Enzymes

Q1.a(2018)

Potato cells contain the enzyme catalase.

This enzyme catalyses the breakdown of hydrogen peroxide into oxygen and water.

Figure 10 shows what happened when a student placed a potato disc in a 5% hydrogen peroxide solution.

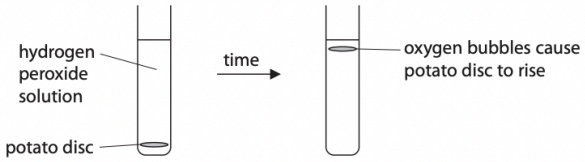

Figure 10

The student measured the time taken for the potato disc to rise.

The student repeated the investigation using 10%, 15% and 20% concentrations of hydrogen peroxide solution.

(a) (i) Which term describes the hydrogen peroxide in this reaction?

(1)

- ☒ **A** product
- ☒ **B** substrate
- ☒ **C** active site
- ☒ **D** control

Q1.b(2018)

The potato discs all had the same mass.

Explain why the student used potato discs with the same mass.

(2)

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Q1.c(2018)

State **two** other factors that need to be kept the same to improve this investigation.

(2)

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Q1.d(2018)

Figure 11 shows the results of this investigation.

The student calculated the rate of reaction using

$$\frac{1}{\text{time in seconds}}$$

concentration of hydrogen peroxide solution (%)	time taken for disc to rise (s)	rate (s^{-1})
5	325	0.003
10	245	0.004
15	132	0.008
20	72	0.014

Figure 11

(i) State and explain a conclusion based on these results.

(4)

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Q1.e(2018)

The student repeated the investigation with a 25% hydrogen peroxide solution and recorded a time of 75 seconds.

Calculate the rate of reaction for the 25% hydrogen peroxide solution.

(2)

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Q1.f(2018)

The student decided that the rate for the 25% hydrogen peroxide solution was not anomalous.

Give the reason why the result was not anomalous.

(1)

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Q2.a(2019)

(a) Lactase is an enzyme that breaks down lactose into glucose and galactose.

A student made some alginate beads containing lactase.

The student added 10 beads to 20 cm^3 of a solution of lactose, as shown in Figure 4.

The student timed how long it took for glucose to be produced.

The experiment was repeated using 15, 20 and 25 beads.

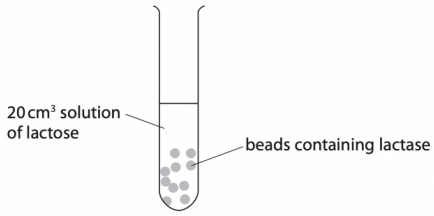

Figure 4

The results are shown in Figure 5.

number of beads containing lactase	time taken to produce glucose in seconds
10	240
15	210
20	150
25	120

Figure 5

(i) What is the rate of reaction for 25 beads?

(1)

- ☒ **A** 0.008 s^{-1}
- ☒ **B** 0.04 s^{-1}
- ☒ **C** 0.21 s^{-1}
- ☒ **D** 4.8 s^{-1}

Q2.b(2019)

Explain the conclusion that can be made from these results.

(3)

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Q2.c(2019)

Explain why the same volume of lactose solution was used for each test.

(2)

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Q2.d(2019)

Devise a method to find the optimum temperature for the enzyme lactase.

(3)

Q3.a(2020)

A student mixed 10 cm^3 of starch solution with 5 cm^3 of amylase solution and kept the tube in a water bath at 25 °C.

The student tested the solution for starch and for glucose every 30 seconds.

Figure 5 shows the results.

time in seconds	starch detected	glucose detected
0	Yes	No
30	Yes	No
60	Yes	Yes
90	Yes	Yes
120	Yes	Yes
150	No	Yes
180	No	Yes

Figure 5

(i) Give **one** reason for the result at 150 seconds.

(1)

Q3.b(2020)

Another student repeated the investigation with the same volumes of solutions and at the same temperature of 25 °C.

Give **two** other variables that would need to be controlled in the investigation.

(2)

Q3.c(2020)

Both students also included a tube containing 10 cm^3 of starch solution with 5 cm^3 of distilled water instead of 5 cm^3 of amylase solution.

They tested the solution for starch and for glucose every 30 seconds.

Give **one** reason why this tube was included in their investigations.

(1)

Q3.d(2020)

Amylase has an optimum pH of 6.8.

Devise a method the students could use to confirm the optimum pH for amylase.

(3)

Q3.e(2020)

Amylase is produced by salivary glands and the pancreas.

Explain why amylase is not produced in the stomach.

(3)

Q4.a(2021)

Chymosin is an enzyme that causes milk to curdle.

When milk curdles the proteins in the milk clump together and become solid.

(a) As part of an investigation, milk was heated in test tubes to different temperatures using a Bunsen burner.

Two drops of chymosin solution were added to each test tube and the time taken for the milk to curdle was recorded.

Figure 7 shows the results.

temperature of the milk in °C	time taken for milk to curdle in seconds
25	125
30	105
35	90
40	70
45	75

Figure 7

(i) Which variables need to be kept constant in this investigation?

(1)

- ☒ **A** the volume of milk and the time
- ☒ **B** the temperature and the time
- ☒ **C** the volume of milk and the concentration of chymosin
- ☒ **D** the temperature and the concentration of chymosin

Q4.b(2021)

Explain why the time taken for the milk to curdle decreases from 30 °C to 40 °C.

(2)

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Q4.c(2021)

Explain what the expected result would be if two drops of chymosin were added to the milk at 70 °C in the test tube.

(2)

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Q4.d(2021)

As part of this investigation, test tubes containing only milk were heated to each temperature and no chymosin solution was added.

State why these test tubes containing only milk were used.

(1)

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Q4.e(2021)

Describe **two** improvements that could be made to the method of this investigation so that the optimum temperature for chymosin can be found.

(2)

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Q5.a(2024)

(a) Pepsin and trypsin are enzymes that break down proteins.

Figure 1 shows the results of an investigation into the activity of pepsin and trypsin at different pH levels.

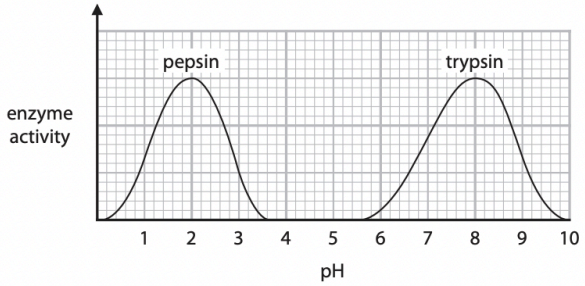

Figure 1

(i) Which molecules are produced when a protein is broken down?

(1)

- ☒ **A** sugars
- ☒ **B** amino acids
- ☒ **C** fatty acids
- ☒ **D** starches

Q5.b(2024)

Describe the trend in the graph for the enzyme pepsin.

Use data from the graph to support your answer.

(3)

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Q5.c(2024)

State the optimum pH for the enzyme trypsin.

(1)

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Q5.d(2024)

Explain why there is no trypsin activity at pH 5.

(3)

Q5.e(2024)

Temperature is a variable that should be controlled in this investigation.

Give **one** way the temperature could be controlled.

(1)