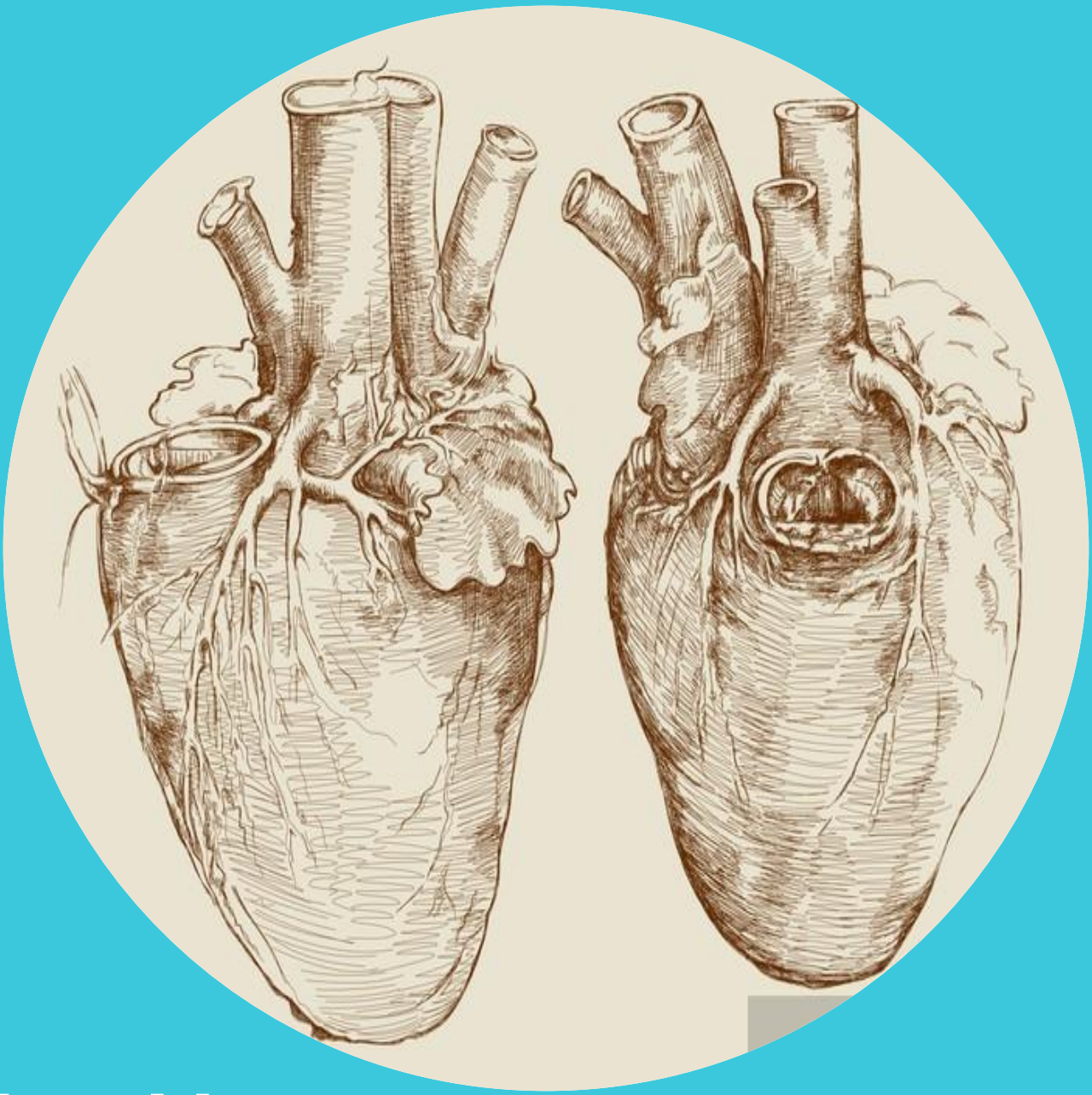

The Heart

Key Stage 4 Revision Programme

Pupil Name

Handbook Designed by Dr Breen

Timetable and Assignment Submission

Timetable – Tutorials

Fill out the times and dates of the tutorials

Tutorial	Date	Time	Location
1 (Baseline assessment)			
2			
3			
4			
5			
6 (Final assessment)			
7 (Feedback)			

Timetable – Homework Assignments

Tutorial 1		
Tutorial 2		
Tutorial 3		
Tutorial 4		
Tutorial 5		

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Tutorial 7	**P45**

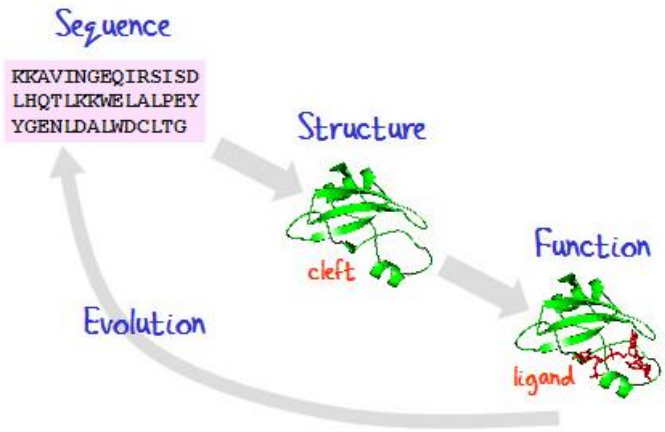
Course Rationale

Deliberate practice is practice which is purposeful and systemic, as opposed to just mindless repetition. The aim is to hone specific skills in small chunks, which, when put together, improve performance to reach a specific goal.

Think about learning an instrument, for example the piano. A pianist does not only practice by playing a piece of music in its entirety again and again. Instead they practice scales and arpeggios, chord progressions and transitions; they focus on certain passages, phrases or even individual bars. This is how a student builds a level of expertise that translates beyond just the one piece and into all of their performances.

In biology, a key idea is that structure determines function. In other words, the way something is arranged enables it to play its role, fulfil its job, within an organism (a living thing). Structure-function relationships arise through the process of natural selection.

In last year's sessions, we considered how the structure of a protein controlled the function. In these tutorials we will expand this concept and we will look at the links between structure and function in the context of the human heart.



GCSE Specification

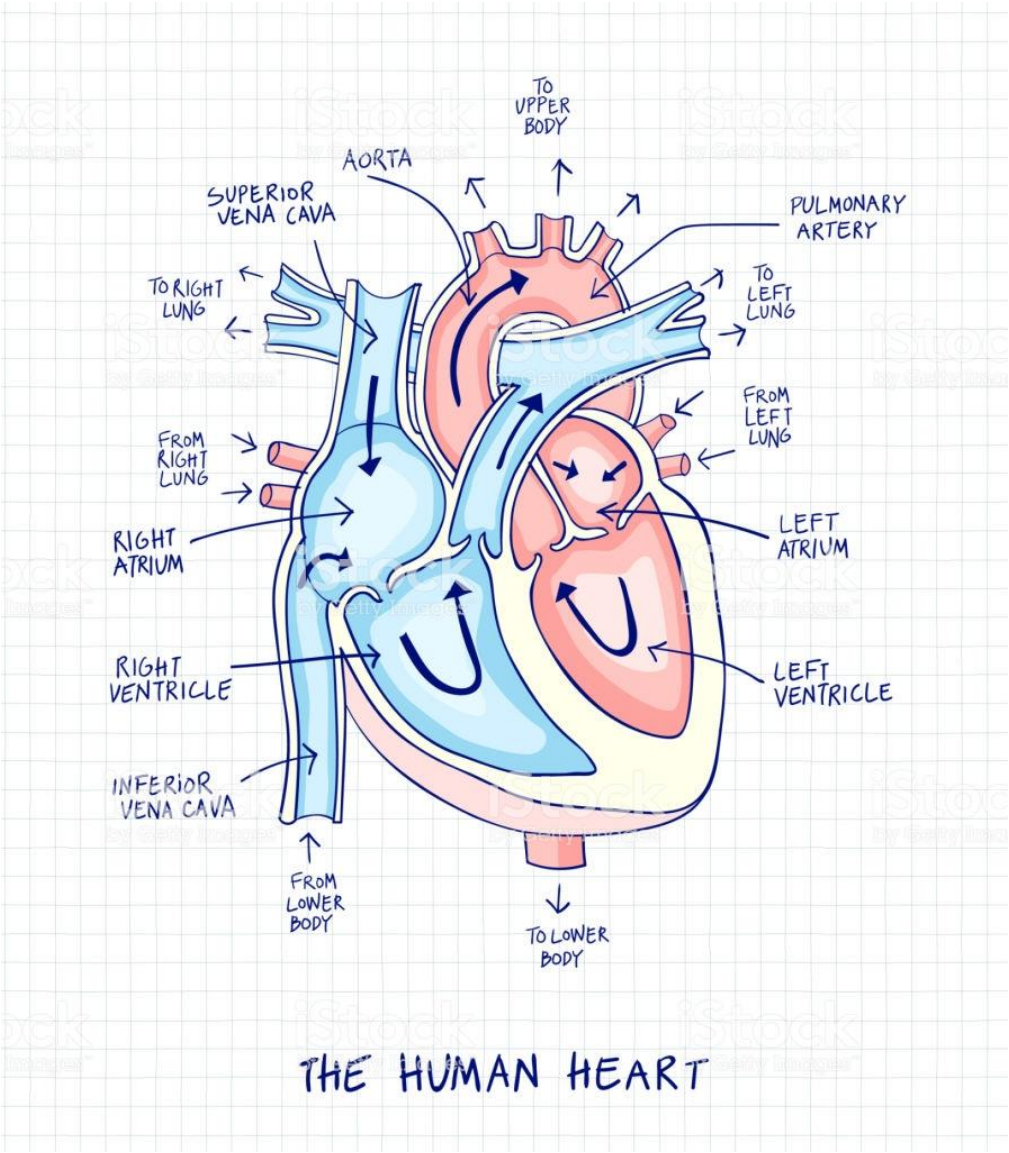
4.2 Organisation	
4.2.2.2 The Heart and blood vessels	The heart is an organ that pumps blood around the body in a double circulatory system. The right ventricle pumps blood to the lungs where gas exchange takes place. The left ventricle pumps blood around the rest of the body. The natural resting heart rate is controlled by a group of cells located in the right atrium that act as a pacemaker. Artificial pacemakers are electrical devices used to correct irregularities in the heart rate. The body contains three different types of blood vessel: •arteries •veins •capillaries.
4.2.2.3 Blood	Blood is a tissue consisting of plasma, in which the red blood cells, white blood cells and platelets are suspended.

Subject Vocabulary

Use this section to create a glossary of the key terms in this topic.

Word	Definition	In a sentence

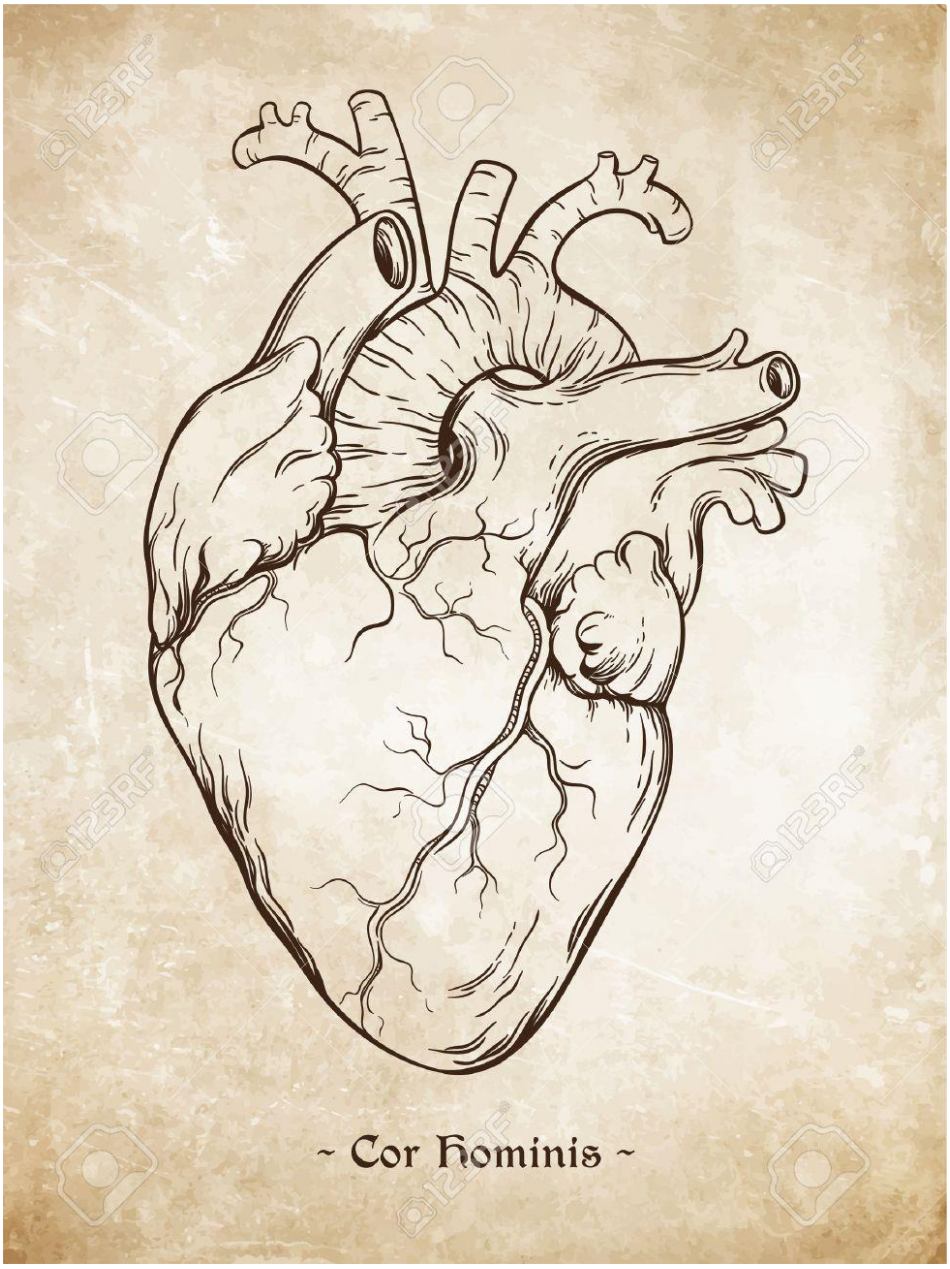
Tutorial 1 – Initial assessment



What is the purpose of tutorial 1?

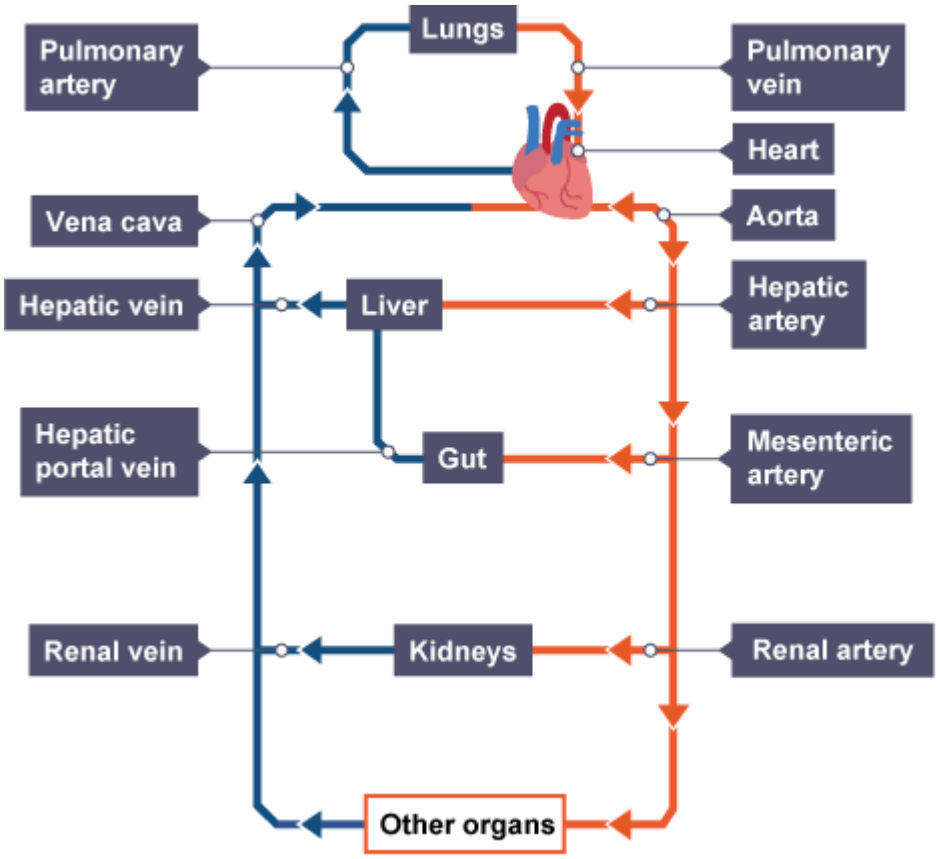
- Complete the initial assessment on the sheets given
- Complete the preliminary survey
- Eat some chocolate

Tutorial 2 – The Function of the Heart



What is the purpose of tutorial 2?

- Recap our knowledge of the heart
- Identify key features and structures within the heart
- Describe the roles of valves



The heart is an organ in the circulatory system. The circulatory system carries oxygen and nutrients to every cell in the body and removes the waste products.

Warm up:
What substances are carried in the blood? Give examples.

Consider the above diagram. How many times does the blood pass through the heart in one cycle?

Practice A: The function of the heart

1. Define these key terms (3):

Organ:

Tissue:

Double circulatory system:

2. Join the body part to the correct scientific description (2):

Part of human body	Scientific name
	An organ
Layer of cells lining the stomach	
	An organism
Stomach	
	An organ system
Mouth, stomach, intestines, liver and pancreas	
	A tissue

3. Fill in the gaps in this paragraph (4):

The _____ is a muscular organ. Its function is to _____. The ____ side pumps blood through the pulmonary circuit, while the _____ side pumps blood through the systemic circuit.

A _____ separates the right and left sides. The left side has _____ walls

4. Explain why the human heart is described as a double circulatory system (2)

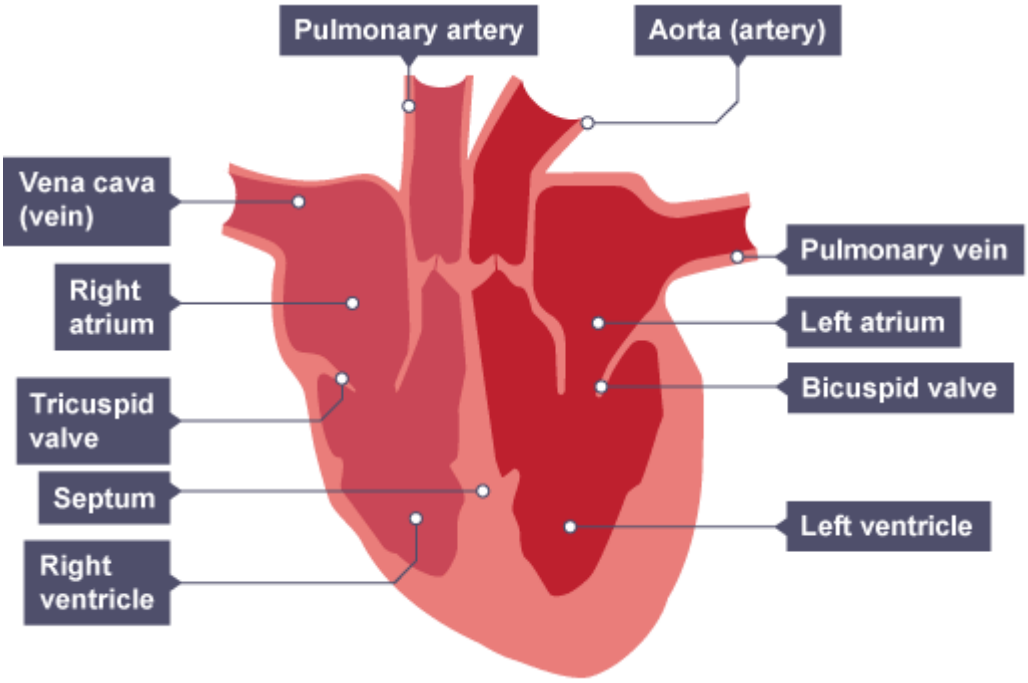
Assessment A: Select the correct answer.

1. What sort of circulatory system is the human circulatory system?

An open circulatory system
A single circulatory system
A double circulatory system
A lymph circulatory system

2. The heart is part of which organ system:

Digestive system
Respiratory system
Cardiovascular system
Central nervous system



The heart pumps blood around the body in a double circulatory system. This means there are two circuits.

- 1: Deoxygenated blood flows into the right atrium and then into the right ventricle which pumps it to the lungs to undergo gaseous exchange

- 2: Oxygenated blood flows into the left atrium and then into the left ventricle which pumps oxygenated blood around the body

Practice B: The structure of the heart

1. Build a model of the heart.

Carefully cut out the model of the heart.
Glue the pieces together as shown on the tabs.
Stick your heart model into the space on the next page.

2. Draw four arrows on your model to show the movement of blood through the heart (4).

Label each arrow as either deoxygenated or oxygenated blood.

3. Describe what could happen if the septum of the heart was damaged. (4)

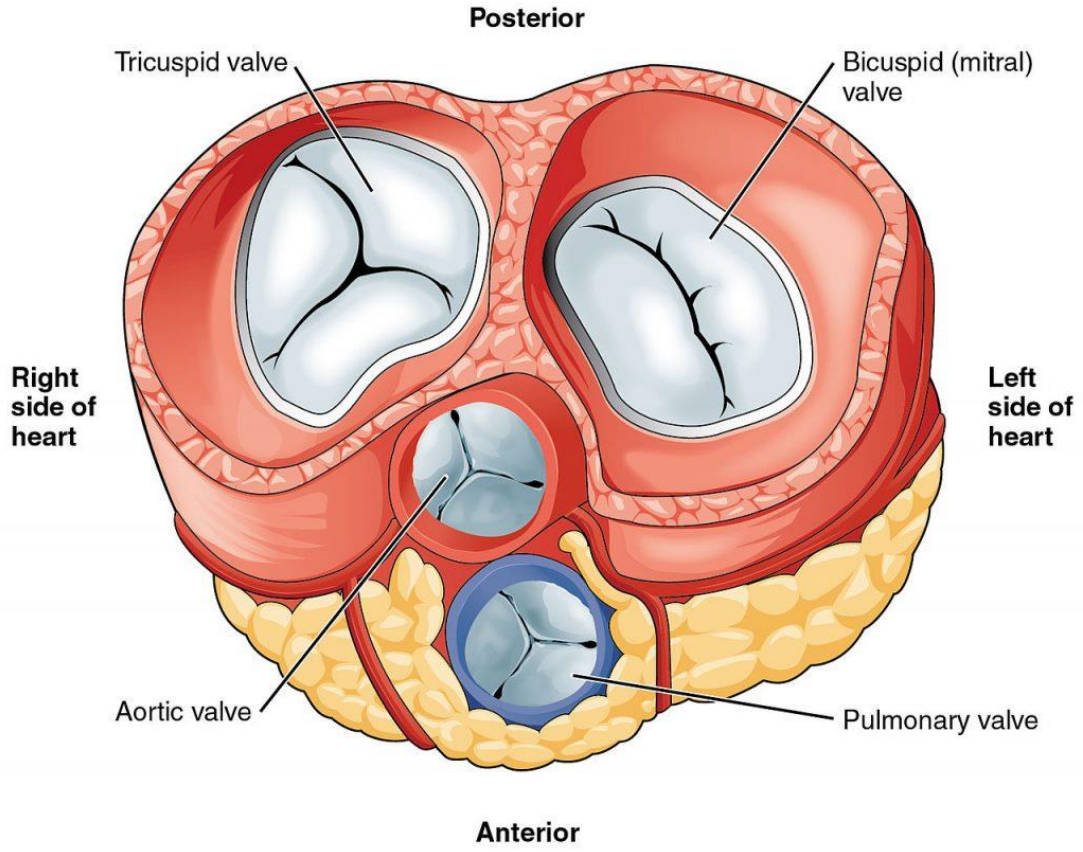
Assessment B: Select the correct answer.

1 . From which chamber of the heart does blood leave to go to the lungs?

Right ventricle
Right atrium
Left ventricle
Left atrium

2. At which chamber does oxygenated blood arrive at the heart?

Right atrium
Left atrium
Left ventricle
Right ventricle



The heart contains valves to prevent the blood flowing backwards:

- the right side has a **tricuspid valve** (a valve with three flaps)
- the left side has a **bicuspid valve** (a valve with two flaps)

Both sides have **semi-lunar valves** (at the entrances to the pulmonary artery and aorta).

Practice C: Valves and their roles

1. Draw and label the valves on your model of the heart (4).

2. Explain the role of each type of valve in the heart (4).

Assessment C:

Which valve prevents blood flowing back into the left atrium from the left ventricle?

The semi-lunar valve
The bicuspid valve
The tricuspid valve

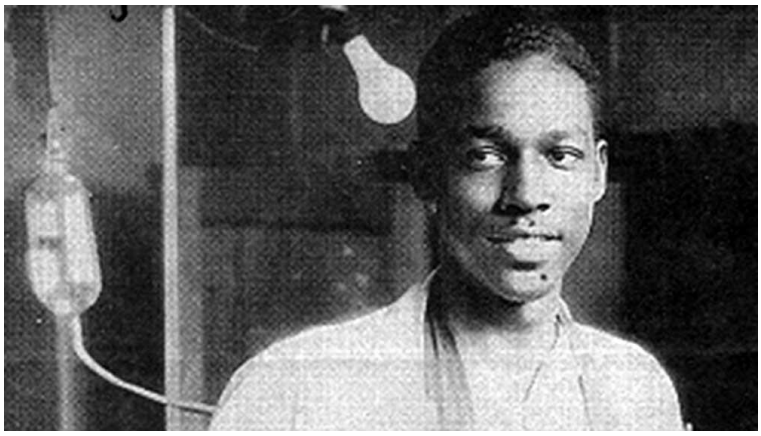
What might happen if the valves of the heart are damaged (2)

Challenge:

Using your knowledge of the heart, describe the journey of a red blood cell, starting in the right atrium.

Describe what structures the blood cell will pass though. State what substances the blood cell might come into contact with at different locations.

Behind the science:



***Dr.* Vivien Theodore Thomas** (August 29, 1910 – November 26, 1985) was an American surgeon who developed a procedure used to treat blue baby syndrome (now known as cyanotic heart disease) in the 1940s.

A black man who grew up in the early 1900s in the South, Thomas graduated from high school and adopted his father's trade: carpenter. Through a series of events, Thomas eventually took a job as lab assistant for Alfred Blalock, MD, of Vanderbilt University Hospital. His responsibilities involved basic laboratory testing of the cardiac physiology of laboratory animals. Eventually, these responsibilities evolved into more complex evaluations of changes in cardiac physiology in laboratory animals. Many of these studies were devised and performed before the development of much of today's standard medical equipment—pulse oximetry, defibrillation, and automatic laboratory analysis. All calculations were performed in longhand and repeated twice for accuracy.

As Dr. Blalock's clinical activities increased, so did Thomas's responsibilities and he soon began performing innovative cardiovascular surgical techniques in laboratory animals. Thomas followed Dr. Blalock to Baltimore when Dr. Blalock was appointed chair of surgery at The Johns Hopkins Medical School. It was at Hopkins that Thomas continued his research and was directly involved in the development of the Blalock-Taussig shunt, also known as the blue-baby operation.

Denton A. Cooley, MD, a surgical resident in Dr. Blalock's program at Hopkins, observed firsthand Thomas's key role in the innovation and pioneering of such previously unimagined surgeries. Thomas remained in the teaching laboratory to train residents, which enabled Dr. Blalock to attend to his increasing clinical responsibilities. After 30 years, Thomas was honoured with the title Instructor Emeritus in Surgery at The Johns Hopkins Medical School, and his portrait was commissioned and presented to The Johns Hopkins Medical Institutions.

Those who gave speeches at the presentation of this portrait to The Johns Hopkins Medical Institutions talked of Thomas's influence and of the high regard in which he was held. Dr. Alex Haller, Jr., relayed the following story:

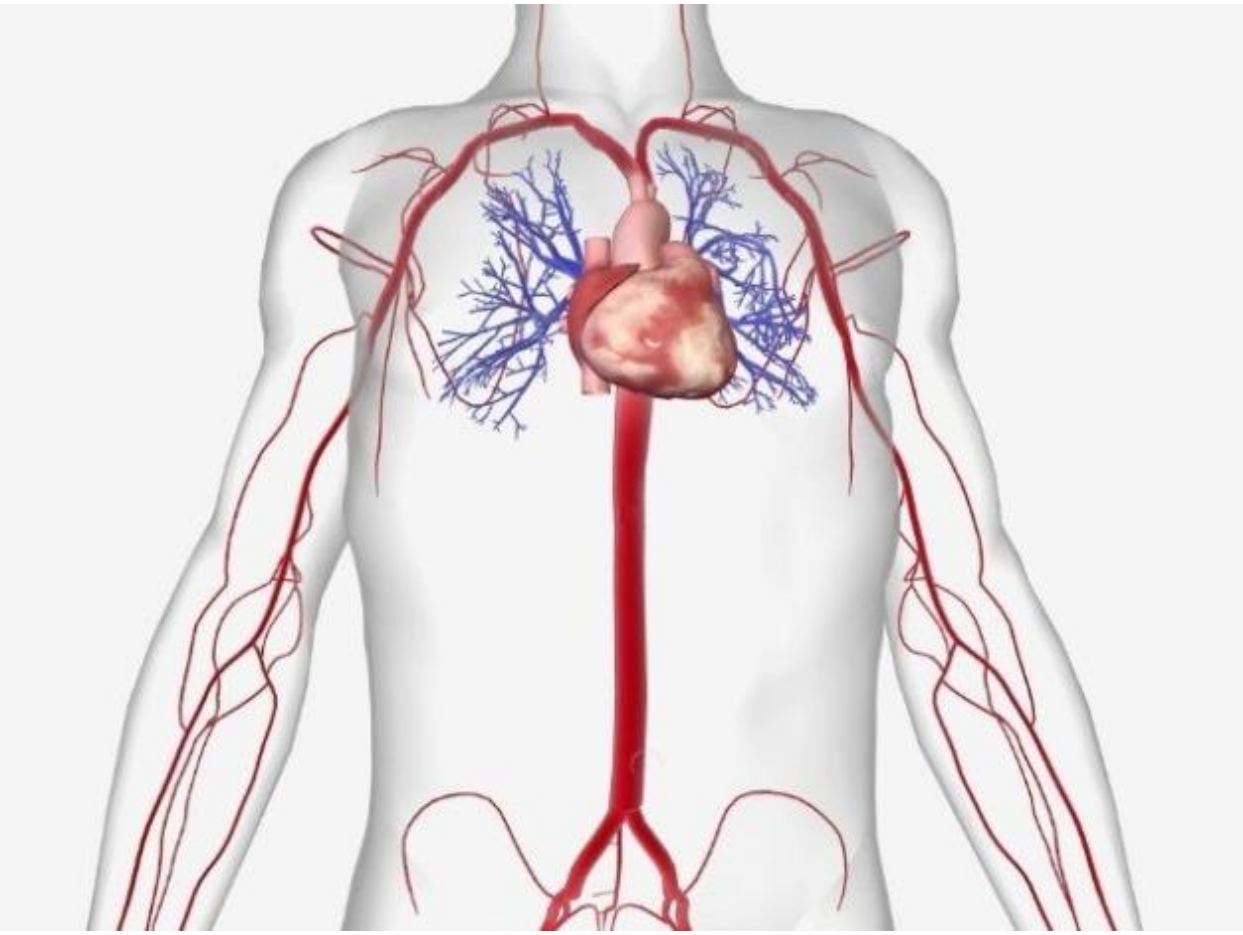
After I finished my internship here under Dr. Blalock, I joined Dr. Glenn Morrow at the National Institutes of Health and worked there in the laboratory. I was the only one there, except for the technician, Mr. Alfred Casper. Casper had spent some time observing Vivien here at the Hunterian Laboratory. As I worked with him in the first couple of weeks, on one occasion we got into trouble with some massive bleeding, which I was able to handle fairly well. At the conclusion of the operative procedure, Casper said to me, "Dr. Haller, I was very impressed with the way you handled yourself in that situation." Feeling overly proud of myself, I said to Casper, "Well, I was trained by Dr. Blalock."

… A few weeks later again we were operating together and we got into trouble for a second time. I did not know what to do. Casper immediately took over, placed the clamps appropriately and promptly and we got out of trouble. I turned to Casper at the end of it and said, "I certainly appreciated everything you did. You knew exactly how to handle your hands very well, too." He looked me in the eye with a little twinkle and said, "I trained with Vivien."

Why are these stories of continued interest and value? Considering the time at which the events took place and the relatively limited scientific training that Bakken and Thomas received, these stories demonstrate the successes of the underdog. For instance, Thomas, who very well could have become a carpenter, would later be recognized by many leading physicians as a pioneer of cardiovascular research and surgery. How would surgery's history and progress have changed had Thomas not had the opportunity to exhibit his innate intelligence and drive?

Kennedy, Damon M. "In search of Vivien Thomas." *Texas Heart Institute journal* vol. 32,4 (2005): 477-8.

Tutorial 3 – Variables and drug trials



What is the Purpose of Tutorial 2?

- Recap the differences between a dependent and independent variable
- Identify variables in any given investigation
- Describe the stages of a drug trial

A reminder:

D:_____
M:_____
I:_____
C:_____

I use "Dairy Millk Ice Cream" to help me remember which variable is which. You can make up your own mnemonic if it will help!

When reading about an experiment, drug trial or piece of research, we need to identify these two variables.

We also need to identify control variables, number of repeats and any other information that could impact the data collected.

Practice A:
Identify the dependent and independent variables in these three experiments:

1. A person did five different activities in turn. These activities needed increasing amounts of energy. For each activity two measurements were made. These were the rate of contraction of the left ventricle and its stroke volume (the volume of blood pumped at each beat). From these measurements the cardiac volume was calculated.

Dependent:

Independent:

2. LDL is one form of cholesterol found in the blood. People with a high concentration of LDL in their blood may be treated with drugs called statins. A high concentration of LDL cholesterol in the blood may result in an increased risk of heart and circulatory diseases. One person with four different statins, **A**, **B**, **C** and **D**, over a period of 8 years and the concentration of LDL in their blood was recorded monthly.

Dependent:

Independent:

3. During exercise, the heart beats faster and with greater force. The 'heart rate' is the number of times the heart beats each minute. The volume of blood that travels out of the heart each time the heart

beats is called the 'stroke volume'. In an investigation, **Person 1** and **Person 2** ran as fast as they could for 1 minute. Scientists measured the heart rates and stroke volumes of **Person 1** and **Person 2** at rest, during the exercise and after the exercise.

Dependent:

Independent:

Assessment A:

Define the term Control variable:

Which variable do you measure?

Dependent

Independent

Control

Drug trials:

New drugs need to be tested and trialled before doctors prescribe them and patients take them. This allows drugs to be checked for:

- safety
- effectiveness
- dosage

Safety

This is important as some drugs are toxic, and have other side effects that might be harmful to people

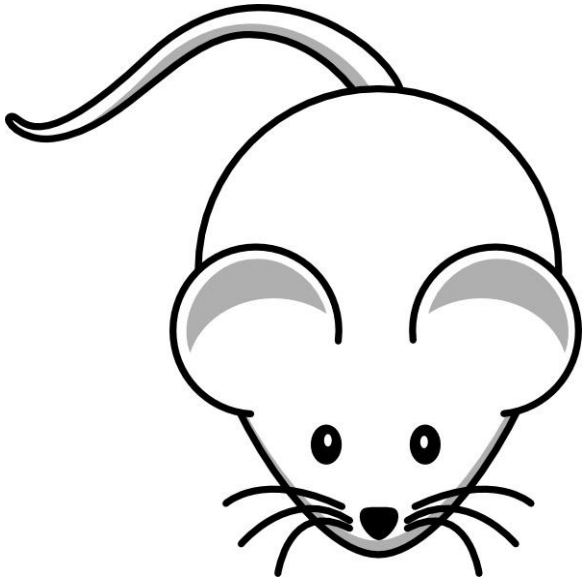
Effectiveness

This is also known as efficacy, and checks how well the drug cures the disease, or improves symptoms.

Dosage

This varies, and has to be closely controlled, as too high a concentration might be toxic.

Three stages of testing drugs



There are three main stages of testing:

1. The drugs are tested using **computer models** and **skin cells grown using human stem cells in the laboratory**. This allows the efficacy and possible side effects to be tested. Many substances fail this first test of a **preclinical drug trial** because they damage cells or do not seem to work.
2. Drugs that pass the first stage are **tested on animals in the second part of a preclinical drug trial**. In the UK, new medicines have to undergo these tests. But it is illegal to test cosmetics and tobacco products on animals. A typical test involves giving a known amount of the substance to the animals, then monitoring them carefully for any side-effects.
3. Drugs that have passed animal tests are used in **human clinical trials**. They are tested on healthy volunteers to check that they are safe. The substances are then tested on people with the illness to ensure that they are safe and that they work. Low doses of the drug are used initially, and if this is safe the dosage increases until the optimum dosage is identified.

Practice B:

1. Draw a line from each stage in **List A** to the correct information in **List B**.

List A **Stage**	**List B** **Information**

	Used to find if the drug is toxic
Tests on humans including a placebo	
	The first stage in the clinical trials of the drug
Tests on humans using very small quantities of the drug	
	Used to find the optimum dose of the drug
Tests on animals	
	Used to prove that the drug is effective on humans

2. **Read the passage:**

Daily coffee dose delays development of Alzheimer's in humans.

Alzheimer's is a brain disease that causes memory loss in elderly people. Scientists studied 56 mice that had been genetically engineered to develop Alzheimer's.

Before treatment all the mice did badly in memory tests.

Half the mice were given a daily dose of caffeine in their drinking water. The dose was equivalent to the amount of caffeine in six cups of coffee for a human.

The other mice were given ordinary water.

After two months, the caffeine-drinking mice did better in memory tests than the mice drinking ordinary water.

The headline for the passage is not justified.

Explain why as fully as possible.

Assessment B:

What are the different stages of drugs trials?

- Testing it on humans to see if the side effects are harmful
- On human volunteers first and then on animals
- Preclinical trials using cells, tissues and animals. Then clinical trials using healthy human volunteers and patients.

What type of drug trials are there?

- Blind and partially blind trials
- Blind, double blind and open trials
- Fully open trials only

'I nearly died in a medical drug trial'

By Jason Caffrey BBC World Service 19 March 2016

When Rob Oldfield signed up for a drugs trial at Northwick Park Hospital in 2006, he thought he had found a way to earn some easy money, and do his bit for medical science. But the trial went disastrously wrong, leaving him and five other healthy men fighting for their lives.

On the morning of 13 March 2006 Oldfield joined seven other test subjects at an independent clinic at Northwick Park Hospital run by Parexel, a company which conducts drug trials for pharmaceutical companies.

He was taking part in the first human trial of what was known as TGN1412, a drug that manipulated the immune system.

The German company that developed the drug hoped it would revolutionise treatment of leukaemia and rheumatoid arthritis.

But within minutes of having the drug administered, all of the test subjects began feeling unwell.

"I was injected at about 8am," says Oldfield. "Around midnight I was taken to intensive care."

The group of eight people had initially been split into two groups of four, who were put in separate rooms. One person in each room was given a placebo. The remaining six were given TGN1412.

"They administered to everybody in the other room," recalls Oldfield, who was subject number seven, "then they came into our room."

"We all had a catheter fitted to our arm and an electronic syringe. They came around, plugged in the syringe and pressed go.

"People started feeling cold. Everyone was starting to look a bit under the weather, freezing cold, a bit of the shivers. I thought 'it'll be OK, I'll probably be a placebo'."

Oldfield had no such luck. Subject number eight was given the placebo and went home shortly afterwards.

"They activated the needle - injected me - then I began to feel cold," recalls Oldfield. "The nurses didn't know what was going on really. They were faffing around looking for blankets to keep us warm.

"I remember being sick into a biohazard bag, and all of us being very ill. But the worrying point for me was when one guy, they drew the curtains around him, then these guys with gowns came up, like from an operating theatre.

"They went behind the curtain, then went away and came back with all this equipment - life-support stuff."

Oldfield had signed up to the trial for a fee of £2,000. He had spent two months in the US training as a screen actor, and returned to the UK with some debts he wanted to clear.

"A friend of mine had told me about medical trials before I'd gone. I thought I may as well take of advantage of it. Plus I thought I could be a kind of ambassador for medical science."

Like the other men taking part, he filled out an 11-page consent form which detailed the risks of taking part. But he had no inkling that the "potential hazards" could have resulted in him needing life-support.

"I didn't know it was dangerous. I had no idea it altered the immune system."

But TGN1412 had a catastrophic effect on the six men's bodies. Headaches and chills rapidly gave way to vomiting, severe pain and shortness of breath.

Swollen tissue, plummeting blood pressure and multiple organ failure followed. One by one, all six were transferred to intensive care.

"I remember quite vividly being pushed through those corridors that hospitals have, and when they go outside and it's like a glass enclosure.

"I remember the cool air hitting me and feeling faint because of the temperature change."

Oldfield ended up in an area where people recover after surgery. Intensive care was short of room.

"There were six of us in this triage space, and that's where they started putting machines on us - haemo-filtration, cleaning your blood."

Despite the drama, it took Oldfield some time to grasp the danger he was in.

He was given steroids, which masked his symptoms, and for a time he thought the adverse reaction to TGN1412 was within expectations - it was a trial after all, and the medical staff treating him were not being explicit about his situation.

"They were just saying we need to put this in the top of your leg, put a big tube into the neck, just to give drugs - it wasn't like 'you are seriously ill'."

At about 02:00, some 18 hours after Oldfield was injected, medical staff called his mother and told her she should come to the hospital.

In the middle of the night, she started driving from her home in Bristol to Northwick Park. "The doctors were saying this is your goodbye perhaps - this person could die," he says.

When his mother arrived, the look in her eyes told him that he was in a bad condition. "I now know that I was very puffy because of the steroids," he says. "The whites of my eyes were orange because of the toxins. I didn't look well."

How trials are regulated

People running clinical trials have legal obligations that are set out in Medicines for Human Use (Clinical Trials) Regulations 2004. conditions include:

- *Anyone taking part in a trial must have a full understanding of the objectives of the research, and any risks and potential inconveniences they may experience when taking part. This information will be given to them at a meeting with a member of the research team*

- *A point of contact must be provided so patients can obtain more information about the trial*

Before a clinical trial of a new medicine can begin, all of the following needs to be in place:

- *The science the research is based on must be reviewed by experts*

- *The researchers must secure funding*

- *An organisation, such as a hospital or research institute, must agree to provide a home base for the trial*

- *The Medicines and Healthcare Products Regulatory Agency (MHRA) needs to review and approve trials of a medicine and issue a clinical trial authorisation (CTA)*

- *A recognised ethics committee must review the trial and allow it to proceed*

For two weeks, Oldfield's blood was filtered 24 hours a day, he recalls. His immune system had crashed, and his liver, kidneys and lungs were failing. Fluid seeped into his lungs and he had to breathe air through a mask, while a direct line pumped vital drugs into his heart.

Thankfully, like all of the men injected with TGN1412 that day, Oldfield survived. After three weeks in hospital, including seven days in intensive care, he emerged alive.

His short-term memory was impaired - for months afterwards he would forget conversations and appointments - and his immune system made extremely weak. Doctors advised him not to use public transport, and avoid other places where he might be exposed to viruses.

But he was, relatively speaking, fortunate.

At least one of the other men in the test experienced severe swelling of the head, leading to the episode being dubbed the "elephant man" trial.

Another spent four months in hospital, and had his toes and parts of his fingers amputated.

Oldfield received substantial cash payments over the course of two years as compensation. He used some of the money to hire a personal trainer to help "get myself in shape and feel more active".

Although he doesn't want to make public the amount of money he received, he believes the compensation was inadequate. He is also critical of Parexel.

He notes that Parexel's own document about the trial said TGN1412 could cause a cytokine storm - the dangerous reaction the men experienced.

The speed at which TGN1412 had been administered was criticised at the time, with one scientist, Prof Terry Hamblin of Southampton University, describing it as "reckless". The eight men in the test were injected at two-minute intervals, leaving very little time to assess its impact on one person before moving on to the next.

An interim review by the Medicines and Healthcare products Regulatory Agency found that Parexel had acted within protocols. But its final report said the trial had not properly considered the safe dosage of the drug for humans - a consideration that at the time was not required by law. It was also noted that there was no formal system in place to provide 24-hour medical cover.

Parexel says it "cannot discuss the specifics of any one patient-related matter to ensure the privacy for our patients and confidentiality for our clients".

Patient safety is the firm's top priority, it says. "Carefully designed and conducted clinical trials are essential in evaluating investigational compounds and treatment regimens."

Oldfield has pursued a career as an actor, and feels his health is reasonable, if not perfect.

"I think my immunity is a bit damaged. I get mouth ulcers more than I ever used to. The specialists say that after two years we should be at the same level as everybody. I don't see how that could be accurate.

"I try to be healthy in general, but who knows?"

Jason Caffrey (19 March 2016) "I nearly died in a medical drug trial" BBC World Service

Tutorial 4 – Interpreting Data

What is the Purpose of Tutorial 3?

- To practice interpreting data and results
- To practice applying scientific knowledge in a range of scenarios
- To apply given data in an exam question

When given experimental data, we must consider the variables and the type of experiment performed.

Often, information will be given that introduces concepts that we may not have encountered before. We need to be prepared to apply our own knowledge, context and understanding of experimental technique to the given information.

Practice A:

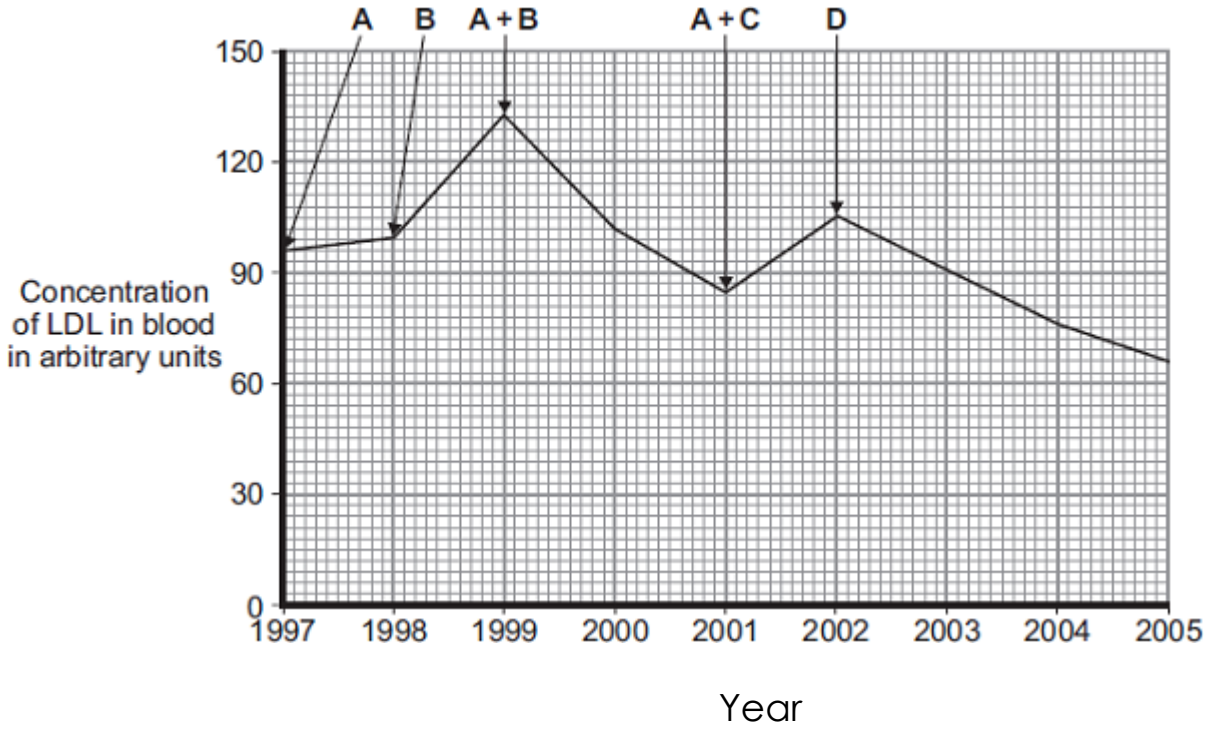
1 . LDL is one form of cholesterol found in the blood.

People with a high concentration of LDL in their blood may be treated with drugs called statins.

A high concentration of LDL cholesterol in the blood may result in an increased risk of heart and circulatory diseases.

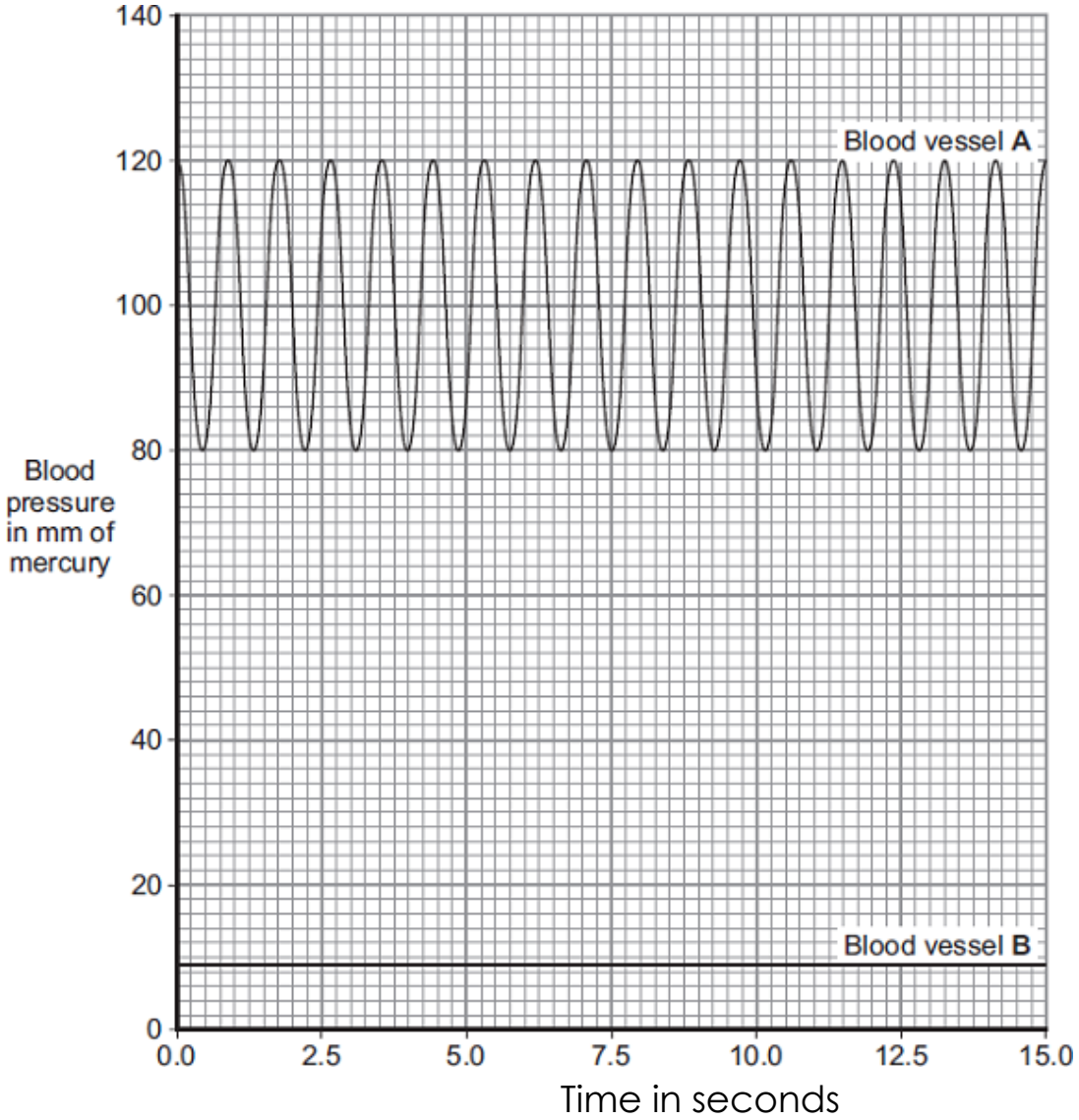
The graph shows the effects of the treatment of one person with four different statins, **A**, **B**, **C** and **D**, over a period of 8 years. The arrows show when each new treatment was started.

Each treatment was continued until the next treatment was started.



Compare the effectiveness of the five treatments in reducing the risk of heart and circulatory diseases for this person.

2. The heart pumps the blood around the body. This causes blood to leave the heart at high pressure. The graph shows blood pressure measurements for a person at rest. The blood pressure was measured in an artery and in a vein.



(a) Which blood vessel, **A** or **B**, is the artery?

Blood vessel _____

Give **two** reasons for your answer.

Reason 1

_____

_____

Reason 2

_____

_____

(b) Use information from the graph to answer these questions.

(i) How many times did the heart beat in 15 seconds?

_____

(ii) Use your answer from part (b)(i) to calculate the person's heart rate per minute.

_____

_____

Heart rate = _____ beats per minute

Assessment A:

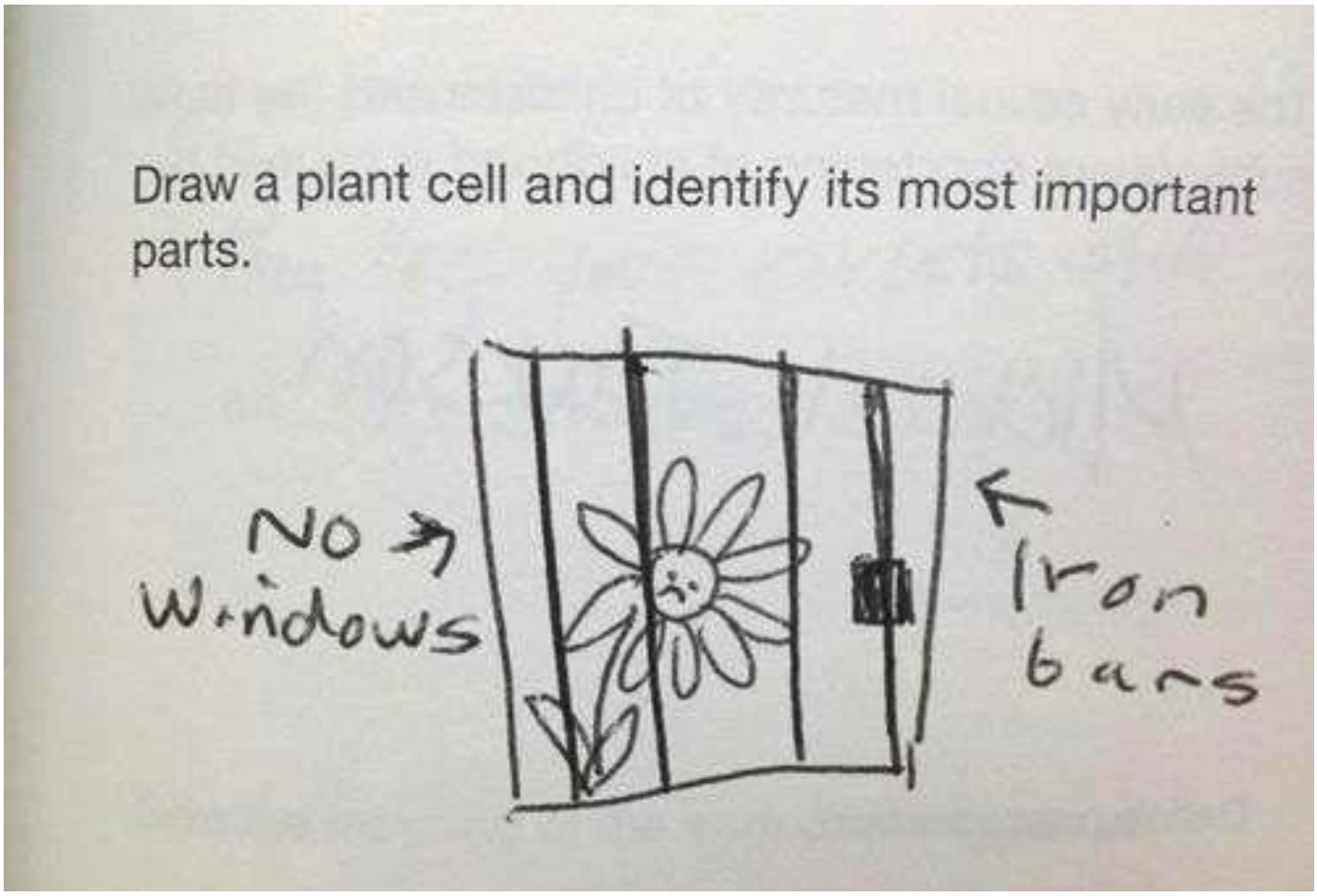
Which variable goes on the X axis?

Which variable goes on the Y axis?

Dissection:

Follow along with Dr Breen as we dissect the hearts. The following two pages are blank for your scientific drawings. Use a pencil, include relevant measurements and labels.

Tutorial 5 – Practice, practice, practice



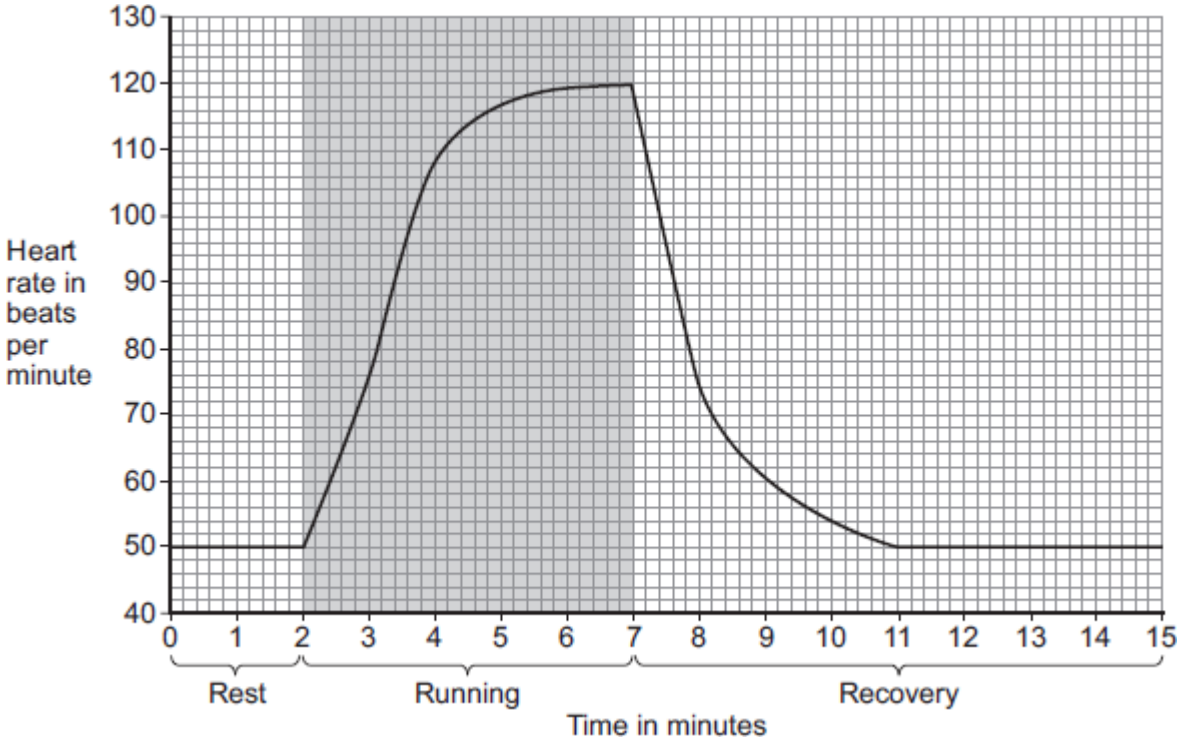
What is the Purpose of Tutorial 5?

- To apply knowledge in a range of contexts
- To be able to adapt knowledge and infer from data
- To practice exam questions

Complete the practice question sets within the given time. Rate your confidence in your answers at the end of each section.

Practice A:
8 minutes

A student ran on a treadmill for 5 minutes. The speed of the treadmill was set at 12 km per hour. The graph below shows the effect of the run on the student's heart rate.



(a) (i) What was the student's heart rate at rest?

_____ beats per minute

(ii) After the end of the run, how long did it take for the student's heart rate to return to the resting heart rate?

_____ minutes

(b) During the run, the student's muscles needed larger amounts of some substances than they needed at rest.

(i) Which **two** of the following substances were needed in larger amounts during the run?

carbon dioxide ☐

Glucose ☐

lactic acid ☐

Oxygen ☐

Protein ☐

(ii) Why are the two substances you chose in part **(b)(i)** needed in larger amounts during the run?

To help make more muscle fibres ☐

To release more energy ☐

To help the muscles to cool down ☐

(c) After exercise, a fit person recovers faster than an unfit person.

Let the student's heart rate at the end of exercise = **a**.

Let the student's heart rate after 2 minutes of recovery = **b**.

The table below shows how the difference between **a** and **b**, (**a** − **b**), is related to a person's level of fitness.

(a − b)	**Level of fitness**
< 22	Unfit
22 to 52	Normal fitness
53 to 58	Fit
59 to 65	Very fit
> 65	Top athlete

What is the student's level of fitness?

Use information from the graph and the table.

a = _____ beats per minute

b = _____ beats per minute

(**a – b**) = _____ beats per minute

Level of fitness = _____

Confidence: ☺ 😐 ☹

Assessment A:
Give the dependent and independent variable in the above experiment.

Practice B:
8 minutes

Table 1 gives information about the blood flow in two people.

Table 1

Person	**Blood flow through the coronary arteries in cm³ / minute**
A – does **not** have coronary heart disease	250
B – has coronary heart disease	155

(a) Calculate the difference in blood flow between person **A** and person **B**.

_____

_____

Difference = _____ cm^3 / minute

(b) Suggest why blood flow through the coronary arteries is lower

in people with coronary heart disease.

_____

_____

(c) Calculate the volume of blood flowing through the coronary arteries of person **A** in 1 hour. Give your answer in dm^3.

_____

_____

_____

_____

_____

Volume of blood in 1 hour = _____ dm^3

Coronary heart disease can be treated by:

- inserting a stent
- using a Coronary Artery Bypass Graft (CABG).

Table 2 gives information about each method.

Table 2

	Stent	**CABG**
Procedure	The patient is awake during the procedure. A small cut is made in the skin. A wire mesh is inserted into the coronary artery via a blood vessel in the arm or leg.	The patient is not awake during the procedure. The chest is cut open. A section of blood vessel from the arm or leg is removed. It is used to create a new channel for blood to bypass the blockage in the coronary artery.
When procedure is recommended	When only one blockage is present	When multiple blockages are present
Time spent in hospital	2-3 hours	at least 7 days

Recovery time after procedure	7 days	12 weeks
Risk of heart attack during procedure	1%	2%
Chance of failure within one year	40%	5%

(d) Give **two** advantages of using a stent instead of CABG.

1._____

_____

2. _____

_____

(e) Give **two** advantages of using CABG instead of a stent.

1._____

_____

2._____

_____

Assessment B:
Give the dependent and independent variable in the above experiment (question A-C)

Practice C:
15 minutes

The concentration of cholesterol in the blood affects people's health.

(a) Give **two** factors that affect the concentration of cholesterol in the blood.

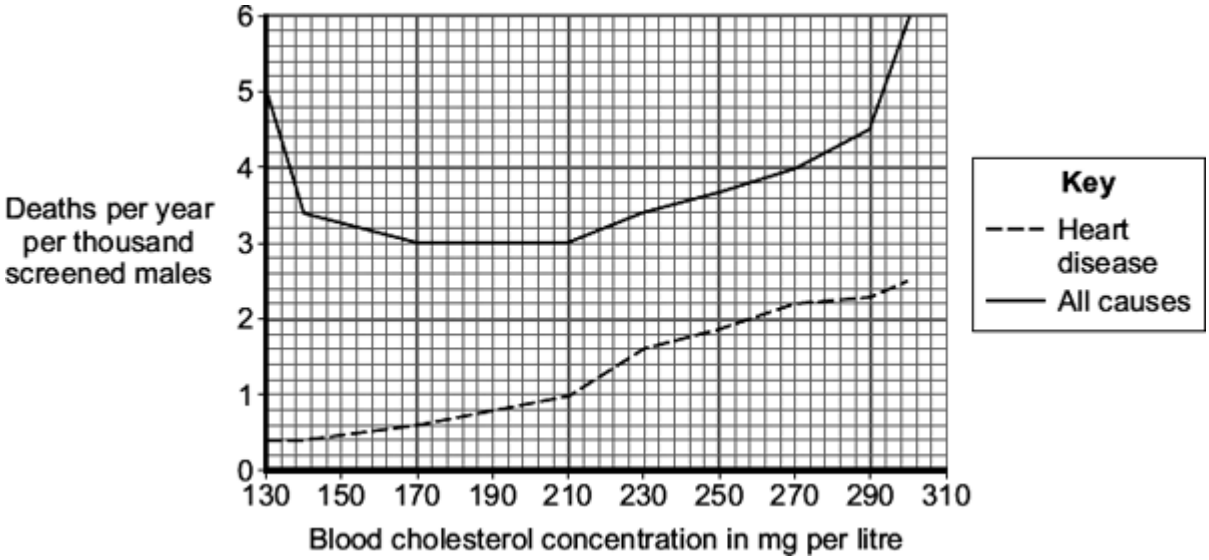
1. _____

2. _____

(b) Doctors screened men for blood cholesterol concentration.

The doctors then compared death rates from heart disease with deaths from all causes in this screened group.

The graph shows the results.



(i) Which is the best conclusion that can be drawn from the data?

There is a positive correlation between blood cholesterol concentration and deaths from all causes. ☐

There is a negative correlation between blood cholesterol concentration and deaths from all causes. ☐

Blood cholesterol concentration is only one of several factors affecting death from all causes. ☐

(ii) Based on the data in the graph **only**, which is the ideal range for blood cholesterol concentration?

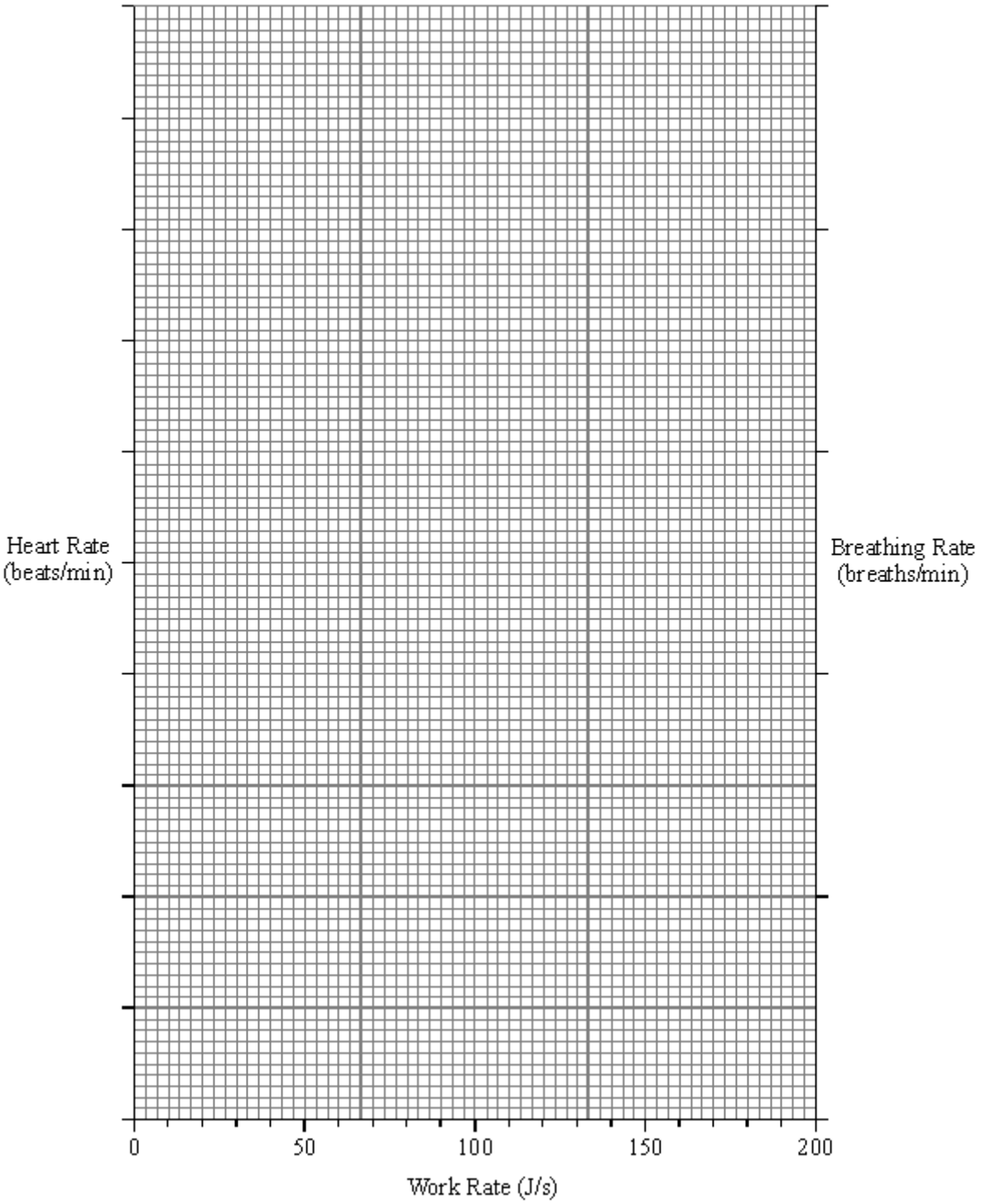
Range _____ to _____ mg cholesterol per litre.

An athlete's heart rate and breathing rate were measured at different work rates.

The table below shows the results which were obtained.

WORK RATE (J/s)	HEART RATE (beats/min.)	BREATHING RATE (breaths/min.)
0	86	9.6
60	106	10.0
80	112	10.4
100	122	10.4
120	135	11.4
140	143	14.5
160	156	15.8
200	174	30.5

(c) Plot the data on the graph paper below.



(d) Explain, as fully as you can, the advantages to the body in the change in breathing and heart rates.

_____

_____

_____

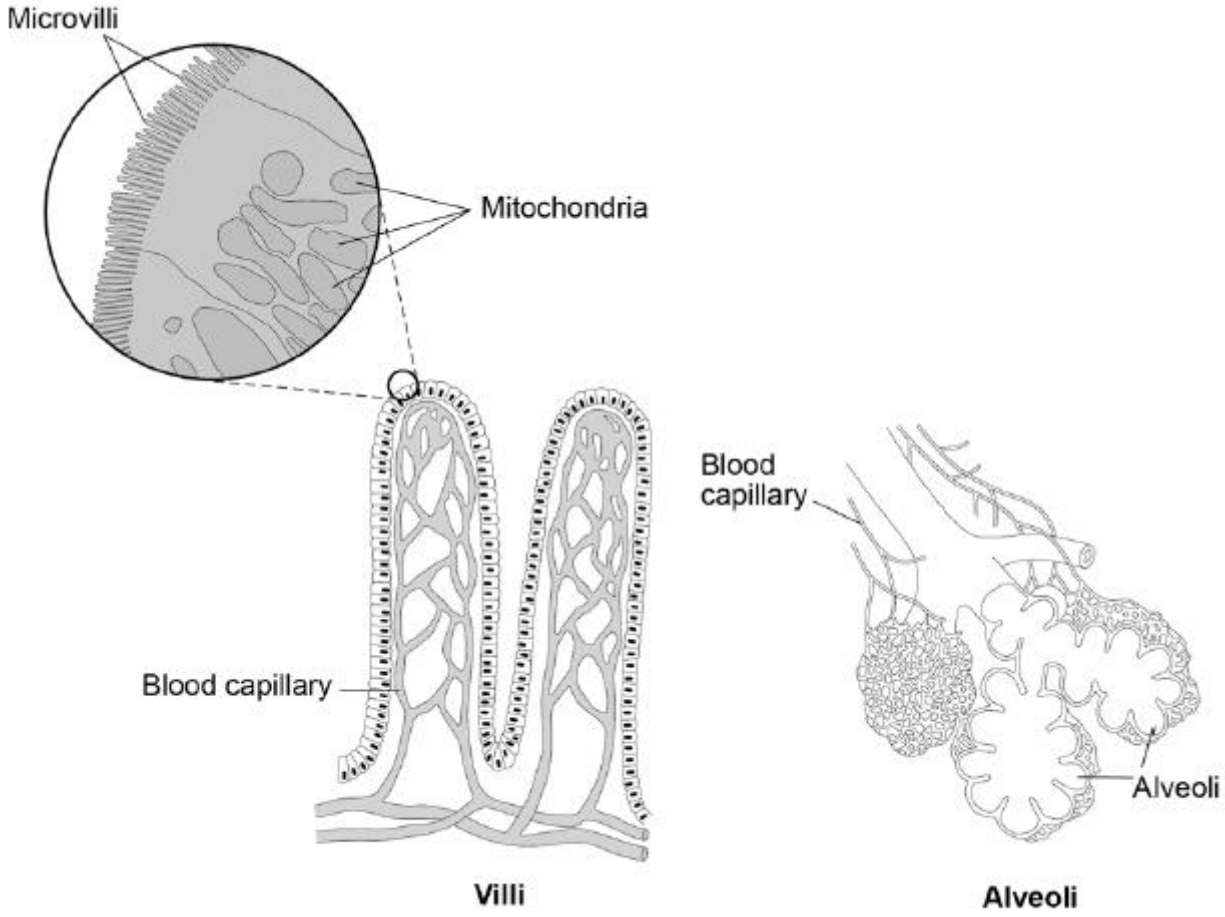
_____

_____

_____

Assessment C:
Give the dependent and independent varibales for the experiment in the previous questiotn (that you plotted the data for!)

Challenge:



Explain how the villi and the alveoli are adapted to absorb molecules into the bloodstream.

Tutorial 6 – Final Assessment

Complete your final assessment on the sheet given

Original assessment score:

Final assessment score:

Tutorial 7 - Feedback

What is the Purpose of Tutorial 7?

- To receive feedback on final assessments.
- To share examples of best practice with the other pupils in your group.
- To write targets for improvement in school lessons.
- To reflect on the programme including what was enjoyed and what was challenging.

Final assessment feedback

What I did well…	What I could have improved on…
•	•
•	•
•	•

My target for future work is…

Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
• • •

What did you find challenging about the programme?	How did you overcome these challenges?
• • •	• • •

Notes

Notes

Notes

UNI PATHWAYS

Course Title

Key Stage 4 Programme

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