Australian Curriculum

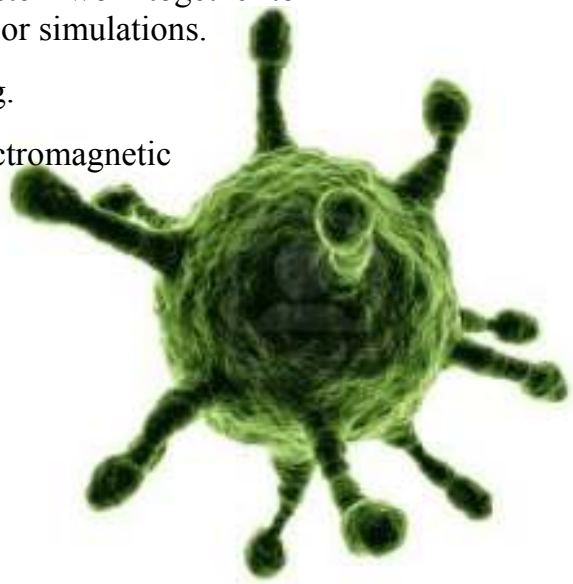
BODY WORKS Part B

Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment:

Booklet 9.1.1b:

When you have completed the activities in this booklet you should be able to

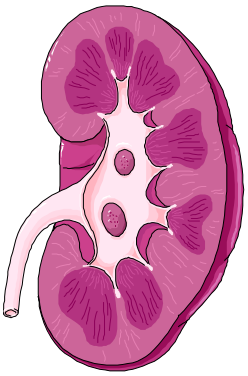
- Describe what is meant by the term ‘excretion’.
- Explain why an excretory system is necessary for survival.
- List the organs of the body that are involved with this process.
- Identify micro-organisms as factors of our environment that may cause disease.
- Describe the importance of our non-specific immune system in protecting us from micro-organisms.
- Describe the first line defences against attack by pathogens, involving both external a barriers and internal defences by macrophages.
- Explain the role of B and T cells in protecting us from disease causing antigens.
- State the importance of the nervous system in coordinating our bodily activities.
- List the parts of a neuron.
- Describe what is meant by a 'reflex arc' and the importance of reflexes to our survival.
- Explain why it takes time for us to respond to a stimulus.
- Describe the endocrine system as a collection of cells and glands that secrete hormones (chemical messengers) into the blood stream.
- Identify some target organs of key hormones and their function.
- Explain how the nervous system and endocrine system work together to maintain our bodies, using models, flow diagrams or simulations.
- Identify radiation as being ionising or non-ionising.
- Describe the effects on humans of exposure to electromagnetic radiations such as X-rays, microwaves and UV radiation.



CONTENTS

Activity 1: Excretion

BACKGROUND INFORMATION



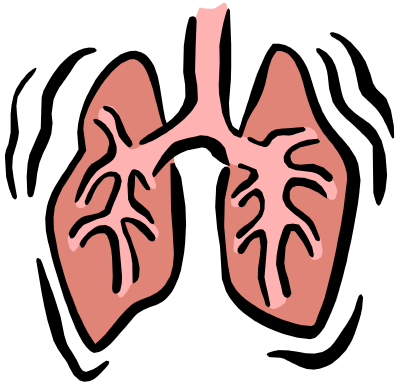
You have already seen how our bodies use oxygen and food in order to function normally. The cells of our body use these materials in a variety of metabolic (chemical) reactions that produce useful materials as well as wastes. These metabolic wastes are removed from the body by a process called EXCRETION.

Excretion is carried out by a number of organs called excretory organs. These organs include the

- Skin
- Lungs
- Urinary (Renal) System.

QUESTIONS:

Use reference books to find answers to these questions:



1. What is meant by the term excretion?

   What are metabolic wastes?

2. Why is it important that they be removed from the body?

3. For each of the three excretory organs named above, identify which metabolic wastes are involved and how they are removed from the body. A table might be a useful way of presenting this information.

Activity 2: The Urinary System

AIM:

To identify the important parts of the urinary system.

EQUIPMENT:

- reference books, Internet

PROCEDURE:

Find and copy a diagram of the urinary system from a reference book.

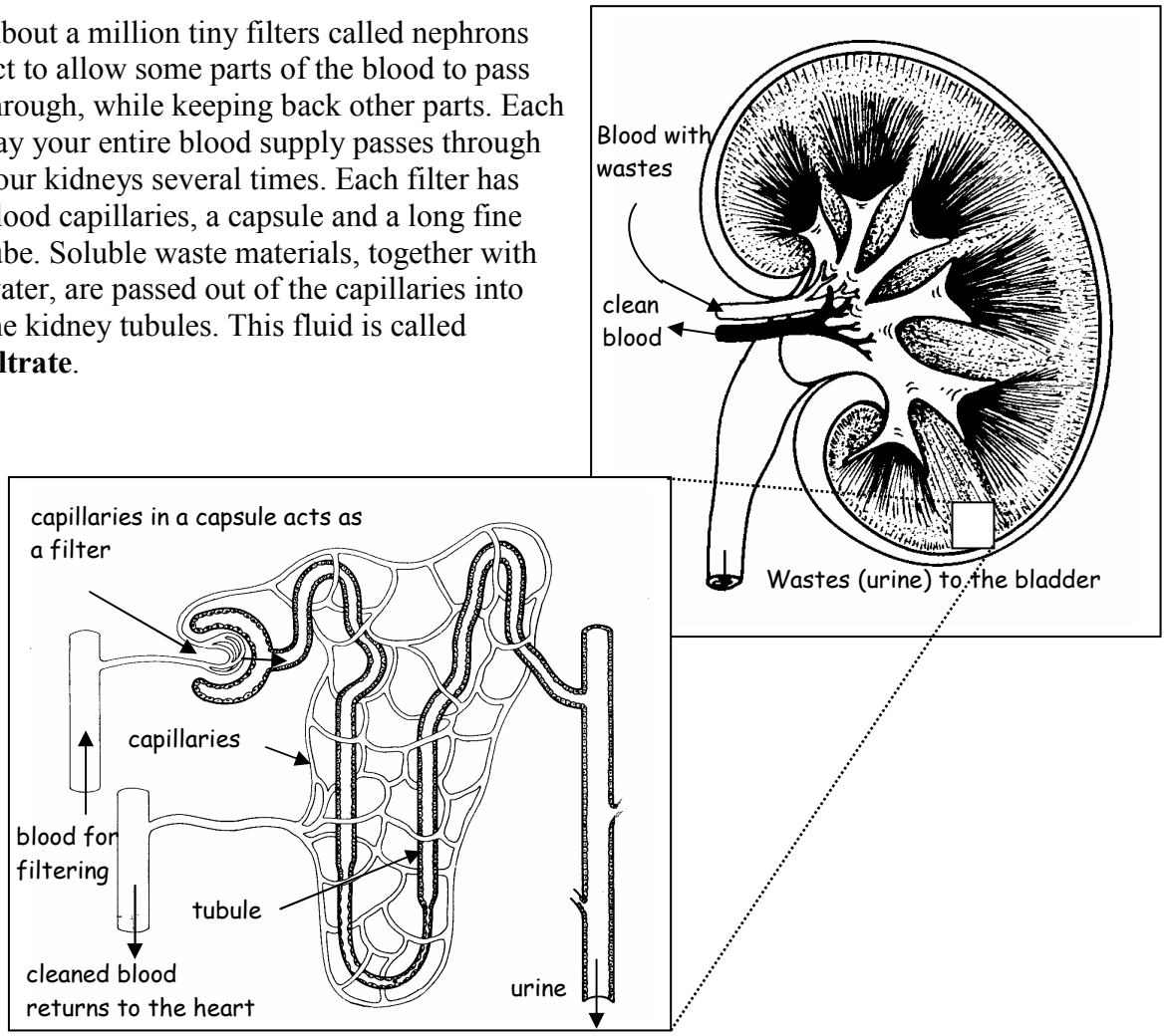
- Use the reference book or Internet to identify all the key parts shown on your diagram.
- Construct a table in which you can summarize the function of each structure of the urinary system that you have labelled.

Activity 3: The Kidney

There are two main processes occurring within the kidney:

1. FILTRATION:

About a million tiny filters called nephrons act to allow some parts of the blood to pass through, while keeping back other parts. Each day your entire blood supply passes through your kidneys several times. Each filter has blood capillaries, a capsule and a long fine tube. Soluble waste materials, together with water, are passed out of the capillaries into the kidney tubules. This fluid is called **filtrate**.



2. REABSORPTION:

In one day your kidney COULD produce up to 200 litres of urine, but in this way you would lose valuable water and other substances and die. Fortunately much of the material filtered off is **reabsorbed** and so only about 1.5 litres of urine are actually produced.

The table below illustrates the function of the kidney by comparing the chemical composition of the blood plasma, the filtrate and the urine over a 24-hour period. Use this table to help you answer the questions that follow.

	Kidney function over 24 hours		
Chemical substance	**In blood plasma entering kidneys**	**In the filtrate entering the tubules**	**Left in the urine after useful matter has been reabsorbed**
Water	200 L	200 L	1.5 L
Protein	8,000g	0 g	0 g
Glucose	180g	180g	0 g
Salt	1200g	650g	15g
Urea	50g	50g	35g

QUESTIONS:

What is meant by the term 'kidney filtrate'?

1. What is meant by 'reabsorption'?
2. What are some of the dissolved substances in blood plasma?
3. What substances do not pass from the blood into the urine?
4. Which substances are more concentrated in the urine than in the blood?

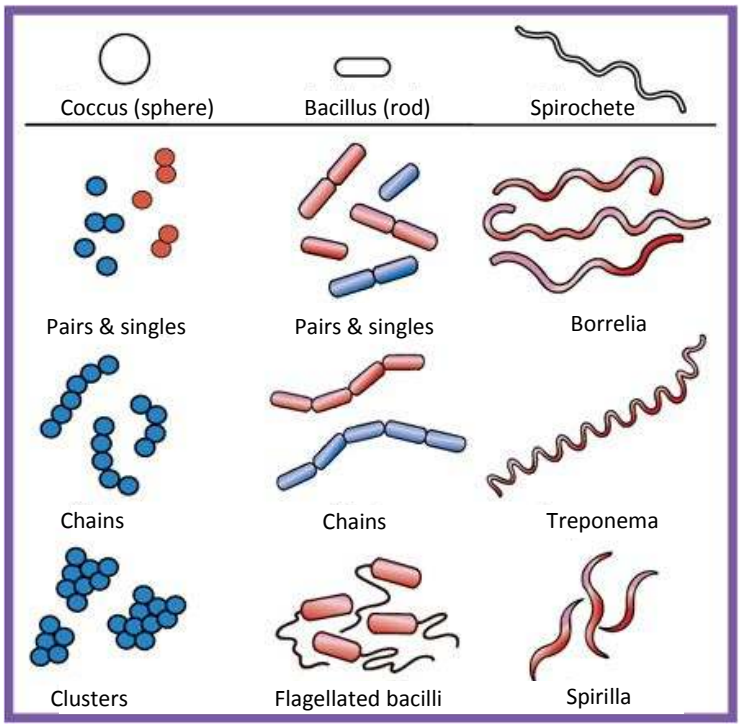
How kidneys work.flv

Activity 4: Micro-organisms

We are surrounded by micro-organisms. They are in the air, in water, inside our bodies and on everything we touch. Some live in hot springs, others live beside undersea volcanic vents. They are simply everywhere.

Micro-organisms include bacteria, fungi as well as microscopic single celled organisms like amoeba and tiny algae.

The illustration below shows the main kinds of bacterial cells, rods, spheres and spirals. Some, like the bacterium that causes the disease cholera are comma shaped.



AIM:

To culture organisms found on your laboratory bench.

EQUIPMENT:

- sterile Petri dishes x 2
- melted sterile nutrient agar in sterile test tubes x 2
- 2 x sterile cotton bud wrapped in alfoil
- Cellulose tape.

PROCEDURE:

- Place the two sterile Petri dishes on the bench in front of you. Mark the lid of one of them ‘Experiment’ and the second ‘Control’.
- Gently lift the lid to the Petri dish labelled ‘Experiment’ to allow you to pour the melted sterile culture medium into the dish.
- Replace the lid. Then very gently swirl the hot medium so that it covers the base of the Petri dish. Wait for it to set and cool.
- Do the same with the “Control’ dish.

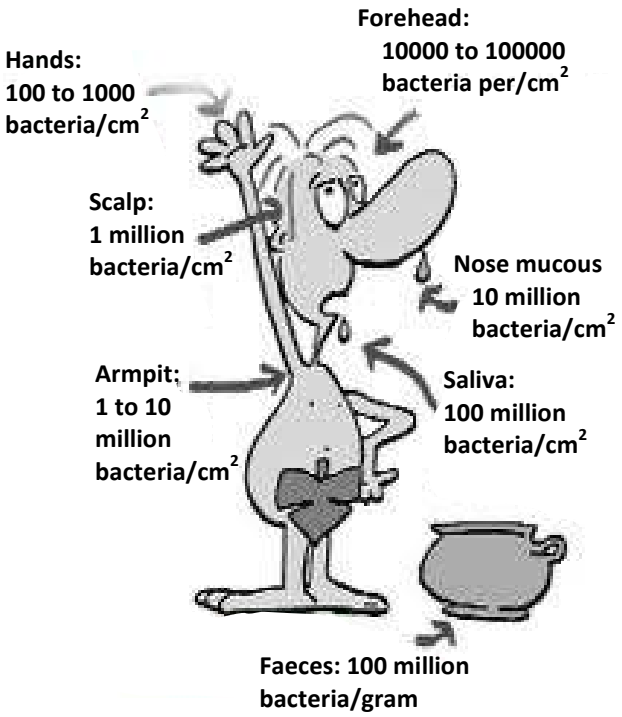
- Carefully open the alfoil wrapper around the cotton buds making sure you do not touch the end of it.
- Take one cotton bud and lightly wipe the head of the cotton bud along the desk in front of you over a distance of 20cm.
- Lift the lid of the Petri dish then gently wipe the end of the cotton bud across the agar.
- Be careful not to dig it into the soft surface of the agar. Replace the lid then use cellulose tape to tape the lid to the base of the Petri dish so that it cannot be removed accidentally.
- Carefully remove the second cotton bud from the alfoil, again being careful not to touch the ends of it. Gently lift the lid of the second Petri dish then wipe the surface of the agar with it. Replace the lid to the Petri dish and seal it with tape.
- Set both Petri dishes in a warm place to culture any micro-organisms that might have grown.
- Examine them daily for a week and record your findings in a suitable table. Record the number of bacterial and fungal colonies found on each plate. Bacterial colonies look shiny while fungal ones look fuzzy.

QUESTIONS:

Why was it important to sterilise the apparatus used in this experiment.

1. What was being 'controlled' by your setting up a 'Control' plate?

- What can you conclude from the results of your experiment?



Activity 5: Non-Specific Immunity

BACKGROUND INFORMATION

From the moment of birth the human body is in contact with bacterial and fungal spores many of which would be able to feed and grow on the mass of organic matter that it is made from. Think of what happens to food items that quickly go bad when not refrigerated.

Viruses may also attack the living cells of our bodies, taking over their function to cause them to make more virus particles.

To survive our bodies have defences against these organisms and particles. Some defences are said to be innate (we are born with them), others develop as we get older and become exposed to more and more microorganisms.

BARRIERS TO INFECTION

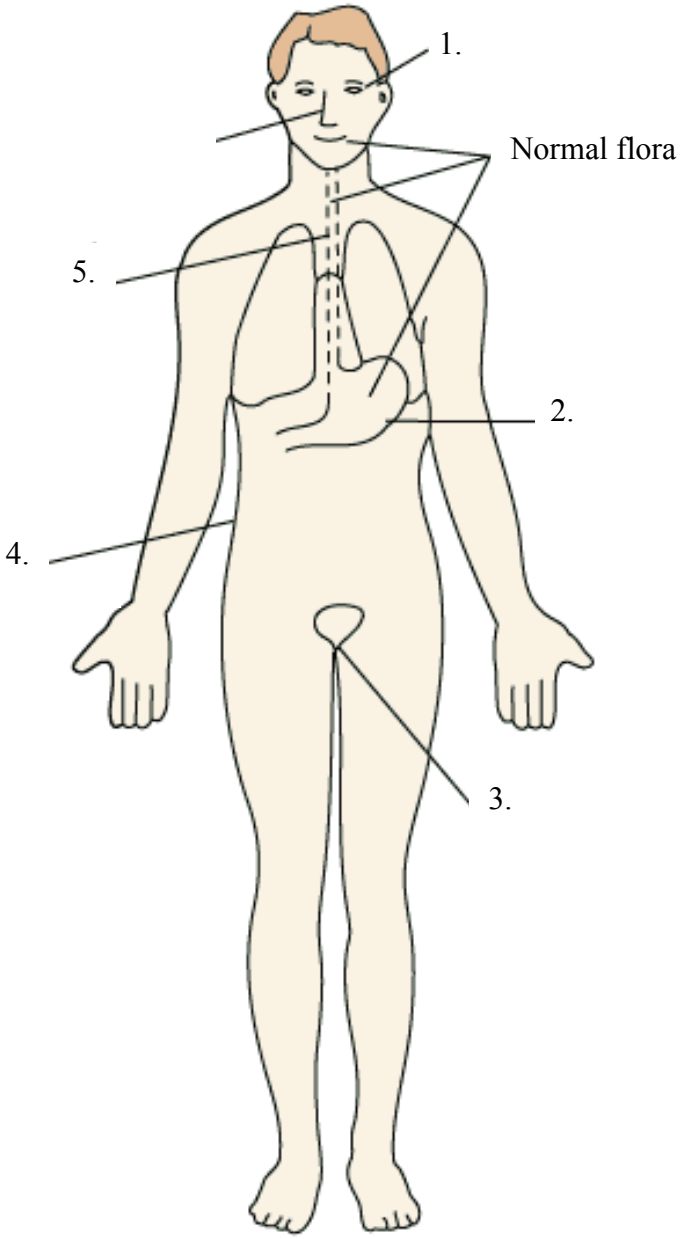
The first line defences against the entry of organisms known as PATHOGENS that might cause disease is the skin itself. As long as the skin is not torn or punctured it forms a very effective barrier. Should the skin barrier be broken e.g. by a splinter that allows germs to enter the tissues below the skin surface, special defence cells called MACROPHAGES are attracted to the area, engulf the germs then destroy them. Pus that forms is made of dead pathogens and white blood cells.
We breathe in air laden with spores of microorganisms. These might cause disease were they not trapped by sticky mucous that lines our nasal passages and airways. Millions of tiny hair-like projections (called cilia) of the cells that line the trachea, bronchi and bronchioles continually wave backwards and forwards propelling this mucous to the back of the throat where it is swallowed or impolitely ejected. If it is swallowed the very acidic stomach juice will destroy any pathogens.
The surface of our eyes is always moist providing an ideal breeding ground for pathogens, were it not for an enzyme found in the tears called LYSOZYME. This enzyme usually destroys any pathogen on the eye surface.
Tears also help to flush germs from the eyes, just as urine flushes germs from the bladder and urethra and vomiting and diarrhoea can flush out our stomach and intestines in the event of infection.

The kinds of defences outline above are made against <u>any</u> microorganism, no matter what kind it is. For this reason theses first line defences are said to be NON-SPECIFIC.

Ask your teacher for a copy of the worksheet "First Line Defences Against Disease."

Summarise the information on this page in the table.

First Line Defences Against Disease



1. Complete this table using the information from given on the previous page..

Part of Body	First line defence against disease
1	
2	
3	
4	
5	

2. What is meant by 'normal flora'? Find out how they protect us from disease.

Activity 6: Specific Immunity

BACKGROUND INFORMATION

Beside the non-specific immunity described in Activity 12, our bodies can also mount a specific response to invasion by pathogens. Two kinds of cells are responsible, B-cells and T-cells. B-cells are so named because they begin their life in bone tissue then migrate to lymph nodes around your body. T-cells also begin their life in bone tissue but then migrate to the thymus gland behind the breastbone where they complete their development.

B-cells are stimulated to form a clone of cells that are able to produce chemicals called antibodies that can target a specific pathogen (= ANTIGEN). Antibodies kill the antigen directly or by attracting other cells like macrophages to do this. The word antigen comes from antibody generator.

T-cells also form a clone of cells following infection by a specific antigen. The cells of this clone then specialise to become a range of different defence cells capable stimulating the formation of B-cells, destroying the antigen, and still others of stopping the response once the invading organism has been destroyed. This response is not immediate - you will suffer symptoms of the disease until your body brings it under control.

In both B-cell and T-cell responses special cells called memory cells are formed. These continue to circulate in your bloodstream in low numbers until the body once more comes into contact with the same antigen. Then, over several days these memory-cells rapidly clone to form more B-cells and T-cells that will protect you from the disease. This explains why a person might suffer a disease like measles only once in his/her life.

REVIEW

1. Draw a flowchart to show what happens when an antigen enters our bloodstream.

2. Copy and complete this summary table for the two types of Immunity:

	Non-specific immunity	Specific immunity
Antigen independent/dependent		
Immediate /delayed response		
Specific/non-specific to antigen		
Immune memory?		

3. If a person who has never been exposed to the measles virus is given an injection containing weakened virus that person becomes resistant to that disease for life. How could this be explained?

Activity 7: Nervous System

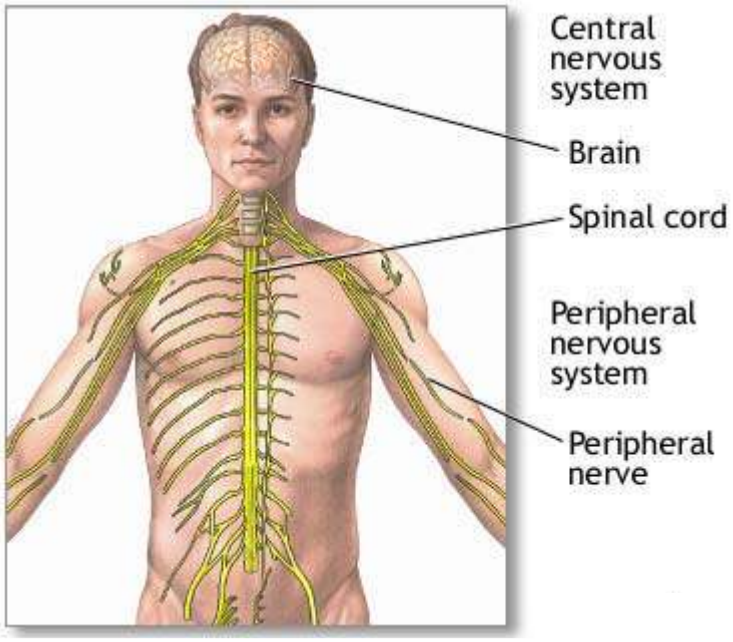
BACKGROUND INFORMATION

The nervous system plays an extremely important role in our bodies of being able to detect changes taking place outside of us through our sense organs (e.g. our eyes) as well as changes taking place inside our bodies (e.g. body temperature). It also allows us to respond to these changes in a coordinated way. For example if we see a puddle we will walk around it; if our temperature climbs we might sweat or shed some clothes.

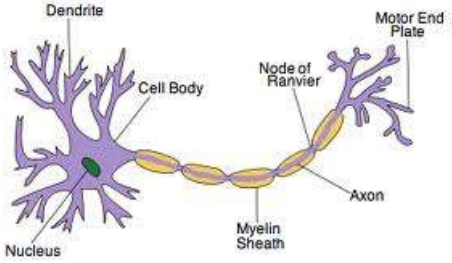
The nervous system has two main parts, the Central Nervous System and the Peripheral Nervous System.

The Central Nervous System (CNS) consists of the brain and the spinal cord.

The Peripheral Nervous System (PNS) consists of the very many nerves that connect the sense and other organs with the CNS which in turn fires nerve impulses towards body structures like our muscles to bring about some action.



The special cells that carry nerve impulses are called nerve cells or **neurons**. While there are a number of different types of neurons, all work in a similar way to allow an electrochemical impulse travel to the CNS from the PNS or from the peripheral organs to the brain.
Common to nerve cells is that they have long processes extending from a cell body. The processes can be very long. Some that serve your toes travel from the toes to the lower spine - over a metre!



While the nerves of the PNS have some powers of regeneration should they be damaged, the nerves of the CNS cannot regenerate. This explains why a person who damages his/her spinal cord or brain will suffer permanent damage that might result in their loss of sensation or ability to move a limb. Paraplegia and quadriplegia are the result of such damage and severely restrict a person's activity for the rest of his/her life.

Questions:

1. There are three main types of neurons. Find out their names and their role.
2. What is the difference between paraplegia and quadriplegia?
3. What are some of the main causes of these conditions?
4. For the diagram of a neuron given above find out the role of each of the labelled parts.

Activity 8: Nervous control of body systems

In an earlier activity you examined how heart rate varied with exercise. The response of your heart to exercise was to increase its rate of contraction. Your breathing rate became faster and deeper.
Both of these responses were due to the nervous system working to control the amount of carbon dioxide in your bloodstream.

BACKGROUND INFORMATION:

When stimulated, nerve impulses travel from receptors in the major arteries (aorta and carotid) to the medulla oblongata at the base of the brain to increase the rate and depth of breathing. To do this impulses travel from the medulla to the muscles joining the ribs together and the diaphragm, stimulating contraction.

HYPOTHESIS:

That breathing rate is dependent on the level of CO_2 rather than the level of O_2 in the bloodstream.

MATERIALS REQUIRED:

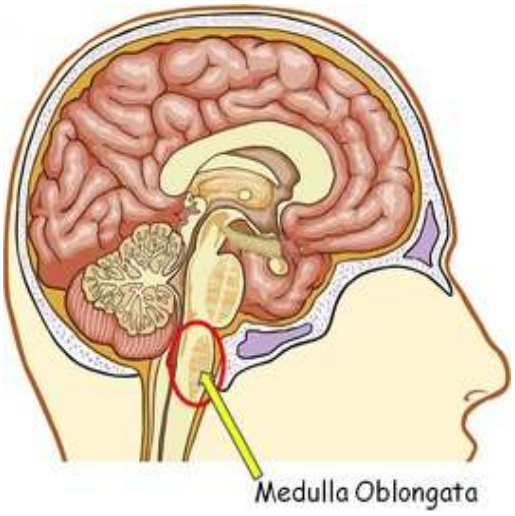
- graph paper

The data below shows how oxygen and carbon dioxide levels link to breathing rate.

% O_2 in inspired air	Breathing rate (breaths/min
4	26
6	20
8	15
10	12
12	11
14	10
16	10
18	10

% CO_2 in inspired air	Breathing rate (breaths/min
0.4	10
1.0	10
2.0	11
3.0	13
4. 0	17
5.0	22
6.0	32
8.0	50

Plot this data as two separate graphs.



QUESTIONS:

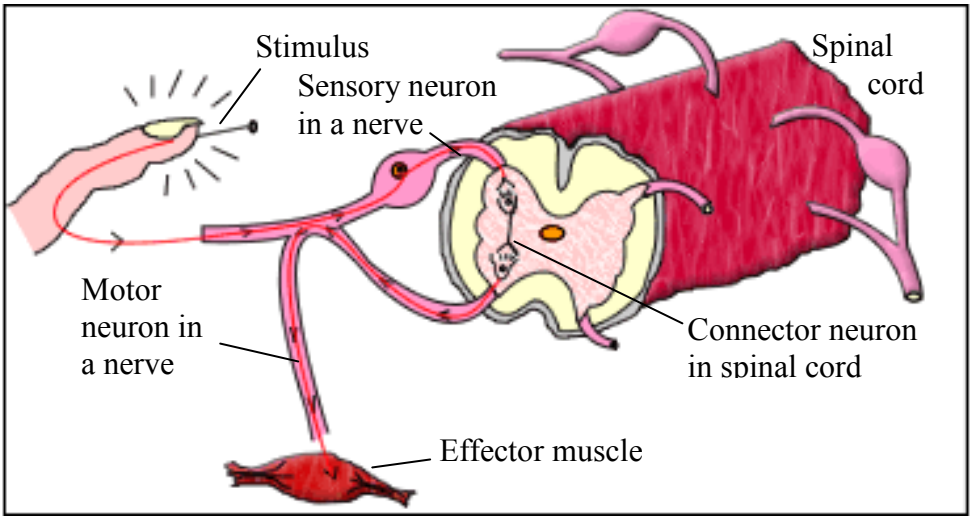
1. What happens to the breathing rate as the level of oxygen in the bloodstream falls?

2. What happens to the breathing rate as the level of CO_2 in the bloodstream rises?

3. What can you conclude - i.e. from the data and your graphs, are the receptors in the aorta, carotid artery and medulla more sensitive to changes in blood O_2 or blood CO_2?

Activity 9: Reflex Arc

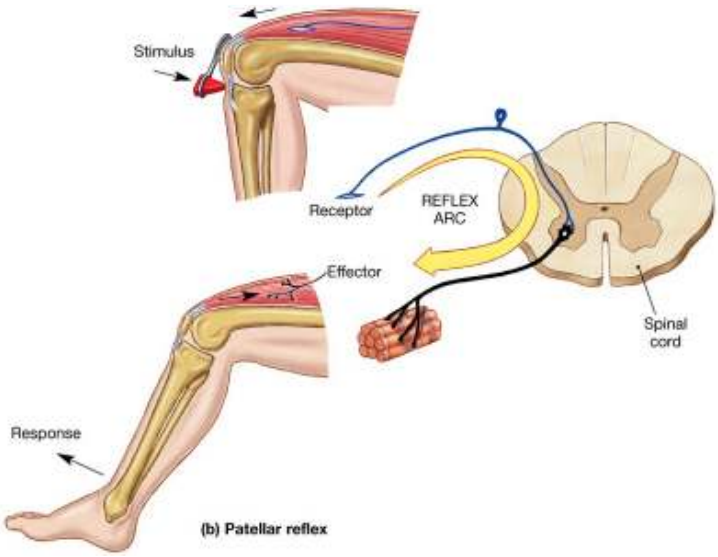
The simplest of nerve pathways is the spinal reflex arc. Sensitive nerve endings called receptors are stimulated to send a nerve impulse along a sensory neuron to the spinal cord. Here a connector neuron is stimulated to carry an impulse to a motor neuron which in turn is stimulated to carry an impulse to an organ like a muscle or gland to cause a response.



This pathway does not require the involvement of the brain, making the response a very rapid one that can protect us from injury.

Some common reflexes:

- knee jerk reaction
- pupillary
- blinking
- vomiting
- plantar flexion
- sneeze
- startle



MATERIALS REQUIRED:

- torch
- "hammer"
- stopwatch
- popstick
- metre rule

Procedure:

Record what happens in each case when you carry out the following tests on a subject

1. Work in pairs. One of the pair (subject) to sit on a chair with one leg crossed over the other. Use the "hammer" to gently strike the patellar ligament just below the knee cap (patella).
2. The subject should then close both eyes. After 1 minute the subject should open both eyes at the same time. Record what happens to the pupil diameter of each eye.
3. Shine the light of the torch into one eye of the subject. Observe what happens to the diameter of the iris when compared to the other eye. Record.
4. Clap your hands in front of the subjects face. Record any response. (Startle reflex).
5. Have the subject remove a shoe and sock. Using the end of the popstick, firmly stroke the sole of the foot on the outer side from the heel to the front. Record what happens. This reaction is known as the (Babinski reflex).
6. All reflexes are involuntary, i.e. do not require you to think or plan, they are subconscious and almost immediate. Were you to tell your subject to blink, the response would take longer. Can you explain why this could be so?
7. Carry out the following test on your standing subject:
    a. have the subject hold the metre ruler vertically between the finger and thumb (separated by one centimetre)..
    b. drop the ruler; your subject should try to catch it as quickly as possible between the thumb and forefinger.
    c. Record the distance the ruler has dropped from its release point.
    d. Repeat this 3 times the average the distance it has travelled.
    e. Now repeat the whole experiment but this time get your subject to do a simple task involving thinking. E.g. count backwards from 20 stating only the odd numbers.
    f. Now repeat giving a more taxing process, e.g. reveal a written calculation like $2 + 5 - 3 = ?$
    g. What was the impact of having a distraction on the reaction time?

http://www.mathsisfun.com/games/reaction-time.html

Activity 10: STOP!!!

Watch the video from the following website:

http://www.sdt.com.au/safedrive-directory-STOPPINGDISTANCE.htm

How does reaction time relate to a real situation? Consider what is involved in completing an emergency stop in a motor vehicle.

The human **perception time** is how long the driver takes to see the hazard, and the brain realize it is a hazard requiring an immediate reaction. This perception time can be as long as 0.25 to 0.5 of a second.

Once the brain realizes danger, the human reaction time is how long the body takes to move the foot from accelerator to brake pedal. Again this reaction time can vary from 0.25 - 0.75 of a second.

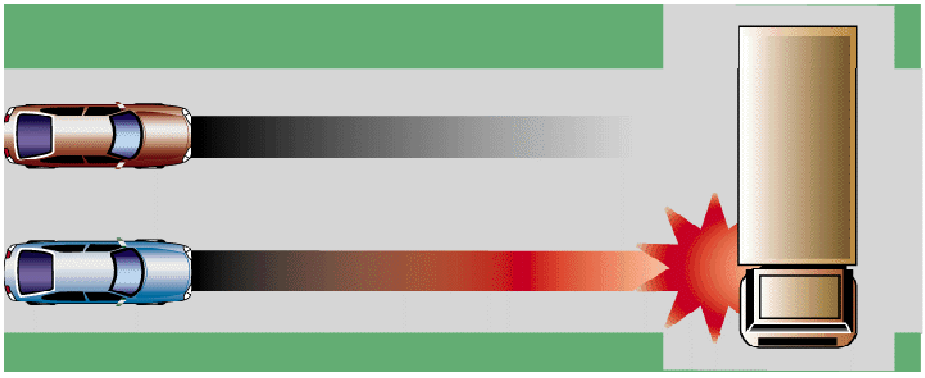
These first 2 parts of stopping distance are human factors and as such can be affected by tiredness, alcohol, fatigue and concentration levels. A perception and reaction time of 3 or 4 seconds is possible. 4 seconds at 100 km/hr means the car travels 110 metres **before** the brakes are applied.

Once the brake pedal is applied there is the **vehicles reaction time** which depends on the brake pedal free-play, hydraulic properties of the brake fluid and working order of the braking system.

This is why the tailgating car usually cannot stop; when the brake light came on in the car in front, this driver had already completed the perception, human and vehicle reaction periods. The following driver was perhaps 1 second to late in applying the brakes. At 100km/hr the car required 28 metres further to stop.

The last factor than determines the total stopping distance is the cars braking capability which depends on factors such as;

- the type of braking system,
- brake pad material,
- tyre pressures,
- tyre tread and grip,
- vehicle weight,
- the friction with the road surface e.g. is the road wet or dry?
- surface smoothness

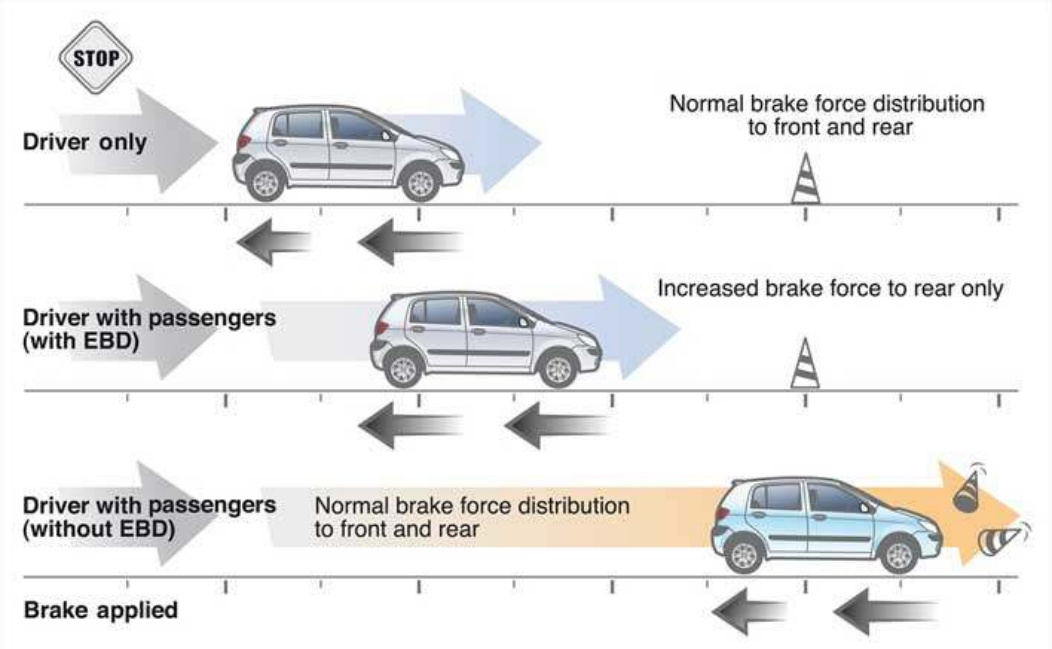


Worth noting is that from 50 to 100 kph the braking distance of a car will increase from 10 metres to 40 metres. When you double the speed of a car braking distance quadruples.

This is based on the laws of physics. When a car is moving it has kinetic energy, $\frac{1}{2}mv^2$ where m = mass and v = velocity. When the speed doubles the kinetic energy quadruples. The braking capability does not increase when driving faster, there are no reserves of friction. As such in any vehicle when your speed doubles braking distance is four times larger.

QUESTIONS:

1. List the two main factors that affect stopping distance?
2. From the information given what is the clear message for safe driving?
3. Modern vehicles have Electronic Brake Distribution fitted. This distributes the distribution of braking power between front and rear brakes depending on load.

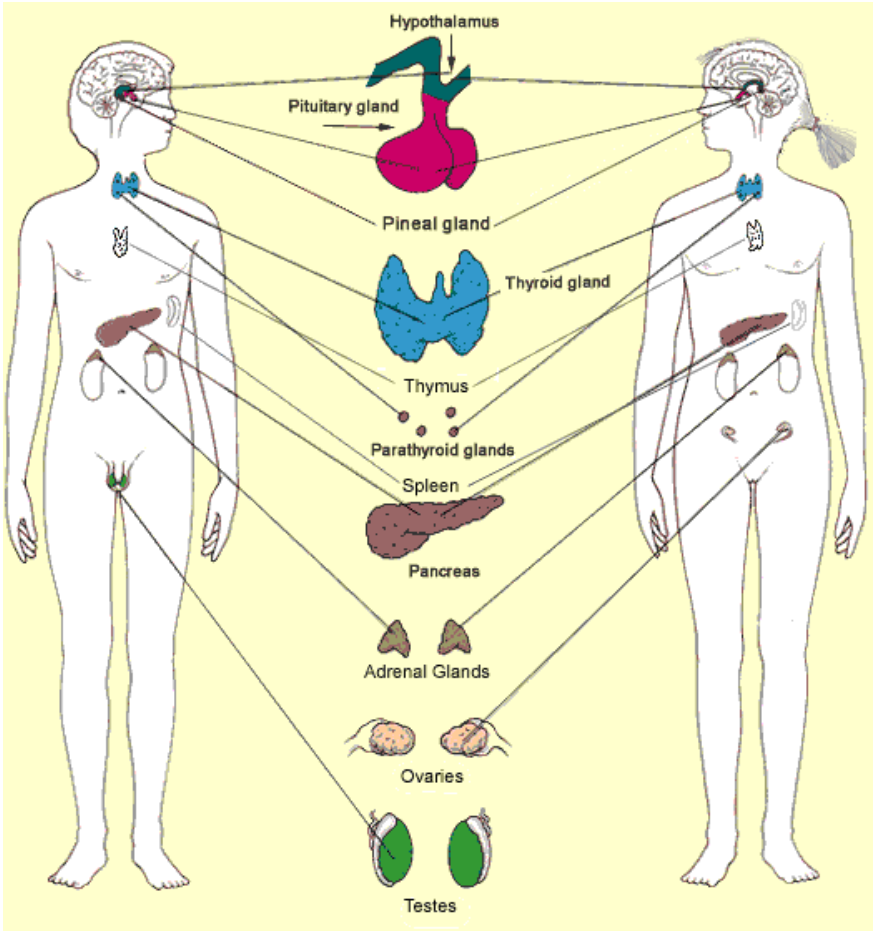


What conclusion can you draw from the diagram above?

Activity 11: Endocrine system

The nervous system does not operate on its own in controlling the bodies reactions to different internal and external stimuli. Another system known as the Endocrine System works, not by sending out impulses, but by sending out chemical messengers called hormones.

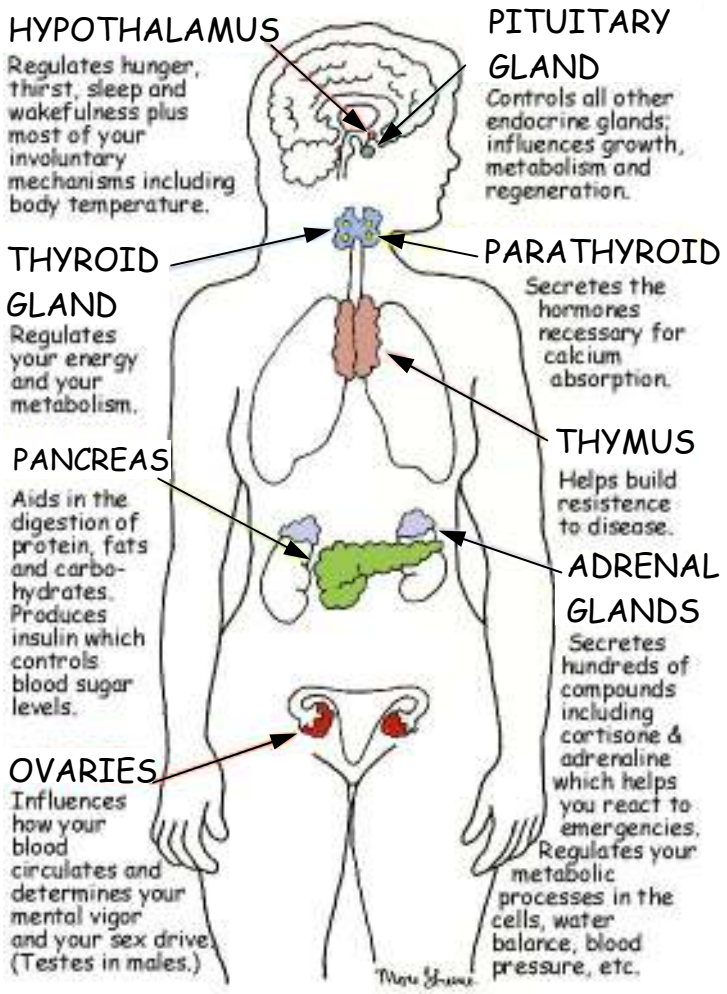
Major Endocrine Glands



The function of the major endocrine glands in a female is shown on the next page. The main difference between the male and female systems is the presence of testes in the male and ovaries in the female. The organs targeted by the gonad stimulating hormones from the pituitary gland are different, depending on the sex of the person.

Summarise the information into a table headed Gland and Function.

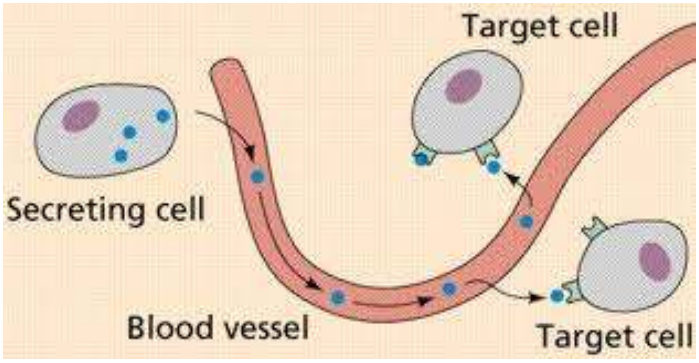
The Endocrine System



METABOLISM - The conversion of nutrients into energy and building materials to meet your body's needs.

Activity 12: The effect of hormones on body systems

Hormones are chemical messengers. Unlike nerve impulses that can only travel along nerve fibres, hormones travel in the blood stream from the gland where they are produced (called an endocrine gland) to the target cells elsewhere in the body. Only these target cells respond.



Some hormones are very specific in their action, targeting only one type of cell, while the effect of other hormones may be more general. For example the thyroid stimulating hormone made in the pituitary gland targets only certain cells of the thyroid gland found in the neck. Adrenaline targets other glands as well as many muscle cells scattered throughout the body.

Adrenaline causes a complex array of responses. Have you ever been in a situation where you were really stressed, for example an argument, a 'near miss' event or a panic attack? Any of these would have resulted in the hormone adrenaline being released from part of the adrenal gland which sits on top of each kidney.

When stimulated by nerve impulses from the brain the adrenal gland begins to secrete adrenaline directly into the bloodstream. It soon reaches blood vessels supplying the muscles causing them to widen, the heart to increase its rate and strength of heartbeat, the respiratory muscles to increase the rate and depth of breathing and glucose is released into the bloodstream from the liver. In addition the pupils of the eyes dilate these responses are known as 'fight or flight responses'.

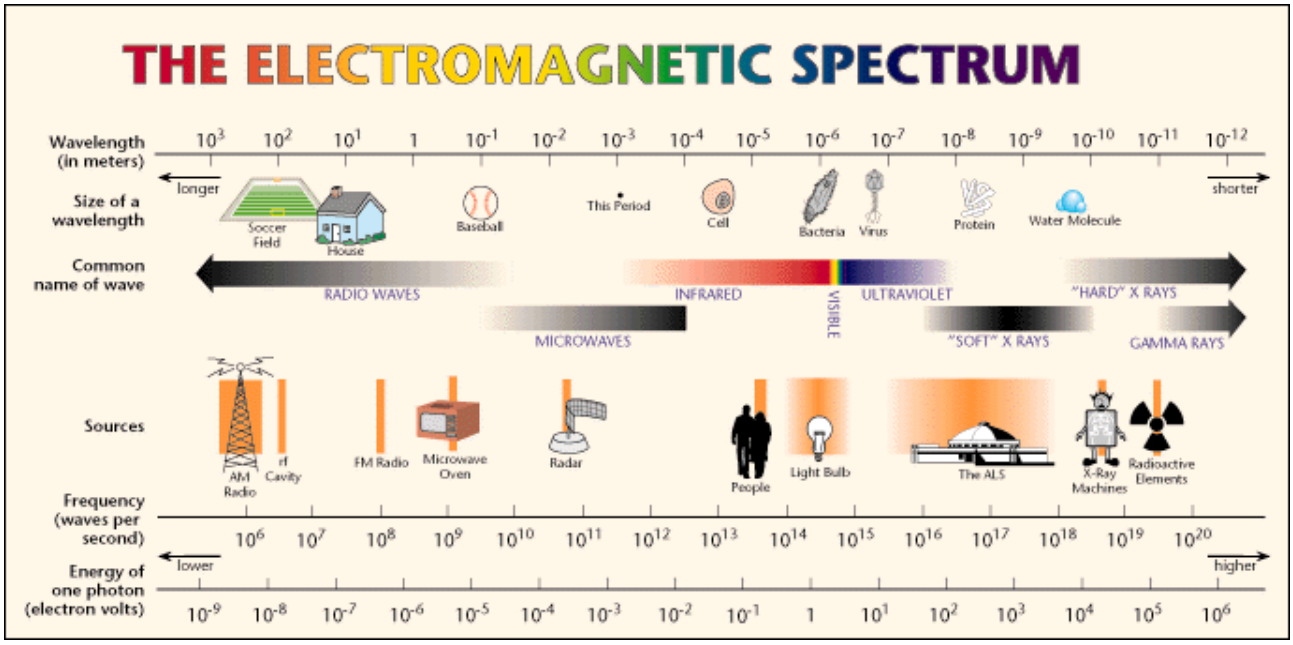
QUESTION

Explain how each of the responses mentioned in the previous paragraph would prepare you for 'fight or flight'.

Fight or Flight Responses vs Relaxation Response

Activity 13: Radiation and you

We live on a planet that is constantly bombarded with radiation from space. Rocks around us release radiation as their radioactive minerals slowly decay. All radiation is part of the electromagnetic spectrum illustrated below:



The electromagnetic spectrum covers a wide range of wavelengths and photon energies (photons are light particles). Light used to "see" an object must have a wavelength about the same size as or smaller than the object.

Look at the picture of the electromagnetic spectrum. See if you can find answers to these questions:

1. What kind of electromagnetic radiation has the shortest wavelength? The longest?
2. What kind of electromagnetic radiation could be used to "see" molecules? A cold virus?
3. Why can't you use visible light to "see" molecules?
4. Some insects, like bees, can see light of shorter wavelengths than humans can see. What kind of radiation do you think a bee sees?

Radiation takes the form of an electronic wave. The frequency of the wave determines its energy. High frequency X-rays and gamma waves have enough energy to displace an electron from its orbit around a nucleus. This kind of radiation is called **ionising radiation.**

Ionising radiation can damage the DNA of our cells causing a change known as **mutation.** It can cause chromosomal damage by causing the DNA to break then reconnect in abnormal ways, causing cell death. It can also cause the DNA to act as an **oncogene** leading to cancer. Should the DNA damage occur during the production of egg or sperm cells in the gonads then it can cause hereditary disorders.

Radiation therapy treats cancer by using high energy to kill tumour cells. The goal is to kill or damage cancer cells without hurting healthy cells.

Non-ionising radiation comes from visible light, heat, microwaves and radio waves.

This kind of radiation can change the position of atoms but not alter their structure, composition or properties. Examples are visible light, ultraviolet and infrared waves, waves from radio or television, cellular phones, microwaves, and electric blankets.

There has been some controversy about the effects of microwaves based on whether or not microwaves exert some sort of force beyond heat, commonly called "microwave effect".

Despite not being able to break atoms apart, non-ionizing radiation (such as microwaves) CAN cause physical alterations.

For example, sunlight can damage your skin and eyes. Over-exposure to radiation can affect tissues by causing molecular damage, DNA mutations, and other changes that can lead to cancer.

The serious concern is, with all of this radiation surrounding us from cell and cordless phones, radio towers, satellites, broadcast antennas, military and aviation radar, home electronic devices, computers and Internet, we are all part of an involuntary mass epidemiological experiment, on a scale never before seen in the history of the human race.

And the truth is that we don't really KNOW what long term, low-level (but persistent) radiation does to us—even the non-ionizing type.

The array of invisible wired and wireless technologies that we are under silent assault from is formidable and growing daily:

Household and Office Wiring	WiFi Routers & Wireless Devices
High Tension Electrical Cables and Towers	WiFi Hotspots
Electrical Powerlines	Computers, Laptops
Substations, Transformers	Microwave Ovens
Radio & Television Transmission Towers	Electric Clocks, Razors, Blankets, Hairdryers
Cell Phone Masts/Towers	Fluorescent and Compact Fluorescent Lighting
Cell Phones	Airport Radars & Telecommunication Equipment
Bluetooth & Headphone Devices	Airport Body Scanners
Cordless Phones, Baby Monitors	Military Radars, RF and ELF

http://articles.mercola.com/sites/articles/archive/2010/05/18/microwave-hazards.aspx

http://www.nrc.gov/about-nrc/radiation/related-info/faq.html

QUESTIONS:

1. What does the author of this passage mean by " an involuntary mass epidemiological experiment"?
2. If you were forced to live under a microwave tower or a radio transmission tower, which would you choose? Justify your answer.
3. Despite there being an enormous number of sources of radiation we have little evidence that exposure to this radiation is harmful. Why is this?

ACTIVITY 14: Detecting UV

BACKGROUND:

UV radiation is invisible radiation that gives you sunburn, can injure your eyes, can damage crops, fade colours and crack plastics. It can also contribute to photochemical smog. Most UV radiation is blocked by the ozone layer in the atmosphere.

UV beads contain pigment that changes colour when exposed to UV radiation from the sun or other source of UV light. They will remain white when shielded from UV light.

AIM:

1. To test UV beads for their sensitivity to UV light.
2. To calibrate the colour changes to measured UV readings.

EQUIPMENT:

- 6 UV beads per group in a 150mL beaker
- Fluorescent light
- UV meter

PROCEDURE:

1. Place beads near a fluorescent light. Record any colour change of the beads?
2. Does the glass of the beaker allow UV radiation to penetrate to the beads within?
3. Take the beads outside, but not in direct sunlight – find a shady spot. Do the beads change colour?
4. Now place the beads in direct sunlight. What do you notice about the intensity of the colours?
5. Brainstorm ideas on materials needed to design an experiment to test how well certain materials listed below block UV radiation:

QUESTIONS:

1. Does a fluorescent light emit UV radiation?
2. Can you get a tan or sunburn by sitting next to a fluorescent light?
3. Does glass stop UV light?
4. Is there UV radiation in the shade?
5. What colours do the various beads turn when exposed to UV radiation?
6. Which of these colours is most intense?
7. Which of these colours is most least intense?

ACTIVITY 15: Blocking UV radiation

We are encouraged to use sunscreens and sunglasses to protect us from UV radiation that is well known as to cause skin damage leading to skin cancer or eye damage. How effective are they? Do different sunscreens have different UV absorption abilities? Do sunglasses really work? Are expensive brands better than cheaper brands?

AIM:

Design an experiment to test the effectiveness of UV creams in stopping the penetration of UV light.

OR

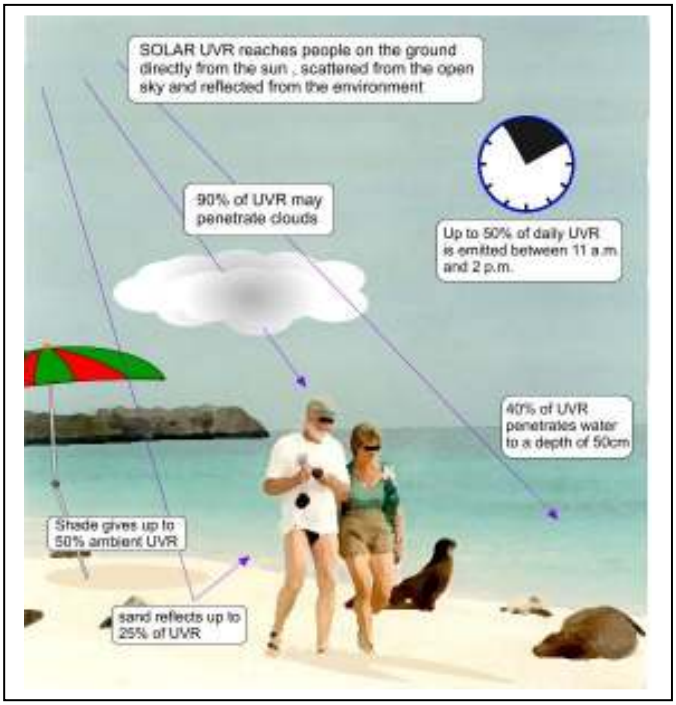
Design an experiment to test whether sunglasses stop UV light.

MATERIALS: Choose from

- UV meter, download an App for an iPhone or Android) or UV beads
- Plastic cling wrap film
- Sunscreen creams
- Sunglass lens

PROCEDURE:

Propose an hypothesis, clearly identifying independent and dependent variables, then plan then carry out an experiment to test your hypothesis. Make certain you include a statement of how you will control extraneous variables. What will be the control your experiment? Collect data then write a conclusion.



RESEARCH:

1. Find out what are the effects of UV light on humans.
2. What are some effects of UV light on life forms other than humans?
3. There is a growing incidence of the disease rickets in Australian children. What is an explanation for this?