

MARRON PUBLICATIONS

C. BOWDEN AND S. GILBERT

IA
Science
Biological
Human

HUMAN BIOLOGICAL SCIENCE SERIES

Do you have a part-time job and if so what are your responsibilities?

What hobbies and other interests do you have?

What sports do you like to watch and/or play?

this?

What are your future aspirations and how will studying Human Biology help you to achieve

What would you like to do or find out about in Human Biology?

List some reasons why you selected Human Biology?

more relevant and meaningful Human Biology course.

Human Biology is a very interesting subject that many students choose for a wide variety of reasons. Your answers to the following questions will be used to help your teacher deliver a

An introduction to Human Biological Science 373771

Physiology –

Nutrition –

Genetics –

Embryology –

Cytology –

Biochemistry –

Anatomy –

Some of the main fields of human biology that we will be covering are outlined below. Write descriptions for what you feel each of the fields may cover. Note – extra lines have been included for you to right down your teachers description. Teachers see Teachers Guide

Human biology is a science. It is the body of knowledge relating to humans, and is concerned with finding out more about them. This knowledge is continually increasing as new discoveries are made, and existing knowledge is often modified, or even rejected, as new evidence accumulates.

Introduction

Anagram —**Differentiation —****Growth —****Responsiveness —****Movement —****Reproduction —****Excretion —****Ingestion —****Metabolism —****Teachers Guide**

The characteristics mentioned above are generally taught in lower school. For this unit the life processes are outlined below. Write a short statement about each of these and create an anagram to remember them (you can reorder them to make up the anagram). Teachers see

Nutrition —**Energy —****Excretion —****Response —****Growth —****Reproduction —****Movement —****Guide**

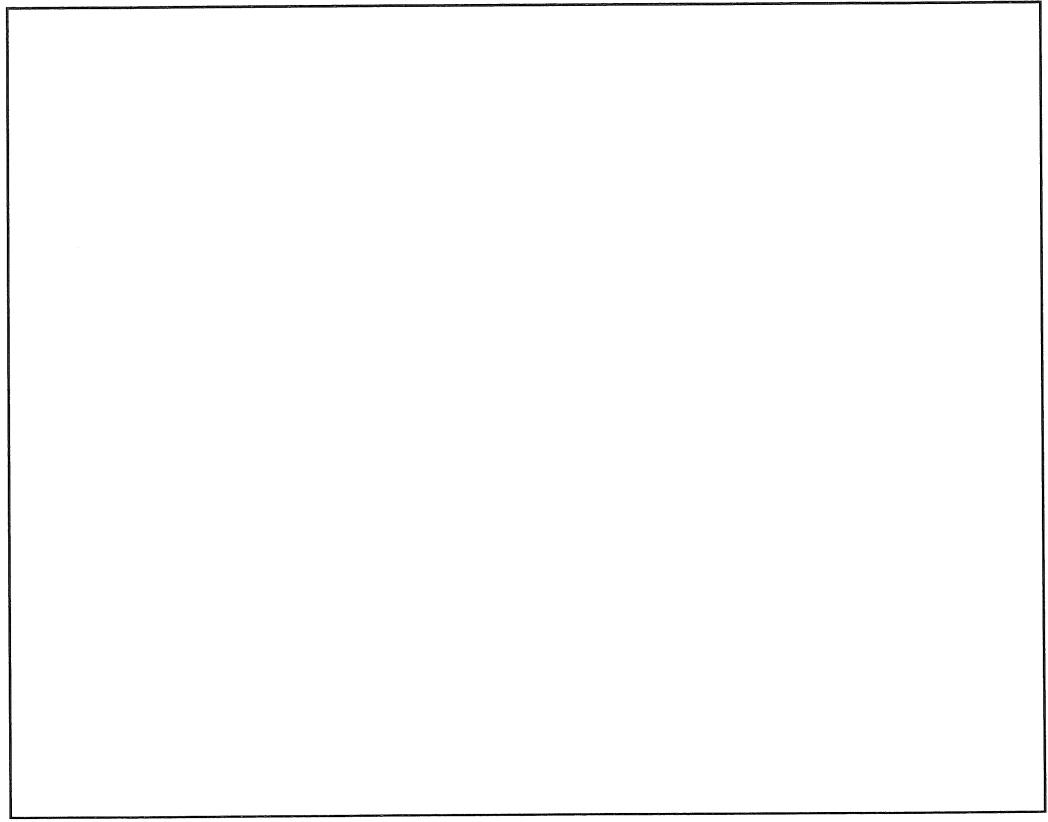
Anagram MR GREEN and the seven characteristics of living things. Teachers see

Biologists have found that living things have certain features in common. These features can be used to decide whether a thing is living or not. You may be familiar with the

Characteristics of living things

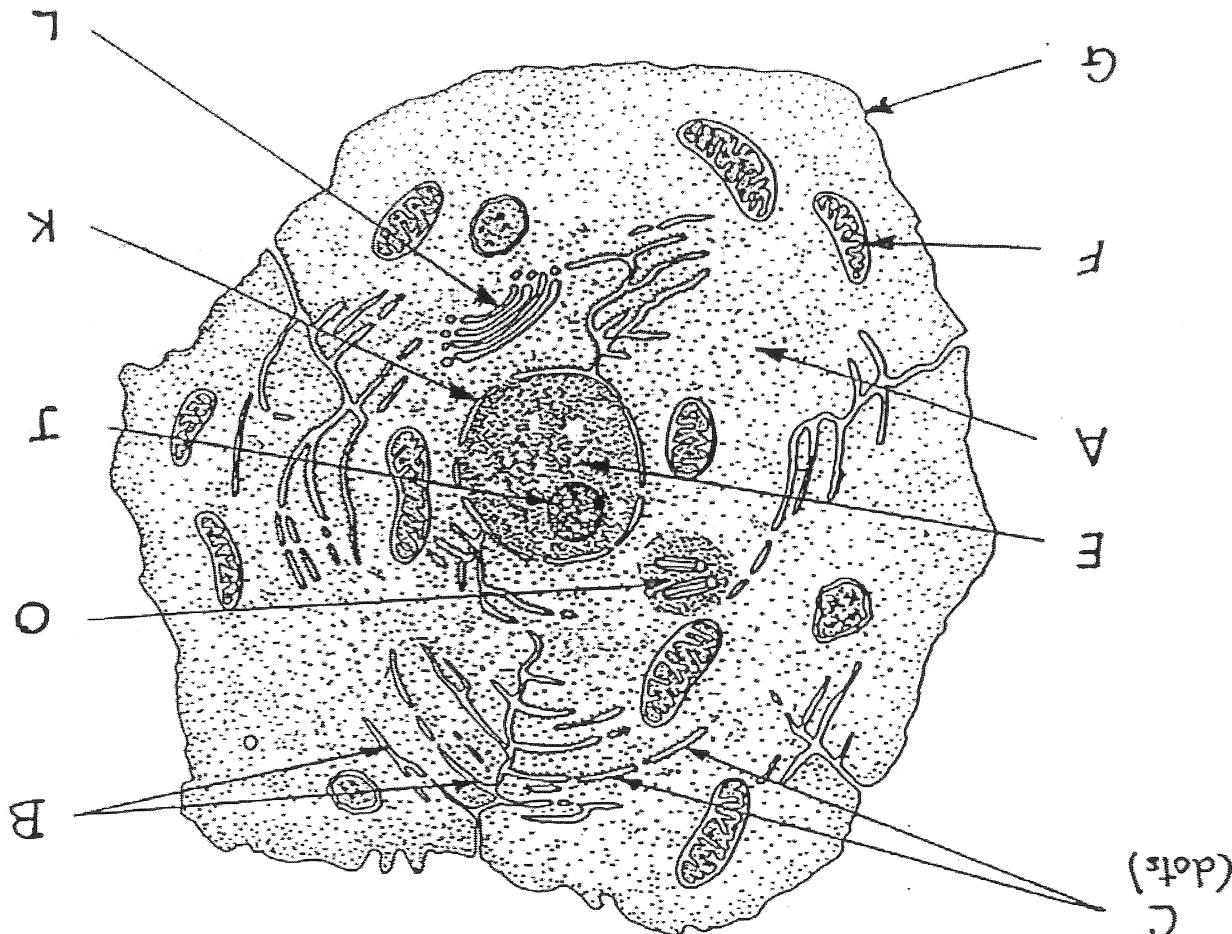
All living things are made up of a diverse range of different sized and shaped cells. Cells are the building blocks of life and virtually all living things are made up of cells. Generalised cells have a cell membrane, nucleus and cytoplasm. The cell membrane surrounds the cell and controls the movement of materials into and out of it. The nucleus controls the cell size and functions of the cell, while the cytoplasm is where most of the cells chemical reactions take place.

In the space below draw a generalised diagram of a typical animal cell and label the nucleus, cytoplasm and cell membrane.



The simple cell

If you have access to the internet go to the URL www.biopictic.co.uk/cellcity/ and take the tour of the cell.



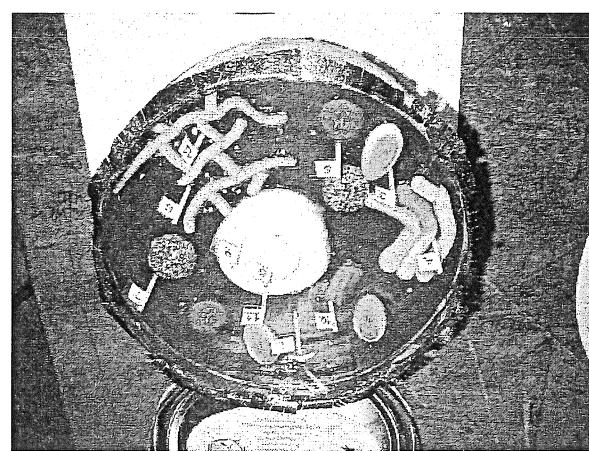
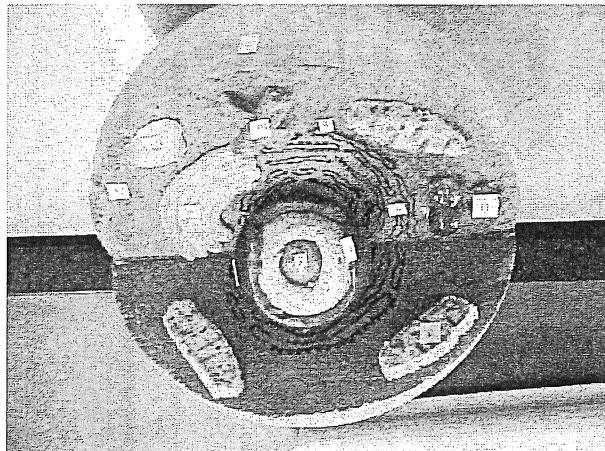
- Cell membrane.
- Cytoplasm.
- Golgi apparatus (body).
- Mitochondria.
- Endoplasmic reticulum.
- Nucleus.
- Nucleolus.
- Ribosomes.
- Centrioles.
- Nuclear membrane.

With the aid of your teacher and other resources label the following structures on the diagram of a generalised human cell;

Cells are made up of various smaller building blocks called organelles. Organelles are ways all animal cells have a number of standard organelles. Cells are responsible for carrying out particular functions in the cell. Although varying in many ways all animal cells have a number of standard organelles.

The complex cell

On the due date the class will mark each model using a marking system with the following criteria. Teachers see Teachers Guide



Some pictures of some sample cell models.

Some suggestions for the main structure of the cell are, polystyrene floats, ice cream containers and cardboard. Suggestions for themes for the organelles are plasticine, clay, dough, lollies e.g smarties, liquidrice, jelly beans, pasta, screws/nuts/bolts/wire, coloured and folded paper, buttons, straws, pipe cleaners etc.

As part of your planning you should discuss with your teacher the materials required and finished size of your model. If your model is likely to be biodegradable e.g decomposes/ become mouldy you should arrange to produce it just before the day it is due.

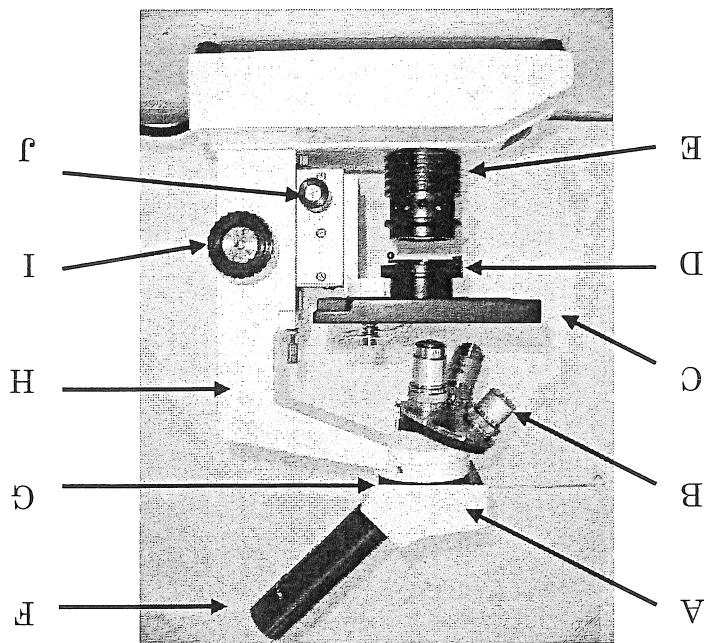
- Endoplasmic reticulum
- Golgi apparatus
- Centrioles
- Mitochondria
- Ribosomes
- Nucleus

- Cell membrane
- Cyttoplasm
- •
- •
- •
- •

Your task is to design and make a model cell. Your cell should display the following labelled organelles. Labels can be either stickers or flags next to or attached to each organelle, or a separate labelled map/key.

Your teacher may be able to show you a plastic model of a cell or diagrams of other generalised cells. You may notice that each of the organelles seem to have a certain shape and in many cases location within the cell.

A model cell



- Procedure**
- Examine and identify the parts of a monocular compound microscope and then label the photo below. (Remember that microscopes will vary, but the basic components and functions will stay the same).

Materials

- Prepared slides (Daphnia, Drosophila, Amoeba etc)
- Microscope lamp
- Microscope

Aim – To use a microscope to focus on some prepared slides.

Parts of a microscope

Microscopes are delicate and expensive pieces of scientific equipment. Read and carefully follow the instructions below, before completing the activity because understand cells, their structure and function.

especially prepared samples. The compound light microscope is used in schools to help magnify up to X1 000 000, however they are very expensive and can only magnify dead structures the amount of resolution (detailed visible) is limited. When greater magnification and resolution is required electron microscopes are used. The electron microscope can sample can be quickly prepared and living cells can be viewed. However with many small compound light microscopes are very common and have a magnification of up to X1500. Since your cells are so small the naked eye can reveal very little about their structure and function. The human body contains billions of cells which are arranged into tissues. Since your cells

Microscopes

Focusing under Low power

Use this procedure to look at a number of prepared slides supplied by your teacher.

a) If I have ANY problems I should see my teacher.

downwards.

m) Look into the ocular and use the fine focus ONLY to focus, only wind upwards never

Lens (the long one). Make sure the lens does not hit the slide.

j) Looking from the side, SLOWLY rotate the nosepiece/turret to engage the high power

Focusing under high power

power).

k) Use the _____ to obtain a clear image (once focused on low power do not move the microscope of adjusters – this will make it easier to focus under high

far, and should repeat steps (i) & (j).

have wound the objective up more than one centimetre above the stage, I have gone too my eye (I may have to move the slide around a little to see if I am close to the focus). If I

Look into the ocular. Using the _____, wind the barrel up towards

i) Using the _____ THE STAGE FROM THE SIDE. Make sure the _____ will not hit the slide.

h) Place the slide on the _____ and attach it with the _____.

g) Replace the ocular.

f) Use the _____ to obtain a circle of light just as large as the field of view.

to set the mirror correctly.

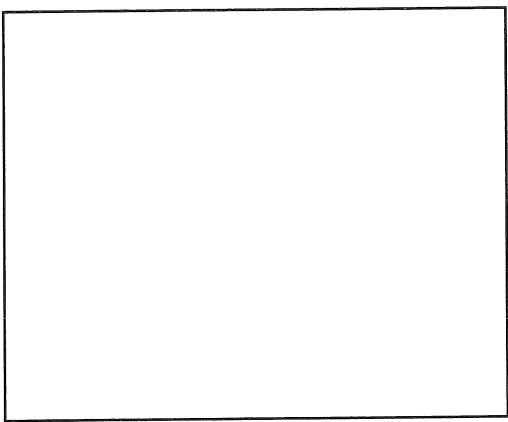
e) Use the _____ to reflect light into the objective. Look down the body tube (barrel)

d) Turn on the _____ if using one.

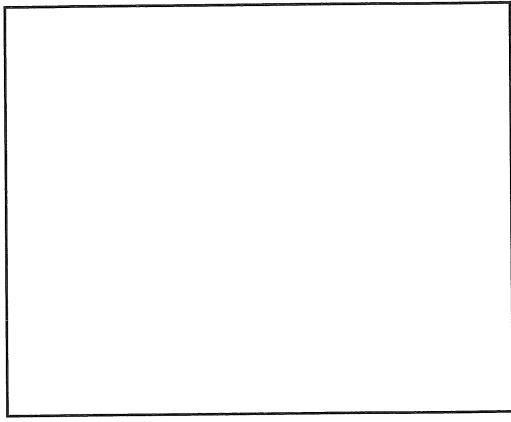
c) Take out the _____ and stand it upright on the bench.

b) Engage the _____ power objective (the shortest lens).

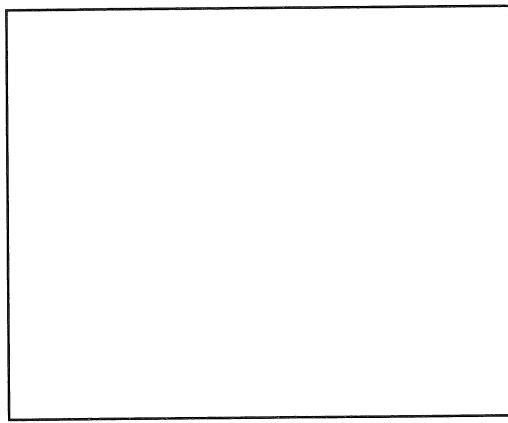
a) Turn the microscope so that the _____ is facing me.



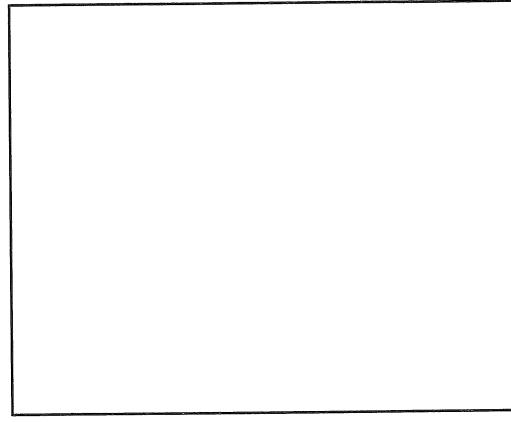
Paramecium — magnification x



Blood — magnification x



Euglena — magnification x

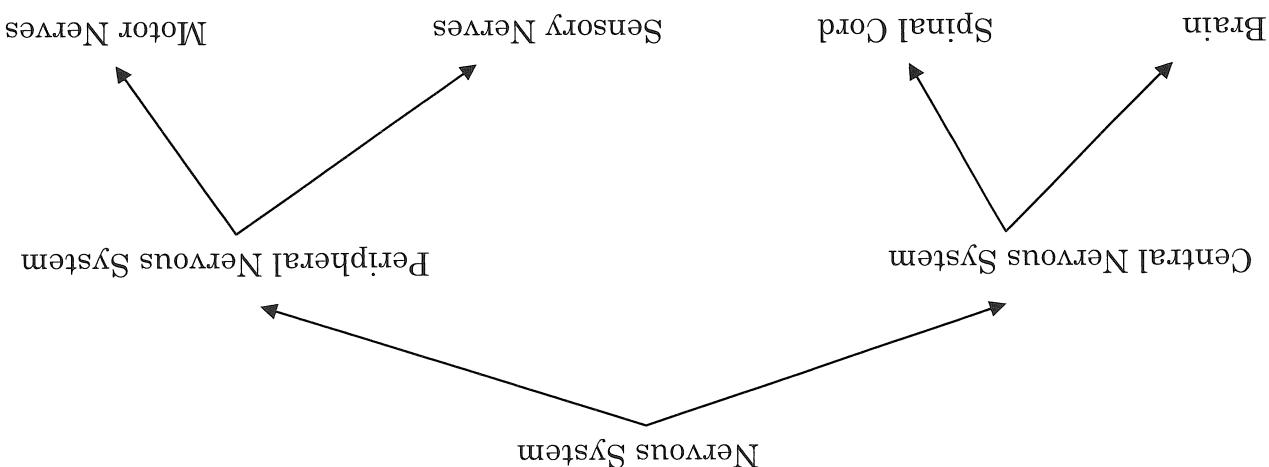


Amoeba — magnification x

- 2) Select a specimen of your choice and draw a biological drawing, your drawing should be;
 - 1) Set up microscope and select a prepared slide.
- In pencil and large enough to be easily viewable.
 - Show the magnification.
 - State the name of the specimen and label with straight lines.
 - Have a short written description.

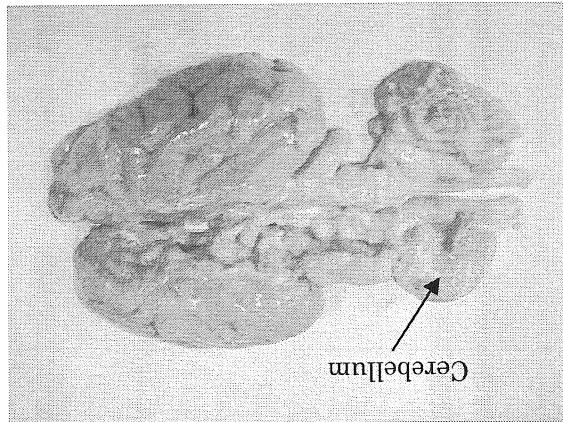
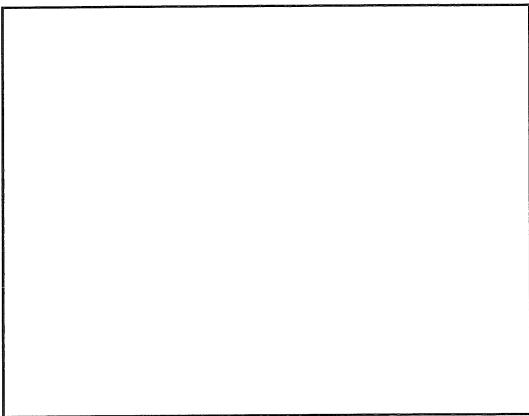
One of the best ways to find out the structure and function of the brain is to complete a brain dissection.

The central nervous system consists of the brain and spinal cord. The brain is one of the most complex organs in the human body and is made up of billions of neurons (nerve cells). The brain is responsible for processing information from the senses and initiating the appropriate response. Other functions of the brain include control of body functions like heart rate, breathing rate and body temperature. It is also responsible for complex thought like imagination, reasoning, emotions and memory.



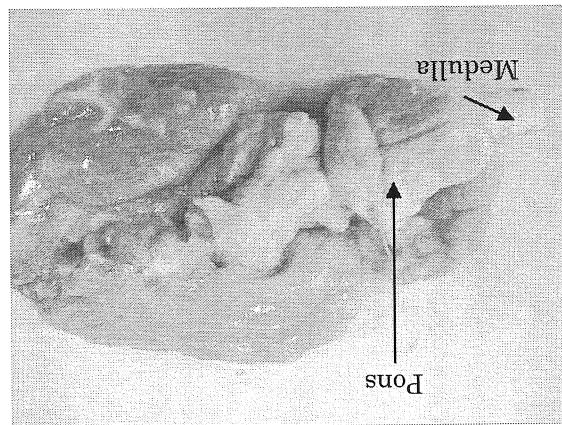
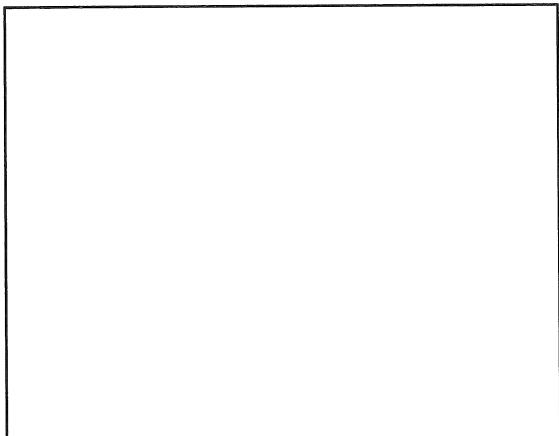
The following diagram gives a general overview of the nervous system.

The nervous system



- 5) You should be able to see the 'leaf-like' structure of the cerebellum at the rear of the brain. Draw it in the space provided.

4) Cut the brain longitudinally (down the middle) as shown in the photograph below.



- 3) Turn the brain over and draw a sketch of the brain to show the parts in this and the previous diagram (pons and medulla).

8. The senses are an important part of the nervous system. They are some of the major receptors that provide the body with information about changes in the environment. The five major senses include

7. What is the maximum jail term under the new "One punch" legislation?

6. What could you do to prevent yourself being involved in this type of situation?

5. A number of people have died in flights by hitting their heads on the road or pavement. A severe blow to the head can cause the brain to swell, considering the location of the brain why may this cause severe brain damage or death? How can doctors try to overcome this problem?

4. Why is the spinal cord at the base of the brain?

3. A blow to the back of the head can seriously effect your coordination. Taking into consideration the location of parts of the brain, what may cause this?

2. Humans have a larger area of cerebral cortex than a sheep. Why do you think this is so?

Part of Brain	Function	Cerebellum
Cerebral Cortex		
Cerebellum		
Spinal Cord		
Pons		
Medulla		

4. On the photo above indicate the main areas where the different taste sensations where detected.
-
-
-

tongue.

- taste sensations in a similar way? Explain your results in terms of receptors in the tests. Record your results in the space below. Did your tongue respond to the different sure you use different cotton buds and that the subjects rinses their mouth between 3. Repeat the above procedure using the salt and the quinine (bitter) solutions, making
-
-

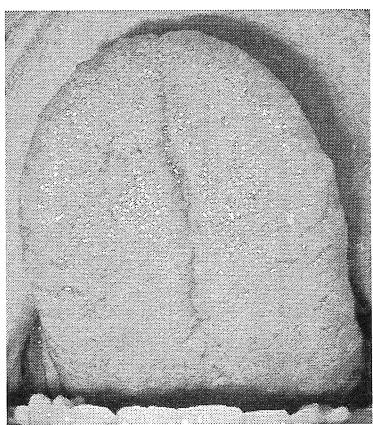
why this may have occurred.

2. Was there any difference in the sensations of the two areas of the tongue? If so explain
-
-

- sensations in these two positions (e.g very sweet, sweet or no sensation).
1. Collect the sugar solution and place some in the bottom of a Petri dish. Using one of the cotton buds, dip it into the sugar solution and dab the cotton bud on the tip of the subjects tongue and at the back of the tongue. Have the subject record their taste sensations tongue.

Procedure and questions

Taste Discrimination



- Ruler and dividers
- 3 sterile Petri dishes
- Quinine solution (0.01%) or Bitrex (available from chemists)
- Sugar solution (15%)
- Salt solution (15%)
- Sterile cotton buds and binford foil

Materials

Aim – To test and record, the location and density, of taste and touch receptors on the body.

As mentioned in the notes the human body has a range of receptors, these receptors are not evenly distributed over the body. This means that particular areas of the body will be able to detect changes in the environment and others will not. An obvious example here is light falling in the eye will be detected (by photoreceptors), however light falling on the back of your neck will not be detected (there are no photoreceptors there). In this experiment we will look at other changes in the environment and the body's ability to detect them.

Detection of different stimuli

1. Which area of the skin had the most correct responses?

Human Biological Sciences

Unit 1A

2. Which area of the skin had the least correct responses?

Human Biological Sciences

Unit 1A

3. Which area of the skin would you expect to have the highest concentration of touch receptors explaining?

Human Biological Sciences

Unit 1A

4. Which areas of the skin would you expect to have the lowest concentration of touch receptors explaining?

Human Biological Sciences

Unit 1A

5. Is there a relationship between the number of receptors and the tasks carried out by the different areas of the skin?

Human Biological Sciences

Unit 1A

6. Why were one and two points arranged in a random order?

Human Biological Sciences

Unit 1A

7. Why did we blindfold the subject?

Human Biological Sciences

Unit 1A

8. Describe what you have learned about the distribution of touch and taste receptors over the body.

Human Biological Sciences

Unit 1A

Structure	Function	
Iris		
Pupil		
Cornea		
Ciliary muscles		
Retina		
Choroid coat		
Sclerotic coat		
Optic nerve		
Vitreous humour		
Aqueous humour		

Your teacher will arrange for you to have access to a suitable text, or the library, so that you can complete the following table to describe the functions of the various parts of the eye.

Functions of different parts of the eye

14) Follow your teacher's directions and clean/return the equipment.

13) Describe the appearance of the newspaper print through the lens.

slide on some news print.

11) Look at the front part of the eye and see if you can locate the ciliary muscles and ligaments which "hold" the lens. What do they look like?

disadvantage?

10) Looking at the rear part of the eye, locate the retina. You may notice an area where the blood vessels of the retina leave the eye. What is the name of this spot and what is its

9) You will notice a jelly like fluid in the halves, what is its name and function?

8) Place each half of the eye with the cut side up on the dissecting tray.

P

without mistakes. Do you have 20/20 vision? Explain.

2. A person with 'normal vision' should be able to read the distance 20 line at 20 feet

this?

1. Was there any variation between your left and right eyes? If so explain what could cause this?

Questions

Line	Right eye number correct	Left eye number correct	Possible	Actual	Possible	Actual	Total 43
Distance 50							
Distance 40							
Distance 30							
Distance 20							
Distance 15							
Distance 10							

Results

- 1) Work in pairs, one will be the SUBJECT, the other the EXPERIMENTER.
- 2) Measure out a distance of 20 feet (3.3 feet = 1 metre) on the classroom floor.
- 3) The experimenter should hold the eye chart 20 feet from the subject.
- 4) Each eye should be tested separately with your palm held over one eye while the other is tested.
- 5) Have the subject cover their left eye and read each line out aloud.
- 6) The experimenter should record the results in the table provided (Use the subject's workbook).
- 7) Repeat step (5) for the left eye but have the subject read each line backwards.
- 8) Swap roles and repeat steps (3) to (7).

Procedure

• Subject

• 1 metre rule

• Standard eye chart (Teachers see Teachers Guide)

Materials

Aim - To test your vision using a standard eye chart.

How good is your vision?

The sense of hearing is very important to humans. Explain using three examples why hearing is so important.

Question

Function	Structure	Pinna	Ear drum	Hammer, anvil, stirrup	Cochlea	Auditory Nerve	Eustachian Tube	Semi circular canals

Grid	Time taken to complete (seconds)	rating (seconds)	more than 9	My rating = steady eddy
1			7 - 9	average
2			5 - 7	good
3			Less than 5	excellent
4				
Average				

Results

- 10) Record your average time and rating in the space provided.
- 9) Calculate your average time taken to complete a grid and your rating.
- 8) Swap roles and repeat the activity.
- 7) Repeat steps 3) to 6) for grids 2, 3 and 4.
- 6) Timer stops stopwatch when the subject touches the L, and records time in space provided below the grid in subject's workbook.
- 5) Subject uses forefinger to touch each of the letters in order from A to L as fast as possible.
- 4) Timer uncovers grid 1 and starts the stopwatch.
- 3) Cover up the alphabet grids. (Studying the series of grids before the activity will lead to when you are ready to proceed.)
- 2) Use the practice grid to trial the procedure. Your teacher will give you the test grids 1) You will need a partner; one will be the TIMER, the other the SUBJECT.

Procedure

- Alphabet grids (Teachers see Teachers Guide)

- Partner

- Workbook

- Stopwatch

- Fingers

- Materials

Aim - To determine the time taken to touch a series of labelled squares in order.

Reaction time activity one – alphabet race (part a)

2. Use an example where practice may reduce a reaction time and increase survival or quality of life.

1. Describe and explain any trends in your results to part B.

Questions

Trial	Time (seconds)
Initial	
Second	
Third	
Fourth	
Fifth	

Results

- 1) Read the procedure in full before commencing.
- 2) Cover up alphabet race grid 4.
- 3) Timer uncovers grid 4 and starts the stopwatch.
- 4) Subject uses forefinger to touch each of the letters in order from A to L as quickly as possible.
- 5) Timer stops stopwatch when the subject touches the L, and records time in the table provided below.
- 6) Allow subject to practice grid four 10 times.
- 7) Repeat steps 3) to 6) e.g. Practice 10 times between each recorded trial.
- 8) Swap roles and repeat the activity.

Procedure -

- Partner
- Workbook
- Stopwatch
- Fingers

Materials

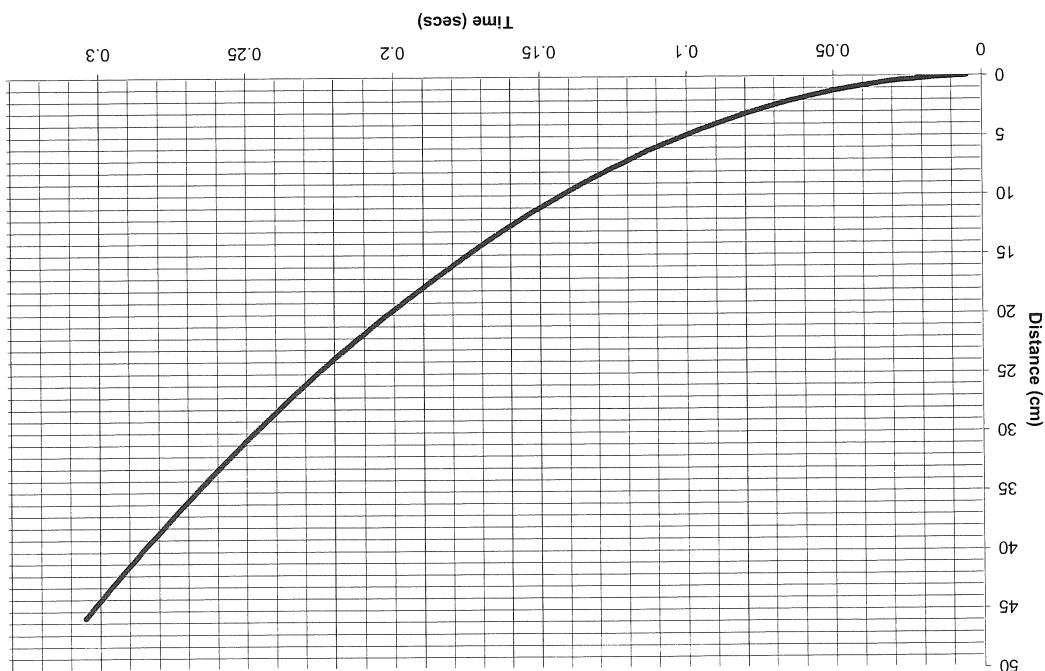
Aim - To see how experience in a particular situation improves reaction time.

Reaction time activity one – alphabet race (part b)

	Name	Reaction time	Name	Reaction time	Class average
1			14		
2			15		
3			16		
4			17		
5			18		
6			19		
7			20		
8			21		
9			22		
10			23		
11			24		
12			25		
13					

- 11) Your teacher will provide a table on the board for the class to enter their average reaction times. Once this has been completed, copy these results into the table below, and calculate the class average reaction time.

My reaction time is _____



Distance vs Reaction Time Graph

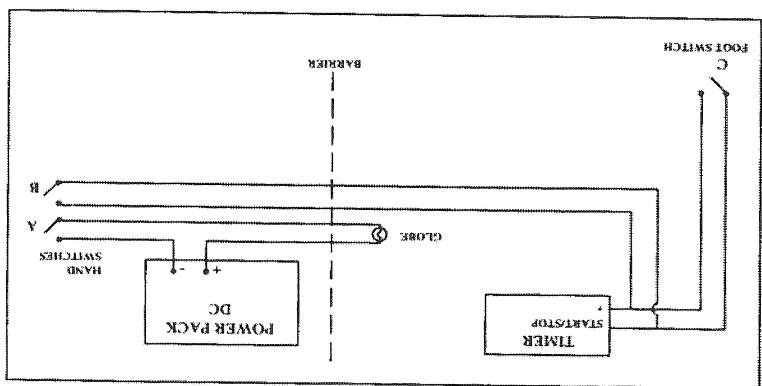
- 10) Use the graph and your average catching distance as calculated in part 1, to determine your reaction time and record the result in the space provided. Use a ruler and pencil to draw on the graph.
- Procedure - Part 2**

Trial	Reaction time (seconds)	Average
4		
3		
2		
1		

Results

- 8) The subject and experimenter should swap roles and repeat (2) to (7).
 - 7) Record your reaction time in the table below, repeat the activity three more times and calculate your average reaction time. (You will have to reset the timer each time).
 - 6) The subject should quickly lift their foot from the ground and tap the foot switch C. This will cause the light bulb to flash and the timer to start.
 - 5) Without warning, the experimenter should quickly tap the hand switches A & B. This will cause the light bulb to flash and the timer to stop.
 - 4) The experimenter should have their hand and the hand switch hidden from the view of switch (brake pedal). The light bulb should be in view.
 - 3) The subject should sit on a chair with their right foot flat on the ground next to the foot demonstrator circuit set up for you to use or copy).
 - 2) Set up the materials as shown in the circuit diagram above. (Your teacher may have a
- EXPERIMENTER.**
- 1) You will need a partner; one of you will be the SUBJECT, the other the

Procedure



Circuit diagram

- 12V light bulb & holder
- Screen
- 3 contact key switches
- Electric timer
- Connecting wires
- Power pack

Materials

Aim - To measure the reaction time of your braking foot.

Reaction time activity three – braking time part a

4. Did you find that you had to concentrate harder when questions and SMS were introduced into the test? Explain.

3. Why do you think this type of distraction slowed down your reaction time?

2. Which type of distraction/increased your reaction time the most?

1. How does your reaction time for braking without distractions compare to your reaction time for braking with distractions?

Reaction Time (Seconds)				Questions and SMS
Distraction	Trial 1	Trial 2	Trial 3	Average
	Questions	SMS		

Results

- 7) Have the experimenter SMS/Text a friend a reasonably long message.
 8) During this press the light switch and record the reaction time.
 9) Repeat this twice and record in the results table.
 10) Combine both the questions and SMS/Text, press the light switch and record the reaction time.
 11) Repeat this twice and record in the results table.
 12) The subject and experimenter should swap roles and repeat the activity.

Bacteria

Description —

Examples of diseases caused by bacteria —

Viruses

Description —

Examples of diseases caused by viruses —

Fungi

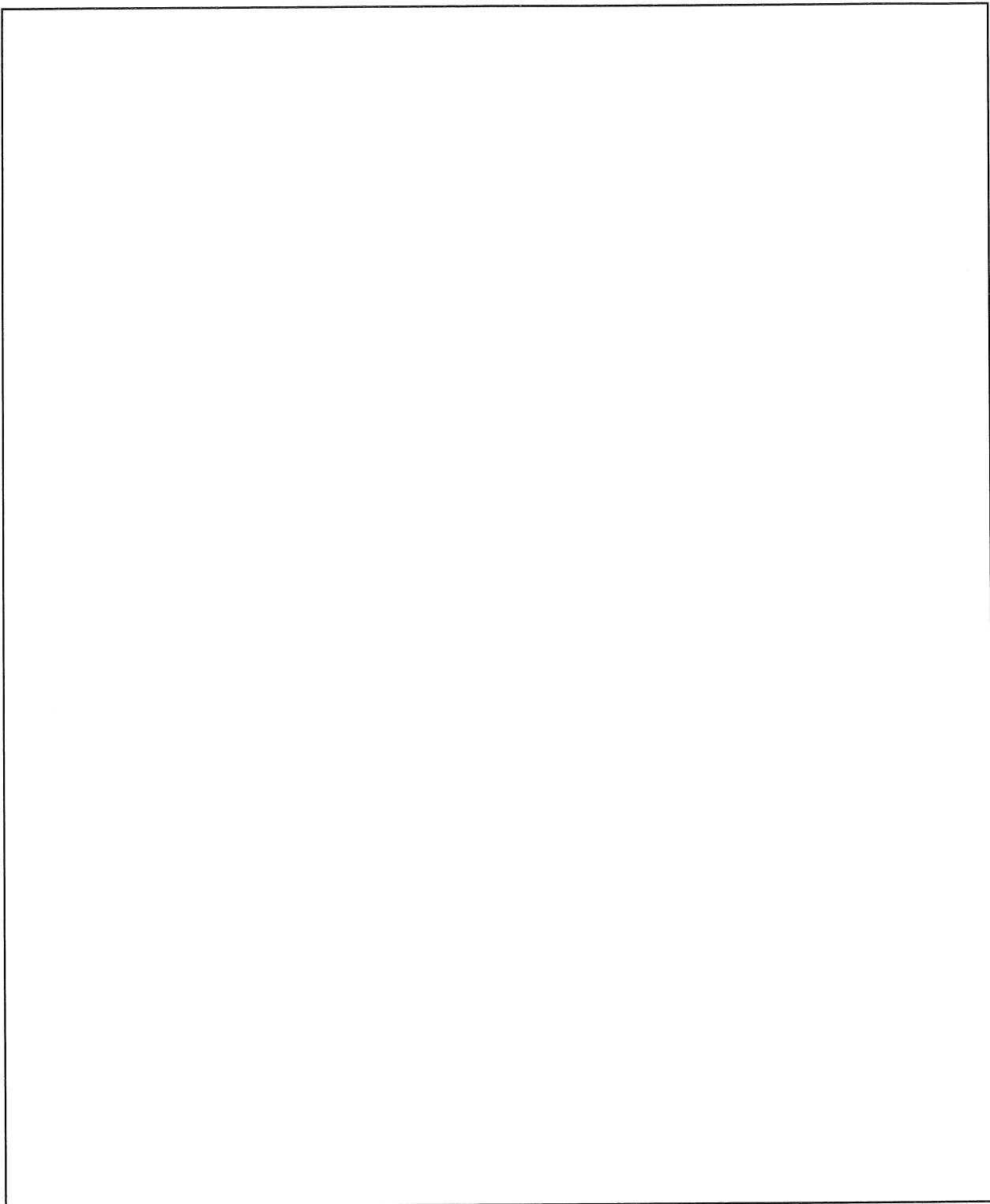
Description —

Examples of diseases caused by fungi —

Animal Parasites

Description —

Examples of diseases caused by animal parasites —



You have seen a number of tables in this book already, but in this case you are to draw your own.

Draw a table that allows you to record for each Petri dish the following:

- Day after incubation.
- Number of colonies.
- Description of colonies (colour, size, shiny, fuzzy etc).

Results

6. Do you think that another pandemic involving a virus is inevitable? Explain.

5. When was the last case of avian influenza in Australia?

4. What concerns do scientists have with the H5N1 avian influenza?

3 What is the correct name for bird flu?

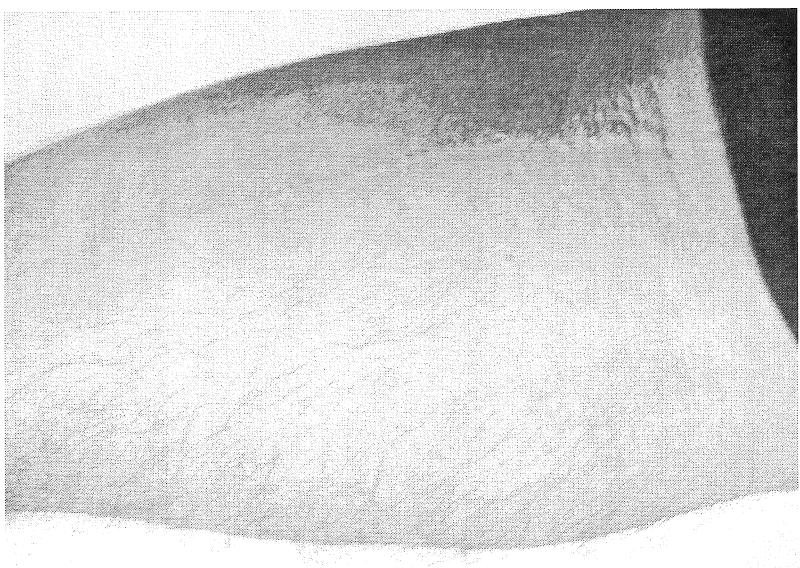
2. How many people did the "Spanish Flu" kill?

1. What is a pandemic?

Questions

Your teacher will give you a copy of an article on bird flu (*Teachers see Teachers Guide*). Read the article and then use the information to answer the questions that follow. This is a reading and comprehension activity. Once you have finished reading you will be asked to return the information sheet before answering the questions, you are not allowed to reread the article.

Bird flu



- **Heat (sunburn).**
 - **Chemicals (hay fever).**
 - **Mechanical injury (scratches).**
 - **Infection (pathogens).**
- The **inflammation response** is a non-specific response that occurs whenever cells are damaged. Tissue damage can be caused by:

The human body has a complex series of actions that it can call on when foreign materials such as pathogens or non living materials e.g. dirt, splinters enter the body via the skin, mucous membranes or body openings e.g. nose. The first line of defence once this occurs is called the **inflammation response**.

If you feel able, use your nails to scratch (without breaking the skin) the inside of your forearm. As you read on, observe your body's response and follow the explanation of what is occurring.

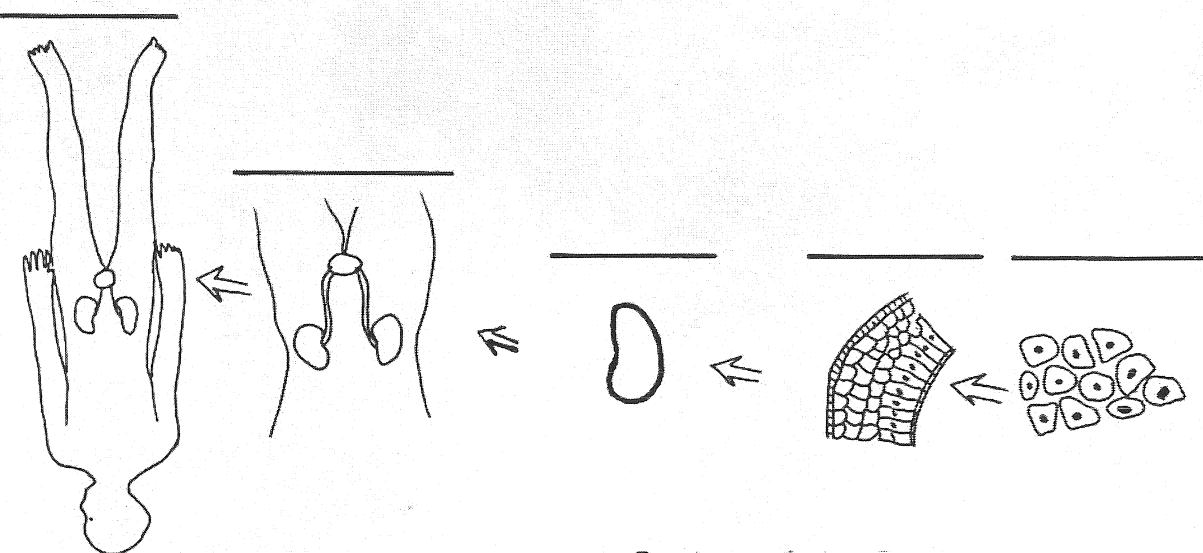
Activity

Non-specific defence (Inflammation)

- The bodies defence system has two main **parts**:
- Preventing or inactivating pathogenic micro-organisms and foreign materials that do internal damage.
 - Killing or inactivating pathogenic micro-organisms and foreign materials that do internal damage.
- The system has two **tasks**:
- Preventing pathogenic micro-organisms and foreign materials from entering the internal environment of the body.
 - Killing or inactivating pathogenic micro-organisms and foreign materials that have entered the internal environment.

The ability of the body to form a defence against disease is essential. The bodies defence

Defence against disease and foreign materials



Label the diagram below with the terms described above.

Summary

Organism

System -

Organ -

Tissues -

Cells -

Teachers see Teachers Guide

All cells need to work together in a coordinated fashion to allow the human body to function efficiently. To do this the human body has arranged the cells into various levels of organisation, which includes individual cells, tissues, organs, systems and the organism.

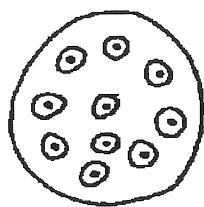
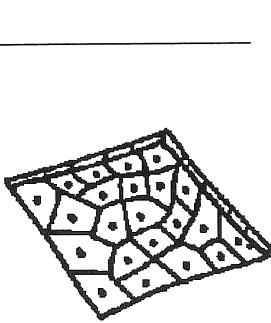
make-up of these cells differ according to the role that they perform.

The Human Body begins one cell formed at fertilisation, from this cell billions of cells are produced that work together to produce a functional organism. The size, shape and

Structural organisation of the human body

Organ systems do not work alone, they work with other organs in a coordinated way as part of a system. The circulatory system is composed of the heart, blood vessels and blood, which have the collective function of transporting materials around the body. Other organ systems conduct impulses to and from all parts of the body. Nervous cells work together to identify changes in the internal and external environments and then to coordinate the body's response to these changes. Some nerve cells can be over one metre in length to help speed up the rate of communication within the body. Nerve cells or neurons are long and stringy, like a thread. Bone, cartilage, ligaments and tendons are all examples of connective tissue.

Connective tissue has the role of supporting the body and other tissues. Connective tissue performs a variety of functions including support and protection. Nerve tissue is composed of specialized cells which not only receive stimuli but also conduct impulses to and from all parts of the body. Nervous cells work together to identify changes in the internal and external environments and then to coordinate the body's response to these changes. Some nerve cells can be over one metre in length to help speed up the rate of communication within the body. Nerve cells or neurons are long and stringy, like a thread. Bone, cartilage, ligaments and tendons are all examples of connective tissue.



Identify and label each diagram as being Epithelial, Nervous, Connective or Muscle tissue.

There are three types of muscle tissue: skeletal, smooth, and cardiac. Muscle tissue is the only tissue type that can contract. As a result muscle tissue is associated with movement, this could be the obvious movement of limbs or the less obvious movement of food or blood through the body. Skeletal muscle is a voluntary type of muscle tissue that is used in the contraction of skeletal parts. Smooth muscle is found in the walls of internal organs and blood vessels, it is an involuntary type. The cardiac muscle is found only in the walls of the heart and is involuntary in nature.

Connective tissue is the most abundant and the most widely distributed of the tissues and includes ordinary loose connective tissue, fat tissue, dense fibrous tissue, cartilage, bone, blood, and lymph. Connective tissue performs a variety of functions including support and protection. Nerve tissue is composed of specialized cells which not only receive stimuli but also conduct impulses to and from all parts of the body. Nervous cells work together to identify changes in the internal and external environments and then to coordinate the body's response to these changes. Some nerve cells can be over one metre in length to help speed up the rate of communication within the body. Nerve cells or neurons are long and stringy, like a thread. Bone, cartilage, ligaments and tendons are all examples of connective tissue.

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1 How are human cells different from each other?

Questions

2 Why do cells need to work together?

3 What are the levels of organisation of the human body?

4 What are the names of the generalised parts of the human cell?

5 What takes place in the cytoplasm of a human cell?

6 Define the term tissue and list the four basic tissue types.

Human Biological Sciences
Unit 1A

Skeletal**Respiratory****Digestive****Muscular****Circulatory**

Below are listed the major systems of the body, complete the notes for each of these functioning of the body. Teachers see Teachers Guide describing the main organs/tissues which make them up and the role that they play in the

defined.

Like the immune and endocrine are less obvious and their role may not be as clearly circulatory, muscular and skeletal, as they have easily identifiable structures. While others contribute to function efficiently. Some of the more well known body systems include the human body is made up of many systems and these systems operate together to enable the large proportion of time in human biology is devoted to studying the bodies systems. The tissues combine to produce organs. Some organs work together to produce systems and a study of the cell and how it functions. As mentioned earlier, cells make up tissues and when looking at the structural organisation of the human body we have spent time

Body systems

			Water
			Vitamins & Minerals
			Protein
			Lipid
			Carbohydrate
Major function(s)	Foods containing this compound contained within the compound in the body	Nutrient(s)	

Use an information resource to complete the following table.

Four of these compounds: carbohydrates, proteins, fats and vitamins are organic compounds because they contain the elements carbon, hydrogen and oxygen. The two remaining compounds, minerals and water are inorganic compounds.

- water.
- minerals
- vitamins
- lipids (fats & oils)
- proteins
- carbohydrates

Every food type contains at least one of six kinds of compounds:

- providing energy.
- maintaining a constant body temperature
- regulating cell & body processes
- repairing existing cells
- building new cells
- maintaining our existing cells

The food we eat contains nutrients, or molecules that provide the energy and material for:

Humans are heterotrophs, that is, we eat other organisms to obtain food and energy for our own survival. Our body is a living machine that requires fuel, our type of fuel is food.

Nutrients

A system in detail - Nutrition and digestion

example, scurvy once common among sailors, was caused by a lack of vitamin C in the diet. Like other essential nutrients, most vitamins can be obtained naturally by eating a balanced diet that includes fresh fruits, vegetables and meats. When the body does not receive a sufficient supply of vitamins, it can develop vitamin deficiency diseases, for example a diet that includes fresh fruits, vegetables and meats.

- **Fat-soluble** - vitamins that can be stored in the fatty tissue of our bodies. Includes vitamins A, D, E, and K.
- **Water-soluble** - vitamins that cannot be stored in the body should be included in a balanced diet every day. Includes vitamins B and C.

There are two main types of vitamins:

Vitamins do not need to be digested, as they are small enough to be directly absorbed. With the single exception of vitamin D (made in the skin under direct sunlight), vitamins are not made by the body and must be obtained from food.

Vitamins are complex organic molecules that are needed by the body in very small amounts that serve as coenzymes (help enzymes in reactions).

Vitamins

Fatty acids are classified as either saturated or unsaturated. A saturated fatty acid has all of its carbon atoms joined (bonded) to hydrogen atoms. In an unsaturated fatty acid there are some, spare, carbon atoms that could be used to bond more hydrogen atoms. A saturated fat mostly contains saturated fatty acids and is generally solid at room temperature. A polyunsaturated fat mostly contains polyunsaturated fatty acids and are generally liquid at room temperature. Fats provide twice as many kilojoules per gram as carbohydrates.

Lipids are derived from fats (solid at room temperature) and oils (liquid at room temperature). A lipid is made of three fatty acids joined to a glycerol molecule. Fatty acids are chains of carbon and hydrogen compounds with a weak acid group attached to one end. Lipids that have only one fatty acid attached to the glycerol are called monoglycerides. Diglycerides are formed when there are two fatty acids attached and when there are three fatty acids it is called a triglyceride. 98% of lipids in foods are triglycerides.

All lipids are composed of carbon, hydrogen and oxygen. Lipids are different to monosaccharides in that they have much less oxygen in relation to the carbon and

hydrogen.

Fatty acids & glycerol

Element(s)	Source of nutrient	Type(s)	Function(s)	Example(s)	Monosaccharides	Amino acids	Fatty acids & glycerol	Vitamins	Minerals	Water

Types of nutrients required by cells – summary table

		Lipid
		Protein
		Starch
		Glucose
Nutrient	+ve colour change observed = ✓ Test completed	

Results
 Tick each of the boxes in the table below if you can identify the positive colour change that indicates that particular nutrient.
 Your teacher may ask you to complete one of the tests in front of them to demonstrate your knowledge of the test and the positive result.

- 1) Use the procedure from the testing foods for nutrient table. Because you are using prepared solutions you do not need to add water to the samples.
- 2) For each solution make sure that you can identify the positive colour change that indicates that particular nutrient.

- Procedure**
- Test tube rack + 4 test tubes + test tube holder + test tube cleaning brush
 - White depression tile + marking pen
 - Plastic pipettes
 - Fat egg butter / lard
 - Solutions of glucose, starch, protein
 - Brown paper
 - Testape
 - Potassium Iodide solution (dropper bottle)
 - Benedict's solution (dropper bottle)
 - Biurets Reagent 1 - Strong Alkali Solution - (1M sodium carbonate solution)
 - Biurets Reagent 2 - Dilute Copper Sulfate Solution (0.1M copper-II-sulfate solution)
- Materials**

Aim – To complete a series of food tests on known food solutions.

Testing foods for nutrients (Part 1)

Vitamin	Good food sources	Role in the body	Effect of a deficiency
A			
B1 (thiamine)			
B2 (riboflavin)			
B3 (niacin)			
B5 (pantothenic acid)			
B6 (pyridoxine)			
B12 (folate)			
C			
D			
E			
K			

A deficiency in a particular nutrient can lead to a deficiency disease or particular symptoms. Your teacher will allocate one or more of the minerals or vitamins in the table below to each member of the class. You are to research good food sources of this nutrient, its role in the body and the effects of a deficiency of this nutrient on the human body.

You will then give a short oral presentation to the class or use a jigsaw or round table to share the information with other members of the class.

You will need to be concise with your information and presentation.

A deficiency in a particular nutrient can lead to a deficiency disease or particular symptoms.

Nutrient deficiencies

The recommended energy intake for a 15/16 year old is between 11 000 – 12 000 KJ per day. This may vary depending on activity levels. Work out the percentage of the recommended energy intake that the meal you outlined above represents. (Show you working)

Step 4

Total carbohydrate	Total fat	Protein	Amount of energy (KJ)	Food item

Step 3

Go to McDonalds Website (www.mcdonalds.com.au) or Hungry Jacks website (www.hungryjacks.com.au) and complete the following table.

Step 2

- Main meal (Burger(s)) - _____
- Side order (Fries/onion rings) - _____
- Drink (Cool drink/shake) - _____
- Desert (Sundae/thick shake) - _____
- Other - _____

Write down below what you would order. (If you don't eat these types of food your teacher will give you an average meal to complete.)

Imagine that your parents are taking you to a fast food / hamburger restaurant for tea/take away and they tell you to order what you like.

Fast food internet activity

Summary Data TableData source - http://www.aihw.gov.au/datoline/riskfactors/RF-BODY_weight.xls#Print -

Year	Body mass index	%Males	%Females
1980	Underweight	1.1	5.8
	Healthy weight	51.5	67.0
	Overweight but not obese	37.9	19.3
	Obese	9.4	7.9
	Underweight	1.2	3.8
	Healthy weight	49.5	64.0
	Overweight but not obese	40.4	21.8
	Obese	8.9	10.4
	Underweight	0.6	3.6
	Healthy weight	46.2	59.5
1983	Overweight but not obese	42.8	24.4
	Obese	10.4	12.5
	Underweight	0.7	2.3
	Healthy weight	34.7	48.2
	Overweight but not obese	45.7	30.3
	Obese	18.9	19.1
	Underweight	0.6	1.6
	Healthy weight	32.1	46.5
	Overweight but not obese	48.2	29.8
	Obese	19.1	22.2
1989	Underweight	0.7	2.3
	Healthy weight	34.7	48.2
	Overweight but not obese	42.8	24.4
	Obese	10.4	12.5
	Underweight	0.6	3.6
	Healthy weight	46.2	59.5
	Overweight but not obese	42.8	24.4
	Obese	18.9	19.1
	Underweight	0.6	1.6
	Healthy weight	32.1	46.5
1995	Overweight but not obese	45.7	30.3
	Obese	18.9	19.1
	Underweight	0.6	1.6
	Healthy weight	32.1	46.5
	Overweight but not obese	48.2	29.8
	Obese	19.1	22.2
	Underweight	0.7	2.3
	Healthy weight	34.7	48.2
	Overweight but not obese	45.7	30.3
	Obese	18.9	19.1
2000	Underweight	0.6	1.6
	Healthy weight	32.1	46.5
	Overweight but not obese	48.2	29.8
	Obese	19.1	22.2
	Underweight	0.7	2.3
	Healthy weight	34.7	48.2
	Overweight but not obese	45.7	30.3
	Obese	18.9	19.1
	Underweight	0.6	1.6
	Healthy weight	32.1	46.5

females and provide a key.

- Use eight colours or similar to illustrate each line e.g Underweight males, Obese females and provide a key.
- On the horizontal axis use a scale from 0 to 2000.
- On the vertical axis use a scale that measures from 0 to 65%.

Note -

Use the grid on the following page to draw a line graph of the data below.

energy use (activity).

imbalance; this is where over a considerable period of time energy intake (food) exceeds energy expenditure. Besides genetic factors, overweight and obesity are caused by an energy imbalance. Besides genetic factors, overweight and obesity are higher in females, with 22% of females estimated to be obese compared to 19% of males. Besides genetic factors, overweight and obesity are higher in females, with 22% of females estimated to be overweight compared to 30% of females. The levels of obesity are highest in females, with 48% of adult males estimated to be overweight compared to 30% of females. The levels of obesity are highest in females, with 48% of adult males estimated to be overweight compared to 30% of females. Males are more likely than females to be overweight, with almost half of males being overweight or obese. Males are more likely than females to be overweight or obese. It is estimated that 67% of adult men and 52% of women are following USA rates. It is estimated that 67% of adult men and 52% of women are following USA rates. Australia is now ranked as one of the flattest developed nations, closely followed by the USA. Australia has almost doubled, Australia is now ranked as one of the flattest developed nations, closely followed by the USA. Over the last two decades the number of Australians who are overweight or obese has almost doubled, Australia is now ranked as one of the flattest developed nations, closely followed by the USA.

Overweight & obesity

23.29	23.94	28.30	29.11	
23.60	24.17	28.60	29.29	
23.90	24.37	28.88	29.43	
24.19	24.54	29.14	29.56	
24.46	24.70	29.41	26.69	
24.73	24.85	29.70	29.84	
				25.00
			30.00	30.00

Table 2 - Classification of overweight and obesity adolescents

BMI Classification	
<18.50	Underweight
18.50 - 24.99	Normal range
>25.00	Overweight
25.00 - 29.99	Pre-obese
30.00 - 34.99	Obese class 1
35.00 - 39.99	Obese class 2
>40.00	Obese class 3

Table 1 - BMI classification

categories. (Teachers see Teachers Guide)

The first table below outlines the classification of different adult BMI's. The second gives a more accurate comparison for adolescence at the cut offs for overweight and obese

discussed with a nurse/doctor.

Note - Body shape and ethnicity can have an effect on BMI, any concerns should be

at a BMI of 25 or more with obesity determined at a BMI of 30 or more.

- Determine your height in metres squared ($2 \text{ m} \times 2 \text{ m} = 4 \text{ m}^2$).
 - Divide your weight (80 kg) by your height in metres squared (4 m).
 - Your BMI would be 20.

If you weighed 80 kg and were 2 m tall, this is how you would calculate your BMI:

Overweight and obesity is measured by using the Body Mass Index (BMI). This is calculated by dividing your weight in kilograms by your height in metres squared. An example of a BMI measurement is detailed below

How overweight and obesity is defined

Percentage of fat in the burger & fries meal = _____

Total weight of fat = _____

Group	1	2	3	4	5	Weight of fat	Weight of 100 ml beaker + Fat	Weight of 100 ml beaker

Weight of burger & fries = _____
Results

Percentage of fat in the meal.

- 11) Record the results in the table and use the class results to determine the weight and percentage of fat in the meal.
- 10) Reweigh the beaker and calculate the weight of the fat.
- 9) Remove the beaker from the refrigerator and use the spoon to scoop the fat into the pre weighed 100 ml beaker.
- 8) Weigh the 100 ml beaker.
- 7) Allow the mixture to cool in the refrigerator until the fat solidifies at the top of the beaker.
- 6) Decant (pour) or strain (not filter) the liquid from the boiled mixture into the 250 ml beaker.
- 5) Boil the meal mixture gently for 15 minutes.
- 4) Add 100 ml of water to your portion of the blended meal and stir well.
- 3) Evenly divide the mixture between each group by pouring part of the blended meal into a series of 500 ml beakers.
- 2) Break up the burger and fries into small pieces and blend with the coke.
- 1) Weigh the burger and fries and record the weight in the results table.

Procedure

- 100 ml of water
- 200 ml graduated cylinder & stirring spoon
- 500 ml beaker, 250 ml beaker, 100 ml beaker
- Bunsen burner, tripod, gauze mat and matches
- Blender, electronic scales & access to a refrigerator
- 1 hamburger with cheese, large fries & large cola

Materias
Per class (5 groups)

Aim - To determine the percentage of fat in a fast food hamburger and fries meal.

MCS lush & Slopper - An investigation of fat content

2. Why do you think the digestive tube needs to be so long?

1. Why do you think different parts of the digestive tube are different lengths?

Questions

Part	Length (cm)	Colour	Function of the part	Total
Mouth	10			-----
Oesophagus	25			
Stomach	20			
Small Intestine	700			
Large Intestine	150			
Rectum	10			

Results

- 1) Use the scissors to cut the coloured string into pieces that can be tied together according to the measurements below. Remember that you need to allow some extra for the knots.
- 2) Tie the pieces together and lay it out in a straight line.
- 3) Complete the table with a key for the colours that you used.
- 4) Write down the function of each part.

- Scissors
- 6 different coloured balls of string/twine

Materials

Aim – To make a simple model to illustrate the length of the human digestive system

How long is the human digestive system?

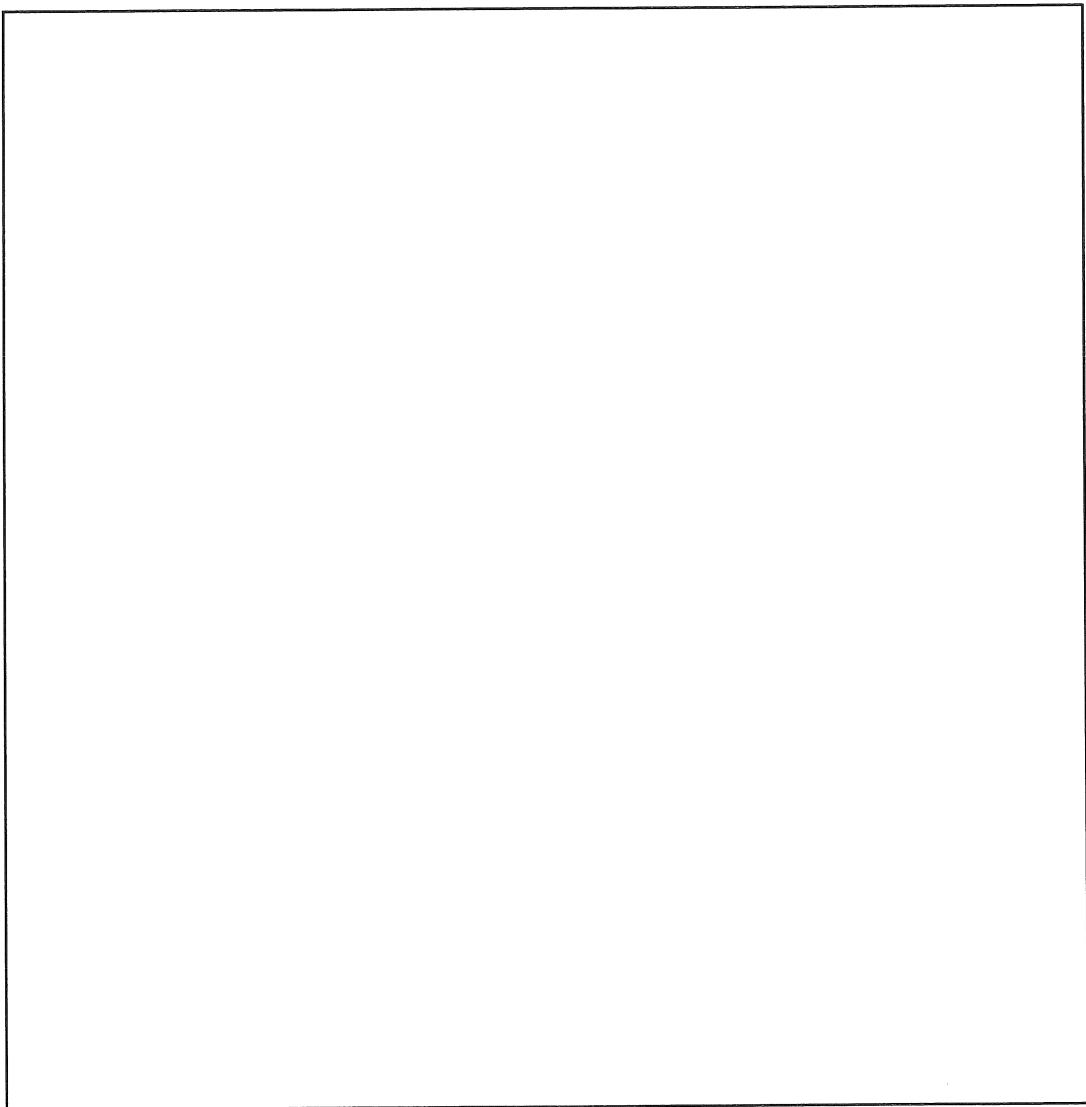
Ingestion	Digestion	Absorption	Egestion
Mouth	Small Intestine	Stomach	Large Intestine
Tongue			
Teeth	Small Intestine	Liver	Anus
Salivary glands			
Pancreas			
Gall Bladder			

The digestive system is comprised of specialised organs associated with its processes. Each process has specialised organs associated with it. The sequence of events of digestion can be divided into four main processes; Ingestion, Digestion, Absorption and Egestion. The sequence of events of digestion can be divided into four main processes; Ingestion, absorption and egestion of nutrients.

The basic digestive tube

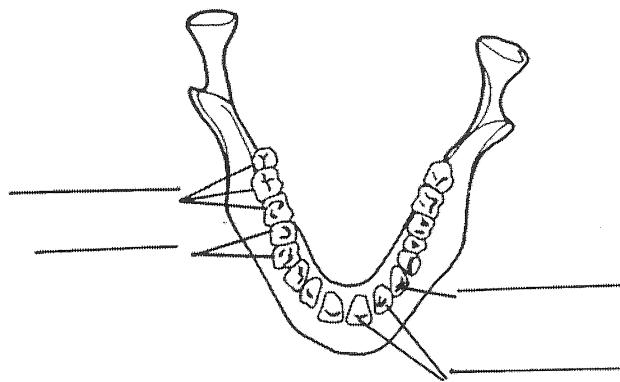
Component	Function
Salivary glands	Mouth
Oesophagus	Stomach
Pancreas	Liver
Gall bladder	Small intestine
Appendix	Large intestine
Rectum	Anus

Functions of the components of the digestive system



Draw a diagram of a molar tooth and label the following
Crown, root, neck, enamel, dentine, pulp cavity/pulp, gum, bone, cementum, blood
vessels/nerves, root canal.

Structure



Label each type of tooth on the diagram below.

Location

Digestive Juice	Source	Function	Gastric HCl	Bile salts	Sodium Hydrogen Carbonate

Enzyme	Source	Substrate	End product	
Salivary amylase				
Gastric protease				
Pancreatic protease				
Pancreatic amylase				
Pancreatic protease				
Pancreatic lipase				
Pancreatic lipase				
Intestinal lipase				
Peptidase				
Intestinal lipase				
Disaccharide enzymes				

The table below outlines the major digestive enzymes. Your teacher will discuss with you the degree of underdigesting and memorisation that is required. Teachers see *Teachers*

- Chemical digestion is the breakdown of small particles of food into small molecules that can be absorbed through cell membranes.
 - It occurs in the mouth, stomach and small intestine.
 - Digestion is controlled by enzymes.
 - The food or substances that enzymes act on are called substrates.
 - The new material that is made is called an end product.
 - In general enzymes are named after their source and the substrate they act on. The name is developed by adding 'ase' as a suffix to the name of the substrate e.g. Pancreatic protease is an enzyme from the pancreas that break down proteins.

Chemical digestion

At first the biscuit / bread would have tasted very bland or plain. However with continued chewing, the taste of the biscuit / bread should turn mildly sweet. This sweet taste is the result of the amylase converting the starch into sugars.

Explanation

Observations

- 4) Record your observations about the taste of the biscuit.
- 3) Swallow or dispose of the biscuit mush after 2 minutes.
- 2) Don't swallow the biscuit.
- 1) Chew on the biscuit for 1 to 2 minutes.

Procedure:

- A low salt saline cracker or biscuit that contains no sugars.

Materials

Aim – To digest a starch containing food in the mouth to produce sugar. Saliva contains amylase, an enzyme that breaks down starch into sugar molecules.

Turning starches to sugars

The substance that causes jelly to thicken is a protein called Gelatin. The bromelain in the fresh pineapple is a protease; this breaks down the gelatin stopping it from setting. The timed pineapple was cooked during the canning process. The heat denatured the bromelain, which stops it from working as a protease; therefore the gelatine was able to set.

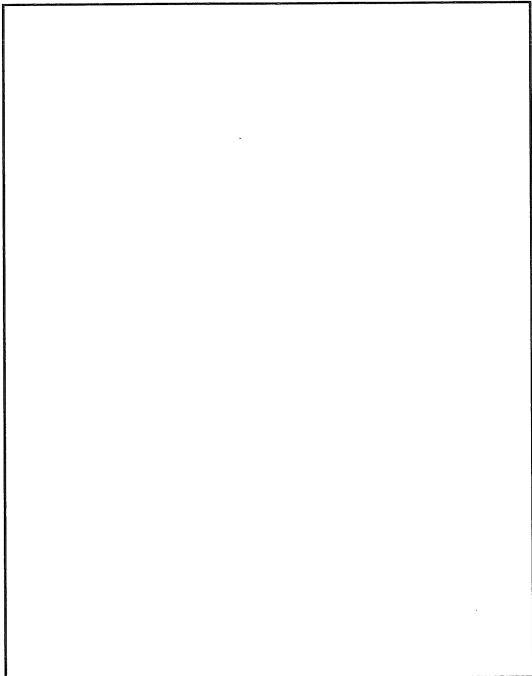
Explanation

Observations

- 2) Record your observations.
- 1) Remove the cling wrap and use your spoon to check the consistency of the jelly. It is permitted by your teacher you can eat the jelly and pineapple.

Procedure – Lesson 2

Explain how the structures that comprise a villus individually and as a whole, aid in the small intestine's role of absorption.



Draw a labelled diagram of a villus highlighting each of the following;

Villi and absorption

- Lymph duct.
- Lacteal.
- Venule.
- Arteriole.
- Capillary network.
- Microvilli.
- Epithelial secretory cell.
- Epithelial absorptive cell.

Following the process of digestion there is a high concentration of nutrients in the lumen. To enable their absorption the small intestine has a number of features. Following the process of digestion the small intestine has a number of features. Teachers see Teachers Guide

Notes

Notes

Teachers see Teachers Guide

Elimination / defecation

absorbed by the intestinal cells.

Some bacteria produce vitamins as a 'waste' product of their metabolism; these are

Mucous secreting cells make mucus, which helps movement as the water is removed. It also houses bacteria that break down the remaining organic nutrients that were not absorbed, their 'waste' product is a gas either methane and/or hydrogen sulphide.

Water-soluble vitamins and minerals are absorbed with the water. By the time the digested food/chyme reaches the large intestine the majority of nutrients have been absorbed. The large intestine is primarily responsible for absorbing water.

Absorption in the Large intestine

Condition / disorder	Description	Cause	Part involved / affected	Treatment / cure
Vomiting				
Indigestion				
Gastric reflux				
Constipation				
Diarhoea				
Peptic Ulcers				
Gastric Ulcers				
Irritable Bowel Syndrome				
Crohn's Disease				
Appendicitis				
Flatulence & belching				

Dietary disorders

12. Ans - Aerophagy
13. Ans - Firmly clenching something like a pencil between the teeth
14. Ans - Borborygmi
15. Ans - Hunger, or by anxiety, or a fright; they are very common in irritable bowel syndrome
16. Ans - Times per day (ranging between 3 and 40 times)
17. Ans - High fibre diet
18. Ans - Normal bacterial fermentation of food residues in the colon
19. Ans - Oligosaccharides
20. Ans - Cabbage, brussel sprouts, cauliflower, turnips, onions, garlic, leeks and some seeds such as fennel, sunflower and poppy
21. Ans - Activated charcoal
22. Ans - Lactose
23. Ans - Narrow anus
24. Ans - Indoles, skatoles and hydrogen sulphide
25. Ans - Asafetida
26. Ans - Sulphur
27. Ans - Chewing gum, smoking, or wearing loose dentures
27. Qu -

The baby/infant is totally reliant on its mother for protection, warmth, fluid/food and baby.

Labour where the body prepares for and then expels the foetus, which is then termed a birth of a foetus is termed parturition and is preceded by a sequence of events called

Baby/infant

From the start of the third month (ninth week) to the end of the ninth month the foetus continues to increase in size and complexity. At the end of the ninth month, just before birth the foetus weighs on average 3.3 kg and is around 50 cm in length.

Between the fourth and seventh week the embryo continues to increase in size as the organ systems develop. By the end of the seventh week it is approximately 3 cm long, noticeably human like in form and is now termed a foetus.

Embryo/foetus

After 3 weeks of growth by mitosis the zygote is termed an embryo.

Fertilisation is the joining of gametes to form a zygote. Fertilisation can be external where dryng out and interference by other external factors.

In sexual reproduction gametes are made by male and females, these gametes join to form a new individual. The gametes are involved in transferring genetic information from parents to offspring and their production and union result in a number of genetic similarities and differences (variation) to each of the parents.

- The implantation of the zygote into the lining of the uterus.
- The joining of the gametes (fertilisation) to form a zygote.
- The placement of these gametes next to each other (coitus).
- The production of specialised reproductive cells called gametes.

Sexual reproduction is a cellular event, it involves:

The life cycle commences with the production of a new individual entity.

Conception

The human life cycle has definite start (conception) and end (death) points, the period in between these can be divided into seven periods; embryo/foetus, baby/infant, toddler, child, adolescent/teenager, adult and geriatric (old age).

The human life cycle on average in Australia currently takes on average 79 years for males and 84 years for females. With advances in medical technology this is increasing.

The human life cycle

Adolescence

From the moment of birth we continue to grow until we reach physical maturity and adulthood. From birth to the age of 2 we grow at a very fast rate, for example at the age of 1 we are growing at an average rate of 16cm a year. (If we continued at that rate how tall would you be at the age of 20?). From 3 to 10 years our growth rate slows down and we are growing on average 5cm per year.

At around 11 years of age the growth patterns of males and females starts to differ. Females start a 2 year growth spurt some where between the ages of 11 and 14. During these two years their height will increase on average 15cm and their weight will increase by an average of 15 kg. The majority of girls go through this growth spurt during year 7 by an average of 15 kg. From 9 to 13 years their height will increase on average 20 cm and their weight will increase by an average of 16 kg. This explains why in year 9 and 10 the boys become larger than the girls.

These changes in weight and height are an integral part of the period of transition from child to adult which is termed adolescence.

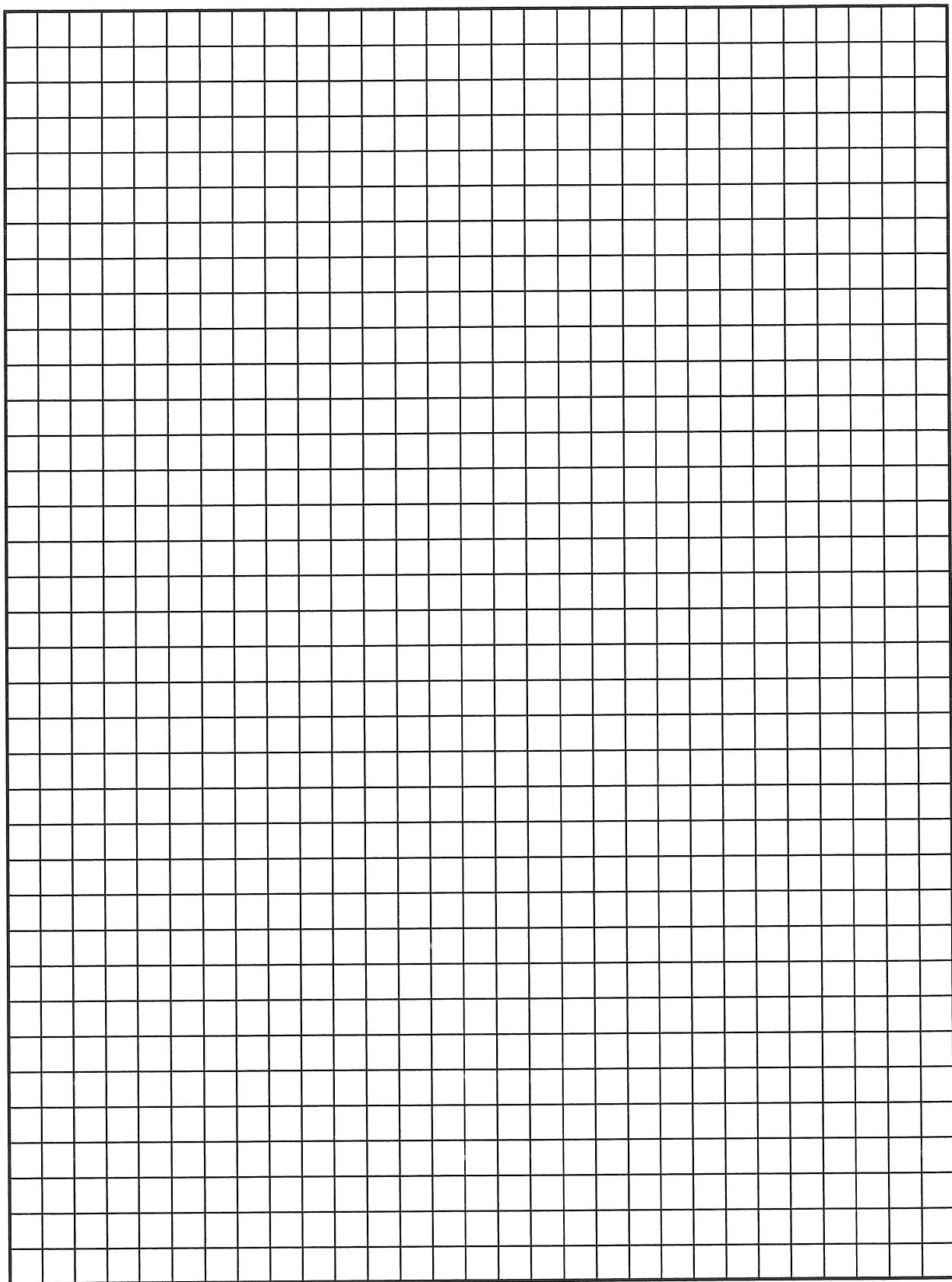
All systems of the body are involved in growth and change during adolescence. In addition to the reproductive system which shows the most obvious changes is the reproductive system is underdeveloped during childhood primarily as it is not required. One of the phases of adolescence, called puberty, is when the reproductive system develops to that it is capable of making gametes. Males also require the ability of transferring them to the female and females the capability of carrying a baby and feeding it following birth.

Over the average of three years of puberty in male there is an increase in the size of the testes and scrotum, lengthening and thickening of the penis, ability to ejaculate semen, and vagina, and menarche (first menstrual cycle) occurs. In addition a number of secondary sexual characteristics develop:

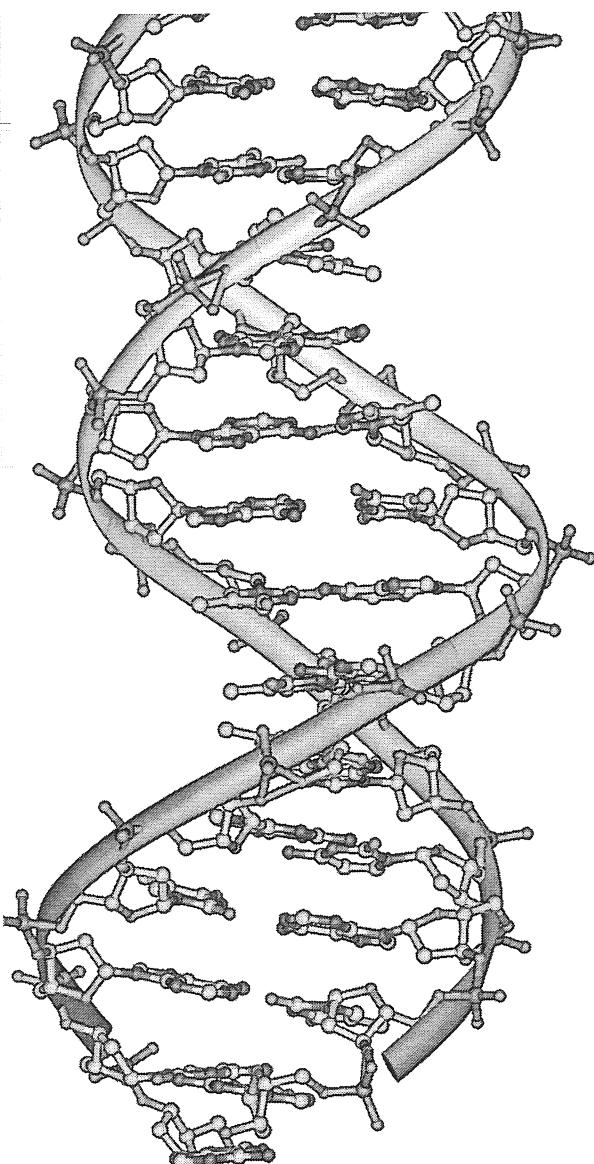
- Increase in body fat distribution to the hips and breasts.
- Development of pubic and some body hair
- Development of the breasts.
- Sexual characteristics develop;

In females there is an increase and size and changes to the structure of the ovaries, uterus and vagina, and menarche (first menstrual cycle) occurs. In addition a number of secondary

the larynx.



Graph



9. Do all animals have the same number of chromosomes? Explain.

8. How many chromosomes does a human cell have and how many pairs does this make?

7. How long is all of the DNA in a human cell and how does it all fit in the nucleus?

Next click on the 'what is a chromosome' link and answer the following questions.

1. How successful were you separating out some DNA? Explain. Draw a side-on view of your beaker showing the DNA.

Questions

Evidence Profile Name	Suspect Profile Number

Results

- 1) Your teacher will give you a worksheet containing a number of DNA profiles of suspects from a crime scene.
- 2) You will also be given a numbered transparency of a DNA profile taken as evidence from from a crime; glue this onto the next page.
- 3) Overlay the transparency over each of the suspect's DNA profiles until you have a match.
- 4) Record the letter of the evidence profile and the corresponding number of the suspect profile in the results table.
- 5) Return the transparency to the front bench and repeat for another seven.

Procedure

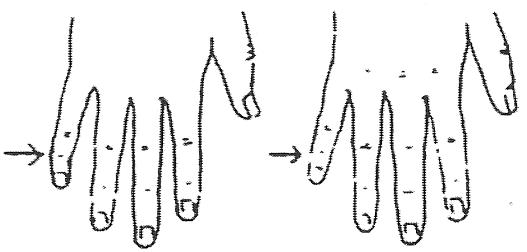
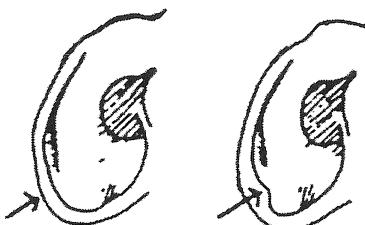
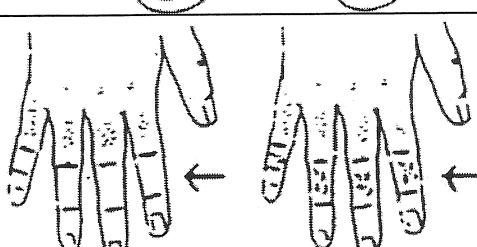
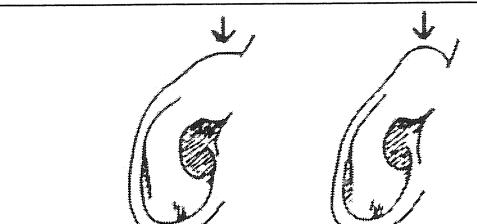
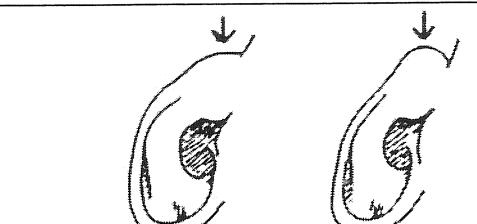
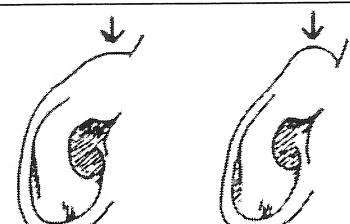
- Worksheet of DNA profiles taken from a range of suspects
- Transparency of a DNA profile taken as evidence from a crime scene

Materials - (Teachers refer to Teachers Guide)

Aim – To determine the identity of a criminal by matching a DNA profile found at a crime scene to those of a number of suspects.

The process of extracting and collecting DNA from a sample of human tissue is very similar in appearance to a barcode. In this activity barcodes will be used to represent DNA transcripts. The end result that is used in law courts is a DNA Profile. This is a photograph involved. The end result that is used in law courts is a DNA Profile. This is a photograph similar in appearance to a barcode. In this activity barcodes will be used to represent DNA profiles.

Barcode DNA

<p>1. Bent little finger</p> <p>Hold your hands before your face with the palms toward you. Place the two little fingers side by side and press them together. The end segments of the little fingers may be straight or turned towards the ring finger. Bent (B) is dominant over (b) straigght.</p> 	<p>Is a projection that varies in size on the upper inner rim of the ear. The tubercle (P) is a dominant characteristic. Its absence (p) is recessive.</p> 
<p>3. Thumb hyperextension</p> <p>Can you bend your thumb back to form an arc shape, if you can you have digital hyperextensibility or 'hitch hikers thumb'. Hitch hikers thumb (D) is dominant over normal thumb (d).</p> 	<p>Do you have hair on the back of the middle segments of the fingers, the presence of hair on one or more middle segments of the fingers is dominant (H). Lack of mid-digital hair is a recessive trait (h).</p> 
<p>4. Mid-digital hair</p> <p>Do you have hair on the back of the middle segments of the fingers, the presence of hair on one or more middle segments of the fingers is dominant (H). Lack of mid-digital hair is a recessive trait (h).</p> 	<p>5. Ear-lobes</p> <p>Ear-lobes that hang free (E) are dominant to attached ear-lobes (e).</p> 
<p>6. Earwax</p> <p>There are two forms of earwax that occur in the auditory canal. Stick your finger in your ear; the dominant type of ear wax (W) is sticky and yellow to brown in colour. The recessive form (w) is grey and crumbly.</p>	<p>A nose that is convex (has a bump) and is prominent (large) is dominant (N) to a straight and moderate nose (n).</p>
<p>7. Shape of nose</p> <p>straight and moderate nose (n).</p>	

Use the following information to determine and record your characteristics for the twenty traits below, in the table that your teacher will give to you (*Teachers see Teachers Guide*), and then compare your traits with others in the class to assess who is genetically most similar to you.

DNA carries the genetic information that determines an individual's features. Except for identical twins, it is highly unlikely that any two people would have the exactly the same combination of genetically determined traits.

Genetically determined variability in humans

?	You	?	?	?	Trait	Bent little finger	Darwin's Point	Thumb hyperextension	Mid-digital hair	Ear-lobes	Earwax	Shape of nose	Dimples	Eye colour	Length of eyelashes	Widow's peak	Handedness	Hair form	Tongue rolling	Hair whorl	Finger nails	Freckles	Face shape
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genetically related to you and complete the table below.

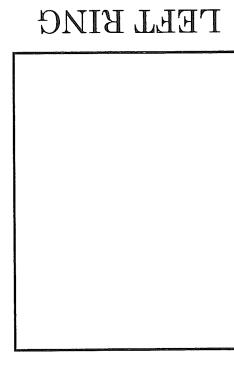
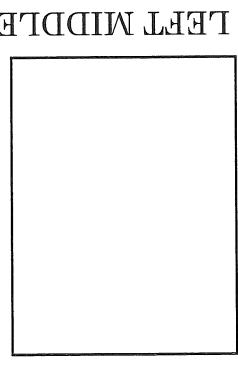
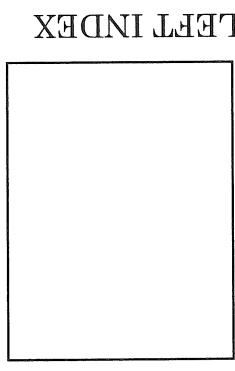
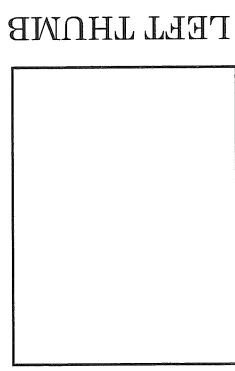
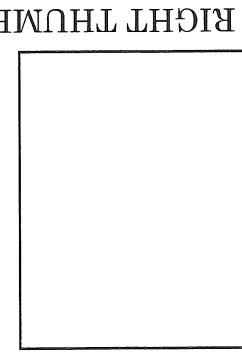
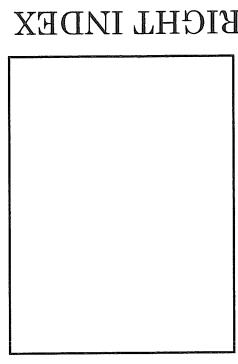
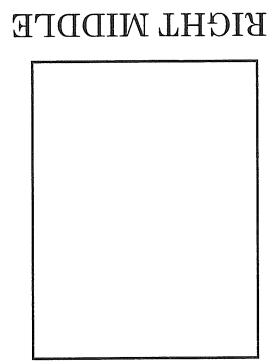
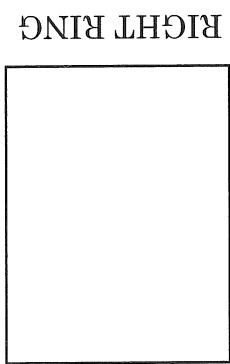
In a similar fashion to the previous activity choose one or more family members who are

ideally your parents due to a strong family resemblance.

situations on parents' nights where although they have not met them before they can identify their mothers and fathers (your grandparents DNA). Your teacher may be able to tell you of

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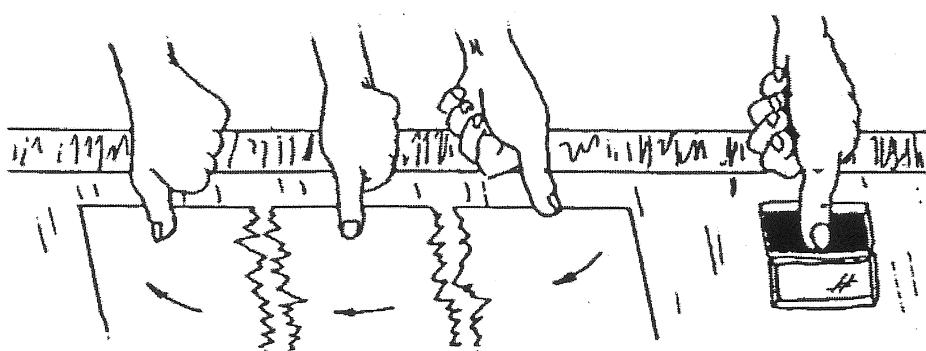
Genetic family features



HINT - Try some practice prints on some scrap paper first!

the same on the spaces provided below.

- 2) Using one finger at a time roll your finger from left to right on the ink pad and then do the same on the spaces provided below.
- 1) Place your inkpad on the table.



- Materials
- Stamp pad (artists water soluble ink)
- Paper towel
- Soap

Aim - To make copies of your own fingerprints.

Looking at your own prints

Measurement

In most experiments in Human Biological Sciences, you will be required to make accurate measurements of physical quantities, for example, time, length, volume and weight. To make these measurements accurately it will be necessary to use scientific equipment such as electronic timers, rulers, measuring cylinders and scales.

Use a ruler and an electronic balance to measure and calculate the following. It is important that you know how to use this equipment correctly and in a safe manner.

Note – be as accurate as you can.

Length (L) of this workbook = _____

Width (W) of this workbook (ignore the black binder) = _____

Height (H) of this workbook = _____

Weight (G) of this book = _____

Volume (V) of this book = L x W x H = _____

Density of this book = G / V = _____

Example For example if a student wanted to work out the average weight of five rats, they would weigh each rat add them together and divide it by the number of measurements.

To calculate averages add together the original data from the trials and divide by the number of trials. Note your averages should be rounded off.

Calculation of averages

$$\text{Eg. Rat 1} - 126\text{g}, \text{Rat 2} - 135\text{g}, \text{Rat 3} - 119\text{g}, \text{Rat 4} - 127\text{g}, \text{Rat 5} - 140\text{g},$$

$$126 + 135 + 119 + 127 + 140 = 647$$

$$647 / 5 = 129$$

$$\text{Average} = 129 \text{ grams}$$

- Notice that the average has been rounded off to the same number of decimal places as the data and that units have been used in the answer.
1. Four students recorded the amount of work they did around the house for a week, Benee did 8 hours, Joshua recorded 6 hours, Laura did 7 hours and Tim said 6.
- What is the average number of hours worked around the house for these students?

2. An enterprising Science student used the skills he had gained in Human Biological Science, to set up a hydroponic garden. He planted 10 tomato seeds and recorded the height of each plant after 5 weeks. His measurements in centimetres were: 36, 45, 52, 39, 41, 30, 45, 50, 38 & 42. Calculate the average height of his crop of plants.
3. When his crop had flowered and produced their fruit he picked the fruit and weighed how many tomatoes was produced by each plant. His measurements in kilograms were: 3.2, 5.1, 4.2, 4.0, 4.9, 3.8, 4.0, 3.9, 4.7 & 4.5.
- Calculate the average weight of tomatoes produced by each plant.
- Show your working.

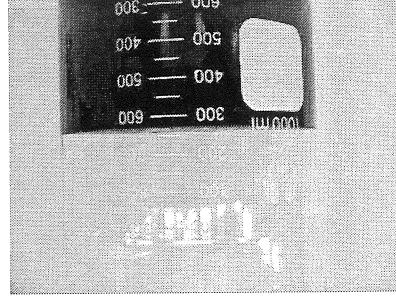
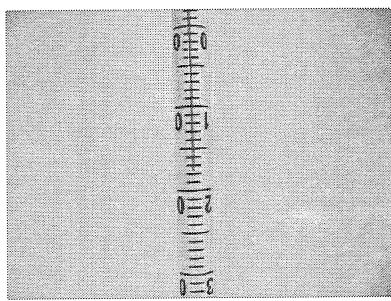
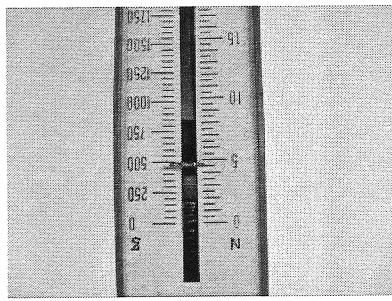
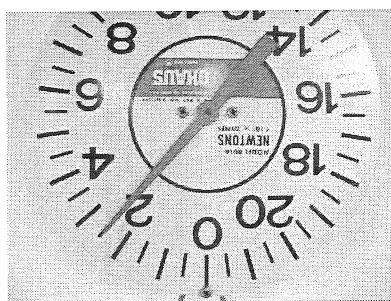
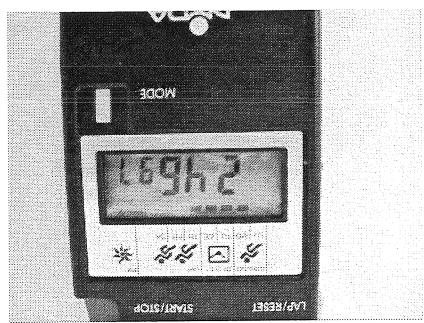
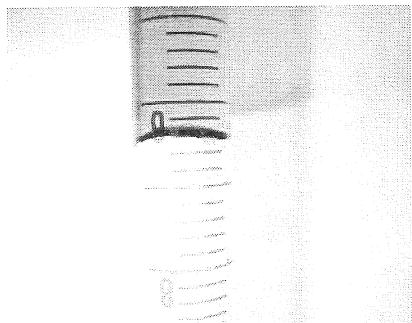
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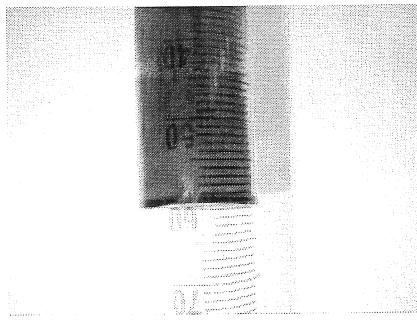
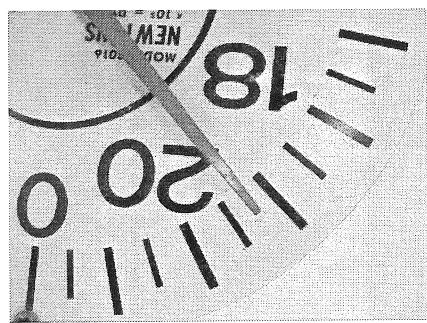
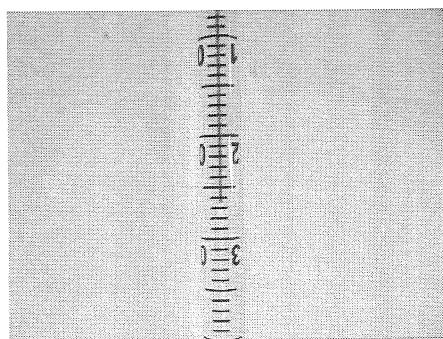
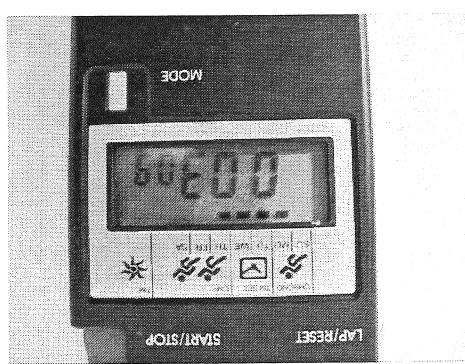
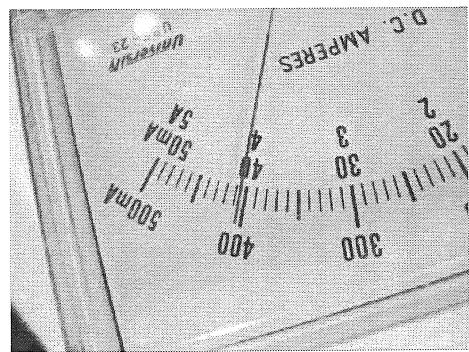
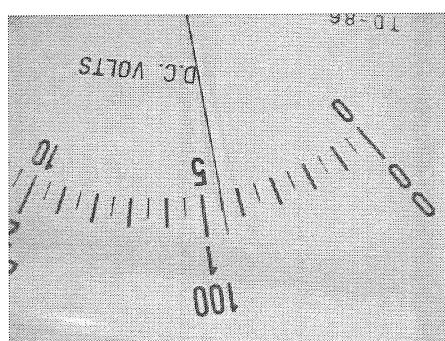
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When using scientific equipment to make quantitative measurements it is important that you can accurately read the scales. For each of the figures following write down the numerical measurement, some will have more than one possible reading (do not worry about units in these practice examples).

Scales



Errors in an experiment can occur due to errors making measurements, equipment problems and biological variation. To help make the conclusion of an experiment more reliable that are a number of procedures that can be used to reduce the EFFECT of these errors (Note – you don't reduce the chance of or the errors themselves).

Generally experiments in Human Biological Sciences will have two set-ups or groups up/group that is exactly the same as the control except one difference has been made (e.g. operating). The set-up/group that is normal is termed the control set-up/group. The set-up/group is termed the experimental set-up/group.

6. Planning a valid experiment

d) weighing balance used.

c) boiling time

b) amount of water

a) weight of mine

The control variables in this investigation are:

start.

In order to make the experiment a fair test all other variables have to be kept the same during the experiment. These variables are called controlled variables. Careful thought needs to be given to all the possible factors that could affect the experiment before you start.

5. Identifying the controlled variables

experiment it is the amount of fat.

In general terms it is the variable that is measured in the investigation and in this

dependent or responding variable.

The measurable change as a result of the independent variable being altered is called the

4. Identifying the dependent variable

normal.

In general terms it is the variable that the investigator deliberately changes in the experiment. In this experiment the independent variable is the type of mine, low fat or

referred to as the manipulated or experimental variable.

independent variable. Because the investigator can alter this variable it is sometimes variable is selected to be varied in the experiment. The variable selected is called the outcome of an environment it termed a variable. When designing an experiment only one anything factor that can be changed or varied during an experiment or that can affect the

3. Identifying the independent variable

- the size of the pupil.”

• “If the amount of light entering the pupil increases then the iris will contract to reduce increase.”

• “If the temperature of the body rises above normal then the rate of sweating will decrease.”

• “If the concentration of carbon dioxide in the blood decreases then the heart rate will

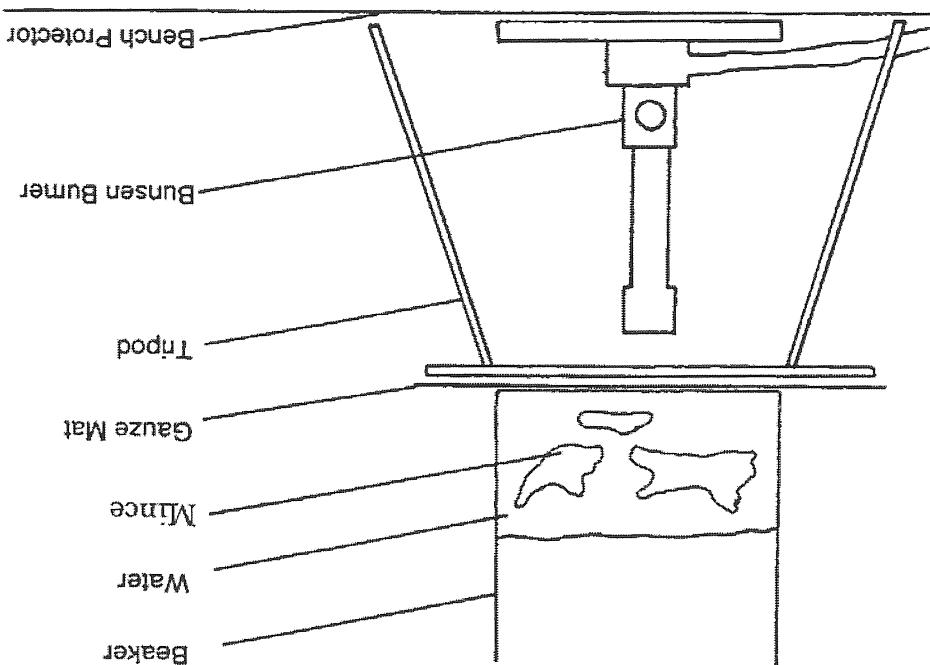
Some hypotheses in the “If / Then” format would be;

You also need to think about any factors that may influence your measurement and take appropriate actions to make sure that they do not. In this experiment for example it is important to use scales (or balances) to measure the weight of mince and fat plus a stopwatch to measure the time.

In most experiments you have to make accurate measurements of physical quantities such as lengths and weights etc, or recordings of time intervals. It is important to use scientific equipment like timers, rulers and scales to make these measurements, and to know how to use this equipment correctly.

When designing and completing experiments there are many potential sources of error. The errors that you are most likely to make are measurement errors.

10. Experimental errors



You should draw a diagram where possible to help explain the method. Diagrams should be in pencil, 2-dimensional (side view), labelled, large and clear. Here is an example for you.

9. Diagram of experimental apparatus

- interesting point, however, is that low fat mince still has quite a lot of fat, 3.52%. So maybe the butcher's customers should not have been complaining. An average. This meant that normal mince in this test had over double the fat of low fat mince". The average fat content for normal mince was 7.80% and low fat mince 3.52%. Our results support the hypothesis "That low fat mince has less fat than normal mince".

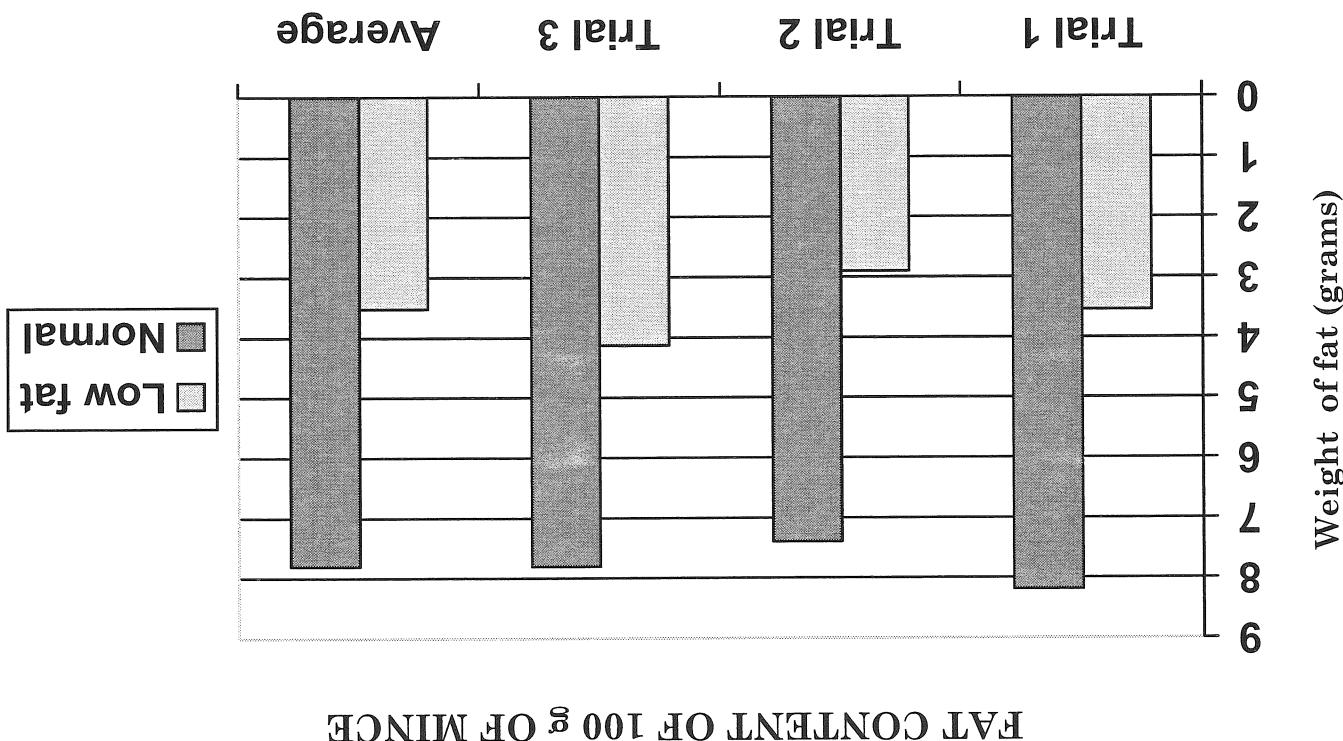
An example of a good conclusion would be:

- Any inferences that can be drawn from the data.
- a general statement concerning the results.
- a repeat of the hypothesis.
- results).

• Whether or not the data supports or not supports the hypothesis (backed up with conclusions state,

conclusions should be presented in a series of separate statements. The conclusion is generally towards the end of an experimental report. Conclusions should be brief and not introduce any new ideas or information not dealt with earlier. Your conclusions should be presented in a series of separate statements.

13. Writing a conclusion



Caffeine group - Heart rate (beats / min)											Average
Student	Rest	1	2	3	4	5	6	7	8	9	10
Time after consumption of cola (min)											

Non caffeine group - Heart rate (beats / min)											Average
Student	Rest	1	2	3	4	5	6	7	8	9	10
Time after consumption of cola (min)											

Results

1. Write a hypothesis for this experiment.
-
2. Which group was the control group? Which group was the experimental group?
-
3. What was the sample size?
-
4. What is the independent variable (the one you changed)?
-
5. What is the dependent variable (the one you measured)?
-
6. List four controlled variables (the ones you keep the same).
-
7. What would be the term for you doing the same experiment again next week?
-
8. What would be the term for another class doing the same experiment next week?
-
9. Compare the graph of the non-caffeine group to that of the caffeine group.
-
10. What effect does caffeine appear to have on pulse rate?
-
11. Cola contains 13 milligrams of caffeine per 100 mL. How many milligrams of caffeine would there be in a 375 mL can of cola?
-
12. Caffeine does not have a noticeable taste. Why then do you think manufacturers of cool drinks add caffeine to their products?
-
13. Determine the percentage change in your pulse rate from its resting level to the highest point it reached in the 10 minute period. Show your working.
-

Questions