

B3- Organisation and the digestive system Exam Practice 2

Name:

Score:

Q1.

Bread contains starch, protein and fat.

- (a) Complete each sentence by choosing the correct words from the box.

amino acids	protein
fat	starch
fatty acids	sugar

Amylase speeds up the digestion of _____ . The product of this digestion is _____ . Protease speeds up the digestion of _____ . The product of this digestion is _____ .

(4)

- (b) Why do molecules of starch, protein and fat need to be digested?

(2)

- (c) In which part of the digestive system does the digestion of starch begin? Draw a ring around your answer.

large intestine mouth small intestine stomach

(1)

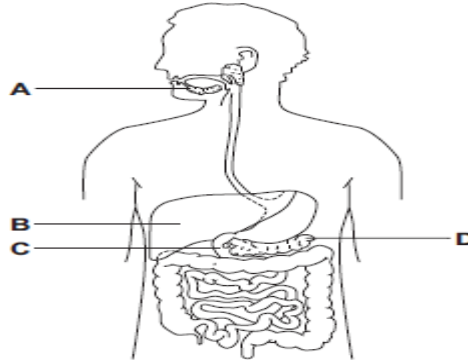
- (d) What do we call substances like amylase and protease which speed up chemical reactions?

(1)

(Total 8 marks)

Q2.

The diagram shows part of the human digestive system.



(a) Name the parts of the digestive system labelled **A**, **B**, **C** and **D**.

A _____

B _____

C _____

D _____

(4)

(b) A student has eaten a steak for dinner. The steak contains protein and fat.

(i) Describe how the **protein** is digested.

(3)

(ii) Explain **two** ways in which bile helps the body to digest **fat**.

(4)

(c) A group of students investigated the action of salivary amylase.
The students:

- collected a sample of salivary amylase
- put a different pH solution and 5 cm³ of a food substance in each of 6 test tubes
- added 1 cm³ of salivary amylase to each of the 6 test tubes
- recorded the amylase activity after 10 minutes.

The results are shown in the table.

pH	7	6	5	4	3	2
Amylase activity in arbitrary units	12	10	3	0	0	0

(i) Name the food substance that amylase breaks down.

(1)

(ii) Suggest what happens to the breakdown of this substance when food reaches the stomach.

Use information from the table to help you to answer this question.

(3)

(Total 15 marks)

Higher Tier Questions

Q3.

Proteins are broken down by protease enzymes.

(a) Which organs in the digestive system produce protease enzymes?

Tick **one** box.

Mouth and liver

Mouth and stomach

Pancreas and liver

Stomach and pancreas

(1)

A student used a colorimeter to investigate the rate of protein digestion of an insoluble protein.

A colorimeter measures the percentage of light that passes through a liquid.

The student measured the percentage of light passing through different concentrations of protein suspension.

The student used the results to produce a concentration curve.

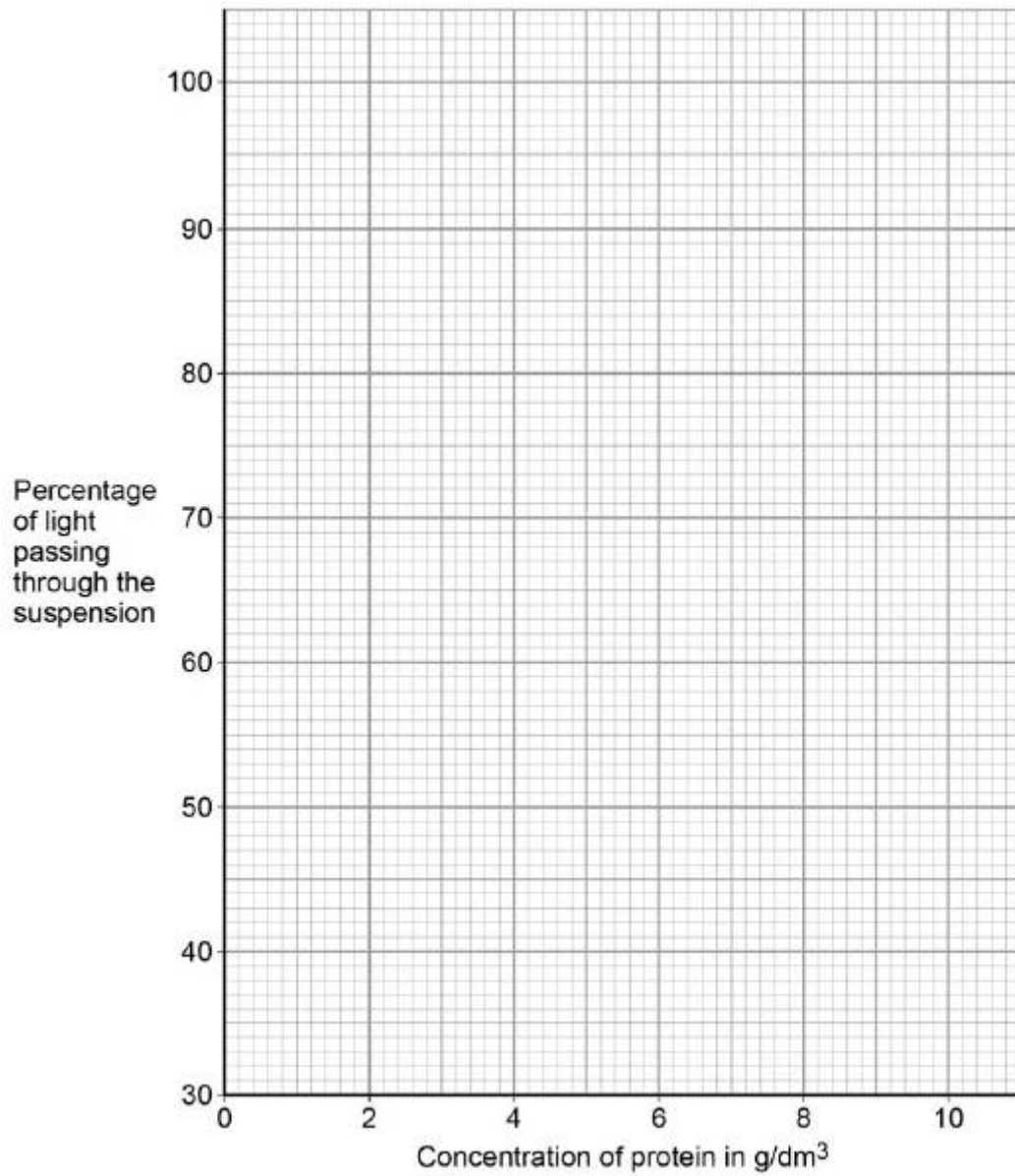
The table shows the results.

Concentration of protein in g/dm ³	Percentage of light passing through the suspension
0.0	100
0.5	93
2.0	75
10.0	38

(b) Plot the data from the table on **Figure 1**.

Draw a line of best fit.

Figure 1



(3)

- (c) Explain the change in the percentage of light passing through the suspension.

(2)

- (d) Suggest how the student could improve their investigation to draw a more accurate concentration curve.

(1)

The student then investigated the rate of protein digestion with protease obtained from two different organs.

This is the method used.

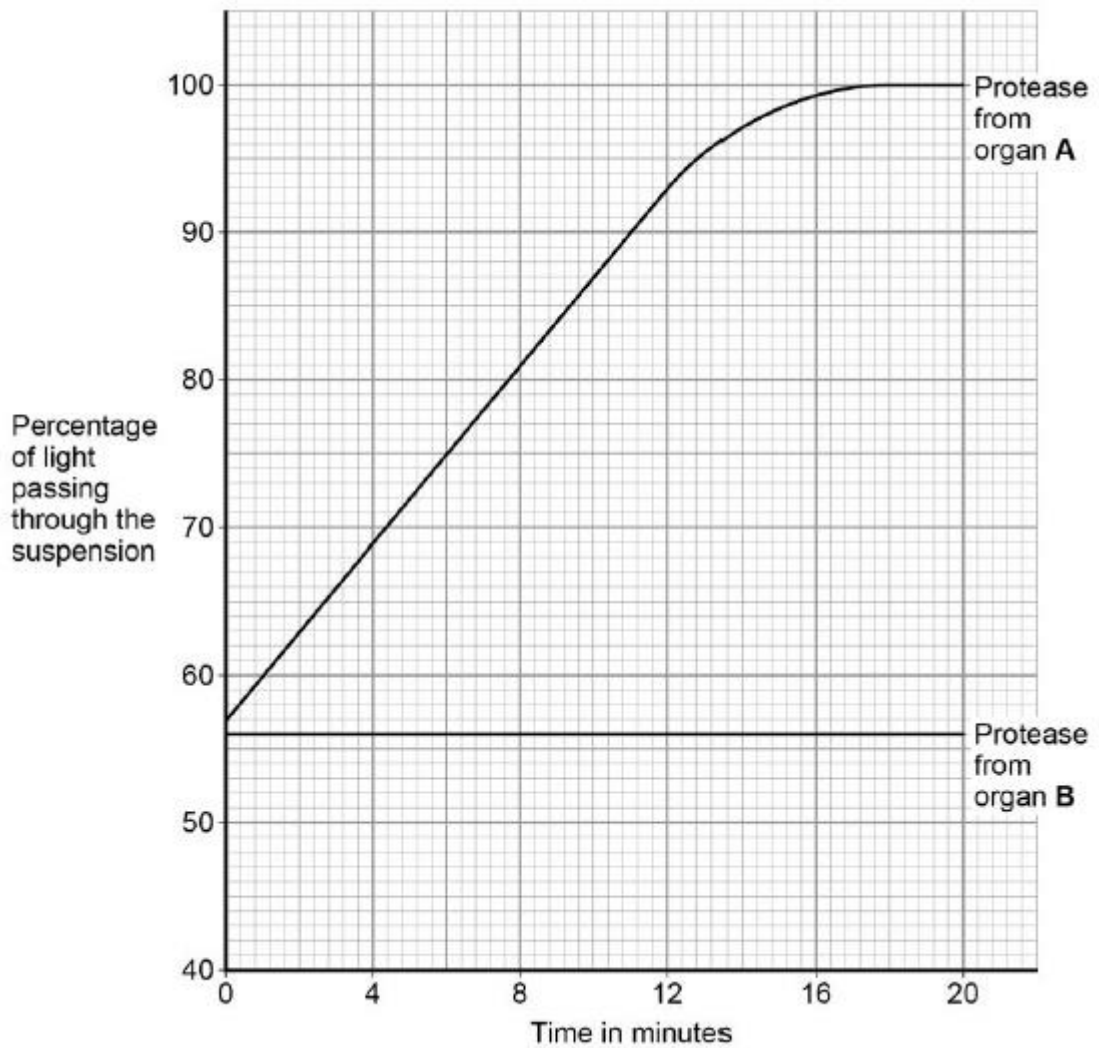
1. Put 5 cm³ of protease from each organ into separate test tubes.
2. Put 10 cm³ of protein suspension into two other test tubes.
3. Put all four tubes into a water bath at 37 °C for 10 minutes.
4. Mix each 5 cm³ of protease into a tube of protein suspension.
5. Take a sample of each mixture every 2 minutes.
6. Measure the percentage of light passing through each sample using a colorimeter.

- (e) Suggest why the protease and the protein suspension were put into a water bath before being mixed.

(1)

Figure 2 shows the student's results.

Figure 2



- (f) Determine the concentration of protein at the start of the reaction with protease from organ A.

Use Figure 2 and your graph in Figure 1.

Concentration = _____ g/dm³

(1)

- (g) Calculate the rate of protein digestion with protease from organ A over the first 12 minutes.

Use Figure 2 and your graph in Figure 1.

Rate = _____ g/dm³ per minute

(1)

- (h) Describe how the activity of protease from organ **B** is different from the activity of protease from organ **A**.

Suggest **one** reason for the difference.

(2)

(Total 13 marks)

Q4.

Fat, protein and carbohydrate are important parts of the human diet.

The table below shows information for cow's milk and three plant-based milks.

Nutrient	Mass of nutrient in grams per 100 grams of milk			
	Cow	Oat	Almond	Soy
Fat	3.7	1.5	2.1	1.7
Protein	3.5	1.0	0.9	2.9
Total carbohydrate	4.6	6.5	3.0	2.8
of which are sugars	4.6	3.8	3.0	2.7

- (a) The different types of milk in the table above can be bought in bottles.

Suggest why the nutritional information is given as 'grams per 100 grams' of milk instead of 'grams per bottle'.

(1)

(b) Suggest which milk in the table above has the greatest energy content.

Give **one** reason for your answer.

Milk _____

Reason _____

(2)

(c) A student added iodine solution to each milk.

Explain why **only** the oat milk and the soy milk turned blue-black.

Use the table above.

(2)

A student tested samples of the different milks for sugar.

This is the method used.

1. Add 1.0 cm³ of the milk sample to a test tube.
2. Add 1.0 cm³ of water and 2.0 cm³ of Benedict's solution.
3. Place the test tube in a water bath at 80 °C.
4. Record the colour of the mixture at the end of the test.
5. Repeat steps 1 to 4 for the other milk samples.

(d) The volume of each mixture in the test tube and the temperature of the water bath were control variables.

Give **one** other variable that should have been a control variable.

Do **not** refer to volume or temperature in your answer.

(1)

(e) What was the dependent variable in the investigation?

(1)

(f) To improve the method the student set up a control test tube.

What should the student add to the control test tube?

(1)

The fat in milk is broken down in the digestive system.

(g) Describe the breakdown of fat in the digestive system.

(2)

(h) Explain why the fat in milk needs to be broken down before it can be used in the body.

(2)

(i) Protein in milk is broken down into amino acids.

Describe how unwanted amino acids are processed and removed from the body.

(2)

(Total 14 marks)

Mark schemes

Q1.

(a) in sequence

starch

1

sugar

1

protein

1

amino acids

1

(b) (too) large **or** insoluble

*do **not** accept "breaking up"*

*do **not** accept complex*

accept 'need to make molecules

smaller / soluble' – reverse argument

1

cannot be absorbed **or**

cannot enter blood **or**

cannot pass through wall / lining of

intestine / gut or villi

"body" not enough

***not** large intestine*

1

(c) mouth

accept positive indication

1

(d) enzymes

allow catalysts

*do **not** accept catalase*

1

[8]

Q2.

(a) **A** – saliva(ry) gland

1

B – liver

1

C – duodenum

ignore small intestine

1

D – pancreas

	<i>accept phonetic spellings</i>	1
(b)	(i) any three from:	
	• chewing / muscle contraction / mechanical digestion <i>allow churning</i>	
	• protease enzymes <i>allow pepsin / trypsin</i>	
	• in stomach / small intestine / duodenum / from pancreas	
	• (break down protein) into amino acids <i>allow (poly)peptides</i>	3
	(ii) neutralises acid pH / makes conditions alkaline	1
	so lipase can work	1
	emulsifies fat	1
	to give large(r) surface area for lipase / enzyme action	1
(c)	(i) starch <i>ignore carbohydrate</i>	1
	(ii) breakdown stops <i>allow slows down</i>	1
	because stomach produces / contains acid / has low pH	1
	and amylase cannot work in acid / low pH <i>accept amylase is denatured / changes shape</i>	1
		[15]

Higher Tier mark Scheme

Q3.

(a)	stomach and pancreas	1
(b)	all points plotted correctly <i>allow 1 mark for 3 points correctly plotted</i>	2
	smooth curve drawn through all the points	1
(c)	as concentration of protein increases the percentage of light passing through decreases	

- (because) mixture more cloudy
allow idea of more particles in suspension 1
- (d) use protein concentrations between 2 and 10 g/dm³ 1
- (e) any one from: 1
- to allow them to reach 37 °C
to allow them to reach body temperature
 - so they would be at the optimum temperature
allow so they would be at the same temperature
 - so reaction temperature controlled
allow temperature affects enzyme activity 1
- (f) correctly read concentration at 57% from their graph 1
- (g) their value given in part (f) – 0.5
allow use of different values over straight line portion of graph 1
- answer for their value given in
- $$\frac{03.6 - 0.5}{12}$$
- 1
- (h) (protease from organ **B**) is inactive **or** rate of digestion is zero **and** protease from organ **A** is active
*allow only protease from organ **B** is inactive* 1
- any **one** from:
- enzyme denatured by pH
 - at the wrong pH
 - enzyme not specific for this protein
allow active site damaged / changed by pH 1

[13]

Q4.

- (a) any **one** from: 1
- as bottle sizes may be different
 - so that the (nutritional information) can be compared

- (b) cow
no marks if cow not chosen 1
- highest mass / proportion of fat
allow most fat
allow highest amount of fat and sugar
ignore references to protein
*do **not** accept highest mass / proportion of carbohydrate* 1
- (c) (oat milk and soy milk) contained starch
allow cow and almond milk do not contain starch 1
- (but) in cow and almond milk all the carbohydrate is sugar (so there is no starch present) 1
- (d) any **one** from:
• time the test tubes in the water bath
• the concentration of Benedict's solution 1
- (e) the colour change (of the mixture)
allow the colour (of the mixture) at the end of the test 1
- (f) 2 cm³ of Benedict's solution **and**
2 cm³ of water 1
- (g) (fat is broken down by the enzyme) lipase 1
- (to break fats down into) fatty acids **and** glycerol
allow bile emulsifies fats to increase surface area (for lipase) 1
- (h) (to form) small / soluble molecules 1
- (so they can be) absorbed into the blood
allow absorbed through gut wall
allow a description of absorption
*allow fat molecules are too large to be absorbed into the blood for **2** marks* 1
- (i) the liver breaks down the amino acids into urea 1
- (which is) carried in the blood to kidneys where it is excreted in the urine

