

Hormonal Coordination in Humans

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science – Trilogy - Biology
Exam Board	AQA
Topic	4.5 Homeostasis and Response
Sub-Topic	Hormonal Coordination in Humans
Difficulty Level	Silver Level
Booklet	Question Paper 1

Time Allowed: 52 minutes

Score: / 48

Percentage: /100

Grade Boundaries:

Q1. Amylase is an enzyme that digests starch.

A student investigated the effect of pH on the activity of amylase.

This is the method used.

1. Mix amylase solution and starch suspension in a boiling tube.
2. Put the boiling tube into a water bath at 25 °C.
3. Remove a drop of the mixture every 30 seconds and test it for the presence of starch.
4. Repeat the investigation at different pH values.

The table below shows the students' results.

pH	Time when no starch was detected in minutes
5.0	7.0
5.5	4.5
6.0	3.0
6.5	2.0
7.0	1.5
7.5	1.5
8.0	2.0

- (a) The student concluded pH 7.25 was the optimum pH for the amylase enzyme.

This is **not** a valid conclusion.

Suggest **two** reasons why.

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2

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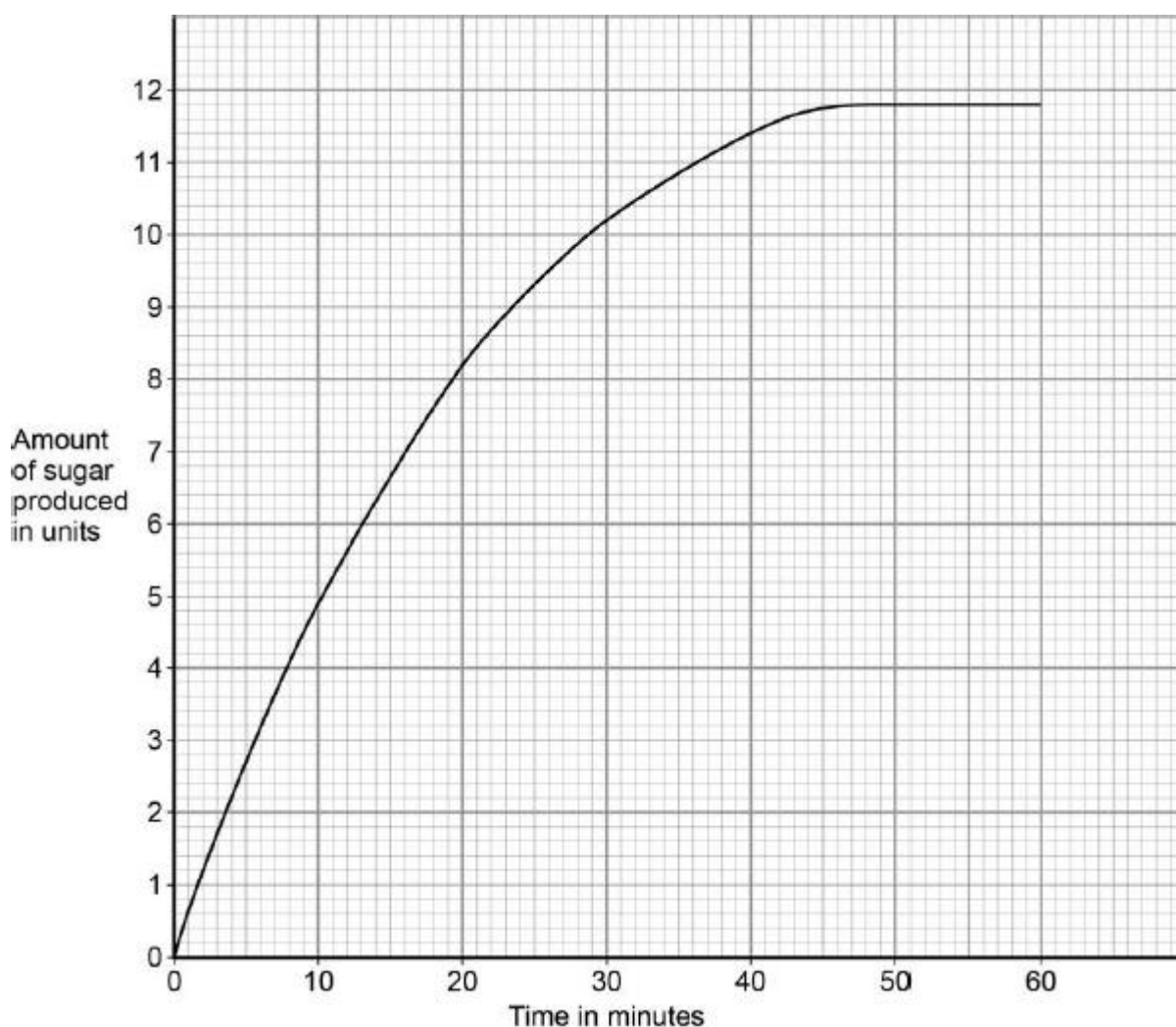
(2)

(b) The student did another investigation.

This is the method used.

1. Put amylase solution and starch suspension into a boiling tube.
2. Make the pH 7.25.
3. Put the boiling tube into a water bath at 25 °C.
4. Measure the amount of sugar produced every 30 seconds.

The results are shown in the figure below.



Calculate the mean rate of sugar produced per minute during the first 5 minutes.

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Mean rate = units per minute

(2)

- (c) Iodine solution is added to a sample taken from the boiling tube after 10 minutes and 60 minutes.

Suggest what you would see in these samples.

After 10 minutes

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After 60 minutes

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(2)

- (d) The scientist repeated the investigation at 37 °C.

Draw a line on the figure above to show the results the scientist would get.

(2)

- (e) The same investigation was done at 65 °C.

How would this affect the results?

Explain why.

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(3)

(Total 11 marks)

Q2. The rate of chemical reactions can be changed by changing the conditions.

- (a) Methane burns in oxygen to produce carbon dioxide and water.

The activation energy for the reaction is 2648 kJ / mol.

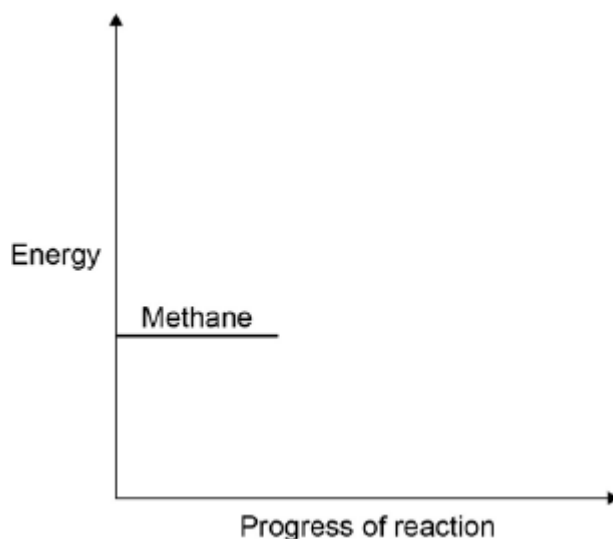
The reaction gives out 818 kJ / mol of energy.

The figure below shows the reaction profile for this reaction.

Complete the reaction profile.

Draw arrows to represent:

- the activation energy
- the energy given out.



(4)

- (b) What percentage of the activation energy is the energy given out?

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(1)

- (c) Calcium carbonate decomposes when it is heated:

The decomposition of calcium carbonate is an endothermic reaction.

How would the reaction profile for decomposition of calcium carbonate be different from the reaction profile of methane burning in oxygen?

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(1)

- (d) Catalysts are used in chemical reactions in industry.

Give **two** properties of catalysts.

For each property, explain why it makes the catalyst useful in industry.

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(4)

- (e) Enzymes are biological catalysts.

What type of molecule is an enzyme?

Tick **one** box.

Carbohydrate

☐

Hydrocarbon

☐

Lipid

☐

Protein

☐

(1)

- (f) If enzymes are denatured they stop working.

Give **two** ways an enzyme can be denatured.

1

2

(2)

- (g) An enzyme called lactase catalyses the reaction that breaks down lactose to smaller molecules.

One model used to explain how enzymes affect reactions is called the lock and key model.

Use the lock and key model to explain why lactase cannot be used to speed up **all** chemical reactions.

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(3)

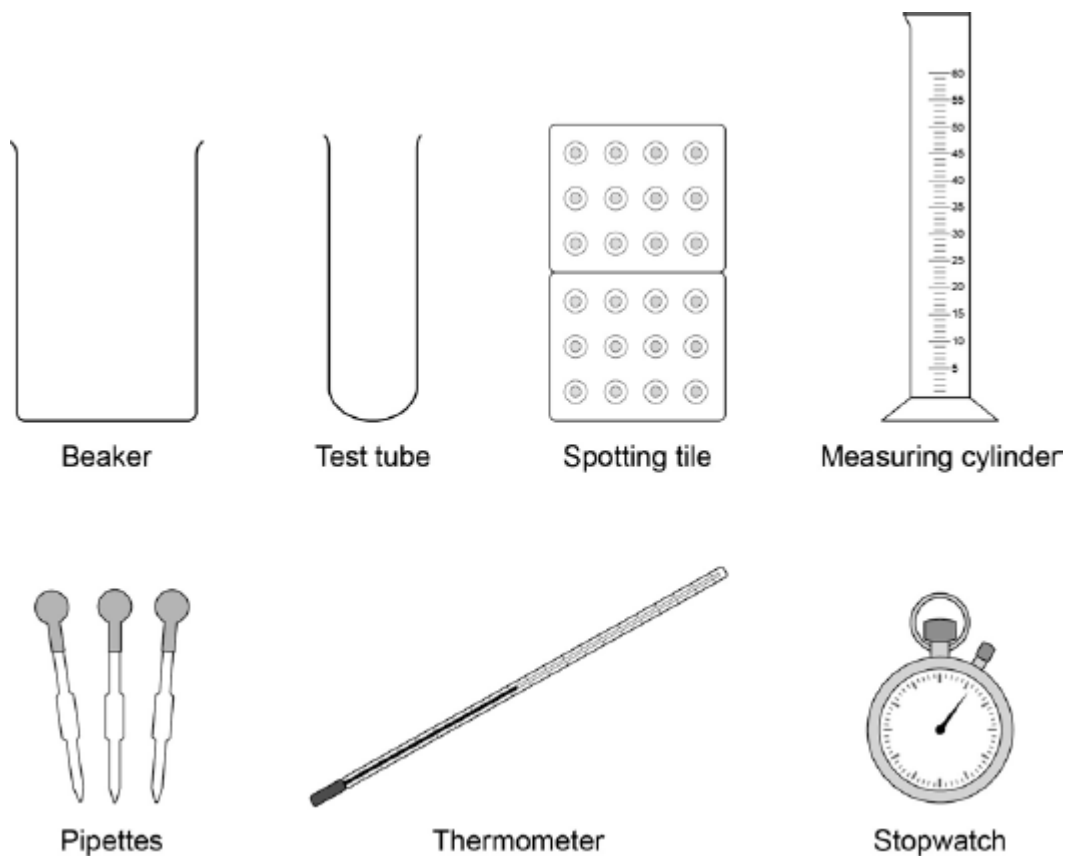
(Total 16 marks)

Q3. Amylase catalyses the breakdown of starch into sugars.

A student investigated the effect of amylase on the reaction at different temperatures.

Figure 1 shows the apparatus the student used.

Figure 1



This is the method used.

1. Put starch suspension into a test tube.
2. Add amylase solution.
3. Put the test tube in a beaker of water at 15 °C.
4. Remove a small sample of the mixture every 30 seconds and put in a spotting tile.
5. Test the sample for starch.
6. Time how long it takes to break down all of the starch in the mixture.
7. Repeat steps 1–5 at 20 °C, 25 °C and 30 °C.
8. Repeat for each temperature twice more.

The table below shows the student's results.

Temperature in °C	Time taken until there was no starch in the sample in minutes			
	Test 1	Test 2	Test 3	Mean
15	6.1	9.4	10.0	8.5
20	4.8	5.0	4.6	4.8

25	3.0	2.5	3.0	3.2
30	1.5	2.0	2.0	

- (a) One of the results in the table above is anomalous.

Draw a ring around the anomalous result.

(1)

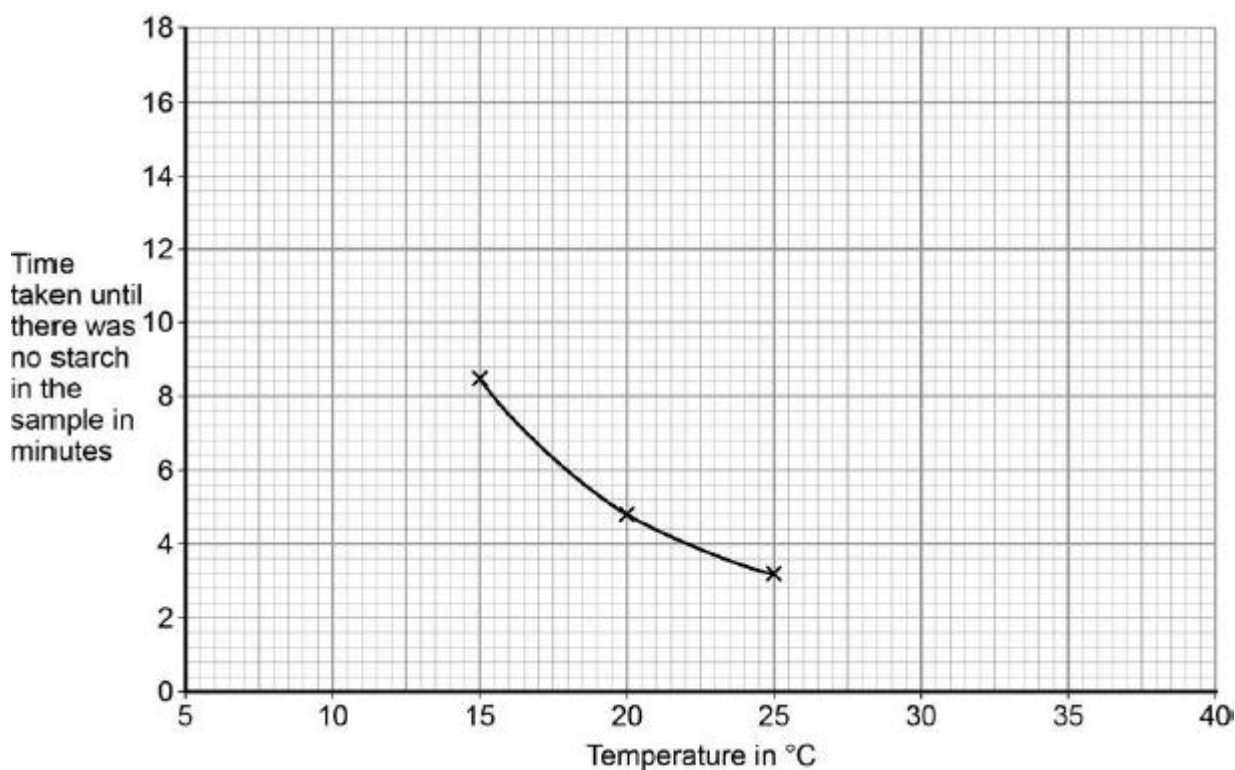
- (b) Calculate the mean for 30 °C.

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(1)

- (c) **Figure 2** shows a graph of the student's results.

Figure 2



Use the graph to predict how long it would take to break down all of the starch at 10 °C.

Time = minutes

(1)

- (d) The student tested samples of the mixture for starch every 30 seconds.

In each test she added one drop of iodine to the sample in the spotting tile.

Predict the colour of the samples from the 20 °C test at 4.0 minutes and 7.0 minutes.

Colour at 4.0 minutes

Colour at 7.0 minutes

(2)

- (e) The student did a fourth test at 30 °C.

In this test the starch did not break down, even after 45 minutes.

Why did the amylase not break down the starch in this test?

Tick **one** box.

The amylase solution and the starch suspension were mixed before the start of the experiment.

☐

The amylase solution had been prepared with water at 95 °C.

☐

The amylase solution had been prepared with water at 20 °C.

☐

The amylase solution had been stored in the fridge.

☐

(1)

- (f) The student made the following conclusion about the optimum temperature for amylase to work at.

‘Amylase works fastest at 40 °C’

Her teacher said that this is **not** a valid conclusion from her results.

Describe how the student could change her method to give results that would improve the validity of her conclusion.

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(6)
(Total 12 marks)

Q4. This question is about hormones.

- (a) (i) Hormones carry messages.

What type of messenger is a hormone?

Draw a ring around the correct answer.

chemical electrical environmental

(1)

- (ii) Which part of the brain secretes hormones?

Draw a ring around the correct answer.

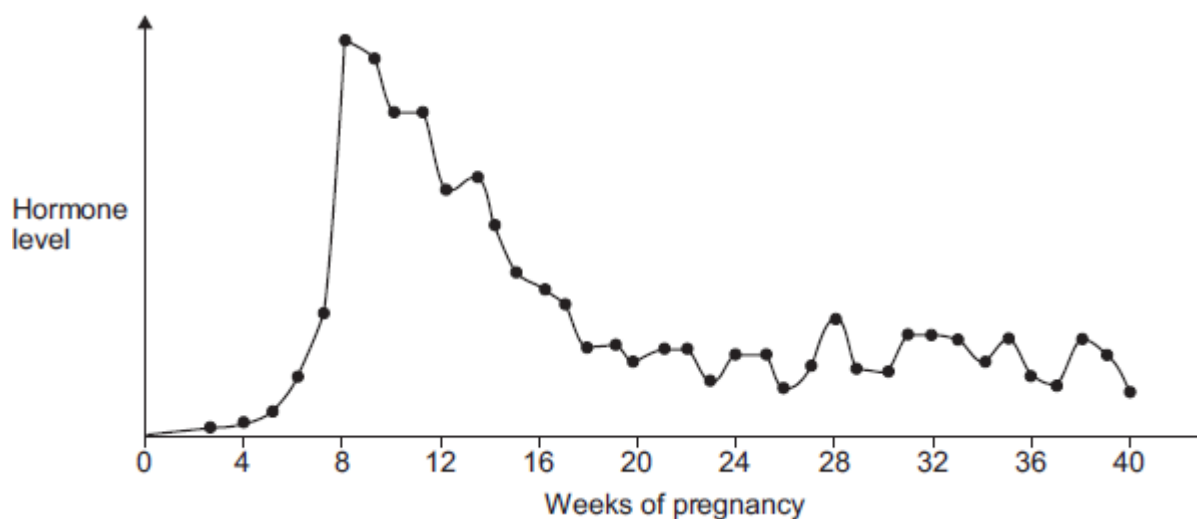
cerebellum medulla pituitary gland

(1)

- (b) **Figure 1** shows the level of a pregnancy hormone over a 40-week pregnancy.

This hormone can be detected in a pregnancy test.

Figure 1



A woman takes a pregnancy test.

In which week of pregnancy is the test most likely to give a positive result?

Use information from **Figure 1**.

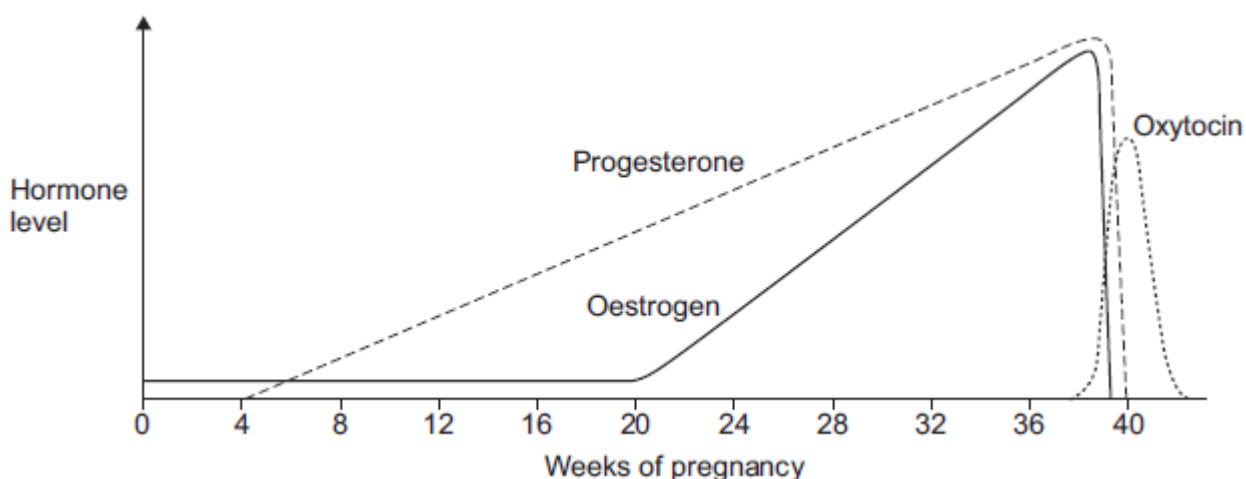
Write the correct answer in the box.

(1)

(c) **Figure 2** shows the levels of three other hormones during pregnancy.

The baby is usually born at about 40 weeks.

Figure 2



Adaptation by kind permission of Biozone International

- (i) Describe the patterns in the levels of oestrogen and progesterone from 0 to 36 weeks.

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(4)

- (ii) Which hormone is likely to stimulate contractions of the uterus (womb) when the baby is born?

Use information from **Figure 2** to give a reason for your answer.

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(2)

(Total 9 marks)