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Words to Watch

account, account for State reasons for, report on, give an account of, narrate a series of events or transactions.

analyse Interpret data to reach conclusions.

annotate Add brief notes to a diagram or graph.

apply Use an idea, equation, principle, theory or law in a new situation.

assess Make a judgement of value, quality, outcomes, results or size.

calculate Find a numerical answer showing the relevant stages in the working (unless instructed not to do so).

clarify Make clear or plain.

classify Arrange into classes, groups or categories.

comment Give a judgement based on a given statement or result of a calculation.

compare Give an account of similarities and differences between two (or more) items, referring to both (all) of them throughout.

construct Represent or develop in graphical form.

contrast Show how things are different or opposite.

deduce Reach a conclusion from the information given.

define Give the precise meaning of a word, phrase or physical quantity.

demonstrate Show by example.

derive Manipulate a mathematical relationship(s) to give a new equation or relationship.

describe Give a detailed account.

design Produce a plan, simulation or model.

determine Find the only possible answer.

discuss Give an account including, where possible, a range of arguments for and against the relative importance of various factors, or comparisons of alternative hypotheses.

distinguish Give differences between two or more different items.

draw Represent by means of pencil lines.

estimate Find an approximate value for an unknown quantity.

evaluate Assess the implications and limitations.

examine Inquire into.

explain Give a detailed account of causes, reasons or mechanisms.

extract Choose relevant and/or appropriate details.

extrapolate Infer from what is known.

identify Find an answer from a given number of possibilities.

justify Support an argument or conclusion.

label Add labels to a diagram.

list Give a sequence of names or other brief answers with no explanation.

measure Find a value for a quantity.

outline Give a brief account or summary.

predict Give an expected result.

propose Put forward a point of view, idea, argument or suggestion for consideration or action.

recall Present remembered ideas, facts or experiences.

show Give the steps in a calculation or derivation.

sketch Represent by means of a graph showing a line and labelled but unscaled axes but with important features (for example, intercept) clearly indicated.

solve Obtain an answer using algebraic and/or numerical methods.

state Give a specific name, value or other brief answer without explanation or calculation.

suggest Propose a hypothesis or other possible answer.

summarise Express concisely the relevant details.

synthesise Put together various elements to make a whole.

1 Body Systems

This chapter examines the body systems of multicellular organisms. You will also investigate how advances in science lead to new technologies that significantly affect people's lives.

1.1	Requirements for life	1.1.1	Oxygen
		1.1.2	Nutrients
		1.1.3	Water
		1.1.4	Wastes
		1.1.5	The respiratory system
		1.1.6	The circulatory system
		1.1.7	The lymphatic system
		1.1.8	The digestive system
		1.1.9	The nervous system
		1.1.10	The endocrine system
		1.1.11	The excretory system
		1.1.12	The skeletal system
1.2	Systems working together	1.2.1	Each system has a job
		1.2.2	Combining the systems
		1.2.3	New technologies help the systems
1.3	Responses	1.3.1	Sense organs detect external stimuli
		1.3.2	Nerve cells
		1.3.3	Reflex arcs
		1.3.4	Endocrine responses
1.4	Micro-organisms cause changes	1.4.1	Different micro-organisms
		1.4.2	Transmission of diseases
		1.4.3	Changing ideas about disease transmission
		1.4.4	The inflammatory response
		1.4.5	The immune response
1.5	Non-infectious diseases	1.5.1	Non-infectious diseases
Chapter 1 Test			

How much do you remember or already know?

1. What is a multicellular organism?
2. What is the function of the digestive system?
3. What is the function of the respiratory system?
4. Which body system is responsible for transporting nutrients, wastes and gases around the body?
5. Which body system consists of ductless glands?
6. Which body system removes wastes made by the body?
7. What is the relationship between cells, tissues, organs and body systems?
8. What is respiration?
9. What is the difference between breathing and respiration?
10. What are the main features of a respiratory surface?
11. What are the main requirements for life?
12. Identify the distinguishing features of living things.
13. What is the function of the heart?
14. Name three types of blood vessels.
15. Which blood vessels have valves?
16. Which type of blood vessels have a pulse?
17. What is the name of the main nitrogenous waste produced by humans?
18. Which organ filters urea from blood?
19. Where is the liver in your body?
20. Outline some functions of the liver.
21. Why are systems needed in multicellular organisms?
22. What is the function of a skeleton?
23. Name the five sense organs.
24. What is the function of the optic nerve?
25. What is the function of the cerebellum in the brain?
26. Name some glands that produce hormones.
27. Name some groups of micro-organisms.
28. Name some organs that are used in organ transplant operations.
29. Name some tissues used in transplants.
30. Why do people need transplants?

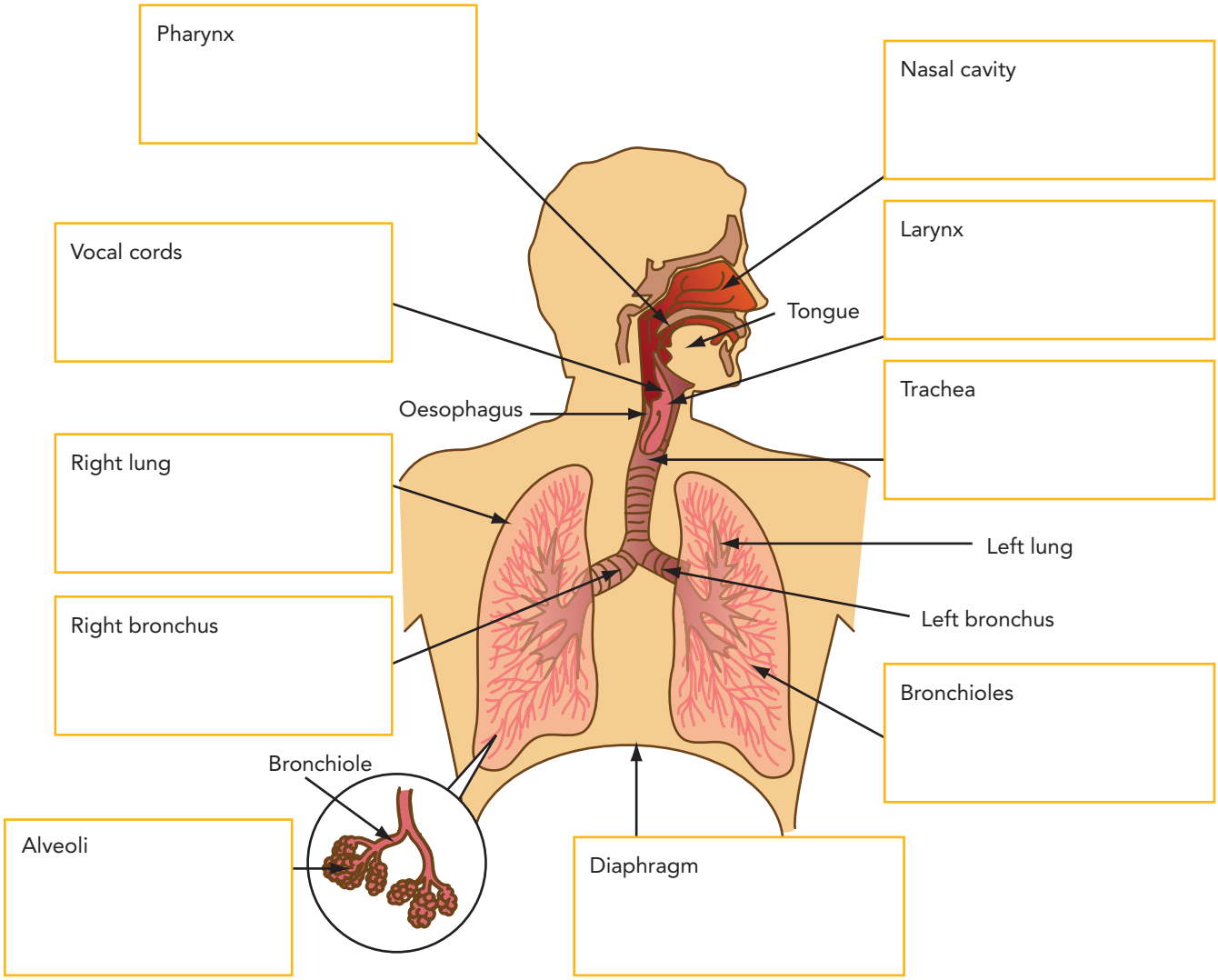
1.1.5 The respiratory system

The respiratory system consists of the mouth, nasal cavity, pharynx, larynx, trachea, bronchi and lungs. The lower section is bounded by the ribs, spine and diaphragm.

The main functions of the human respiratory system are to:

- Provide a large surface area for gas exchange.
- Move air to and from the lungs.
- Protect the gas exchange surface from dehydration and temperature changes.
- Defend the system against invasion by micro-organisms including pathogens.
- Produce sounds, e.g. speaking, singing.

1.1.5.1 You covered the respiratory system in year 8. Use your knowledge of the respiratory system or research to write a brief description of the function of each part of the human respiratory system in each of the boxes.



1.1.9 The nervous system

The vertebrate nervous system can be divided into the **central nervous system** (CNS) and the **peripheral nervous system** (PNS). The CNS consists of the brain and the spinal cord and the PNS is all the sensory and motor neurons that connect to the CNS.

The nervous system works by sending messages along neurons. A **neuron** is a nerve cell. There are three types of neurons – sensory neurons, connector neurons and motor neurons. A **ganglion** is a cluster of nerve cell bodies.

Neurons link together to form circuits that carry out specific jobs. The most complex circuits are in the brain. The vertebrate brain is divided into three sections – the **cerebellum** which controls balance and movement, the **medulla oblongata** which is concerned with regulation of heartbeat, body temperature and the rate of breathing and the **cerebrum** which is concerned with thinking, intelligence, memory, language, reasoning, feeling and learned skills.

1.1.9.1 What is the function of the nervous system?

.....

1.1.9.2 What are the two divisions of the vertebrate nervous system?

.....

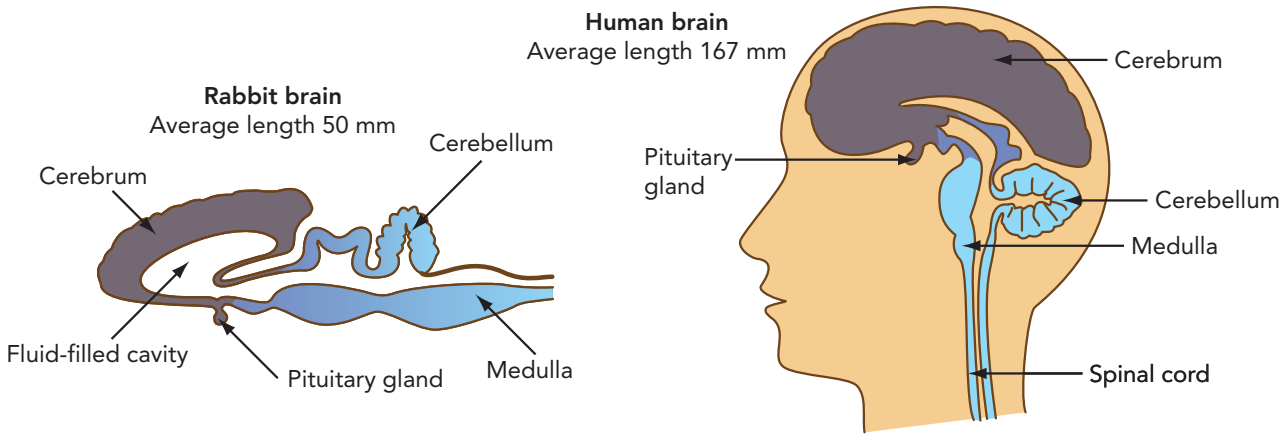
1.1.9.3 What is a neuron? .....

1.1.9.4 What is a ganglion? .....

1.1.9.5 How does the nervous system work?

.....

1.1.9.6 The diagram compares a human brain with a rabbit brain.



(a) Which section shows greater development in humans? .....

(b) Why is this region of the brain important? .....

.....

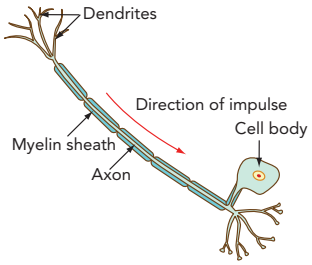
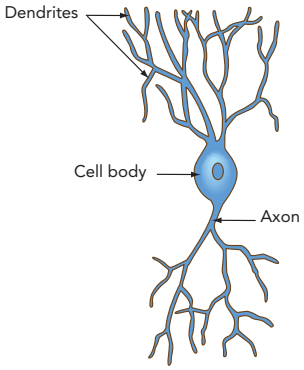
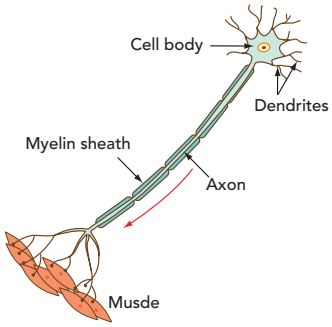
1.3.2 Nerve cells

Neurons carry messages or nervous impulses around the body. They are messengers and the nervous impulse is the message. Neurons have a distinct shape that is different to other types of cells. Each neuron has **dendrites** which pick up the impulse, a **cell body** which controls the cell and an **axon** which takes the message to the next neuron. Some neurons are very long, e.g. over 1 metre in length. The **synapse** is the gap between two neurons. At the synapse a chemical called a **neurotransmitter** is released. This chemical diffuses to the next cell and starts the impulse in this next cell.

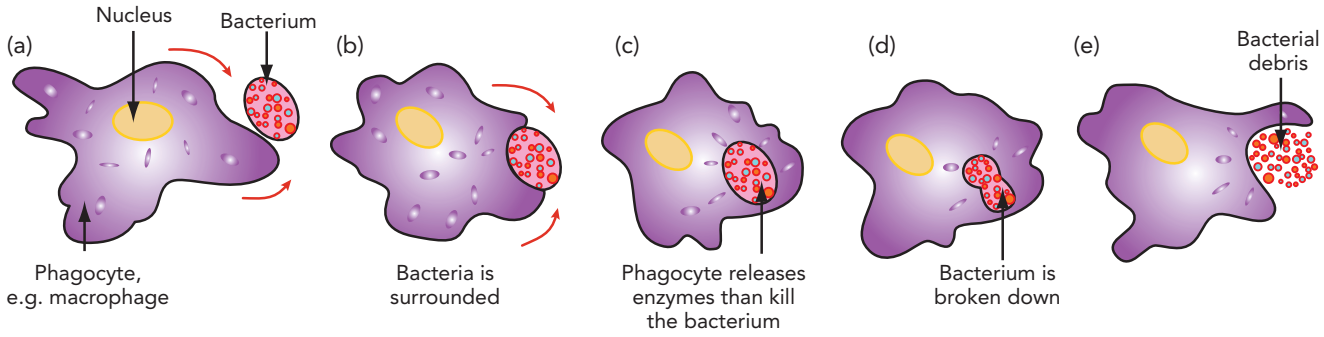
Sensory neurons connect to the receptors that pick up the stimulus and take the message to connector neurons. **Connector neurons** join sensory neurons to motor neurons. **Motor neurons** go to muscles or glands taking the message for the response.

Nerves form a pathway from the receptor to the central nervous system then to the responding organ which is called the effector. A stimulus starts the message and it ends with a response – the **stimulus-response pathway**.

1.3.2.1 Complete the table to summarise the three types of neurons and how they work together to make the nervous pathway to bring about responses.

Type of neuron	Diagram of neuron	Its function
Sensory neuron		
Connector neuron		
Motor neuron		

1.4.4.2 The diagram shows a phagocyte and phagocytosis.



(a) What is a phagocyte?

.....

.....

(b) What is phagocytosis?

.....

.....

(c) Explain why phagocytes and phagocytosis are needed in the inflammatory response.

.....

.....

.....

.....

1.4.4.3 The castle represents your body.

(a) What part of the diagram represents your skin?

.....

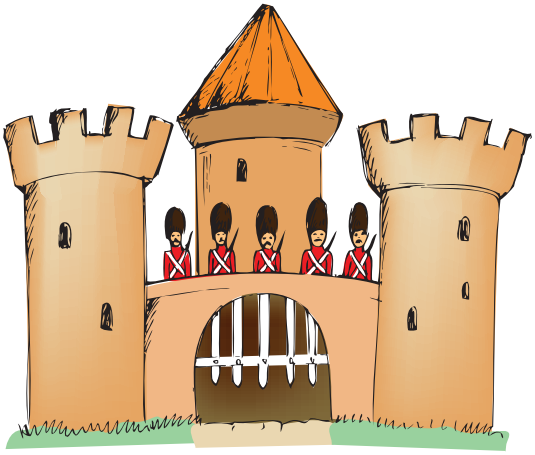
(b) Which cells of your body are the soldiers?

.....

(c) How do these 'soldiers' defend your body?

.....

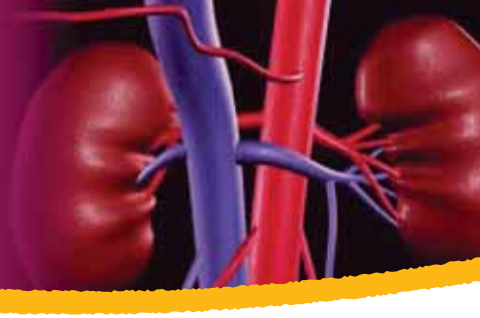
.....



(d) Suggest a feature you could add to the castle to show another barrier against the entry of pathogens.

.....

Chapter 1 Test



1. Which process releases oxygen gas into the atmosphere?

(A) Respiration.
(B) Photosynthesis.
(C) Combustion.
(D) Evaporative cooling.

2. What are the six most important elements in living things?

(A) Hydrogen, carbon, oxygen, nitrogen, phosphorus and sulfur.
(B) Hydrogen, carbon, oxygen, nitrogen, calcium and fluorine.
(C) Carbon, oxygen, phosphorus, calcium, fluorine and sulfur.
(D) Oxygen, nitrogen, phosphorus, calcium, fluorine and potassium.

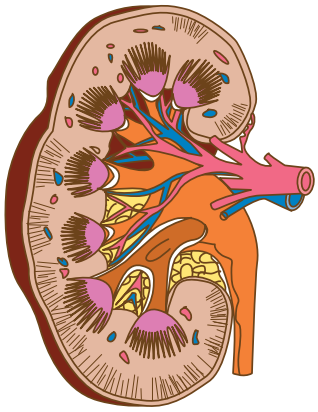
3. Which element makes up about 65% of the human body?

(A) Hydrogen.
(B) Carbon.
(C) Oxygen.
(D) Nitrogen.

4. What is the order of the six most abundant elements in the human body from most abundant to least abundant?

(A) Phosphorus, calcium, nitrogen, hydrogen, carbon, oxygen.
(B) Hydrogen, carbon, oxygen, nitrogen, calcium, phosphorus.
(C) Oxygen, carbon, hydrogen, nitrogen, phosphorus, sulfur.
(D) Oxygen, carbon, hydrogen, nitrogen, calcium, phosphorus.

5. The diagram shows a cross-section of an organ in the human body.
What is the organ and how is it involved in the excretion of wastes?



	Name of organ	How it is involved with excretion
A	Lung	Excretes carbon dioxide.
B	Kidney	Excretes urea.
C	Liver	Excretes urea.
D	Kidney	Excretes carbon dioxide.

6. When is a sound heard?

(A) When the eardrum begins to vibrate.
(B) When the small bones of the middle ear cause the oval window to vibrate.
(C) When the message from the nerves reaches the brain.
(D) When the fluid in the cochlea begins to vibrate.

2 Communities and the Environment

This chapter examines communities that are found in different ecosystems and how different features of the environment affect the size of a population. You will also continue to revise and practise inquiry skills and how to analyse patterns and trends in data.

2.1 Ecosystems
- 2.1.1 Different Australian ecoregions
- 2.1.2 The abiotic environment

2.2 Relationships
- 2.2.1 Predators and prey
- 2.2.2 Parasites
- 2.2.3 Competitors
- 2.2.4 Pollinators
- 2.2.5 Disease

2.3 Size of populations
- 2.3.1 Seasonal changes
- 2.3.2 Destruction of habitat
- 2.3.3 Introduced species

2.4 Energy flows
- 2.4.1 Energy pathways
- 2.4.2 Food pathways
- 2.4.3 Sustainability

2.5 Changes in ecosystems
- 2.5.1 Bushfires
- 2.5.2 Australian animals and bushfires
- 2.5.3 Australian plants and bushfires
- 2.5.4 Droughts
- 2.5.5 Floods
- 2.5.6 Floods, kangaroos and rabbits
- 2.5.7 Australian plants and floods

Chapter 2 Test

2.2.3 Competitors

Competition occurs when the demand for food and resources is greater than the supply. **Interspecific** competition occurs between members of different species while **intraspecific** competition occurs between individuals of the same species.

The introduction into Australia of many plants and animals led to competition with native species. Many **invasive plants** are so successful at competing with native plants that they have become environmental weeds, e.g. rubber vine in northern Australia, aleman grass in wetlands, athel pine along inland rivers and alligator weed on and near water courses. The federal government lists 20 weeds of national significance (WONS) and 28 plant species are on the national environmental alert list.

Getting a mate

Within a species, competition to get a mate has led to aggressive fights among males, e.g. only about 10% of elephant seals win a 'harem' of females. In some other species there is a marked difference in the appearance of males and females, with the females choosing the male with the best features, e.g. brightest peacock feathers. Getting a mate is a competitive business!

2.2.3.1 When does competition occur? .....

2.2.3.2 What is the difference between interspecific competition and intraspecific competition?

.....

.....

2.2.3.3 Resources are anything in the environment that the organism uses. List the resources needed by plants and animals.

Resources needed by animals	Resources needed by plants

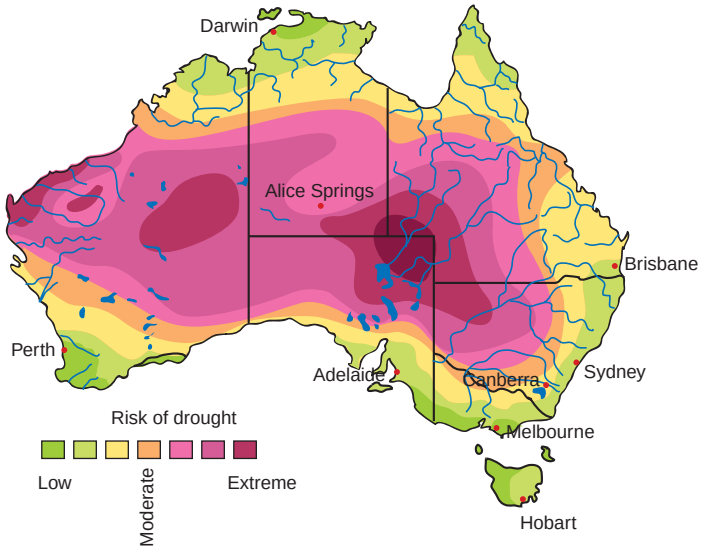
2.2.3.4 The Australian magpie is found across Australia. Many people walking through a magpie nesting area have stories about magpie attacks – some people are even seriously pecked! Explain this magpie behaviour in terms of interspecies competition.

.....

.....

2.5.4 Droughts

Many areas of Australia have periods of drought when water is scarce. A drought is a long period of time when there is below average rainfall. An area in drought may still have a higher rainfall than an area with a normal low rainfall, e.g. a desert.



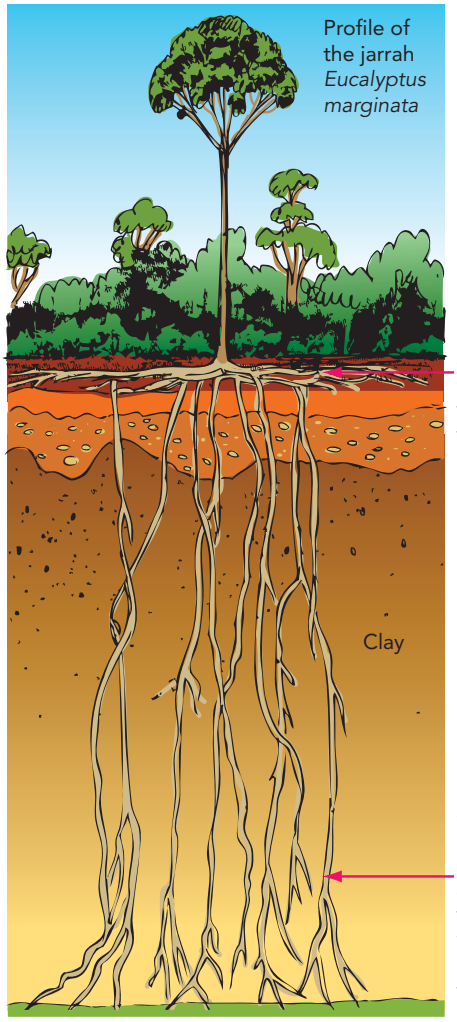
Cause of drought in Australia

Australia's climate is connected with the El Nino/La Nina-Southern Oscillation effect (ENSO). **El Nino/La Nina** refers to the temperature of the surface of the tropical eastern Pacific Ocean. El Nino brings warm currents near the South American coast and La Nina brings cold water in the eastern Pacific. **The Southern Oscillation** refers to the air surface pressure in the tropical western Pacific. High air pressure in the west is associated with El Nino and low air pressure with La Nina. El Nino brings drought to Australia and the western Pacific and heavy rains and floods to South America and the eastern Pacific.

Plant adaptations to drought

Different Australian plants have different ways to survive drought. The jarrah has a double **root system** with surface roots collecting water from the surface soils and a second root system growing down to the water table. Eucalypts planted in other countries have been called 'drought creators' as they are so efficient at collecting water that other species cannot compete and can die if growing near the eucalypts. **Lignotubers** store water and nutrients and aid survival during drought.

The **leaves** of many Australian plants are covered in a thick waxy cuticle which helps conserve water. Gumleaves hang vertically with their edge facing the Sun. This reduces heat from sunlight affecting the plant. The stomates on gumleaves will also close when the plant is under water stress so more water cannot be lost from the plant.



2.5.4.1 Define drought.

.....

2.5.4.2 What is ENSO?

.....

.....

3 The Structure of Matter

Everything around us is made of matter, and it behaves the way it does because of the type of matter it is made of. You will learn a little about the history of the development of our understanding of the structure of the atom, along with some detail of the structure we accept at the present time (simplified).

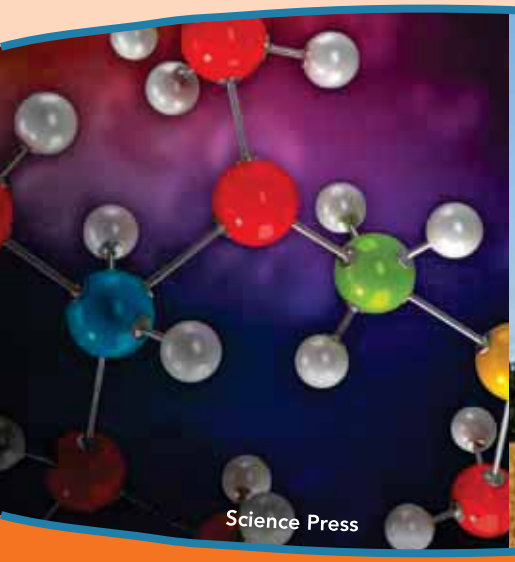
Nuclear energy and radioactivity is seldom far from the news, so hopefully what you learn about it here will help you have a better understanding of what is happening around the world in this arena.

You will develop skills in understanding written and diagrammatic representations of the structure of atoms and isotopes and learn how to extract information from the periodic table of elements.

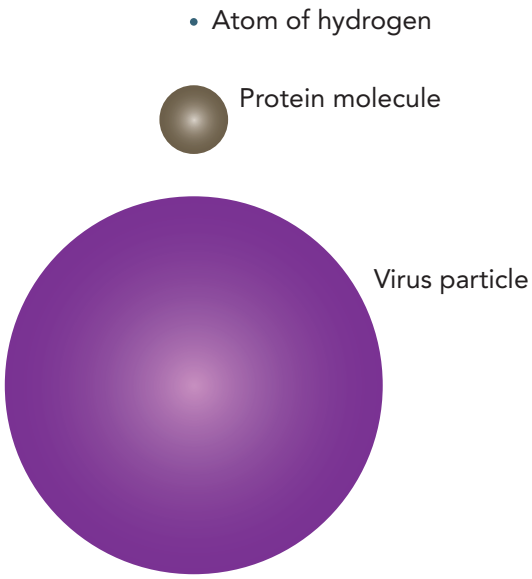
3.1 History of the atom
3.2 The structure of atoms
3.3 Subatomic particles
3.4 Radioactivity

3.1.1 Revision questions from last year's work
3.2.1 Particles of matter
3.2.2 Atomic structure
3.3.1 The particles
3.3.2 Isotopes of elements
3.4.1 What is radioactivity?
3.4.2 Half-lives of radioisotopes
3.4.3 The Curies and radioactivity
3.4.4 Energy changes in nuclear power stations

Chapter 3 Test



3.2.2.4 The circles represent the relative sizes of an atom of hydrogen, a molecule of a protein and a virus particle. According to this information:



(a) How much larger than a hydrogen atom is a protein molecule?

.....

(b) How much larger than a hydrogen atom is a virus particle?

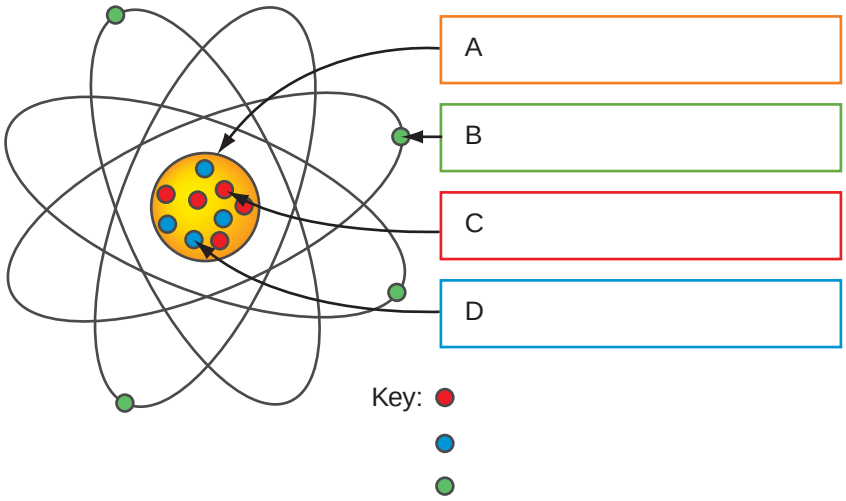
.....

(c) How much larger than a protein molecule is a virus particle?

.....

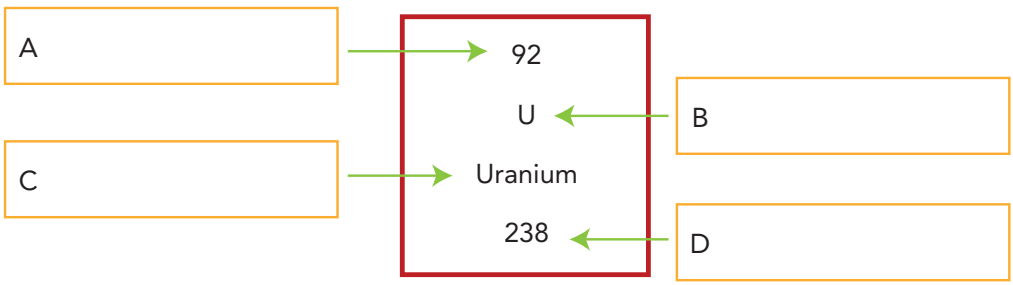
3.2.2.5

(a) Complete the labels on the key and the diagram of an atom of an element below.



(b) Identify the element represented by this diagram and its symbol. .....

3.2.2.6 The diagram shows an element on the periodic table. Identify the labels.



3.3 Subatomic particles

3.3.1 The particles

Our model of an atom considers atoms as particles, with a nucleus containing protons and neutrons and with electrons orbiting the nucleus.

The number of protons in the nucleus determines which element the atom is; the number of protons in the nucleus of atoms of a particular element is always the same. For example, atoms of hydrogen *always* have one proton, those of helium *always* have two, those of carbon have six and those of oxygen have eight protons.

Protons and neutrons are about the same size and have the same mass. Their masses are about 0.000 000 000 000 000 000 001 673 g (1.673×10^{-24} g and about 0.000 000 000 000 000 000 001 675 g (1.675×10^{-24} g) respectively. This is too small to handle, so we define this amount of mass as **1 atomic mass unit** (**1 amu** or **1 μ**).

3.3.1.1

(a) What do we mean by 'subatomic'?

.....

.....

(b) Complete the table to summarise what you already know about subatomic particles.

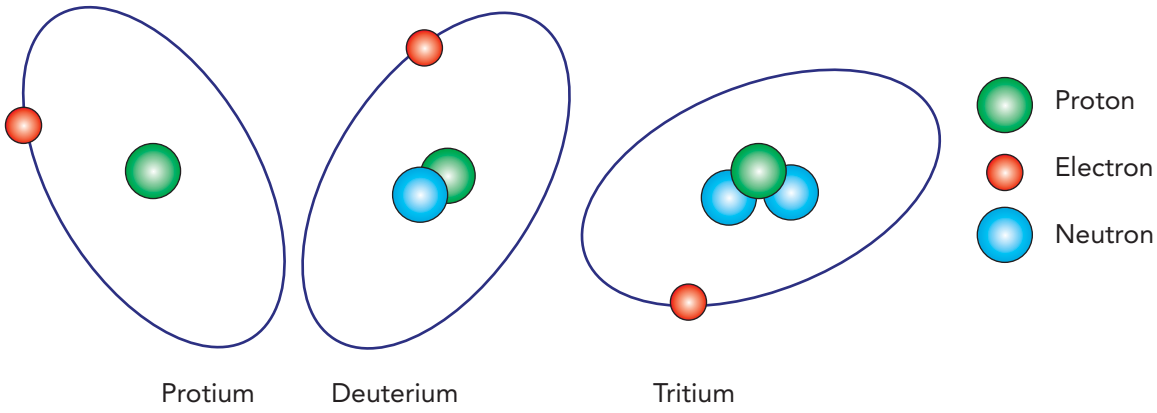
Name of subatomic particle	Where particle is found	Charge on particle

3.3.1.2 Use the information above to complete the table. (You may research information on the internet if you feel you need to.)

Particle	Mass (g)	Mass (g) (scientific notation)	Mass (amu)
Proton			
Neutron			
Electron			
Oxygen atom			
Calcium atom			

3.3.2 Isotopes of elements

While the number of protons in atoms of elements is constant for a particular element, the number of neutrons in the nucleus of atoms of a particular element can actually vary a little. For example, consider the three atoms in the diagram below.



These three atoms represent three different types of hydrogen atoms – they all have only one proton in the nucleus, therefore they are all hydrogen atoms. They all have the same atomic number (1). However, each has a different number of neutrons in the nucleus. Therefore they each have a different mass number. They are called **isotopes** of hydrogen

3.3.2.1 What are isotopes?

.....

.....

3.3.2.2 There is actually a fourth isotope of hydrogen (very unstable, exists only in laboratory experiments) which has a mass number of 4. It is called quadrium.

Draw a labelled diagram of an atom of quadrium in the space provided below using the same key as the diagrams above.

Periodic table of elements

Key (for example, gold)

Atomic number	79
Symbol	Au
Standard atomic weight	197.0
Name	Gold

1 H 1.008 Hydrogen																	2 He 4.003 Helium
3 Li 6.941 Lithium	4 Be 9.012 Beryllium											5 B 10.81 Boron	6 C 12.01 Carbon	7 N 14.01 Nitrogen	8 O 16.00 Oxygen	9 F 19.00 Fluorine	10 Ne 20.18 Neon
11 Na 22.99 Sodium	12 Mg 24.31 Magnesium											13 Al 26.98 Aluminium	14 Si 28.09 Silicon	15 P 30.97 Phosphorus	16 S 32.07 Sulfur	17 Cl 35.45 Chlorine	18 Ar 39.95 Argon
19 K 39.10 Potassium	20 Ca 40.08 Calcium	21 Sc 44.96 Scandium	22 Ti 47.87 Titanium	23 V 50.94 Vanadium	24 Cr 52.00 Chromium	25 Mn 54.94 Manganese	26 Fe 55.85 Iron	27 Co 58.93 Cobalt	28 Ni 58.69 Nickel	29 Cu 63.55 Copper	30 Zn 65.38 Zinc	31 Ga 69.72 Gallium	32 Ge 72.64 Germanium	33 As 74.92 Arsenic	34 Se 78.96 Selenium	35 Br 79.90 Bromine	36 Kr 83.80 Krypton
37 Rb 85.47 Rubidium	38 Sr 87.61 Strontium	39 Y 88.91 Yttrium	40 Zr 91.22 Zirconium	41 Nb 92.91 Niobium	42 Mo 95.96 Molybdenum	43 Tc Technetium	44 Ru 101.1 Ruthenium	45 Rh 102.9 Rhodium	46 Pd 106.4 Palladium	47 Ag 107.9 Silver	48 Cd 112.4 Cadmium	49 In 114.8 Indium	50 Sn 118.7 Tin	51 Sb 121.8 Antimony	52 Te 127.6 Tellurium	53 I 126.9 Iodine	54 Xe 131.3 Xenon
55 Cs 132.9 Caesium	56 Ba 137.3 Barium	57–71 Lanthanoids	72 Hf 178.5 Hafnium	73 Ta 180.9 Tantalum	74 W 183.9 Tungsten	75 Re 186.2 Rhenium	76 Os 190.2 Osmium	77 Ir 192.2 Iridium	78 Pt 195.1 Platinum	79 Au 197.0 Gold	80 Hg 200.6 Mercury	81 Tl 204.4 Thallium	82 Pb 207.2 Lead	83 Bi 209.0 Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89–103 Actinoids	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium						

Lanthanoids

57 La 138.9 Lanthanum	58 Ce 140.1 Cerium	59 Pr 140.9 Praseodymium	60 Nd 144.2 Neodymium	61 Pm Promethium	62 Sm 150.4 Samarium	63 Eu 152.0 Europium	64 Gd 157.3 Gadolinium	65 Tb 158.9 Terbium	66 Dy 162.5 Dysprosium	67 Ho 164.9 Holmium	68 Er 167.3 Erbium	69 Tm 168.9 Thulium	70 Yb 173.1 Ytterbium	71 Lu 175.0 Lutetium

Actinoids

89 Ac Actinium	90 Th 232.0 Thorium	91 Pa 231.0 Protactinium	92 U 238.0 Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium

Non-metals
Transition metals
Rare earth metals
Halogens
Alkali metals
Alkali earth metals
Other metals
Inert elements