BTec National Extended Certificate in Applied Science

Summer Independent Learning

Y12-13

Part 1 – Compulsory Unit 3 Content (pages 2-18)

There are 3 sections to the compulsory content (Biology, Physics and Chemistry)

For each section.

1. Watch the videos and use to make flashcards / similar resources, so you can use them to test yourself (metacognition)
2. Complete the follow up questions
3. Mark the questions (mark scheme at the end of the document)
4. The mark Scheme is at the end of the document, please check your answers after completing the questions.

This will be assessed in the initial assessment

Part 2 – Compulsory Unit 8 content (page 20)

You must complete this as a Word document and save it. You must thoroughly research each point and save any references which you use. This will make things much easier for you when you start this assignment unit in Year 13.

Mark schemes (pages 29-48)

Part 1 – Compulsory Content Unit 3

Biology – Enzymes

Protein structure

Watch the videos:

From 7:20 – 10:50

https://www.youtube.com/watch?v=QFq9o72Qal8&list=PL0Mjub5NT755dp8xUfC-yoXlbPTcjVM1i&index=7

What is the general structure of an amino acid?

How do two amino acids form a dipeptide?

Describe the following protein structures:

Primary Structure

Secondary Structure

Tertiary Structure

Enzymes

https://www.bbc.co.uk/bitesize/guides/z88hcj6/revision/1

Enzyme definitions.

This section revises many of the key terms for GCSE to do with enzyme
structure and function. A GCSE level question follows to assess your understanding. Whilst most of the definitions are from the GCSE specification you may find that some are unfamiliar to you.

Define these key words.

Enzyme:

Active site:

Substrate:

Activation energy:

Denature:

Q1. (a) Enzymes are used in body cells.

(i) What is an enzyme?

Draw a ring around the correct answer.

antibody	**biological catalyst**	**hormone**

(1)

(ii) All enzymes are made of the same type of substance.
What is this substance?
Draw a ring around the correct answer.

carbohydrate	**fat**	**protein**

(1)

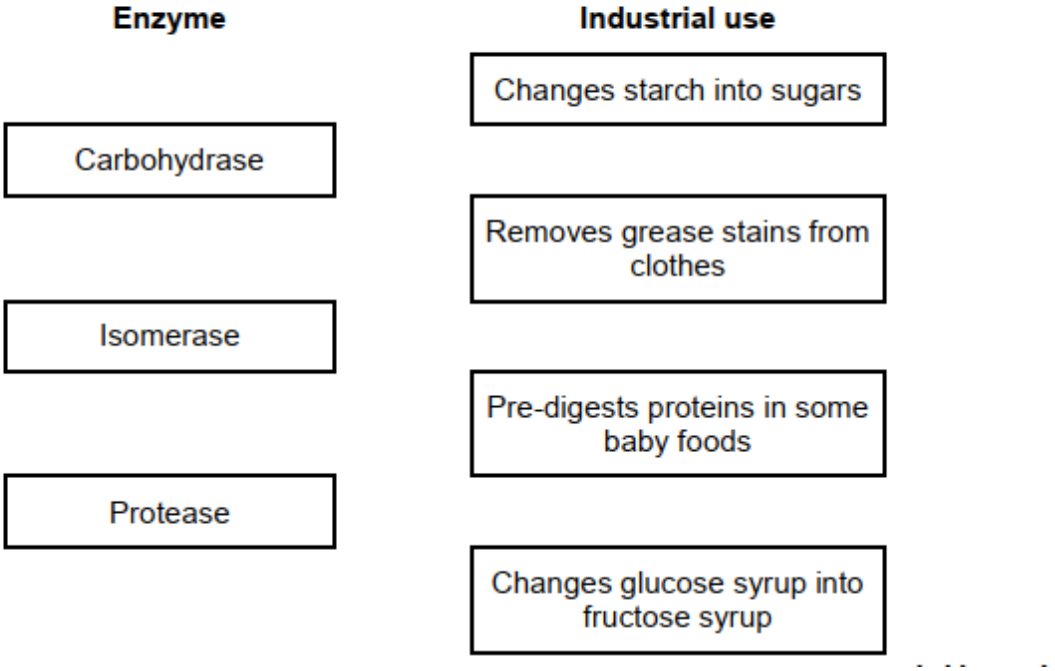
(iii) Where is the enzyme amylase produced in the human body?
Draw a ring around the correct answer.

liver	**salivary glands**	**stomach**

(1)

(b) Enzymes are sometimes used in industry.

Draw **one** line from each enzyme to the correct industrial use of that enzyme.



Interpreting enzyme graphs.

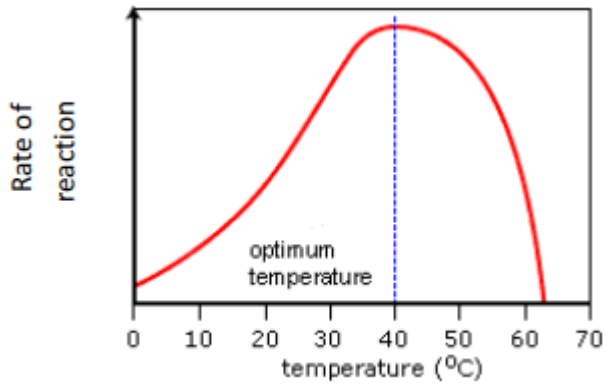
This section requires you to explain how different conditions affect enzyme activity.

Using the following link from our YouTube channel, watch the video and annotate each of the graphs.

You need to ***explain*** the shape of each graph in terms of enzyme activity.

https://www.youtube.com/watch?v=Pk3Lb2UHVcA&list=PL0Mjub5NT755dp8xUfC-yoXlbPTcjVM1i&index=9&t=0s

Q1. Change in temperature.



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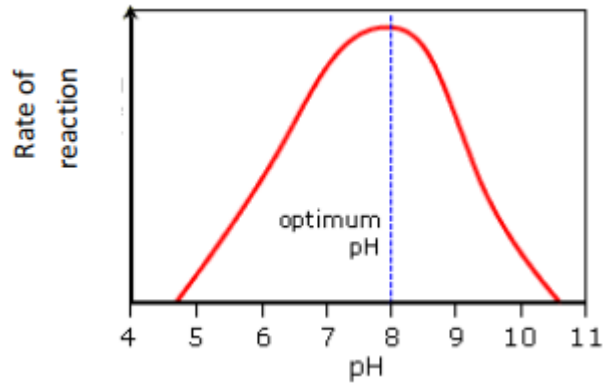
Q2. Change in pH.



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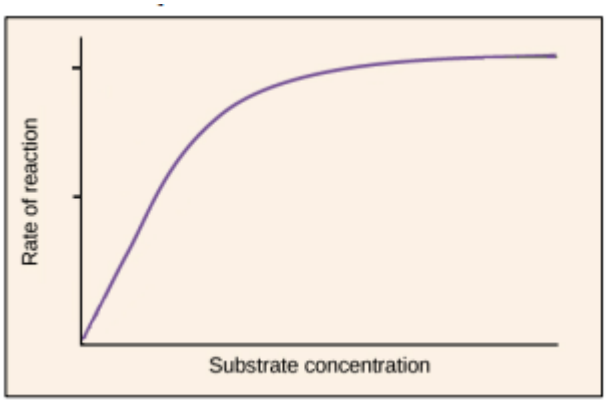
Q3. Change substrate concentration.



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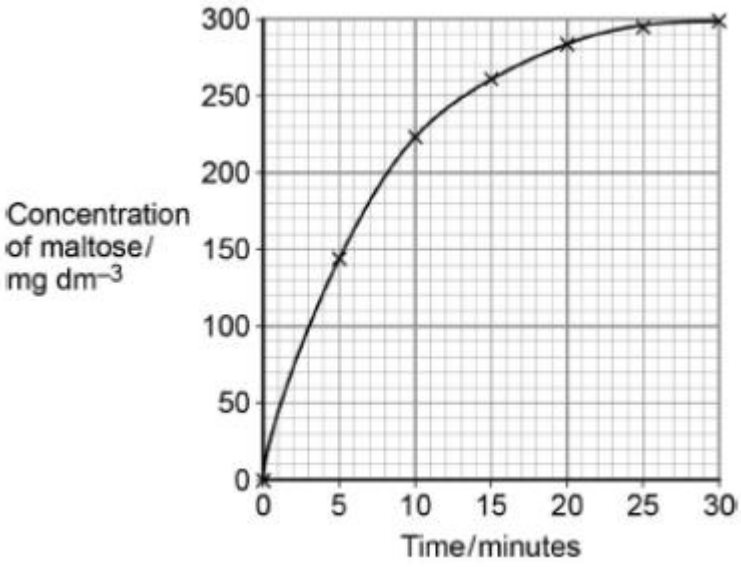
Q4. A scientist investigated the hydrolysis of starch. He added amylase to a suspension of starch and measured the concentration of maltose in the reaction mixture at regular intervals.

His results are shown in the graph below.



Explain the results shown in the graph.

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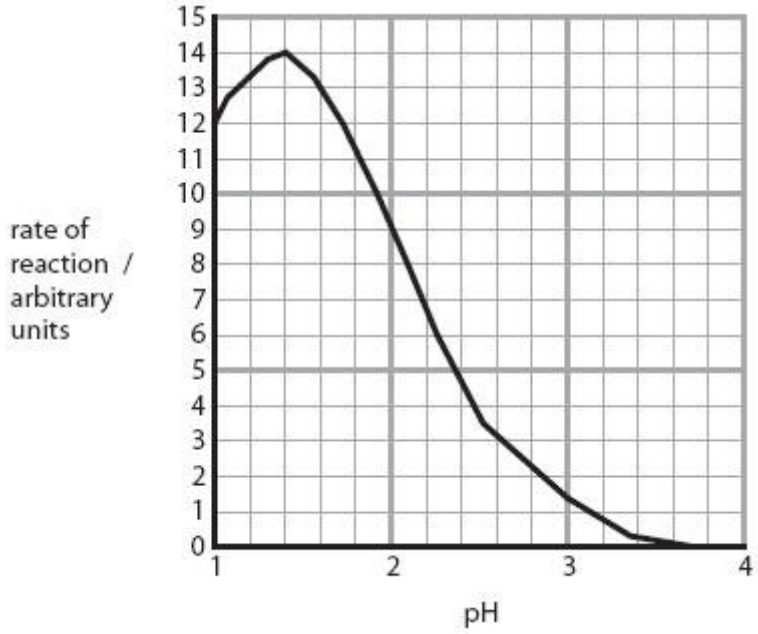
(2)

Questions

Q1.

The graph shows how pH affects the rate of the reaction catalysed by enzyme R.



(i) Name enzyme R.

(1)

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(ii) The rate of reaction can be determined by measuring how quickly molecule W is formed. Name molecule W.

(1)

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(iii) Calculate the difference in the rate of the reaction between pH 1 and pH 2.

(2)

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(iv) Suggest why this enzyme works better at pH 1 than at pH 2.

(2)

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Q2.

Complete the sentences by putting a cross (☒) in the box next to your answer.

(i) Enzymes are

(1)

☒ **A** cells
☒ **B** hormones
☒ **C** proteins
☒ **D** sugars

(ii) An enzyme is a biological catalyst that

(1)

☒ **A** slows down all chemical reactions
☒ **B** speeds up a chemical reaction
☒ **C** prevents all chemical reactions taking place
☒ **D** has no effect on a chemical reaction

Q3.

(a) Complete the sentences by putting a cross (☒) in the box next to your answer.

(i) Enzymes are

(1)

☒ **A** cells
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(ii) An enzyme is a biological catalyst that

(1)

☒ **A** slows down all chemical reactions
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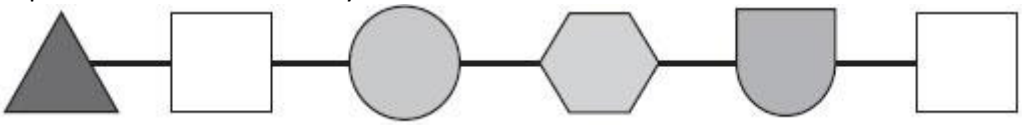
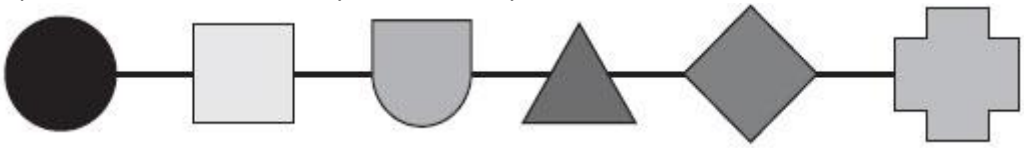
☒ **C** prevents all chemical reactions taking place
☒ **D** has no effect on a chemical reaction

(b) The diagrams show two sequences of six amino acids.

Sequence 1 is found in an enzyme called catalase.



Sequence 2 is found in an enzyme called amylase.



(i) Suggest how the structures of the enzymes, catalase and amylase, are different from each other.

(2)

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(ii) Suggest why the action of these two enzymes will be different.

(2)

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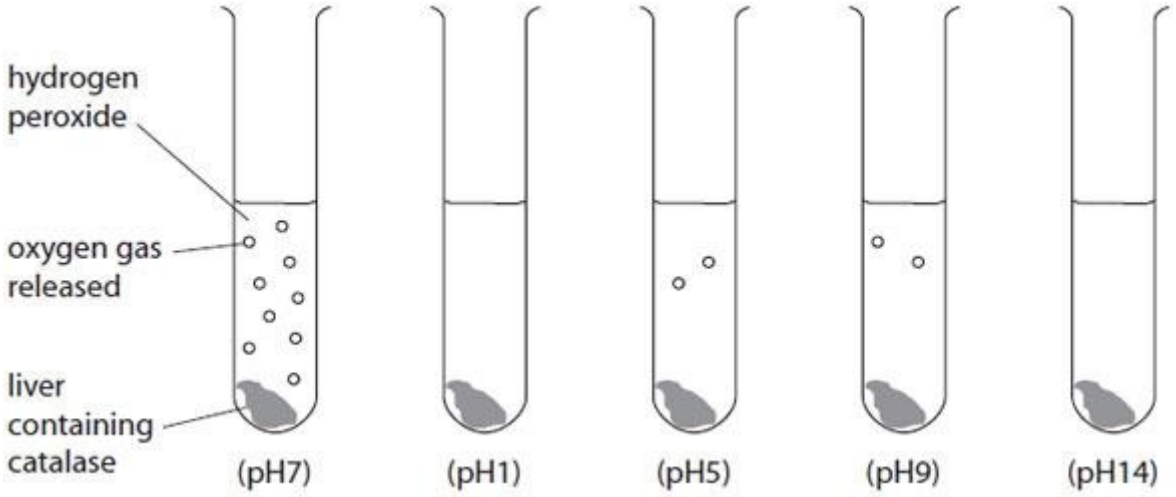
***(c)** A student carried out an investigation to study the effect of pH on the activity of catalase.

In the presence of catalase, hydrogen peroxide breaks down to release oxygen gas.

The student set up five test tubes, as shown in the diagram, and observed the amount of oxygen gas released.



Explain the effect of pH on the enzyme catalase in this investigation.

(6)

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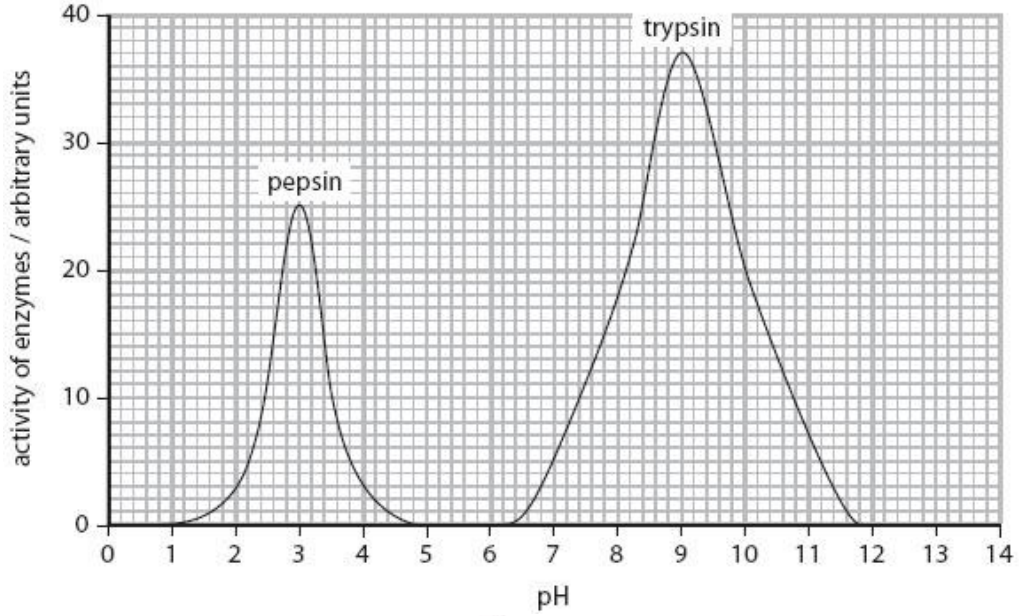
Q4.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.
Pepsin is an enzyme that digests protein into

(1)

☒ **A** amino acids
☒ **B** fatty acids
☒ **C** glucose
☒ **D** glycerol

(ii) An experiment was carried out to investigate the effect of pH on the activity of pepsin and another enzyme called trypsin.
The graph shows the results of the experiment.



Complete the sentence by putting a cross (☒) in the box next to your answer.
The graph shows that

(1)

☒ **A** pepsin only works at a pH of 3
☒ **B** pepsin has an optimum pH of 3
☒ **C** trypsin only works at a pH of 3
☒ **D** trypsin has an optimum pH of 3

(iii) Using the graph, describe **two** ways in which the activity of pepsin is different to the activity of trypsin.

(2)

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(iv) Explain why the activity of trypsin is different at pH 11 compared to pH 9.

(2)

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Section B – Physics – Circuits

GCSE bitesize

https://www.bbc.co.uk/bitesize/guides/zgvq4qt/revision/1

Intro to circuits

https://www.youtube.com/watch?v=R3hdaLpq2AA

V=IR

https://www.youtube.com/watch?v=hRojfU77c38

Power = work done / time

https://www.youtube.com/watch?v=kCJUzdCBOk0&list=PLidqqIGKox7UVC-8WC9djoeBzwxPeXph7&index=7

Q1.

Figure 1 shows a person using an electric lawn mower.

Figure 1

(a) The lawn mower is connected to the mains electricity supply.

What is the frequency of the mains electricity supply in the UK?

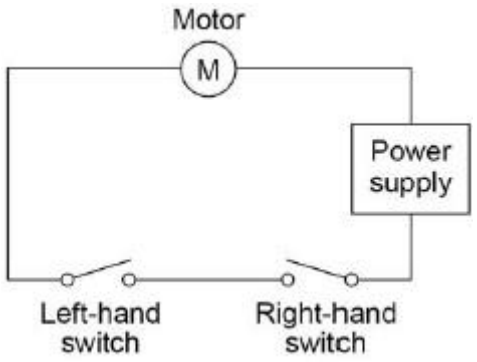
Frequency = _____ Unit _____

(2)

The lawn mower has a switch on each side of the handle.

Figure 2 shows the circuit diagram for the lawn mower.

Figure 2



(b) The motor in the lawn mower can only be turned on when the person using it holds the handle of the lawn mower with both hands.

Explain why.

_____

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_____

(2)

(c) The power input to the motor is 1.8 kW

The resistance of the motor is 32 Ω

Calculate the current in the motor.

_____

_____

_____

_____

Current = _____ A

(3)

(d) The useful power output from the motor is 1.5 kW

Calculate the time it takes for the motor to transfer 450 000 J of useful energy.

_____

_____

_____

Time = _____ seconds

(3)

(Total 10 marks)

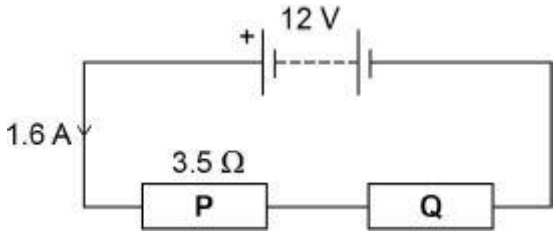
Q2.

(a) Draw a diagram to show how 1.5 V cells should be connected together to give a potential difference of 4.5 V.

Use the correct circuit symbol for a cell.

(2)

A student built the circuit shown in the diagram below.



(b) Calculate the total resistance of the circuit in the diagram above.

Use the equation:

$$\text{resistance} = \frac{\text{potential difference}}{\text{current}}$$

_____

_____

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Total resistance = _____ Ω

(2)

(c) The resistance of **P** is 3.5 Ω.

Calculate the resistance of **Q**.

_____

_____

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Resistance of **Q** = _____ Ω

(1)

(d) The student connects the two resistors in the diagram above in parallel.

What happens to the total resistance of the circuit?

Tick **one** box.

It decreases ☐

It increases ☐

It does not change ☐

(1)

Give a reason for your answer.

_____

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(1)

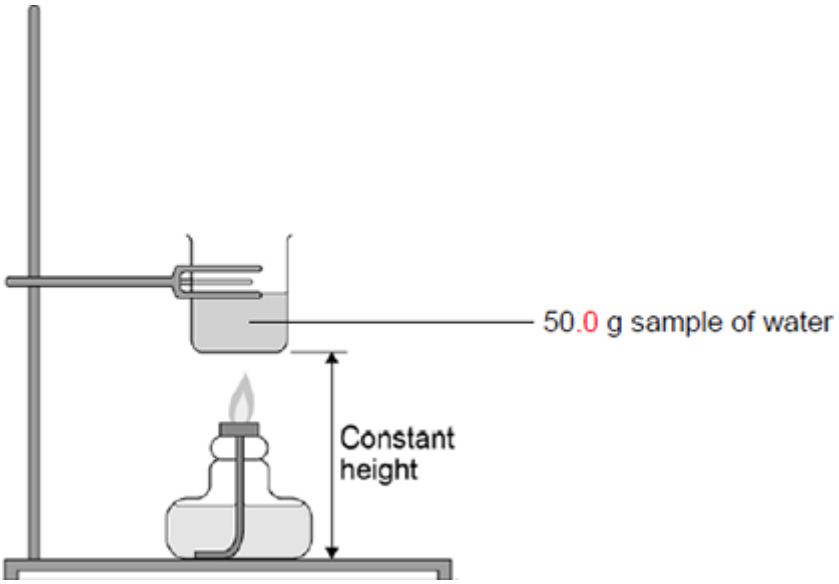
(Total 7 marks)

Section C – Chemistry – Fuels

https://www.youtube.com/watch?v=weKJ3_WbZ0Q

Q1.

The figure below shows apparatus used in an experiment to determine the enthalpy of combustion of leaf alcohol.



The alcohol is placed in a spirit burner and weighed. The burner is lit and the alcohol allowed to burn for a few minutes. The flame is extinguished and the burner is re-weighed. The temperature of the water is recorded before and after heating.

The following table shows the results obtained.

Initial mass of spirit burner and alcohol / g	56.38
Final mass of spirit burner and alcohol / g	55.84
Initial temperature of water / °C	20.7
Final temperature of water / °C	40.8

PTO

(b) Use the results from the table above to calculate a value for the enthalpy of combustion of leaf alcohol. Give units in your answer.
(The specific heat capacity of water is 4.18 J K^{-1} g^{-1})

Enthalpy of combustion = _____ Units = _____

(4)

(c) State how your answer to part (b) is likely to differ from the value quoted in reference sources.
Give **one** reason for your answer.

_____

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(2)

(d) A 50.0 g sample of water was used in this experiment.

Explain how you could measure out this mass of water without using a balance.

_____

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_____

(2)

(Total 9 marks)

1. Use the information on burning fuels to answer the following:

alcohol	number of carbon atoms	energy released (kJ/mol)
methanol	1	726
ethanol	2	1367
propanol	3	2021
butanol	4	2676
pentanol	5	3329
hexanol	6	3984
heptanol	7	4638
octanol	8	5294

a. Draw a graph of number of carbon atoms against energy released – **on the next page**

b. Describe the trend seen:

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c. Carry out research to explain the trend seen.

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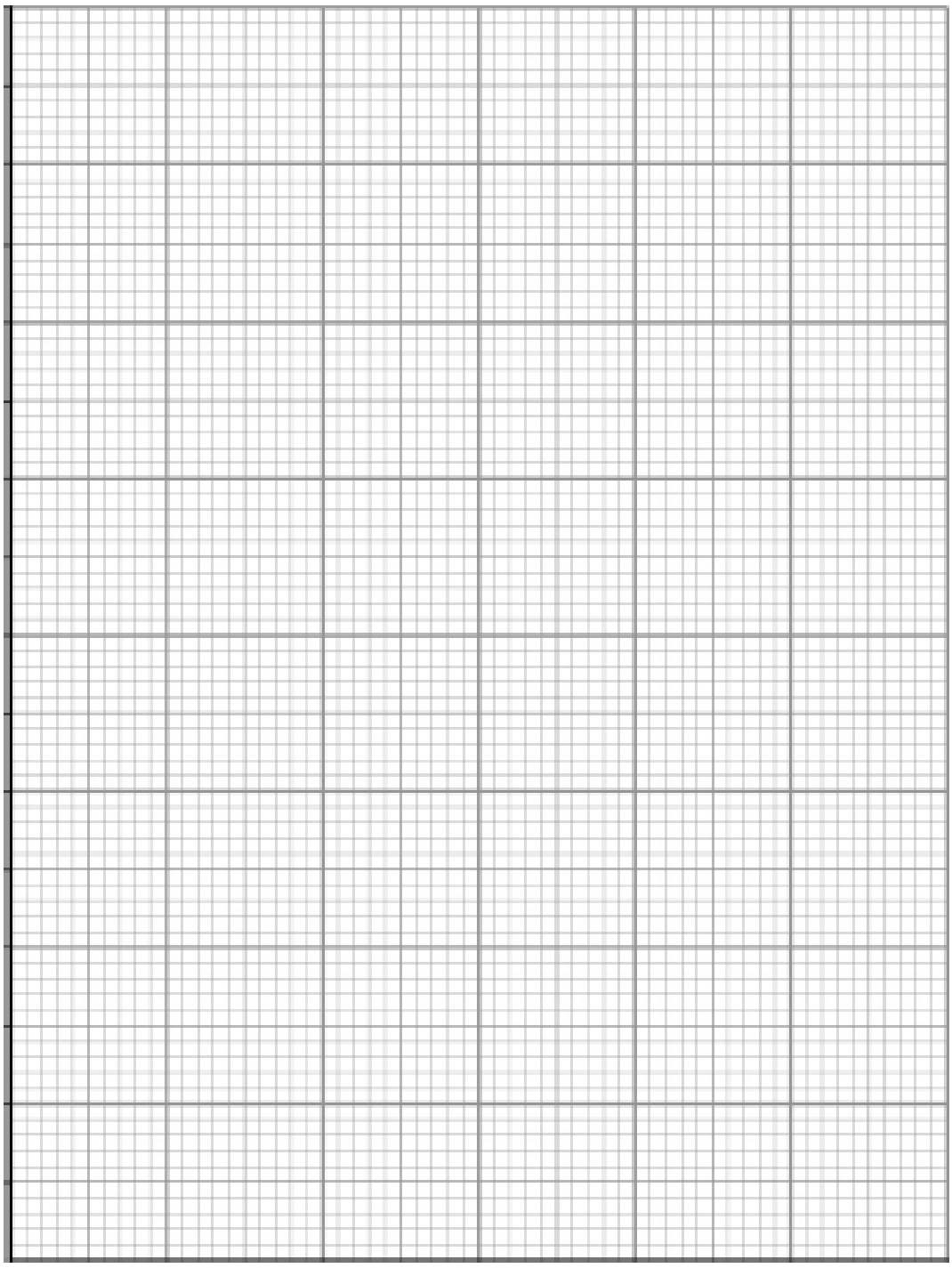

Part 1 – Compulsory Content Unit 8

THIS PART OF THE SIL MUST BE DONE AS A WORD DOCUMENT (TYPED). YOU WILL THEN ATTACHED IT TO AN ASSIGNMENT ON TEAMS WHICH YOUR TEACHER WILL SET. YOU MUST SAVE ALL OF THE REEFERENCES YOU USE, THIS WILL MEAN YOU CAN USE THE WORK IN AN ASSIGNMENT.

This should take you around 5 hours to complete to the correct standard and should be around 4 pages of work.

Task 1: For each of the following digestive organs, research the points below:

- Describe the structure
- Describe the function
- Describe any chemicals produced and why they are needed
- Describe any enzymes produced

ORGANS TO RESEARCH: Mouth, oesophagus, stomach, small intestine (all 3 parts: duodenum, jejunum, ileum), large intestine, rectum, anus, pancreas, liver, gall bladder

Task 2: Key terms. Find the definitions of the terms below.

Digestion

Absorption

Assimilation

Task 3: Key terms

What is mechanical digestion?

What is chemical digestion?

What does hydrolysis mean?

Task 4: Enzymes. Complete the table below

Enzyme	What it digests	Products formed	Where in the body it is made	Where in the body it ACTS	Optimum pH
Protease					
Amylase					
Lipase					