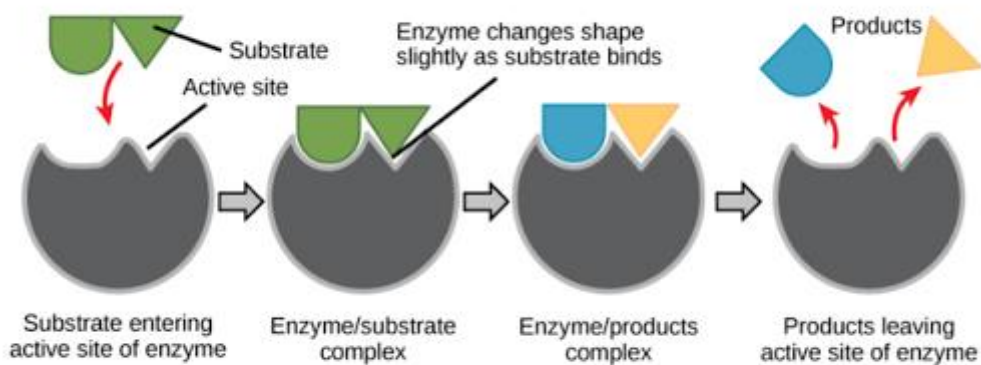
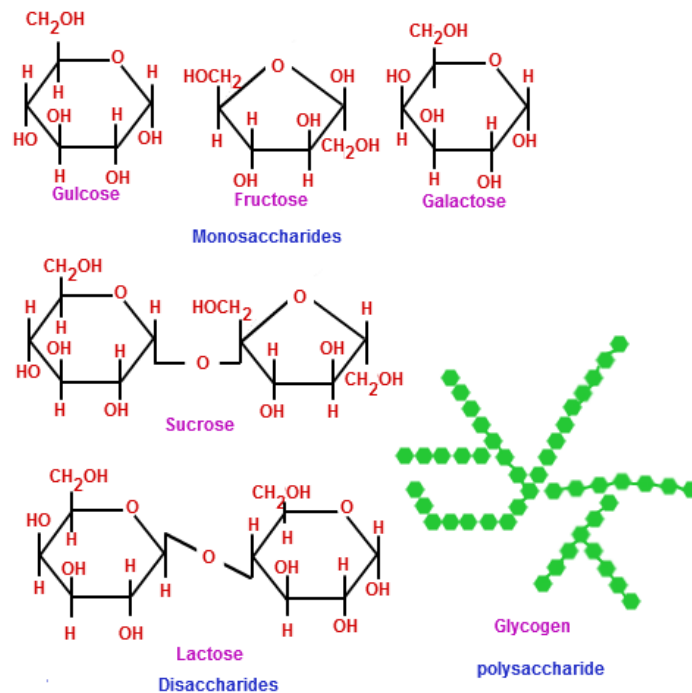


WJEC Medical Science NCB

Summer Independent Learning



Medical Science Summer Independent Learning Activity.

Welcome to Medical Science, please complete **ALL** of the following tasks ready for your first day at New College. You can print the booklet, write on the PDF file or answer the questions on paper.

Part 1: Structure of Carbohydrates, Lipids and Proteins

Task 1: Carbohydrate Structure

Task 2: Lipid Structure

Task 3: Protein Structure

Part 2: Enzymes

Task 4: Enzyme definitions.

Task 5: Interpreting enzyme graphs.

Part 3: Maths

Task 6: Calculating percentage change.

Task 7: Calculating ratios.

Task 9: Standard form

Task 10: Significant figures

Part 4: Self-reflection.

Please be aware that you will have **an assessment** on these topics (excluding the digestive system) shortly after beginning the Medical Science course and the knowledge covered is essential to understanding the subsequent content. Many of the following tasks are GCSE revision, but you will need to use specific A Level resources for some of the tasks.

The following resources will be useful:

- [www.youtube](https://www.youtube.com/channel/UC...) type in NCP Biology for our department's channel.
- GCSE notes and revision guides
- SENECA learning – sign up, enrol onto the Biology A level AQA course, within the Unit 1 section, there are sections for all these topics.

Part 1: Task 1: Structure of carbohydrates

Use the following video links to support with your answers:

- | | |
|------------------------------------|---|
| 1. Monomers and polymers | https://www.youtube.com/watch?v=t3VPjObFd0I |
| 2. Monosaccharides | https://www.youtube.com/watch?v=E4itgKrEzak |
| 3. Disaccharides | https://www.youtube.com/watch?v=SZdz1yiAO5U |
| 4. Polysaccharides (glycogen only) | https://www.youtube.com/watch?v=WNHg_jV2PMo |

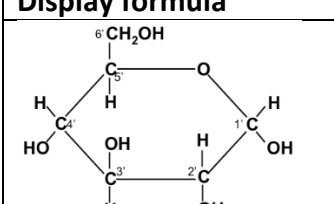
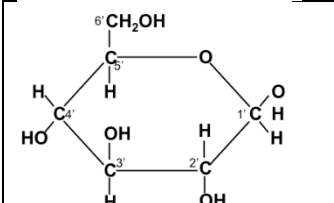
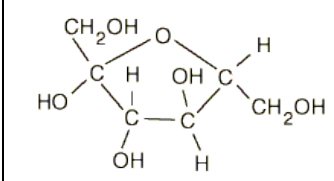
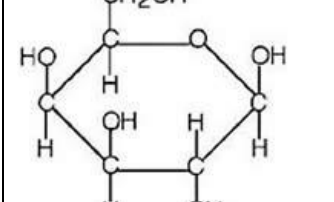
What is a monomer?

What is a polymer?

Describe the condensation reaction

Describe the hydrolysis reaction

These molecules are monosaccharides, name the individual molecules:

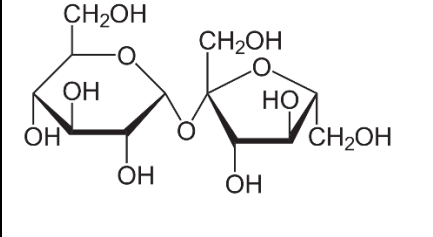
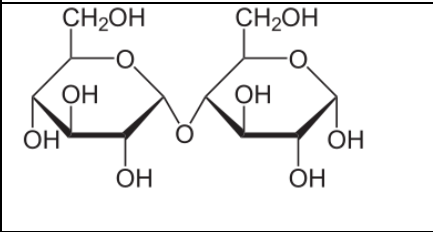
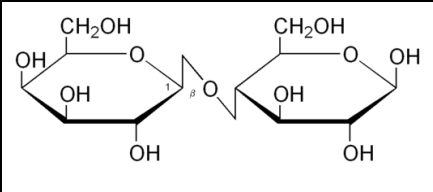
Display formula	Formula	Name	Type of sugar
	$C_6H_{12}O_6$	Alpha-glucose	hexose
		Beta-glucose	
			
			

$ \begin{array}{c} \text{H} \\ \\ \text{C}=\text{O} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{CH}_2\text{OH} \end{array} $			triose
			pentose
		deoxyribose	

Disaccharides - <https://www.thesciencehive.co.uk/biological-molecules-a-level/>

Describe how a disaccharide is formed:

These molecules are disaccharides, name the individual molecules:

Display formula	Formula	Name	Made from
			
			
			

Draw a diagram to show how a condensation reaction occurs between two monosaccharides to form maltose. Label the bond that forms.

Describe how glycogen is formed. Include the monomer, the reaction and the bond formed.

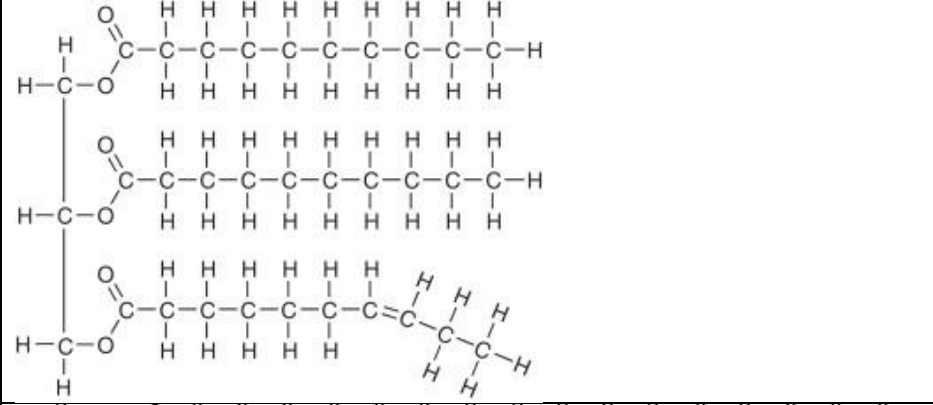
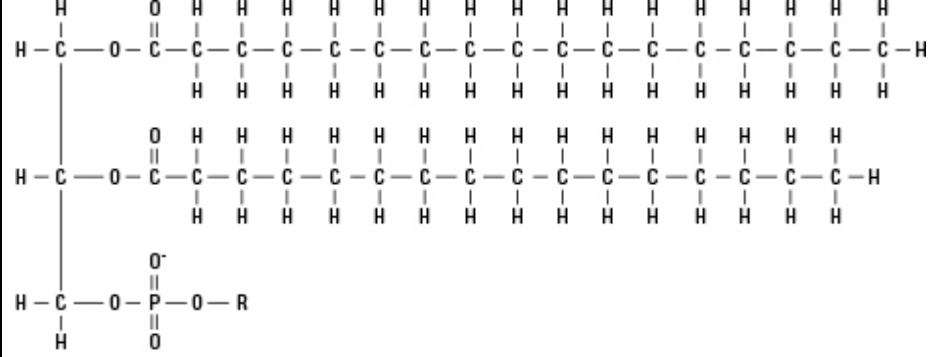
Draw a diagram of glycogen:

Explain what makes it a good storage molecule for glucose, inside cells:

Part 1: Task 2: Lipid Structure

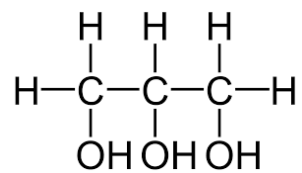
(see <https://www.thesciencehive.co.uk/biological-molecules-a-level>)

Watch this video <https://www.youtube.com/watch?v=55oCUwxKpsk>

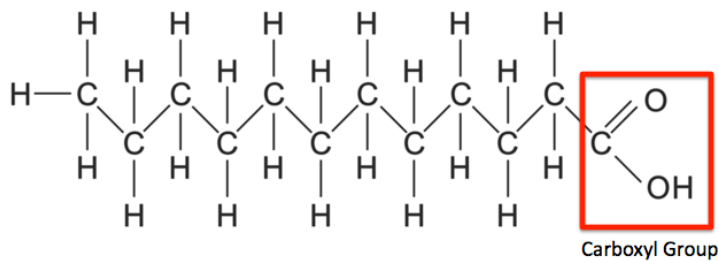
Display formula	Name
	<p>triglyceride</p>
	

Draw a diagram to represent a triglyceride and a fatty acid.

What is the formula for glycerol?

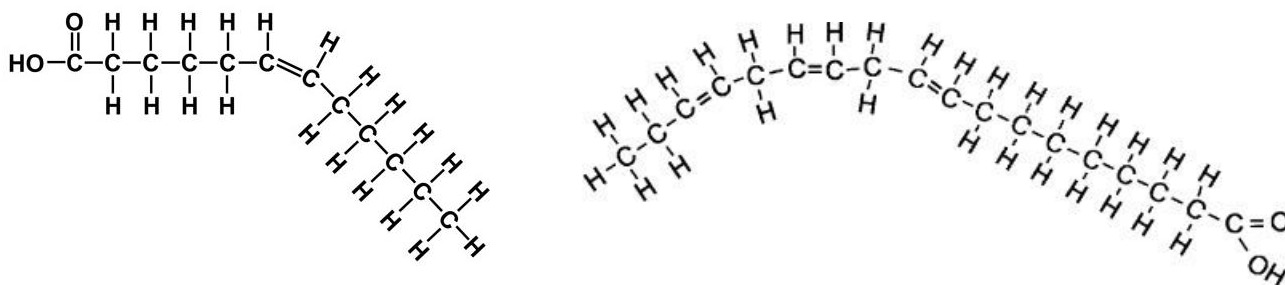


What is the general formula for a saturated fatty acid?



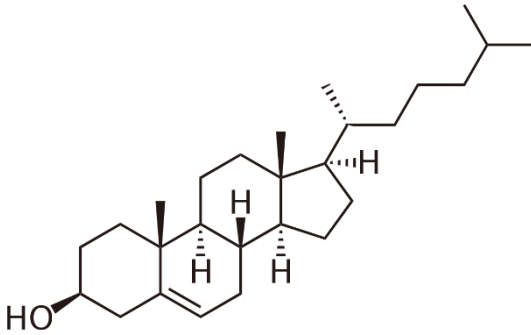
What does the term saturated mean when describing a fatty acid?

What is the difference between mono-unsaturated fatty acids and poly-unsaturated fatty acids?



	Triglyceride	Phospholipid
Function		
Properties		

Describe the structure of cholesterol:



How can you recognise a steroid hormone from its structure?

Give 2 examples of steroid hormones that are made from cholesterol:

What is cholesterol a vital component of?

Part 1: Task 3: Protein structure

(see <https://www.thesciencehive.co.uk/biological-molecules-a-level>)

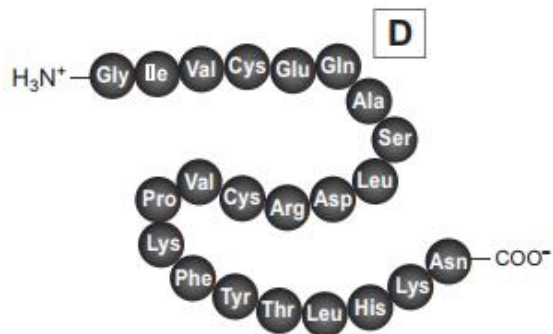
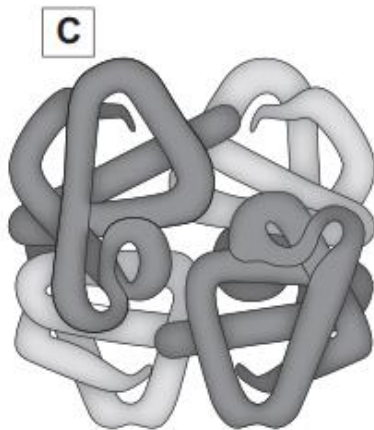
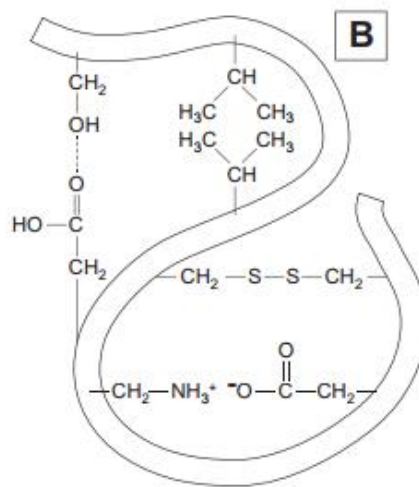
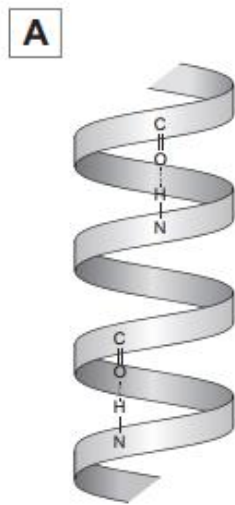
Watch <https://www.youtube.com/watch?v=a56ChCHTa3w>

Draw and label the general structure of an amino acid:

How do 2 amino acids differ?

How many different amino acids are coded for in proteins?

Label the structures within a protein and any bonds that are shown in the diagrams.



Describe the following protein structures, including the bonds that hold them together:

Primary Structure

Secondary Structure

Tertiary Structure

Quaternary

Part 2: Enzymes (see <https://www.thesciencehive.co.uk/enzymes-a-level>)

Task 4: 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? **(1)**

Draw a ring around the correct answer.

antibody	biological catalyst	hormone
-----------------	----------------------------	----------------

(ii) All enzymes are made of the same type of substance.

What is this substance? **(1)**

Draw a ring around the correct answer.

carbohydrate	fat	protein
---------------------	------------	----------------

(iii) Where is the enzyme amylase produced in the human body? (1)

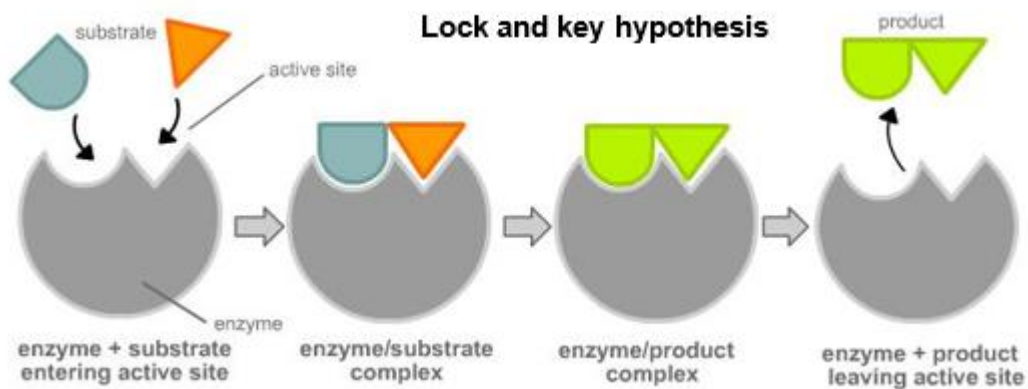
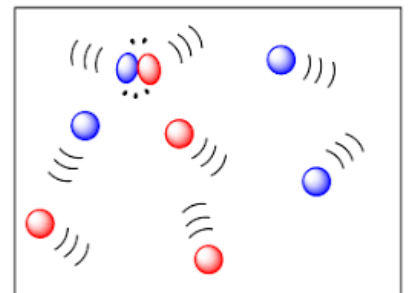
Draw a ring around the correct answer.

liver	salivary glands	stomach
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Enzyme reactions:

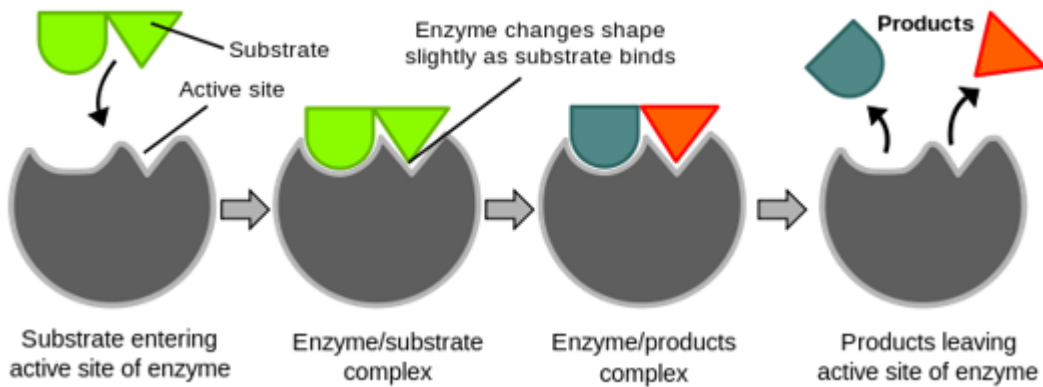
Use the diagram to describe how collision theory is involved in enzyme controlled reactions.

<https://www.bbc.co.uk/bitesize/guides/z2gccdm/revision/2>



Use the diagram to describe the lock and key model of enzyme controlled reactions.

Induced fit model



Use the diagram to describe the induced fit model of enzyme controlled reactions.

Task 5: Interpreting enzyme graphs.

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

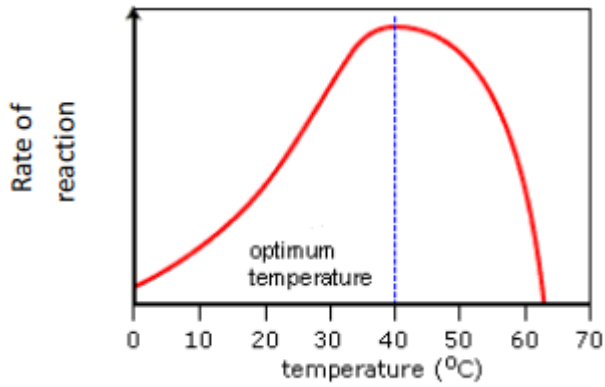
Using the following link from our YouTube channel, watch the video and annotate each of the graphs.

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.



.....

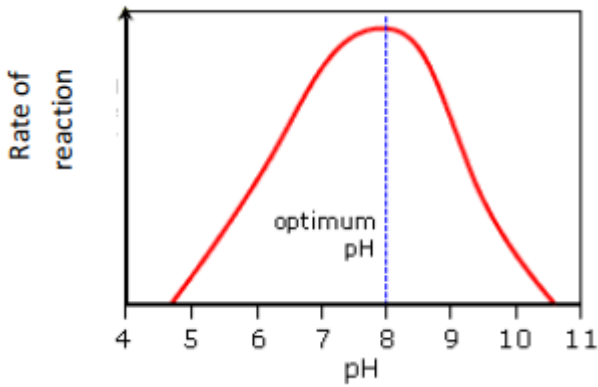
.....

.....

.....

.....

Q2. Change in pH.



.....

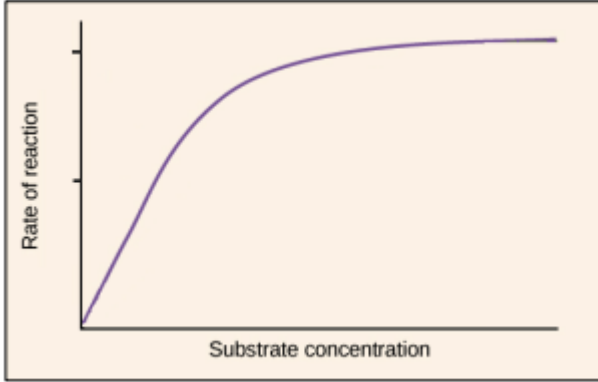
.....

.....

.....

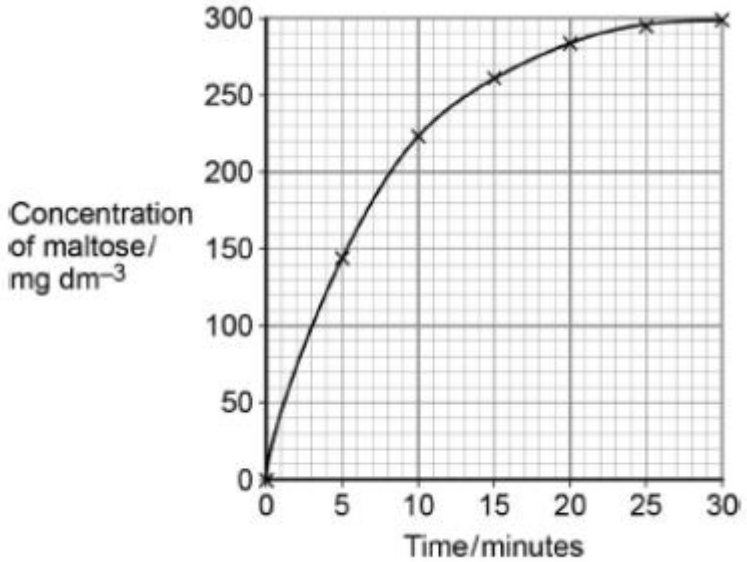
.....

Q3. Change substrate concentration.



.....
.....
.....
.....
.....

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.

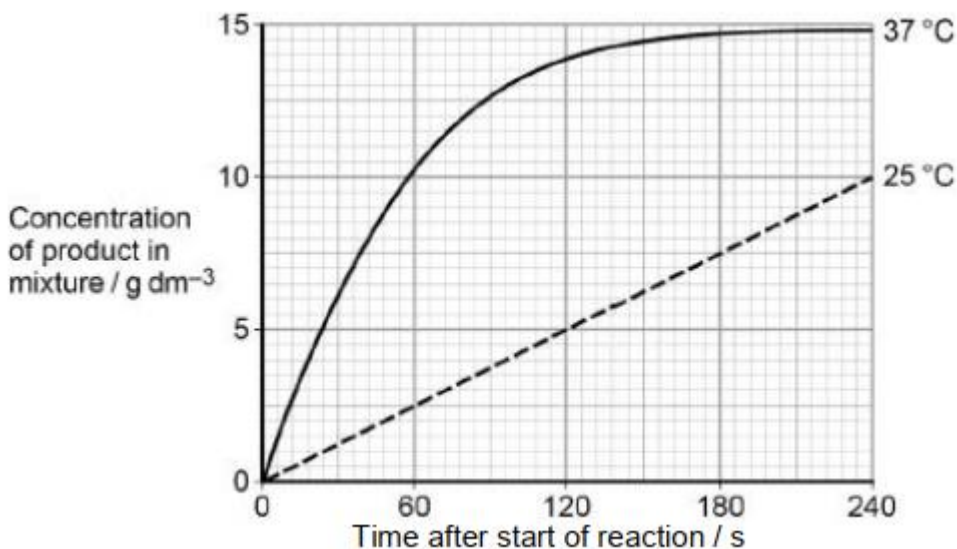


Explain the results shown in the graph.

.....
.....
.....
.....
..... (2)

Q2. A technician investigated the effect of temperature on the rate of an enzyme-controlled reaction. At each temperature, he started the reaction using the same volume of substrate solution and the same volume of enzyme solution.

The figure below shows his results.



(a) Describe and explain the differences between the two curves.

.....

(5)

Part 3: Maths

Task 6: Calculating percentage change.

This section requires you to understand how to calculate percentage change from given data. This is a common skill required in exams. Read the worked examples and complete the questions.

You **MUST** show your working.

https://www.youtube.com/watch?v=CbfxFBfB7kk&list=PL0Mjub5NT756MyHewhXhdRSlygaF_woF3&index=4&t=0s from **2:10** on the NCP Biology You tube channel in order to help you with the follow section.

$$\text{Percentage change} = \frac{\text{Change} \times 100}{\text{Original}}$$

Worked example.

The mean height of some seedlings is 12mm at day 6 and 18mm at day 12.
What is the % change in height?

$$\% \text{ change} = \frac{(18-12)}{12} \times 100 = 50\%$$

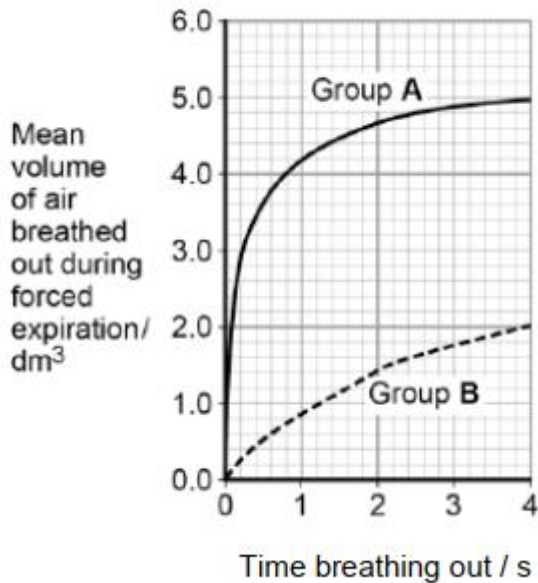
1. The table shows how environmental temperature affects the food intake, water intake and milk production of cows in a fixed period of time.

Environmental temperature / °C	Food intake / kg	Water intake / dm ³	Milk production / dm ³
20	18.2	81.8	27.0
25	17.7	88.6	25.0
30	17.0	95.0	22.9
35	16.7	144.1	18.0

Calculate the percentage decrease in milk production between the temperatures of 30 °C and 35 °C. Show your working.

Answer %

Q2. Forced expiration volume (FEV) is the volume of air a person can breathe out in 1 second. Using data from the first second of forced expiration, calculate the percentage decrease in the FEV for group B compared with group A.



..... %

Task 7: Calculating ratios.

This section requires you to understand how to calculate ratios from given data. This is a common skill required in exams. Read the worked examples and complete the questions. You **MUST** show your working.

You may wish to watch the https://www.youtube.com/watch?v=CbfxFBfB7kk&list=PL0Mjub5NT756MyHewhXhdRSlygaF_woF3&index=4&t=0s from 0:30 video on the NCP Biology You tube channel in order to help you with the follow section

A ratio is a way to compare amounts of something. Recipes, for example, are sometimes given as ratios. To make pastry you may need to mix 2 parts flour to 1 part fat. This means the ratio of flour to fat is 2:1

When calculating a ratio divide the first value by the second value then divide the second value by itself.

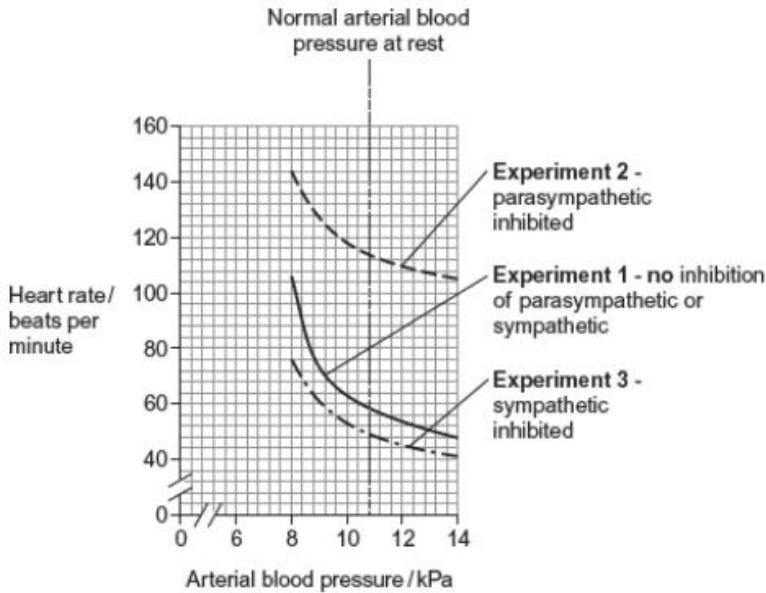
Q.1. Worked example.

A zoo has a population of monkeys. 56 are female and 19 are male. What is the ratio of females to males?

$$\frac{56}{19} = 1.3 \qquad \frac{19}{19} = 1 \text{ the ratio is } 1.3:1$$

It is important that the number are presented in the same order as the question. In this case it is female's first them males.

Q2. Doctors investigated the relationship between heart rate and arterial blood pressure. They recruited healthy volunteers. For each volunteer, they recorded their normal arterial blood pressure at rest. With each volunteer, they then carried out the following experiments. The graph shows the results for one volunteer.



Calculate the ratio of heart rate in **experiment 2** to heart rate in **experiment 3** at an arterial blood pressure of 10 kPa.
Show your working.

Answer = (2)

Q3. Researchers investigated some characteristics of people from different parts of England. In the north of England they selected 200 people and recorded their phenotypes for three different characteristics. Their results are shown in the figure below.

Phenotype produced by dominant allele	Number of people	Phenotype produced by recessive allele	Number of people
Tongue roller	131	Non-tongue roller	58
Right-handed	182	Left-handed	14
Straight thumb	142	Hitch-hiker thumb	50

Calculate the ratio of straight thumb to hitch-hiker thumb in this study.

Ratio = (1)

Task 8: Standard Form

Follow the link to BBC Bitesize to review standard form from GCSE Maths.

Read all 7 pages from the link. <https://www.bbc.co.uk/bitesize/guides/zxsv97h/revision/1>

Then answer the following questions.

1. Write these as ordinary numbers:	
(a) 3.6×10^4	
(b) 4.76×10^7	
(c) 2.41×10^{-3}	
(d) 9.02×10^{-5}	
(e) 8.77×10^3	
(f) 6.10×10^{-4}	
2. Write these numbers in standard form:	
(a) 345 610	
(b) 54 million	
(c) 7590	
(d) 135.7	
(e) 32.01	
(f) 0.738	
3. (a) Write these numbers in order, largest to smallest in the row below. 3.42×10^4 7.80×10^3 4.2×10^4 8.7×10^3 3.42×10^6	
(b) Write these numbers in order, smallest first in the row below. 9.34×10^{-3} 3.94×10^{-2} 3.49×10^{-3} 9.34×10^{-5} 4.93×10^{-2}	
(c) Write these numbers in order, smallest to largest in the row below. 1.52×10^6 1.52×10^{-6} 2.51×10^{-5} 2.15×10^5 2.15×10^{-5}	

Task 9: Significant figures

Follow the link to BBC Bitesize to review significant figures.

Read pages 4 and 5 from the link <https://www.bbc.co.uk/bitesize/guides/zv3rd2p/revision/4>

Then complete the following table.

Number	To 3 s.f.	To 2 s.f.	To 1 s.f.
4213			
6435			
23.65			
43.89			
0.0465			
0.009231			
0.9649			
0.4054			
0.07008			
0.4109			
0.005007			

Part 4 Task 10: Highly recommended additional content – Stomach Ulcers.

In this qualification, case studies of diseases are used to assess your understanding of Medical Science. Read the case study on Stomach Ulcers below and then answer the questions that follow.

Stomach ulcers

Stomach ulcers are open sores that develop on the lining of the stomach.

Symptoms of stomach ulcers

The most common symptom of a stomach ulcer is a burning pain in the centre of the abdomen. Some people may experience other symptoms, such as indigestion, heartburn and feeling sick. The pain can last from a few minutes to a few hours and often starts within a few hours of eating. Serious complications include vomiting blood or passing dark, sticky, tar-like faeces.

Causes of stomach ulcers

Stomach ulcers are usually caused by a bacterium called *Helicobacter pylori* (*H. pylori*). This bacterium can break down the stomach's defence against acid, allowing the stomach lining to become damaged and an ulcer to form. *H. pylori* infections are common, irritating the lining and making it more vulnerable to damage from stomach acid.

Non-steroidal anti-inflammatory drugs (NSAIDs) also cause stomach ulcers to a lesser extent. NSAIDs are medicines widely used to treat pain, high temperature (fever) and inflammation (swelling). Commonly used NSAIDs include ibuprofen and aspirin.



Diagnosing stomach ulcers

The GP or hospital may recommend one of the following tests:

- urea breath test
- faecal antigen test
- blood test
- gastroscopy

The GP will also want to know if a patient is taking NSAIDs.

Treatments for stomach ulcers

If the stomach ulcer is caused by a *H. pylori* infection, a course of antibiotics and a medication called a proton pump inhibitor (PPI) is recommended. If the stomach ulcer is just caused by taking NSAIDs, only a course of PPI medication is required. A GP may also prescribe additional antacid medication to neutralise the stomach acid and provide immediate, but short-term, symptom relief.

Preventing stomach ulcers

It is difficult to avoid infection from *H. Pylori*. Good food hygiene, avoidance of tobacco products and alcohol, and caution with use of NSAIDs is recommended.

Questions (Use a number of different websites to answer the following questions. Type in the URL of the website you found the information and state why you think the website is a good source of information)

Q	URL of website used	Reason for using the website
1		
2		
3		
4		
5		
6		
7		

Questions

1	Explain the meaning of the term 'symptom'.
2	Describe what a person's abdomen is.
3	Find out whether <i>Helicobacter pylori</i> is a Gram positive or Gram negative bacterium.
4	How does the NSAID ibuprofen relieve the symptoms of pain?
5	Explain what a gastroscopy is. Your answer should include the following terms: endoscope, camera, biopsy, oesophagus, stomach.
6	Explain how an antacid can relieve the symptoms of heartburn.
7	Find 3 examples of PPI drugs.

Task 9: Self-reflection

Having completed all of the tasks please complete the self-reflection table below. This both you and us to identify your individual areas of strength and those that require improvement.

1= very confident/fully covered at GCSE

10= Not at all confident/not at all covered at GCSE

Have a good summer and we will see you in September!

Task number	How confident you were with it (1-10)	How much you had covered at GCSE (1-10)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		