B3- Organisation and the digestive system Exam Practice 1

Name:

Score:

Q1.

Proteins are an important part of the human diet.

(a) Proteins are large food molecules that must be broken down in the digestive system.

Which enzyme breaks down proteins?

Tick (✓) **one** box.

Carbohydrase ☐

Lipase ☐

Protease ☐

(1)

Proteins are digested into amino acids.

The body breaks down unwanted amino acids.

(b) Which organ breaks down unwanted amino acids?

Tick (✓) **one** box.

Brain ☐ Liver ☐ Lung ☐

(1)

(c) What is produced by the breakdown of unwanted amino acids?

Tick (✓) **one** box.

Fat ☐ Starch ☐ Urea ☐

(1)

Mycoprotein is a protein made from a fungus.

The table below shows information about mycoprotein sausages and meat sausages.

Nutrient	Mass of nutrient in grams per 100 grams	
	Mycoprotein sausages	**Meat sausages**
Protein	14.3	18.3
Carbohydrate	4.5	0.0
Fat	2.0	19.8
Salt	0.9	1.1

(d) Give **three** differences between the nutrient content of mycoprotein sausages and meat sausages.

1 _____

_____

2 _____

_____

3 _____

_____

(3)

A student tested the mycoprotein sausage and the meat sausage for protein.

(e) What is used to test for protein?

Tick (✓) **one** box.

Biuret reagent ☐

Iodine solution ☐

pH indicator solution ☐

(1)

(f) What colour is the positive result for the test for protein?

Tick (✓) **one** box.

Black ☐

Lilac ☐

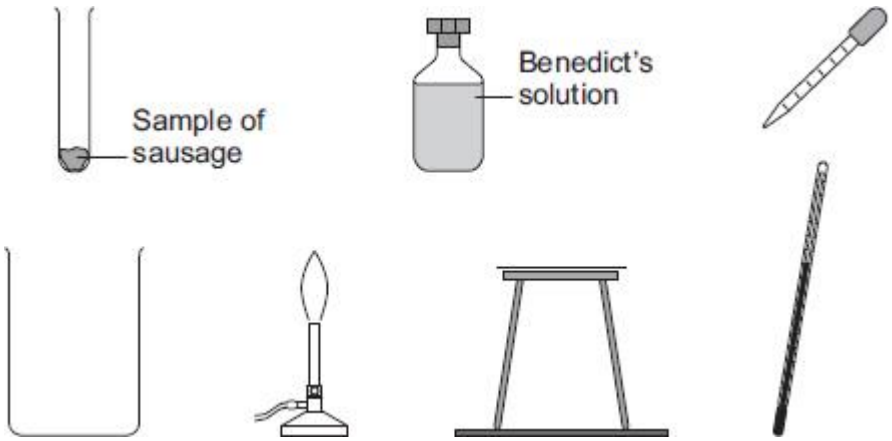
Red ☐

White ☐

(1)

(g) The student investigated the sugar content of the mycoprotein sausage and the meat sausage.

The figure below shows some of the apparatus used.



Describe a method to compare the amount of sugar in the two types of sausage.

Use the apparatus in the figure above in your answer.

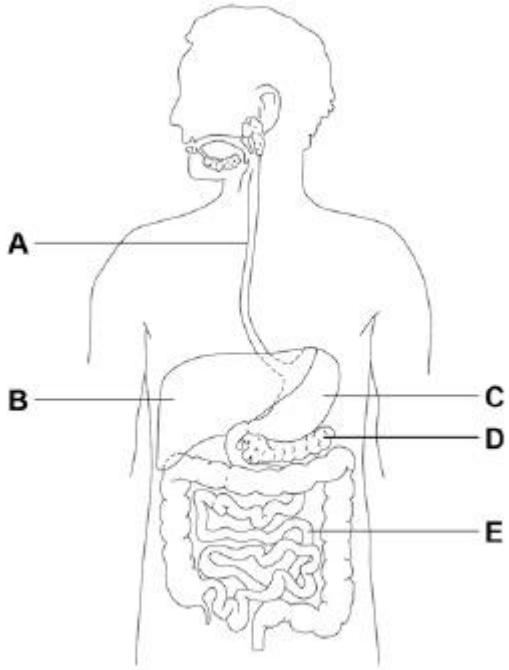
(6)

(Total 14 marks)

Q2.

Figure 1 shows the human digestive system.

Figure 1



(a) Which organ in **Figure 1** produces acid?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(b) Which organ in **Figure 1** produces bile?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(c) Where in **Figure 1** are digested foods absorbed into the blood?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(d) Food molecules such as proteins **cannot** be absorbed unless they are digested.

Give **one** reason why.

_____

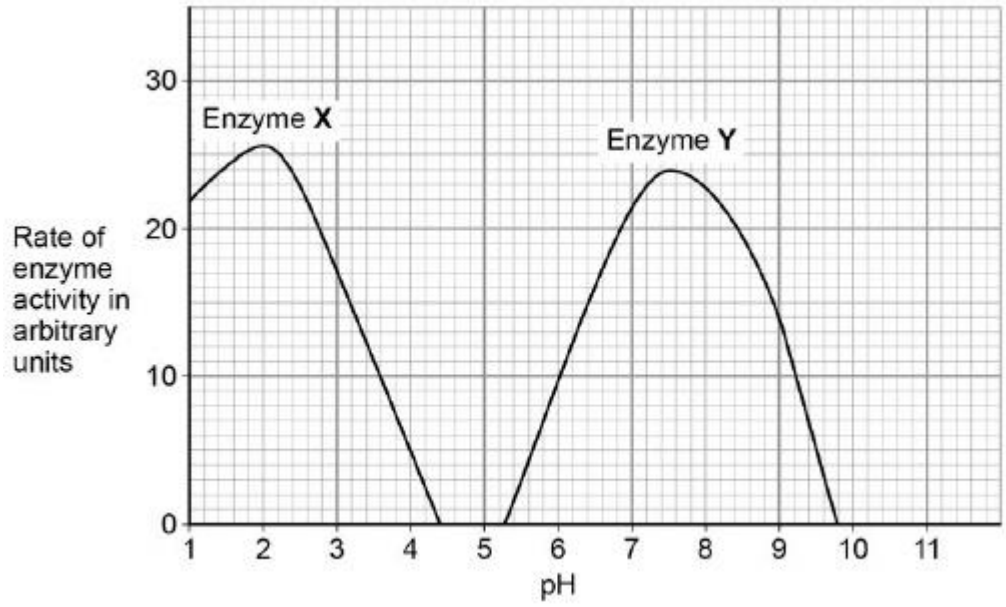
_____

(1)

A scientist investigated the effect of pH on the activity of two protease enzymes.

Figure 2 shows the results.

Figure 2



(e) What is the optimum pH for enzyme **Y**?

pH _____

(1)

(f) Where in the digestive system might the two protease enzymes be produced?

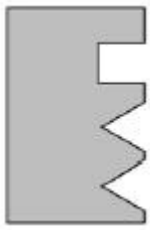
Tick **one** box.

Enzyme X	Enzyme Y	
Mouth	Stomach	☐
Pancreas	Mouth	☐
Small intestine	Pancreas	☐
Stomach	Small intestine	☐

(1)

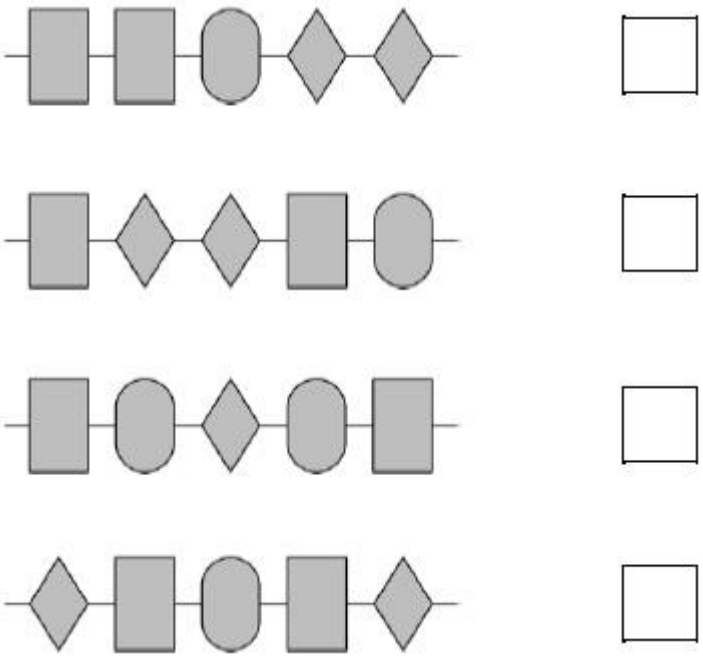
Figure 3 shows a model of an enzyme molecule.

Figure 3



(g) Which substrate fits the enzyme molecule in **Figure 3**?

Tick **one** box.



(1)

(h) The enzyme and substrate diagrams are used as a model for a theory of enzyme action.

What is the name of this theory?

Tick **one** box.

- Evolution ☐
- Lock and key ☐
- Natural selection ☐
- Protein synthesis ☐

(1)

(i) Explain why pH affects enzyme activity.

_____

_____

_____

_____

(2)

(Total 10 marks)

Combined Higher Exam Question

This question is about the enzyme amylase.

(a) Amylase can only digest starch.

Explain why amylase **cannot** digest other substances.

_____

_____

_____

_____

(2)

Students investigated the effect of pH on the rate of starch digestion.

This is the method used.

1. Add 2 cm^3 of amylase solution at pH 5.0 to a test tube in a water bath at 37 °C
2. Add 2 cm^3 of starch suspension to the same test tube.
3. Start the timer.
4. Remove a drop of the amylase-starch mixture after 30 seconds.
5. Test the drop for starch.
6. Repeat steps **4** to **5** until no starch is detected.
7. Record the total time taken for no starch to be detected.
8. Repeat steps **1** to **7** using amylase solution at different pHs.

(b) Which is the dependent variable in the investigation?

Tick (✓) **one** box.

pH of amylase solution ☐

Temperature of water bath ☐

Time for no starch to be detected ☐

Volume of starch suspension ☐

(1)

(c) Describe the test for starch.

Give the result of the test if starch is present.

Test

_____

_____

Result

_____

_____

(2)

(d) The amylase solution and starch suspension were kept in the water bath at 37 °C for 10 minutes before being mixed.

Why were the amylase and starch kept at 37 °C for 10 minutes before being mixed?

_____

_____

(1)

The table below shows the results.

pH	**Time for no starch to be detected in seconds**
5.0	420
5.5	330
6.0	270
6.5	240
7.0	120
7.5	90
8.0	120
8.5	180
9.0	270

(e) Student **A** concluded that:

'The optimum pH for amylase is 7.5'.

Give **one** reason why this conclusion could be correct.

Use the table above.

_____

_____

(1)

(f) Student **B** concluded that:

'The optimum pH is between 7.0 and 8.0 but may **not** be 7.5'.

How can student **B** determine a more accurate value for the optimum pH?

Use the table above.

_____

_____

(1)

(Total 8 marks)

Q1.

(a) protease

1

(b) liver

1

(c) urea

1

(d) any **three** from: mycoprotein sausages

allow converse for meat sausages

- contain less protein
- contain more carbohydrate

allow contain carbohydrate but meat sausages contain none

- contain less fat
- contain less salt

allow contain less energy (than meat sausages)

3

(e) Biuret reagent

1

(f) lilac

1

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

5–6

Level 3: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3–4

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

1–2

No relevant content

0

Indicative content

- grind up the sausage
- add the sausage to the test tube
- add water to the sausage and shake
- add the same mass of sausage
- add Benedict's solution to the test tube
- using a pipette
- add the same volume of Benedict's solution
- place the test tubes in a water bath
- heat the water bath (to ≥ 65 °C / to boiling)
- monitor the temperature of the water bath

- leave the test tubes in the water bath for the same time
- repeat the test for each sample
- record the colour change of the Benedict's solution
- Benedict's will go green / yellow / orange / brown / red if sugar present
- Benedict's solution will stay blue if no sugar present

Level 3 must refer to comparison of test colour for meat sausage and mycoprotein sausage.

[14]

Q2.

(a) **C**

1

(b) **B**

1

(c) **E**

1

(d) any **one** from:

- they are too big
- they are insoluble

1

(e) (pH) 7.5

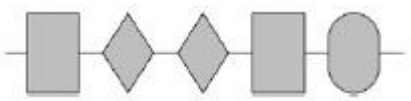
allow answers in range 7.4 to 7.6

1

(f) (enzyme **X**) stomach

(enzyme **Y**) small intestine

1

(g) 

1

(h) lock and key

1

(i) (some pH values):

change the shape of the active site

allow some pH values denature enzymes

1

(so) so substrate will no longer fit / bind to the active site

1

[10]

Combined Higher Mark Scheme

(a) (enzyme / amylase) has an active site

1

(with a specific / unique shape) which will only fit / bind to the starch / substrate (molecule)

1

(b) time for no starch to be detected

1

(c) iodine solution

allow reagent for solution

1

(iodine solution) turns blue-black

allow (iodine solution) turns black
*do **not** accept blue*

1

(d) to ensure the starch (suspension) and amylase (solution) both reached the same / body temperature

allow temperature of solution / suspension is a control variable

ignore 37 °C is body / optimum temperature

1

(e) at pH 7.5, the least time taken (for no starch to be detected)

1

(f) repeat using smaller pH intervals

allow repeat at pH 7.1, 7.2 …

1

[8]