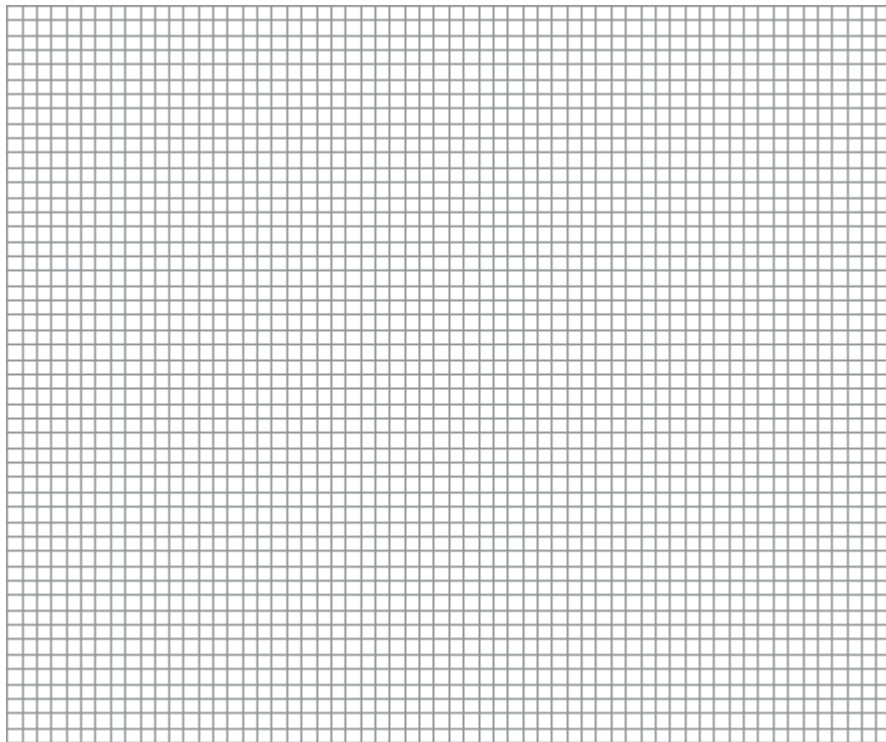
**Table 2**

Temperature in $^{\circ}\text{C}$	Rate of water uptake in $\text{mm}^3$ per minute
10	0
15	0.4
20	1.0
25	2.1
30	3.2
35	4.0
40	4.4

Plot the data from **Table 2** on the graph paper in **Figure 2**.

Choose suitable scales, label both axes and draw a line of best fit.

**Figure 2**



**(5)**

- (c) What would happen to the leaves if the potometer was left for a longer time at 40 °C?

Explain your answer.

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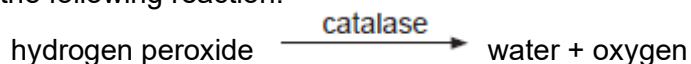
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**(3)**

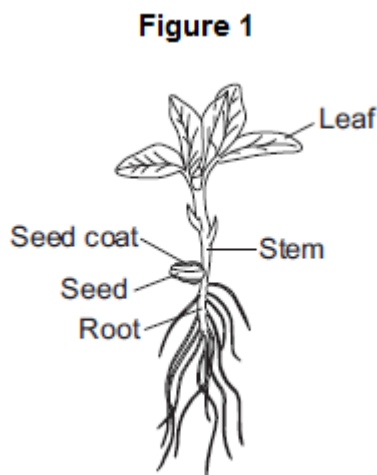
**(Total 13 marks)**

**Q5.**

Catalase is an enzyme found in many different tissues in plants and animals. It speeds up the rate of the following reaction.



**Figure 1** shows a 25-day-old broad bean seedling.



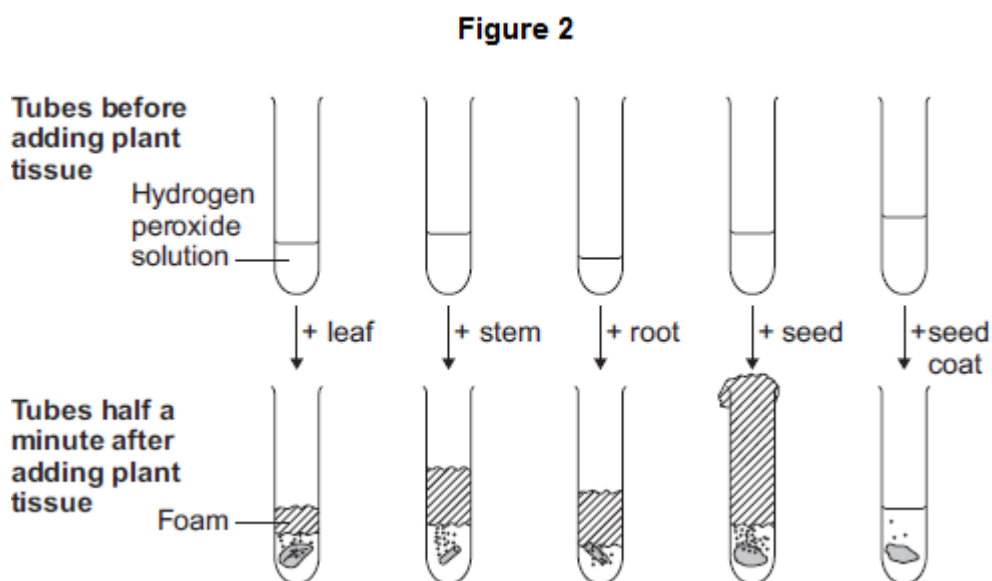
Some students investigated whether different parts of bean seedlings contained different amounts of catalase.

The students:

- put hydrogen peroxide into five test tubes
- added a different part of a bean seedling to each tube
- recorded the results after half a minute.

If there was catalase in part of the seedling, oxygen gas was given off. When oxygen gas is given off, foam is produced in the tubes.

**Figure 2** shows the results.





- (b) Scientists investigated the effect of pH on the activity of the enzyme catalase in a fungus.

The table below shows the scientists' results.

pH	Enzyme activity in arbitrary units					
	Test 1	Test 2	Test 3	Test 4	Test 5	Mean
3.0	0	0	0	0	0	0
4.0	6	5	8	4	7	6
5.0	38	65	41	42	39	
5.5	80	86	82	84	88	84
6.0	100	99	96	103	102	100
6.5	94	92	90	93	91	92
7.0	61	63	61	62	63	62
8.0	22	22	21	24	21	22

- (i) Calculate the mean enzyme activity at pH 5.0.

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Mean = \_\_\_\_\_ arbitrary units

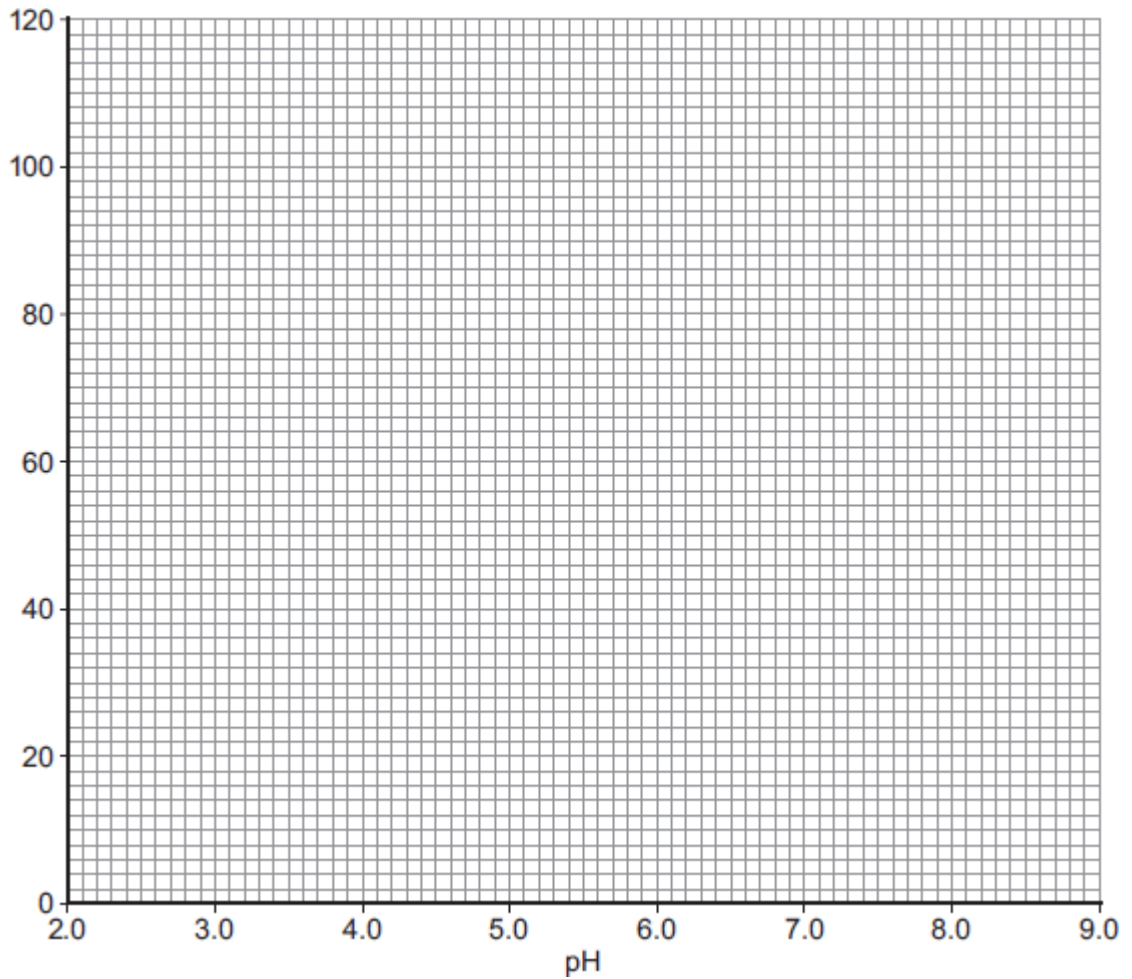
(2)

- (ii) On the graph paper in **Figure 3**, draw a graph to show the scientists' results.

Remember to:

- add a label to the vertical axis
- plot the mean values of enzyme activity
- draw a line of best fit.

**Figure 3**



(4)

(iii) At what pH does the enzyme work best?

\_\_\_\_\_

(1)

(iv) Predict the activity of the enzyme at pH 9.0.

\_\_\_\_\_ arbitrary units

(1)

(v) Suggest why the enzyme's activity at pH 3.0 is zero.

\_\_\_\_\_  
\_\_\_\_\_

(1)

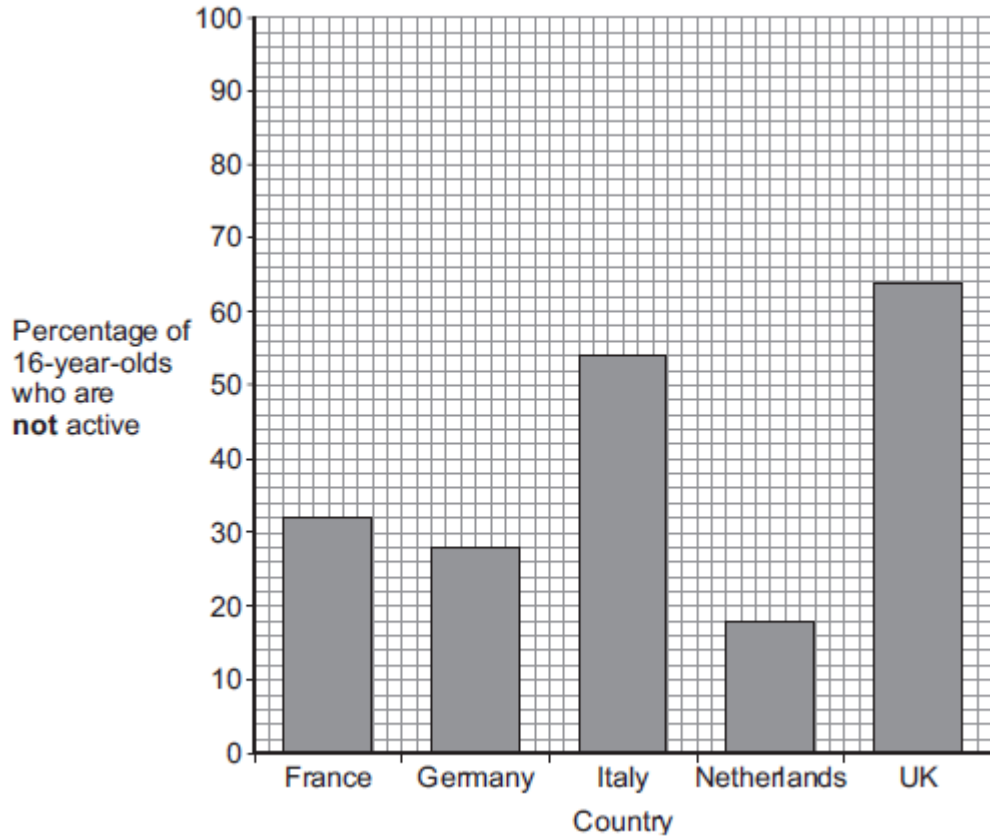
**(Total 15 marks)**

**Q6.**

Scientists investigated the effect of different factors on health.

- (a) People who are **not** active may have health problems.

The graph shows the percentage of 16-year-olds in some countries who are **not** active.



- (i) What percentage of 16-year-olds in the UK are **not** active?

\_\_\_\_\_ %

(1)

- (ii) What percentage of 16-year-olds in the UK are **active**?

\_\_\_\_\_ %

(1)

(iii) A newspaper headline states:

People in the UK are the laziest in the world.

Information in **Figure 1** does **not** support the newspaper headline.

Suggest **one** reason why the newspaper headline may be wrong.

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(1)

(b) Doctors gave a percentage rating to the health of 16-year-olds.  
100% is perfect health.

The table shows the amount of exercise 16-year-olds do and their health rating.

Amount of exercise done in minutes every week	Health rating as %
Less than 30	72
90	76
180	82
300	92

What conclusion can be made about the effect of exercise on health?

Use information from the table.

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(1)

(c) Inherited factors can also affect health.

Give **one** health problem that may be affected by the genes someone inherits.

Draw a ring around the correct answer.

**being malnourished**

**having a high cholesterol level**

**having a deficiency disease**

(1)

(d) White blood cells are part of the immune system.

Use the correct answer from the box to complete each sentence.

<b>antibiotics</b>	<b>antibodies</b>	<b>pathogens</b>	<b>vaccines</b>
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(i) When we are ill, white blood cells produce \_\_\_\_\_ to kill microorganisms.

(1)

(ii) Many strains of bacteria, including MRSA, have developed resistance to drugs called

\_\_\_\_\_

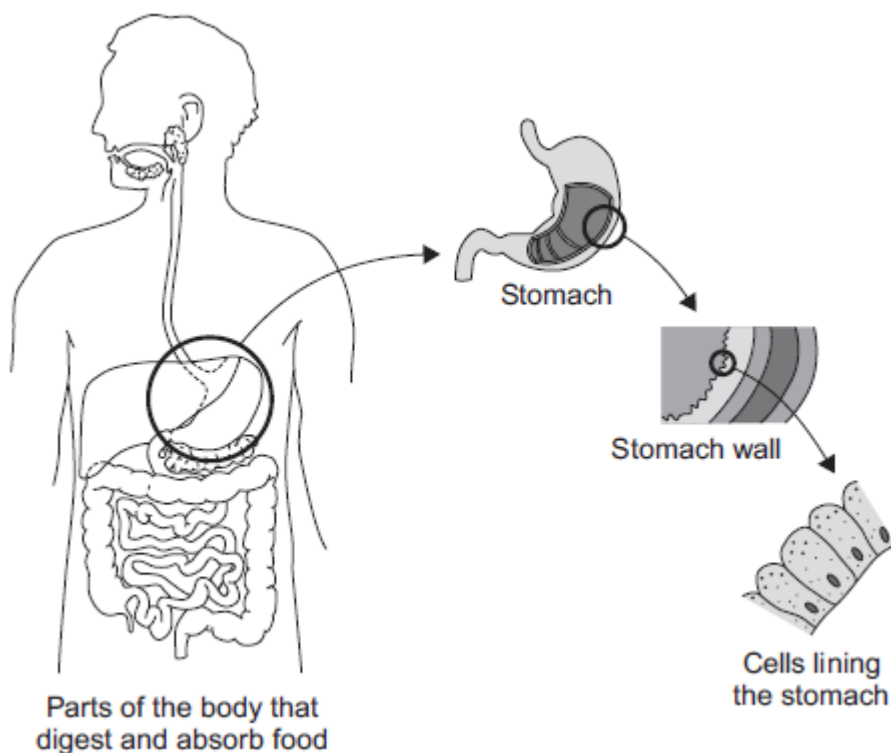
(1)

(Total 7 marks)

**Q7.**

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.

Structure	Organ	Organ system	Tissue
Stomach			
Cells lining the stomach			
Mouth, oesophagus, stomach, liver, pancreas, small and large intestine			

(2)

- (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 \_\_\_\_\_.

(1)

- (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**

(1)

- (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)

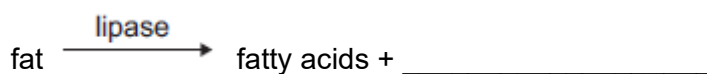
### Q8.

Lipase is an enzyme that digests fat.

- (a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

<b>glucose</b>	<b>glycerol</b>	<b>glycogen</b>
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(1)

- (ii) Name **one** organ that makes lipase.

\_\_\_\_\_

(1)

- (b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:

- 1 mixed milk and bile in a beaker
- 2 put the pH sensor of a pH meter into the beaker
- 3 added lipase solution
- 4 recorded the pH at 2-minute intervals
- 5 repeated steps 1 to 4, but used water instead of bile.

Suggest **two** variables that the students should have controlled in this investigation.

1. \_\_\_\_\_

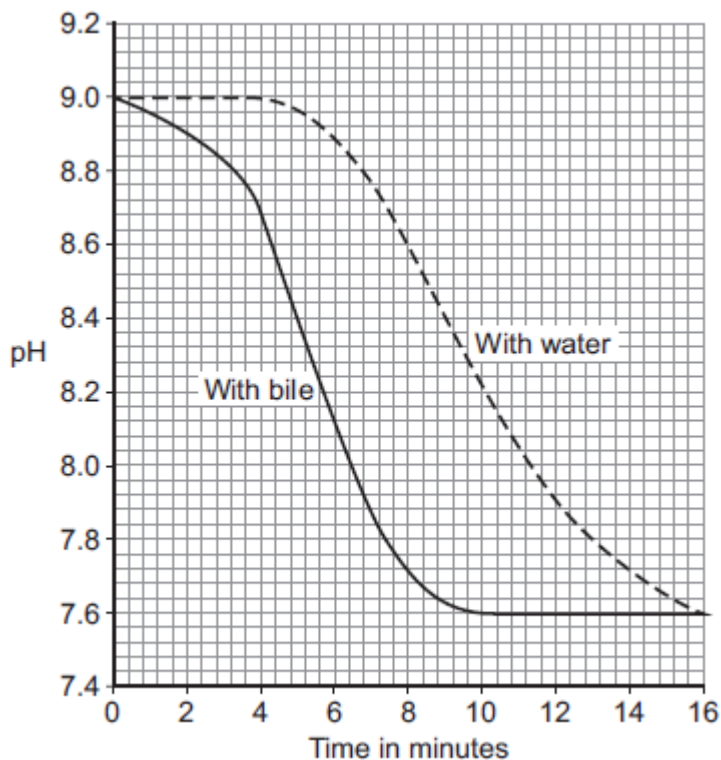
\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(2)

(c) The graph shows the students' results.



(i) Why did the pH decrease in both investigations?

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---

(1)

(ii) Bile helps lipase to digest fat.

What evidence is there in the graph to support this conclusion?

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(1)

(iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

---

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(1)

(Total 7 marks)

## Mark schemes

### Q1.

- (a) (i) doesn't have valves  
*allow veins have valves* 1
- has a thicker wall **or** thicker layer of muscle  
*allow has a smaller lumen*  
*ignore references to elastic (in walls)* 1
- (ii) any **two** from:
- (artery has) more oxygen
  - (artery has) more glucose  
*allow (artery has) more amino acids / fatty acids*
  - (artery has) less carbon dioxide
  - (artery has) less lactic acid  
*ignore urea*  
*ignore reference to pressure*  
*accept converse for veins if veins is clearly stated* 2
- (b) any **two** from:
- no rejection  
*allow no tissue matching required*
  - abundant supply
  - low risk of infection  
*allow named example ie HIV, CJD*
  - longer shelf life  
*allow less space needed for storage*  
*ignore side effects* 2

[6]

### Q2.

- (a) tissue → organ → organ system  
*one right for 1 mark*  
*three right for 2 marks* 2
- (b) **Epithelial tissue** → covers the outside and the inside of the stomach  
*more than one line from a tissue = no mark* 1
- Glandular tissue** → produces digestive juices 1
- Muscular tissue** → allows food to be churned around the stomach 1
- (c) (i) light

*ignore dark*

1

(ii) moving (to the dark)

1

(iii) any **two** from:

- use more woodlice
- repeat the experiment
- run for a longer time

2

[9]

**Q3.**

(a) 55%

*2 marks for correct answer alone*

*accept 54 – 56*

*5.5 / 10 × 100 alone gains 1 mark*

2

(b) any **three** from:

- amino acids
- antibodies
- antitoxins
- carbon dioxide
- cholesterol
- enzymes
- fatty acid
- glucose
- glycerol
- hormones / named hormones
- ions / named ions
- proteins
- urea
- vitamins
- water.

*ignore blood cells and platelets*

*ignore oxygen*

*max 1 named example of each for ions and hormones*

*allow minerals*

3

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content.

**Level 1 (1 – 2 marks)**

There is a description of pathogens with errors or roles confused.

**or**

the immune response with errors or roles confused.

**Level 2 (3 – 4 marks)**

There is a description of pathogens **and** the immune response with some errors or confusion

**or**

a clear description of either pathogens **or** the immune response with few errors or little confusion.

**Level 3 (5 – 6 marks)**

There is a good description of pathogens **and** the immune response with very few errors or omissions.

**Examples of biology points made in the response:**

- bacteria and viruses are pathogens  
*credit any ref to bacteria and viruses*
- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

white blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses  
*credit engulf / digest / phagocytosis*
- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)  
*credit memory cells / correct description*
- this leads to immunity from that pathogen.

6

[11]

**Q4.**

- |     |      |                                     |   |
|-----|------|-------------------------------------|---|
| (a) | (i)  | 5.0                                 | 1 |
|     |      | (5 × 0.8) <b>or</b> 4               |   |
|     |      | <i>allow ecf from distance</i>      | 1 |
|     |      | 0.4                                 |   |
|     |      | <i>allow ecf from 10-min volume</i> | 1 |
|     | (ii) | increased (rate of uptake)          | 1 |
|     |      | more transpiration / evaporation    | 1 |
| (b) |      | correct scales                      |   |
|     |      | <i>allow reversed axes</i>          | 1 |

correctly labelled axes with units	1
correct points	
<i>one plot error = max 1 mark</i>	2
curved line of best fit	
<i>allow correct straight line</i>	1
(c) leaves <u>wilt</u>	1
because plants lose too much water (by evaporation)	1
through the <u>stomata</u>	
<b>or</b>	
because cells become <u>plasmolysed</u>	
<b>or</b>	
<u>stomata</u> close	
controlled by <u>guard cells</u>	
to prevent <u>wilting</u>	1

[13]

### Q5.

- (a) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance and apply a 'best-fit' approach to the marking.

#### 0 marks

No relevant content.

#### Level 1 (1–2 marks)

The method described is weak and could not be used to collect valid results, however does show some understanding of the sequence of an investigation.

#### Level 2 (3–4 marks)

The method described could be followed and would enable some valid results to be collected, but lacks detail.

#### Level 3 (5–6 marks)

The method described could be easily followed and would enable valid results to be collected.

#### Examples of the points made in the response:

- bean seedlings of same age
- cut material from same part of each organ (for repeats) e.g. top 1 cm of stem / a whole cotyledon / seed
- equal mass of each organ  
    *accept weight for mass*
- grind / homogenise
- in equal amounts of water / buffer
- equal volumes of hydrogen peroxide solution

- equal concentrations of hydrogen peroxide solution
- same temperature
- temperature maintained in water bath
- quantitative measure of gas production eg height of foam in mm / collect gas in graduated syringe in cm<sup>3</sup>
- for same time period
- repetitions (3+ times)
- calculate mean for each.

6

(b) (i) correct answer: 40

*1 mark for 45 as the anomalous result has been included in the calculation*

*or*

$$\frac{(38 + 41 + 42 + 39)}{4}$$

*1 mark for*                      4

$$\frac{160}{4}$$

*or* 4

2

(ii) vertical axis correctly labelled:  
‘Enzyme activity in arbitrary units’

*allow ecf from (b)(i)*

1

points plotted correctly  $\pm 1$  mm

*deduct 1 mark for each incorrect plot*

2

suitable line of best fit

*not feathery, not point to point*

1

(iii) 6.0 / 6

*allow  $\pm 0.1$*

*if 6.0 not given, allow correct for candidate’s graph  $\pm 0.1$*

1

(iv) in range 0 to 14 units

*allow correct for candidate’s graph*

1

(v) enzyme denatured / enzyme (active site) shape changed

*allow substrate no longer fits (active site)*

*ignore reference to temperature*

*do not allow enzyme dies*

1

[15]

**Q6.**

(a) (i) 64

1

(ii) 36

allow e.c.f from (i) i.e. 100 – answer given in (a)(i)

1

(iii) any **one** from:

- only considers 16-year-olds  
*ignore lack of evidence*  
*allow does not refer to all ages*
- only about some / 5 countries  
*allow does not refer to all countries.*

1

(b) the more exercise done the healthier a person is

*allow the more exercise done the higher the health rating*

*allow the less exercise done the lower the health rating*

1

(c) having a high cholesterol level

1

(d) (i) antibodies

1

(ii) antibiotics

1

[7]

### Q7.

(a)

Structure	Organ	Organ system	Tissue
Stomach	✓		
Cells lining the stomach			✓
Mouth, oesophagus, stomach, liver, pancreas, small and large intestine		✓	

all 3 correct = 2 marks

2 correct = 1 mark

1 or 0 correct = 0 marks

2

(b) (i) diffusion

*allow phonetic spelling*

1

(ii) glucose

1

(iii) mitochondria

1

## Q8.

- (a) (i) glycerol 1
- (ii) pancreas / small intestine  
*accept duodenum / ileum*  
*ignore intestine unqualified* 1
- (b) any **two** from:
- type of milk
  - volume / amount of milk
  - vol. bile equals vol. water
  - volume of lipase
  - concentration of lipase
  - temperature
- ignore time interval*  
*ignore solution unqualified*  
*do **not** allow pH*  
*ignore starting pH*  
*ignore volume / amount of bile / water*  
*ignore concentration of bile*  
*accept amount of lipase if neither volume nor concentration given* 2
- (c) (i) fatty acid (production) 1
- (ii) faster reaction / digestion (with bile)  
**or**  
 pH decreases faster (with bile)  
**or**  
 takes less time (with bile)  
**or**  
 steeper fall / line (with bile)  
*allow use of data*  
*ignore easier* 1
- (iii) all fat / milk digested  
**or**  
 same amount of fatty acids present  
**or**  
 (lower pH) denatures the enzyme / lipase  
*allow all reactants used up*  
*ignore reference to neutralisation*  
*allow enzyme won't work at low pH*  
*do **not** allow enzyme killed* 1