Science test

Your own perception of competence and confidence is one thing, but how would you do if actually put to the test? As always, it doesn't matter how well or how badly you test now; you will have lots of time to make up for the science you have forgotten or simply never knew in the first place. The following pages explore your knowledge and understanding in many key areas of primary science using a variety of established test techniques. Take as long as you like and try not to cheat too much by looking at the answers! The marking system is fairly straightforward and easy to use. (As it is impossible to monitor, give yourself 1 mark for every correct answer!)

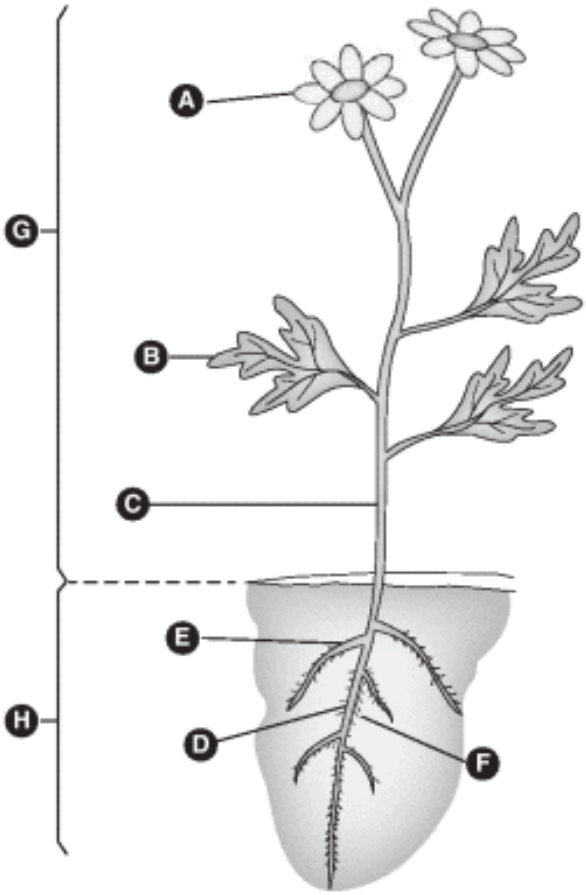
Biology

Structure and function of living organisms: plants

1 Match the labels below with parts **A** to **H** shown in the diagram of the flowering plant.

leaf
root system
flower
lateral root
root hair
stem
shoot system
tap root

[8 MARKS]

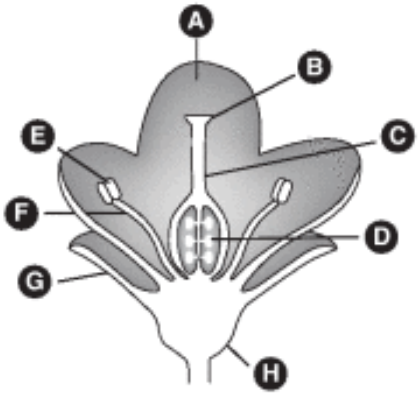


Complete the following sentences by inserting the most appropriate words.

Roots _____ plants firmly in the ground. They are also responsible for the uptake of _____ and _____ from the soil. Stems hold plants upright, spread out leaves for _____ and elevate flowers for _____. Most leaves are green due to the presence of _____. Flowers are the structures of most plants that are responsible for _____.

[7 MARKS]

2 In the diagram of the flower section shown, label the parts **A** to **H.**



anther
sepal
receptacle
style
petal
ovary with ovules
filament
stigma

[8 MARKS]

Complete the following sentences by inserting the most appropriate words.

Flowers usually consist of five main elements (though these are not always present or immediately obvious): often brightly coloured and scented petals which attract _____, papery sepals which _____ the flower in bud, male and female reproductive organs which work together to ensure the _____ of each species, and a receptacle which _____ the weight of everything.

[4 MARKS]

3 The male reproductive organs or stamen of a flowering plant includes:

(a) **petals, sepals and a receptacle**
(b) **the stigma, style and ovary**
(c) **the anther and filament**

[1 MARK]

4 The female reproductive organs or carpel of a flowering plant includes:

(a) **the stigma, style and ovary**
(b) **the anther and filament**
(c) **petals, sepals and a receptacle**

[1 MARK]

5 Rearrange the following items to write out a word equation for photosynthesis.

energy in sunlight
glucose
carbon dioxide
oxygen
chlorophyll
water

[3 MARKS]

6 Plants are made from cells. Draw lines which match the specialised cell types on the left to their main function on the right.

root hair cells	**form vessels which conduct simple sugars in sap**
guard cells	**carry out most photosynthesis in leaves**
phloem cells	**take up water and dissolved minerals from soil**
xylem cells	**form vessels which conduct water and dissolved minerals**
palisade cells	**allow various gases to move into and out of leaves**

[5 MARKS]

7 Plants display certain characteristics which demonstrate that they are alive and carry out certain life processes in order to stay alive. These include:

(a) **movement, growth and reproduction**
(b) **respiration, sensitivity, excretion and nutrition**
(c) **all of the above**

[1 MARK]

8 The reproductive cycle of a flowering plant proceeds in five well-defined stages. Draw lines which match the reproductive stages on the left to the description which fits best on the right.

pollination	**development of embryo plant**
fertilisation	**the transfer of pollen from anther to stigma**
seed formation	**scattering mechanism which helps avoid competition**
seed dispersal	**appearance of new root and shoot systems**
germination	**nuclei of male and female sex cells meet and fuse**

[5 MARKS]

9 The common causes of ill health in plants include:

(a) **mineral deficiencies**
(b) **invertebrate organisms and plant pathogens**
(c) **all of the above**

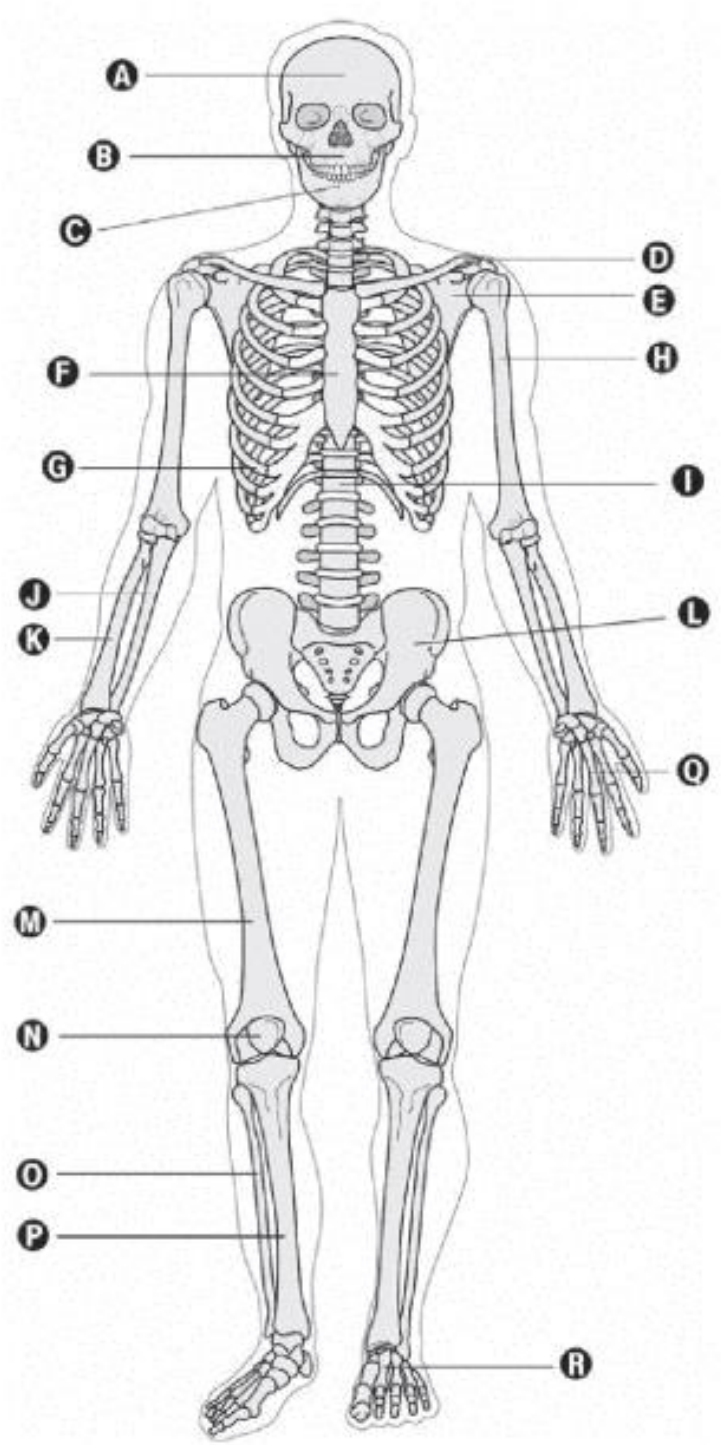
[1 MARK]

10 Green plants and other photosynthetic organisms are capable of making their own simple food substances like glucose by photosynthesis. Photosynthesis involves a reaction between carbon dioxide and water. Where does the energy come from to drive this reaction?

[1 MARK]

Structure and function of living organisms: humans and other animals

1 In the diagram of the skeleton shown, label the bones **A** to **R**.



patella

cranium

mandible

scapula

sacrum, ilium and coccyx (bones of the pelvis)

maxilla

radius

femur

carpals, metacarpals and phalanges (bones of the hand)

fibula

sternum

clavicle

humerus

vertebra

rib

ulna

tibia

tarsals, metatarsals and phalanges (bones of the foot)

[18 MARKS]

Complete the following sentences by inserting the most appropriate words.

The human skeleton _____ vital organs. It provides a framework which supports the _____ of individuals and, with the help of muscles, allows humans to _____ upright. The human skeleton also provides attachment for _____ and _____ allowing free movements to take place across joints.

[5 MARKS]

2 How many bones would you expect to find in the skeleton of an average human adult?

(a) **103**

(b) **206**

(c) **602**

[1 MARK]

3 Bone is a living tissue. True or false?

[1 MARK]

4 Refer to the diagram of the human arm.

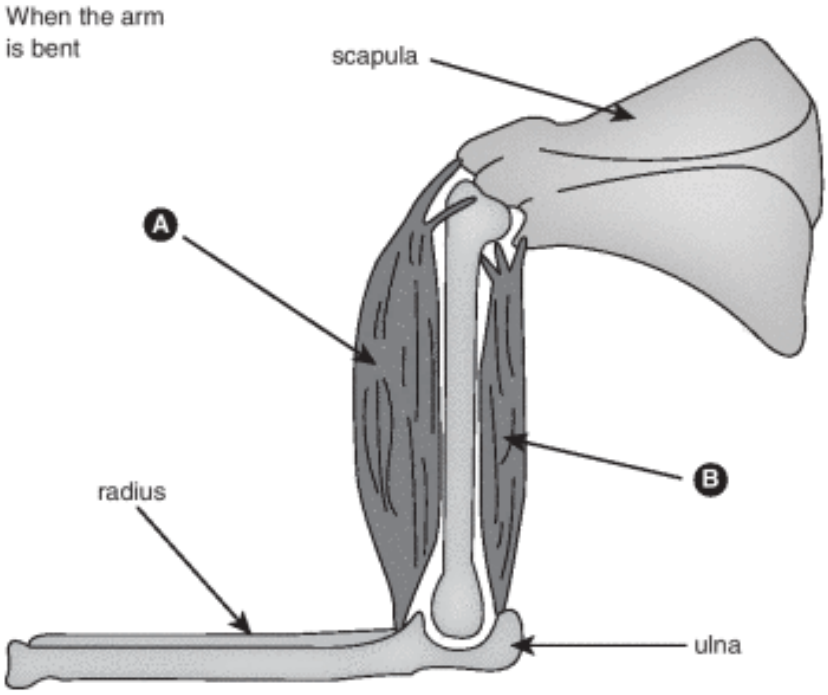
(a) Name the muscles labelled A and B.

(b) What would you expect to happen as muscle A contracts?

(c) What would you expect to happen as muscle B contracts?

(d) What are pairs of muscles like A and B called?

(e) Where else in the human body might you find a pair of muscles like A and B?



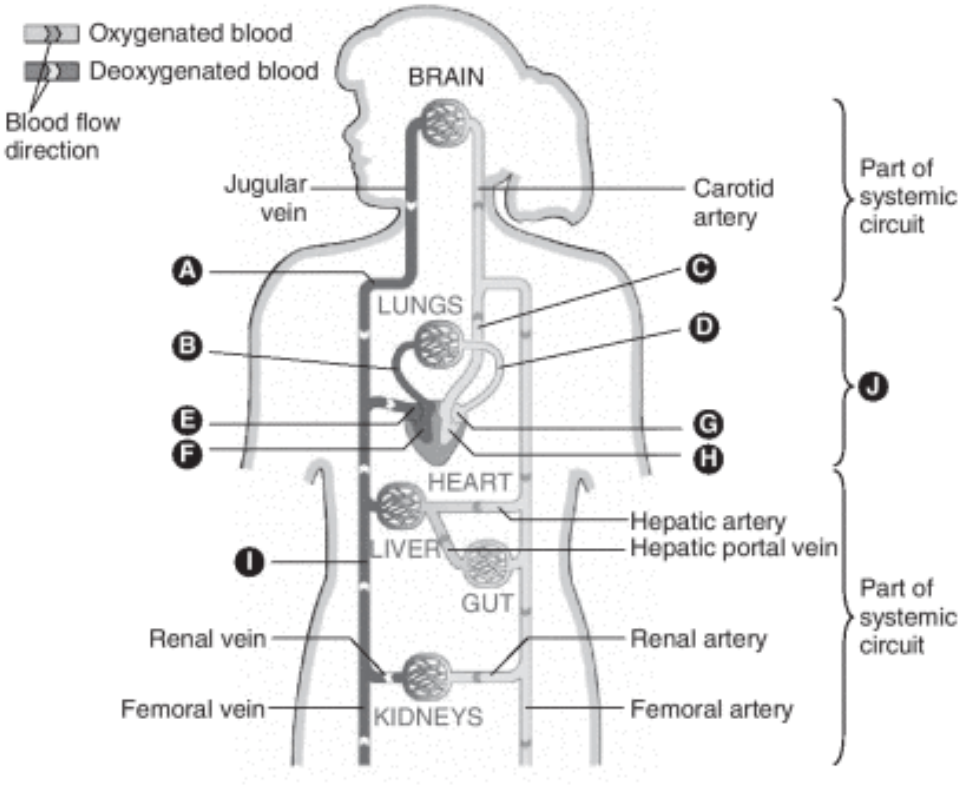
[5 MARKS]

Complete the following sentences by inserting the most appropriate words.

Muscles have the ability to _____ when stimulated by nerves. Almost all movements within the human body, voluntary and involuntary, are caused by muscles, and muscles allow humans to _____ or to get around from one place to another. Muscles are grouped on the basis of structure and function into three types: _____ muscle, _____ muscle and _____ muscle.

[5 MARKS]

5 In the diagram of the human circulatory system shown, label the parts **A** to **J**.



aorta

right ventricle

left ventricle

pulmonary artery

left atrium

right atrium

pulmonary vein

superior vena cava

inferior vena cava

pulmonary circuit

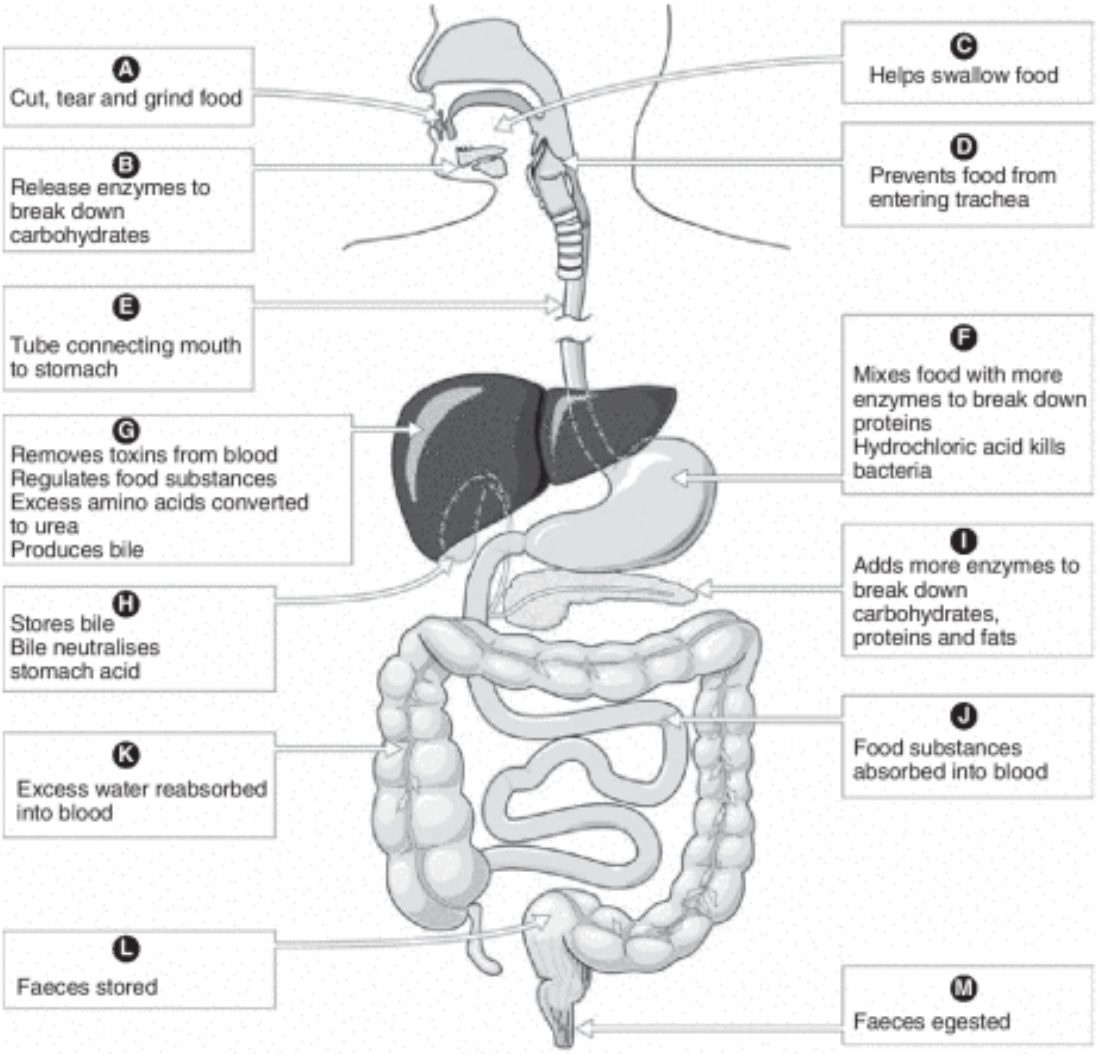
[10 MARKS]

Complete the following sentences by inserting the most appropriate words.

Blood is circulated around the body by the _____, a four-chambered organ that works like two pumps side by side. The human circulatory system transports _____, food substances and _____ all around the body. It gets white blood cells and platelets to where they are needed for the fight against _____ and for _____ wounds.

[5 MARKS]

6 In the diagram of the human digestive system shown, label the parts **A** to **M**.



teeth	**pancreas**	**large intestine**
liver	**tongue**	**epiglottis**
salivary glands	**rectum**	**small intestine**
stomach	**gall bladder**	
oesophagus	**anus**	

[13 MARKS]

Complete the following sentences by inserting the most appropriate words.

The human digestive system essentially receives and, where necessary, processes food into substances that will _____. These are eventually transported around the body in the _____ to wherever they are needed. The processing of food takes place in three stages: _____, digestion and _____. During digestion, which takes place in the digestive tract or _____ canal, the useful constituents or nutrients within food are released. A _____ diet of _____, fats, _____, vitamins, _____, fibre and water provides all the nutrients humans need.

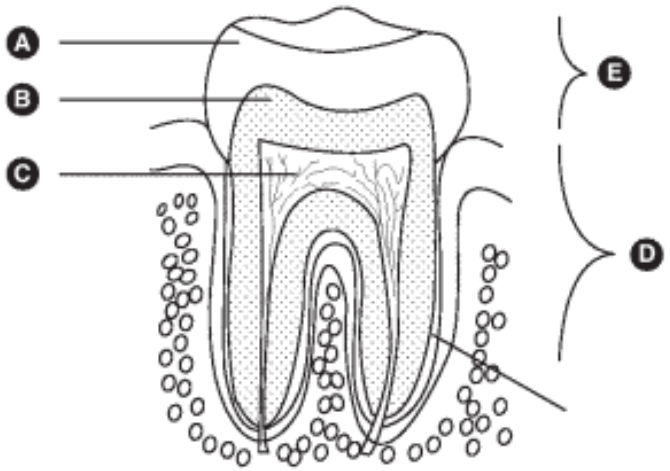
[9 MARKS]

7 Draw lines which match the teeth on the left to their function on the right:

incisors	**tearing food**
canines	**crushing and grinding hard food**
premolars	**cutting food**
molars	**crushing and grinding soft food**

[4 MARKS]

8 Label the diagram of the tooth below.



enamel

dentine

pulp

root

crown

[5 MARKS]

Complete the following sentences by inserting the most appropriate words.

The hardest substance in your body is _____, but this can be eroded by _____ which live on your teeth. They feed on _____ and produce _____, which dissolves your teeth causing tooth _____. _____ in toothpaste helps strengthen the _____ to resist acid attack.

[7 MARKS]

9 Complete the following sentences by inserting the most appropriate words.

Humans reproduce sexually. The_____fertilisation of a female _____or sex cell (an egg or ovum) by a male _____ or sex cell (a sperm), usually following sexual intercourse, results in the fusion of cell nuclei and the formation of a_____. This contains all of the genetic information or_____ needed in order to produce a fully formed adult. Eventually, and in the uterus, a human _____ grows within its own environment in a fluid-filled sac or amnion, which protects it. Here, it gets its oxygen and other useful substances from its mother via the _____ and _____ cord. After a gestation period of about _____weeks, female humans give birth to babies who grow and mature in order to complete their own life cycles.

[9 MARKS]

10 In common with all other living organisms, humans display certain characteristics which demonstrate that they are alive, and carry out certain processes in order to stay alive. These are frequently represented in the mnemonic **Mrs Gren.** Which life processes are contained within **Mrs Gren?**

[7 MARKS]

11 The four main types of pathogen that cause disease in humans are bacteria, viruses, fungi and protoctista. Draw lines which match the pathogens on the left to the types of disease they cause on the right.

bacteria	**amoebic dysentery, sleeping sickness, malaria**
viruses	**sore throats, tuberculosis, typhoid, cholera**
fungi	**athlete's foot, ringworm, thrush**
protoctista	**colds, flu, measles, mumps, polio**

[4 MARKS]

12 Rearrange the following taxonomic groups in order of size starting with Kingdom.

Kingdom Species Order Genus Family Phylum Class

[1 MARK]

13 Humans are mammals. **True or false?**

[1 MARK]

State the five main characteristics of mammals.

[5 MARKS]

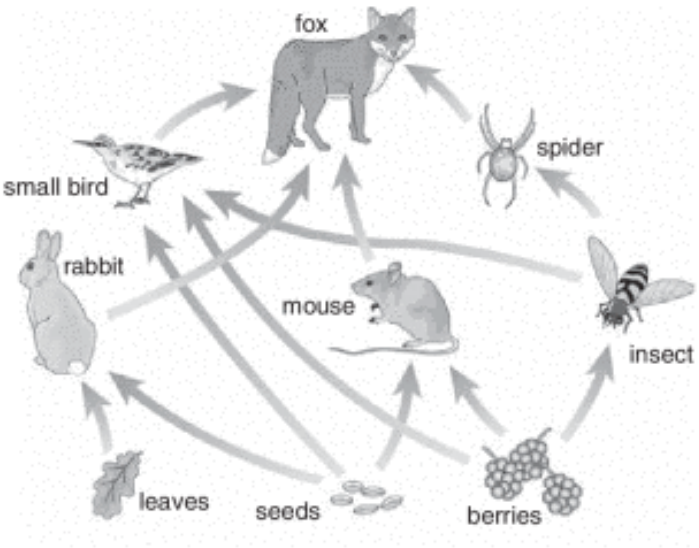
14 Common invertebrate organisms are also animals. Draw lines which match the invertebrate animals on the left to their correct taxonomic group on the right.

woodlice	**arachnids**
worms	**molluscs**
spiders	**crustaceans**
snails	**insects**
butterflies	**annelids**

[5 MARKS]

Interactions and interdependencies

1 Look at the diagram of the food web shown and complete the following tasks.



(a) **Name one producer.**

(b) **Name one herbivore and its diet.**

(c) **Name one omnivore and its diet.**

(d) **Name one carnivore and its diet.**

(e) **Write out a complete food chain involving three consumers.**

(f) **What would you expect to happen to the number of foxes if the number of rabbits increased?**

[6 MARKS]

2 Draw lines which match the living organism on the left to its position in a simple food chain on the right.

grass	**primary consumer (herbivore)**
rabbit	**producer**
fox	**secondary consumer (carnivore)**

[3 MARKS]

Complete the following sentences using the most appropriate words.

The place where a community of organisms live is called a _____. A community, together with the living and non-living environmental factors which affect how organisms interact and live their lives, is called an _____. All living organisms need food for _____ and the raw materials necessary for healthy growth. _____ plants are _____ and make their own food by photosynthesis. Animals are _____ and get their food by eating plants and other animals. A food _____ shows how living organisms feed on other living organisms. Complex feeding relationships are better shown using a food _____. Micro-organisms which feed on the remains of dead plants and animals and return useful chemicals into the soil are known as _____.

[9 MARKS]

3 Circle the causes of the loss of biodiversity in an ecosystem.

pollution	**litter**
hole in the ozone layer	**increase of human population**
traffic	**introduction of alien species**
intensive farming	**global warming**

[5 MARKS]

Genetics and evolution

1 Draw lines which match the adaptations of the animals to their environment.

polar bear	**long eyelashes**
camel	**large amount of subcutaneous fat**
seal	**big feet**

[3 MARKS]

Chemistry

Materials and their properties including the particulate nature of matter

1 Materials exhibit different physical properties. Some of these are shown in the following table. Complete the table by selecting from the descriptions and examples provided.

Property	Description	Example
Elastic	_____	_____
Plastic	_____	_____
Hard	_____	_____
Tough	_____	_____
Brittle	_____	_____

Descriptions:

breaks easily
deforms when a force is applied but returns to its original shape when force is removed
is permanently deformed as a result of a force acting on it
does not break or tear easily
very difficult to scratch

Examples:

rubber band
play dough
glass
polythene wrapping
diamond

[10 MARKS]

2 Which of the following statements about physical and chemical changes are **true** and which are **false**?

Physical changes:

(a) are usually reversible
(b) are usually irreversible
(c) produce new substances
(d) cause changes in the arrangement of the particles in a substance

Chemical changes:

(a) are usually reversible
(b) are usually irreversible
(c) produce new substances
(d) cause changes in the arrangement of the particles in a substance

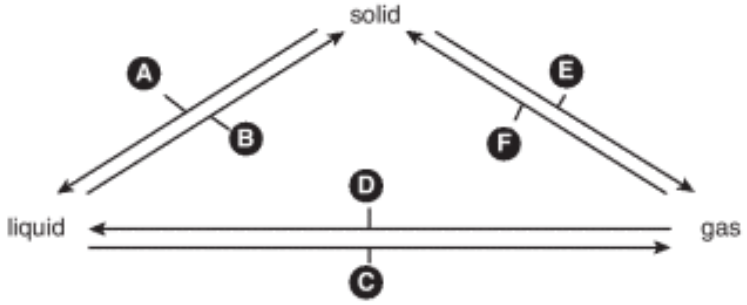
[8 MARKS]

3 Draw lines which match the state of matter on the left to its best description on the right.

solid	**takes the shape of the container it is in, fixed volume, moderate density, very slightly compressible**
liquid	**no definite shape, no fixed volume, low density, easily compressible**
gas	**definite shape, fixed volume, moderate to high density, not compressible**

[3 MARKS]

4 In the diagram of the states of matter below, label the changes **A** to **F** which take place between them.



melting
evaporating/boiling
condensing
subliming
solidifying/freezing
reverse subliming

[6 MARKS]

5 Which of the following statements about the change of state of a material from a solid to liquid are **true** and which are **false**?

(a) **The particles move faster.**
(b) **The particles change shape.**
(c) **The particles lose mass.**
(d) **The particles move further apart.**
(e) **The particles gain mass.**
(f) **The particles have more energy.**
(g) **The particles are more tightly bonded.**

[7 MARKS]

6 When a solid changes to a liquid and then to a gas:

(a) **energy is transferred to the molecules of the substance**

(b) **energy is released**

(c) **no energy is required**

[1 MARK]

7 Identify each of the following as a **chemical** or a **physical** change.

solid carbon dioxide changing into gaseous carbon dioxide

ice changing to water

paper burning

a lump of play dough rolled into a 'wiggly worm'

an egg being boiled

sugar dissolving in a cup of coffee

salt added to an icy path

grass cuttings decomposing in a compost heap

concrete hardening

an iron nail rusting

[10 MARKS]

8 Exothermic reactions occur in chemical reactions when the creation of new bonds requires less energy to form than the bonds that were broken. Endothermic reactions occur in chemical reactions when the creation of new bonds requires more energy than the bonds that were broken. Which of the following examples are exothermic reactions and which are endothermic reactions?

(a) **bicarbonate of soda and vinegar becomes cooler**

(b) **plaster of Paris and water becomes hotter**

(c) **nuclear fission**

(d) **obtaining iron from iron ore**

[4 MARKS]

9 When natural gas burns in oxygen, the resulting compounds or products are carbon dioxide and water (see the word equation below):

methane + oxygen ⟶ carbon dioxide + water + heat

The products would have:

(a) **more mass than the reactants**

(b) **less mass than the reactants**

(c) **the same mass as the reactants**

[1 MARK]

10 Draw lines which match the mixture types on the left with the examples on the right.

solid in a solid	**air**
gas in a liquid	**smoke**
gas in a gas	**Coca Cola**
liquid in a gas	**clouds**
solid in a gas	**sand and pebbles**
liquid in a liquid	**flour in water**
solid in a liquid	**milk**

[7 MARKS]

11 Match the mixtures on the left with the examples of separation technique on the right.

paper clips and sawdust	**chromatography**
pebbles and sand	**dissolving, filtering, evaporating**
salt and sand	**using a magnet**
different coloured inks	**sieving**
water and alcohol	**distillation**

[5 MARKS]

12 When a salt dissolves in water the salt crystals:

(a) fill up the spaces between the water molecules

(b) combine with the water to form a new substance

(c) break up and become so small that they are no longer visible

[1 MARK]

13 In each of the following examples, identify the solvent, the solute and the solution.

(a) water, salt, brine

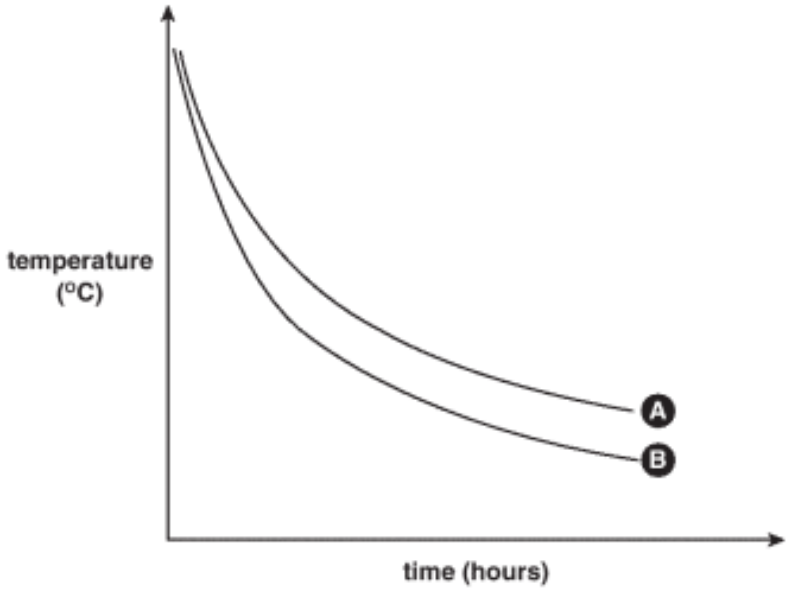
(b) sugar, water, syrup

(c) alcohol, plant oils, perfume

(d) pigment, ink, water

[4 MARKS]

14 Refer to the graph showing tea in two different cups cooling over time below.



(a) Which cup keeps the tea hottest for longest, A or B?

(b) One cup is made of china and the other polystyrene, which cup is which?

(c) Give a reason for your answer.

(d) What would happen to the cooling curves if milk were added to the tea?

(e) What would happen to the cooling curves if sugar were added to the tea?

(f) Explain in energy terms exactly what is happening as the tea cools and the temperature drops. You may wish to consider heat transfers in terms of conduction, convection, radiation and evaporation.

[6 MARKS]

Earth and atmosphere

1 Complete the table below using the choices provided.

Rock type	Origin	Examples
Igneous	_____	_____
Metamorphic	_____	_____
Sedimentary	_____	_____

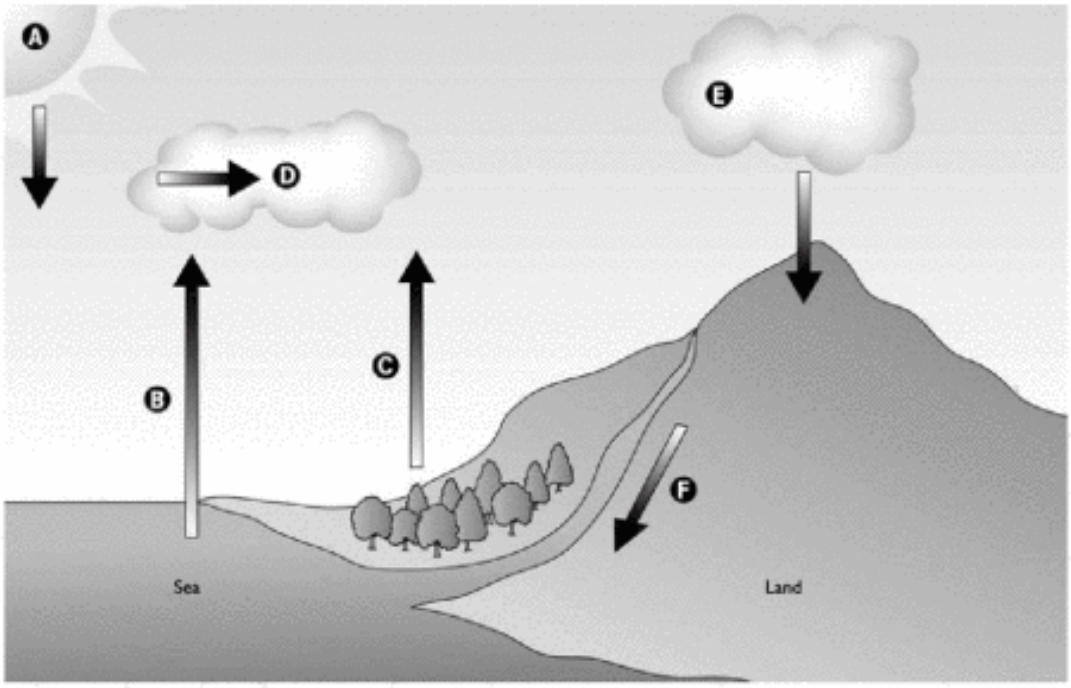
Origin:

formed when layers of sediment get buried and crushed under the weight of other layers
formed when heat and pressure completely change existing rocks over long periods of time
formed from the intrusion or extrusion and cooling of molten rock

Examples:

limestone, mudstone, sandstone
granite, basalt
slate, schist, gneiss, marble

[6 MARKS]



2 Complete the diagram of the water cycle below by labelling the parts **A** to **F**.

evaporation
precipitation
transpiration
run-off
heat energy from the Sun
condensation

[6 MARKS]

3 Coal, oil and natural gas are fuels. Fuels are not forms of energy themselves but potential sources of it. Energy can be released from fuels when they are burned. Burning is an irreversible chemical reaction. Coal, oil and natural gas are examples of non-renewable energy sources. What does the term non-renewable used here mean?

[1 MARK]

4 Energy can also be obtained from the Sun, the wind and waves. These are examples of renewable energy resources. What does the term renewable used here mean?

[1 MARK]

5 Fossils are:

(a) the petrified remains of animals from a previous geological age

(b) old plants and animals

(c) shapes and impression of plants and animals found in rocks

(d) the petrified remains of different organisms from a previous geological age

[1 MARK]

Physics

Motion and forces

1 Complete the following sentences by inserting the most appropriate words.

A force is a _____, a _____, a twist or a turn. When an object is stationary or moving at a constant speed in a straight line the forces acting on it are said to be _____. Unbalanced forces cause objects to start moving and _____ up, slow down and come to a stop, or change _____. Unbalanced forces also bring about changes in _____. If an object has no _____ force moving it along, it will always slow down and stop because of friction. Friction also includes _____ resistance and _____ resistance. Friction always increases as the speed of a moving object increases. Friction can also be useful. Without friction, standing up, riding a bicycle or driving around in cars would be very _____.

[10 MARKS]

2 Identify and draw, using force arrows, the balanced forces operating in each of the examples below.

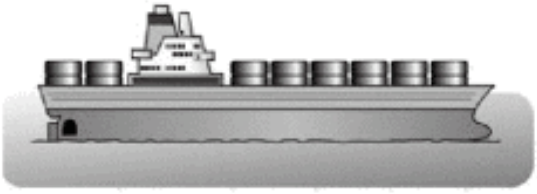
(a) **a book resting on a table**

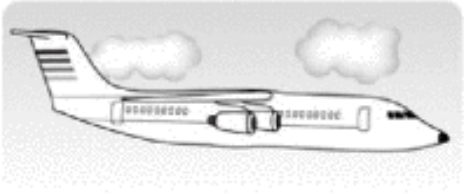
(b) **a car travelling steadily along a motorway**

(c) **an oil tanker at sea**

(d **a jet aircraft cruising at altitude**

[8 MARKS]





3 Examples of contact forces include:

(a) **pushes and pulls**

(b) **twists and turns**

(c) **all of the above**

[1 MARK]

4 Examples of non-contact forces include:

(a) **gravity and magnetism**

(b) **electrostatic attraction and repulsion**

(c) **all of the above**

[1 MARK]

5 In what units are forces measured?

(a) **kilograms (kg)**

(b) **newtons (N)**

(c) **pascals (Pa)**

[1 MARK]

6 Describe what you would expect to see happen when a feather and a hammer are dropped from the same height at the same time by a person standing on the surface of the Earth. Describe what you would expect to see happen if the same experiment took place on the surface of the Moon. (This experiment actually took place during one of several Apollo missions to the Moon.)

[2 MARKS]

7 Complete the following sentences by inserting the most appropriate words.

Mass and weight are separate things. The mass of an object is simply the amount of _____in it. Mass is measured in _____ (kg).The mass of an object remains the same regardless of whether it is found on Earth or in space. Interestingly, any two objects with mass exert a _____ on each other but this is only noticeable when one of the objects is particularly massive. This force of attraction between all masses is called gravity. Weight is a force. As a result, weight is measured in _____ (N). The weight of an object changes depending on where it is in the Universe. All objects on the surface of the Earth are pulled towards it with a force of about 10 N/kg. The Moon is much less massive than the Earth. All objects on the surface of the Moon are pulled towards it with a force of about 1.6 N/kg. An object on the surface of the Earth therefore weighs _____ than the same object on the surface of the Moon even though it has exactly the _____ mass.

[6 MARKS]

8 Gravity forces can act between two objects with mass at a distance. **True or false?** Give an example to justify your answer.

[2 MARKS]

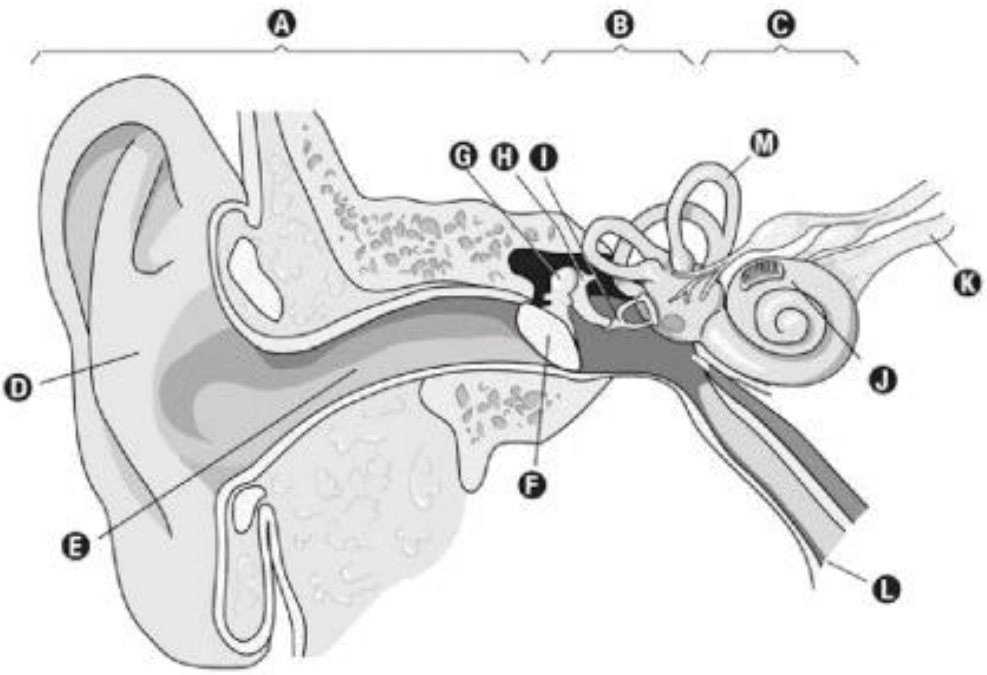
9 Complete the following sentences by inserting the most appropriate words.

The movement of an object can be described in terms of its speed or how _____ it is going. The speed of an object can be calculated easily if we know the _____ it travels and the _____ taken to travel that distance. Speed is usually measured in _____ (m/s). The movement of an object can also be described in terms of its velocity. The term velocity should be used in preference to speed when the _____ in which an object is moving is given. Objects do not always travel at a constant speed or velocity, however. They can always speed up or change direction. Objects which speed up, change direction or do both at the same time are said to _____.

[6 MARKS]

Sound

1 In the diagram of the human ear shown, label the parts **A** to **M.**



[13 MARKS]

ear drum	**Eustachian tube**
outer ear	**inner ear**
ear canal	**pinna**
cochlea	**auditory nerve**
anvil	**middle ear**
stirrup	**semi-circular canals**
hammer	

Complete the following sentences by inserting the most appropriate words.

Ears allow us to hear. We have two ears in order to help locate sound sources accurately. Sounds entering the ears cause the ear drums to _____, which in turn force the three small bones of the middle ear to move. Specialised cells within the cochlea (sensitive to vibration and movement) change sound energy to electrical energy. Electrical impulses travel via the auditory nerve to the brain where they are _____ and interpreted as sound. Unwanted or disagreeable sound is called _____. Exposure to particularly loud sounds even for short periods of time can damage the ear drum and lead to partial or complete _____. The ears are never 'switched off'. The Eustachian tube in each ear is responsible for maintaining _____ balance between the middle ear and the outside world. The semi-circular canals are concerned with _____ and orientation and not hearing.

[6 MARKS]

2 Sound travels in air at:

(a) **about 330 m/s**
(b) **about 330 km/s**
(c) **about 330 cm/s**

[1 MARK]

3 Underline the most appropriate word found in brackets.

Sound travels in waves. These waves are described as (transverse/longitudinal) waves.

[1 MARK]

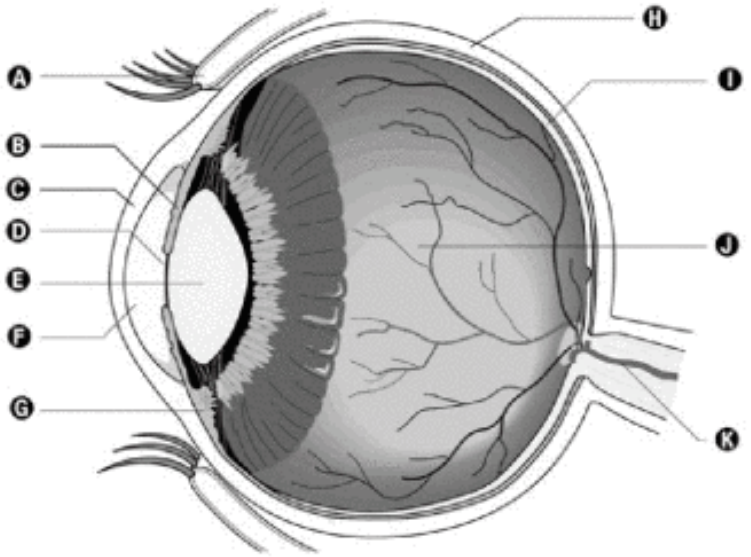
4 Consider the following sources of sound. For each, identify the source of vibration. In the case of the guitar, identify three ways in which the pitch of the sound produced can be changed and one way in which the volume of the sound can be changed.

(a) **piano**
(b) **drum**
(c) **recorder**
(d) **guitar**

[8 MARKS]

Light

1 In the diagram of the human eye shown, label the parts **A** to **K.**



eyelid	**pupil**	**aqueous humour**
lens	**optic nerve**	**vitreous humour**
retina	**cornea**	**sclera (white of eye)**
iris	**ciliary muscle**	

[11 MARKS]

Complete the following sentences by inserting the most appropriate words.

Eyes allow us to see. Each eye has a series of _____ which allow movement within the retaining eye socket. Two eyes provide _____ vision, which provides depth perception and distance judgement. Light enters the eye through the cornea and lens which focus the light rays onto a _____-sensitive layer called the retina. Specialised cells within the retina called _____ (sensitive to colour) and _____ (sensitive to 'greys') change light energy to electrical energy. Electrical impulses travel via the optic nerve to the brain where they are _____ and interpreted as sight. Between the cornea and the lens is the iris. The iris determines the _____ of the eye. At the centre of the iris is the pupil. The pupil changes size in response to the amount of _____ entering the eye. This means that in areas with _____ light the pupil will be _____ than in darker areas.

[10 MARKS]

2 Which of the following sources of light are primary and which are secondary?

(a) **a torch**

(b) **the Moon**

(c) **a burning candle**

(d) **the Sun**

[4 MARKS]

3 Light travels in a vacuum at:

(a) **300 000 km/s**

(b) **300 000 m/s**

(c) **300 000 mph**

[1 MARK]

4 Underline the most appropriate word found in brackets.

Light travels in waves. These waves are described as (transverse/longitudinal) waves.

[1 MARK]

5 The primary colours of light are:

(a) **red, blue and yellow**

(b) **red, blue and green**

(c) **red, green and yellow**

[1 MARK]

6 The primary colours of artists' pigments are:

(a) **red, green and yellow**
(b) **red, blue and green**
(c) **red, blue and yellow**

[1 MARK]

7 A beam of 'white' light passing through a glass prism is 'bent' and split into its component colours. This effect is known as dispersion. List the seven colours you might expect to see in the 'spectrum' produced.

[1 MARK]

8 The colour of an object is actually the colour or the wavelength of the light it reflects. All other colours or colour wavelengths are absorbed.

(a) **What colour wavelengths do green objects absorb?**
(b) **Why do some objects appear white and others appear black?**

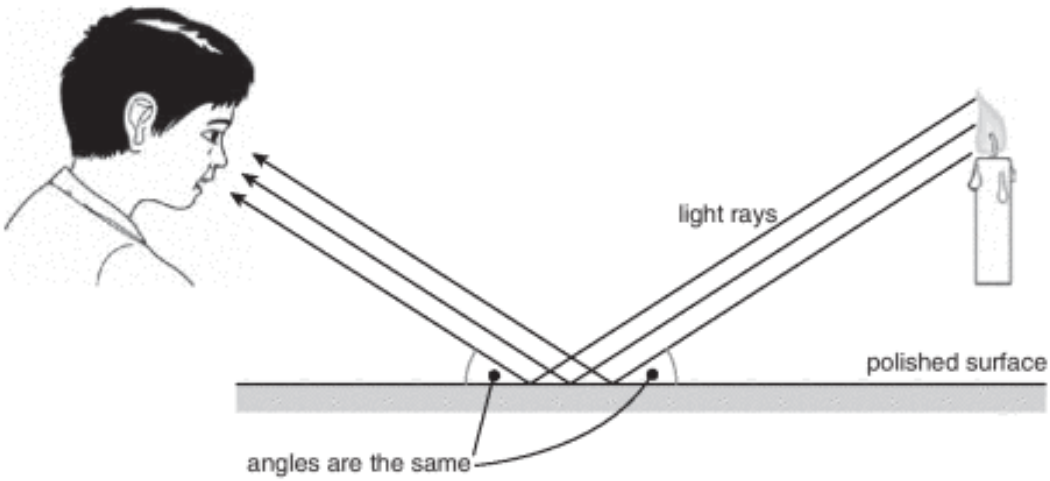
[3 MARKS]

9 Underline the most appropriate words found in brackets.

Shadows are formed when light is blocked. When the light from a projector is blocked by an object, the shadow formed on a wall, for example, can be made (bigger/smaller) by increasing the distance between the object and the screen or by decreasing the distance between the projector and the object. Some shadows are 'black'. Some shadows appear with a dark central area and a fuzzy, grey outline. The dark part of the shadow is known as the (umbra/penumbra). The fuzzy, grey outline is known as the (umbra/penumbra).

[3 MARKS]

10 Look at the diagram below. Complete the ray diagram to indicate how and where the image of the candle appears to the observer.



[2 MARKS]

11 Why are polished surfaces better at reflecting light than rough surfaces?

[1 MARK]

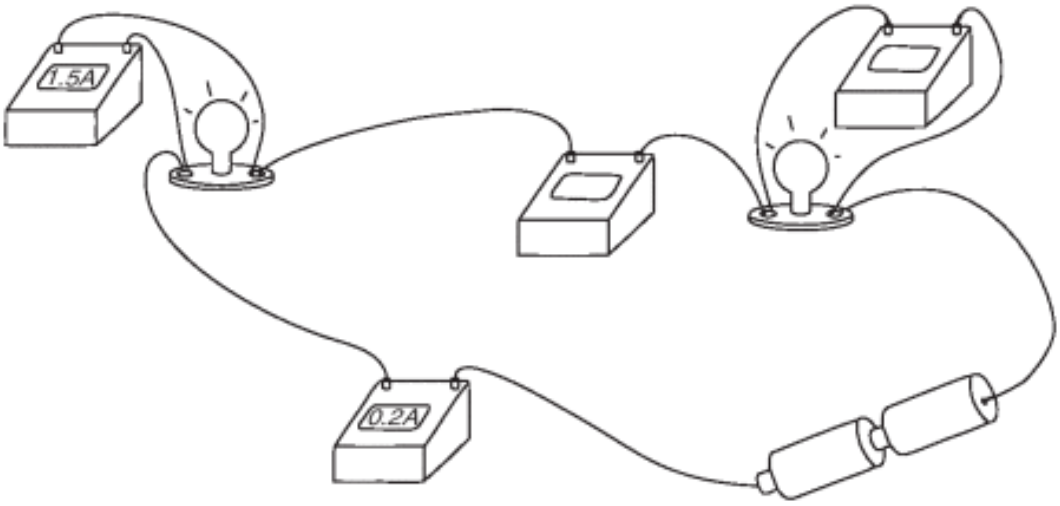
12 Match the words on the left with their description on the right.

transparent	**blocks light and images completely**
translucent	**allows light to pass and objects to be seen clearly**
opaque	**allows light to pass but objects appear blurred**

[3 MARKS]

Electricity and magnetism

1 Look at the picture of a simple circuit shown here and complete the following tasks. The filament lamps or bulbs are identical.



3 volts supplied by battery

(a) This is a series circuit. True or false?

(b) Underline the most appropriate words in brackets. Unscrewing one bulb from its holder will cause the other bulb to (glow brighter/glow dimmer/glow about the same/go out).

(c) The current flowing in the circuit as shown by one ammeter is 0.2A. What reading would you expect the other ammeter to show?

(d) The voltage (or potential difference) across one of the bulbs as shown by one voltmeter is 1.5V. What reading would you expect the other voltmeter to show?

(e) Use Ohm's Law (V = IR) to calculate the resistance, R, of each of the two bulbs.

(f) Draw a circuit diagram of the picture using standard symbols.

(g) Use the circuit diagram to describe what is happening in the circuit in terms of energy and energy transfer.

(h) Imagine adding a third identical bulb to the circuit.

- The three identical bulbs will be equally bright. True or false?
- The three identical bulbs will be as bright as the two bulbs in the previous series circuit. True or false?

Briefly explain why, using the concept of 'resistance'.

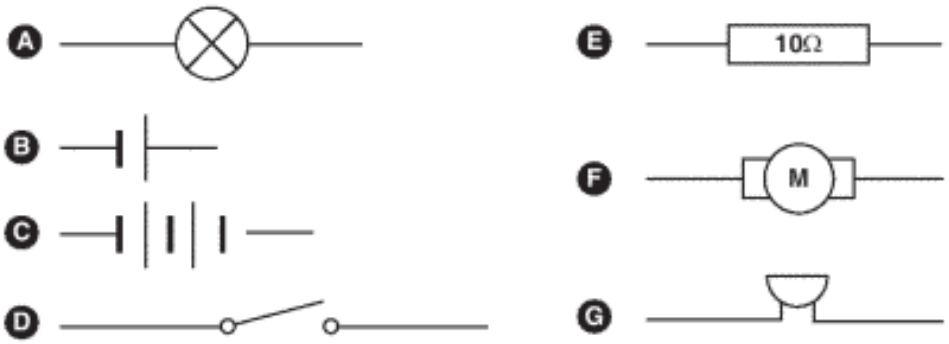
(i) Draw a circuit diagram which shows the two original bulbs connected in parallel.

(j) Refer to the parallel circuit.

- How would you expect the bulbs to appear in terms of their brightness compared with the series circuit?
- What will happen if you remove one of the bulbs?

[13 MARKS]

2 In the diagram of the circuit symbols shown, identify the components **A** to **G**.



motor
resistor
battery
switch
buzzer
cell
filament lamp or bulb

[7 MARKS]

3 Define the following terms.

conductor
insulator
current
voltage
resistance
power

[6 MARKS]

4 Under normal circumstances, which of the following materials are good electrical conductors, poor electrical conductors or insulators?

(a) copper

(b) water

(c) rubber

(d) aluminium

(e) gold

(f) wood

(g) skin

(h) air

[8 MARKS]

5 Complete the following sentences by inserting the most appropriate words.

Some materials are magnetic. That means that they are both _____ to magnets and can be _____. Magnetic materials include the metals _____ and _____ as well as nickel and cobalt. All magnets have _____ and _____ poles. The rule of magnets states that _____ poles attract while _____ poles _____. That means that when _____ poles of magnets are brought close together it is possible to feel an _____ force between them. When _____ poles of magnets are brought close together it is possible to feel a _____ force between them. A simple compass is nothing more than a freely moving magnet which aligns itself with the Earth's magnetic field. The end of the magnet which points north is referred to as the _____-seeking pole. The rule of magnets tells us, therefore, that what we refer to as geographical north is actually the Earth's magnetic _____ pole.

[15 MARKS]

6 A simple electromagnet can be made by winding a length of wire around an iron nail. When connected to a battery, a current flows through the wire creating a magnetic field around it. The magnetic field strength is increased by the presence of the nail. List up to three changes that could be made to alter the magnetic field strength of this simple electromagnet.

[3 MARKS]

Space physics

1 Complete the following sentences by inserting the most appropriate words.

The Universe is, quite literally, everything that exists: _____ (from atoms and molecules to stars and galaxies), _____ (visible light together with the rest of the electromagnetic spectrum) and _____ (the vast emptiness within and between galaxies). The Universe is about 12 _____ years old and most probably emerged from an explosive event referred to as the _____. The Universe has been growing in size or _____ ever since.

[6 MARKS]

2 Complete the following sentences by inserting the most appropriate words.

Galaxies are assemblages of _____, nebulae and other interstellar materials. A typical galaxy contains more than _____ billion stars and measures about _____ light years across. Galaxies are classified into four main groups depending on their appearance: _____, barred spirals, _____ and irregulars. Galaxies are not randomly scattered throughout the Universe; they occur in clusters: _____ clusters of hundreds or thousands of galaxies and _____ clusters of a few tens. Our own Sun is located within the Orion Arm of what is referred to as the _____ galaxy, one of about 30 other galaxies known as the Local Group.

[8 MARKS]

3 Rearrange the following in order of decreasing size starting with the Universe.

Universe	**Solar System**	**local group of galaxies**
Earth–Sun–Moon system	**Earth**	**Milky Way**
	Moon	**Sun**

[1 MARK]

4 Draw lines which match the contents of the Solar System on the left to their best description on the right.

Sun	**chunks of ice and other material often seen with a tail**
planets	**natural satellites which orbit planets**
moons	**a star (ball of hot, glowing gas)**
asteroids	**lumps of rock often referred to as minor planets**
comets	**small particles of dust and rock fragments**
meteoroids	**rocky and gassy objects which orbit the Sun**

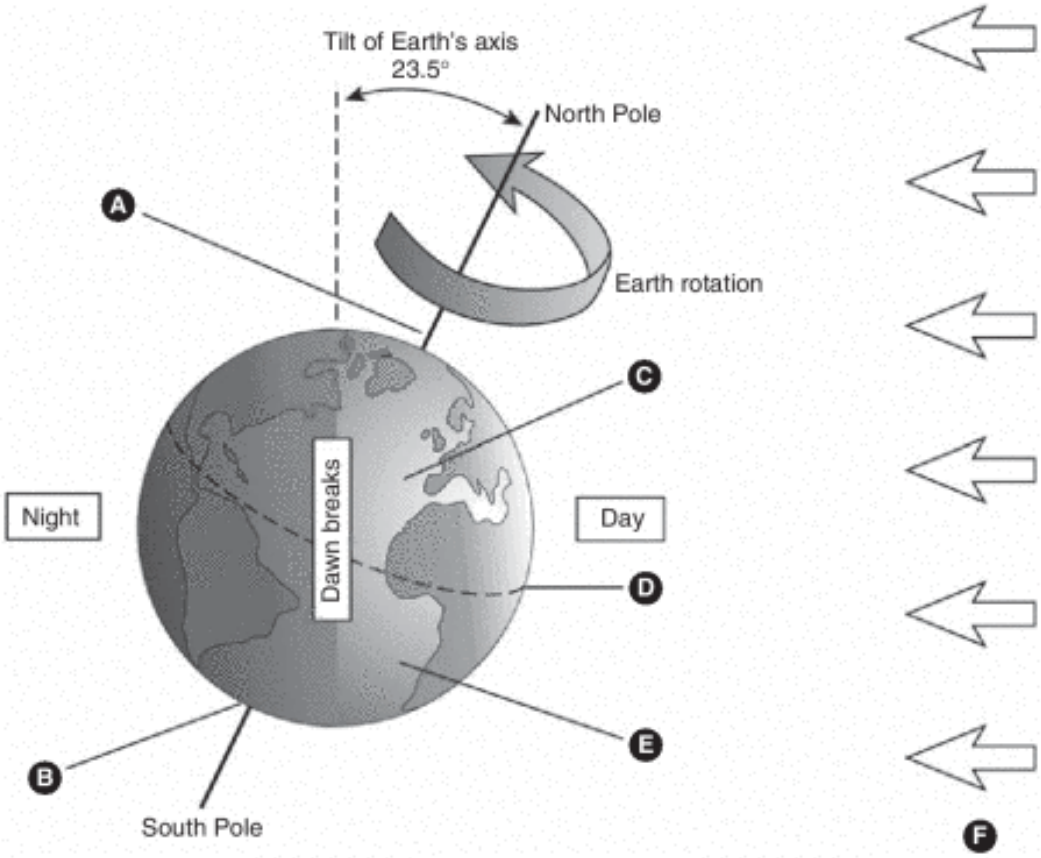
[6 MARKS]

5 Refer to the Solar System.

(a) List the nine known planets which orbit the Sun in order starting with Mercury.
(b) Which planets are known as the terrestrial or rocky planets?
(c) Which planets are known as the Jovian planets or gas giants?
(d) Mercury, being nearest to the Sun, is the hottest planet. True or false?
(e) Which is the largest planet?
(f) Which planet has the most moons?
(g) Which planets have no moons at all?
(h) Which planets have rings?
(i) The Solar System formed about 4.6 billion years ago. True or false?

[9 MARKS]

6 Correctly label features **A** to **F** of the day and night cycle in the diagram shown.



light from the Sun
where more than 12 hours of daylight are experienced
where the Sun never 'rises'
where exactly 12 hours of daylight are experienced
where the Sun never 'sets'
where less than 12 hours of daylight are experienced

[6 MARKS]

7 The day and night cycle is caused by the rotation of the Earth about its axis. The time from one 'sunrise' to the next is:

(a) **approximately 24 hours**
(b) **365.25 days**
(c) **about one month**

[1 MARK]

8 With reference to the seasons, complete the following sentences by inserting the most appropriate words and by circling the most appropriate words found in brackets.

The _____ of the Earth's axis relative to the plane of its orbit around the Sun causes the seasons. In the UK, the year-long cycle of seasons includes spring, summer, autumn and winter. In June, the _____ hemisphere is tilted _____ the Sun and experiences summer while the

_____ hemisphere is tilted away and experiences _____. The effects are dramatic. In the UK, for example, summer days are (long/short), the Sun 'rises' (high/low) above the horizon so the Sun's rays reach the surface of the Earth at a (high/low) angle, and the Earth is (heated/cooled) by the Sun for (more/less) than 12 hours. The Sun's heating effect is (more/less) efficient and summers are warm. In December the opposite occurs.

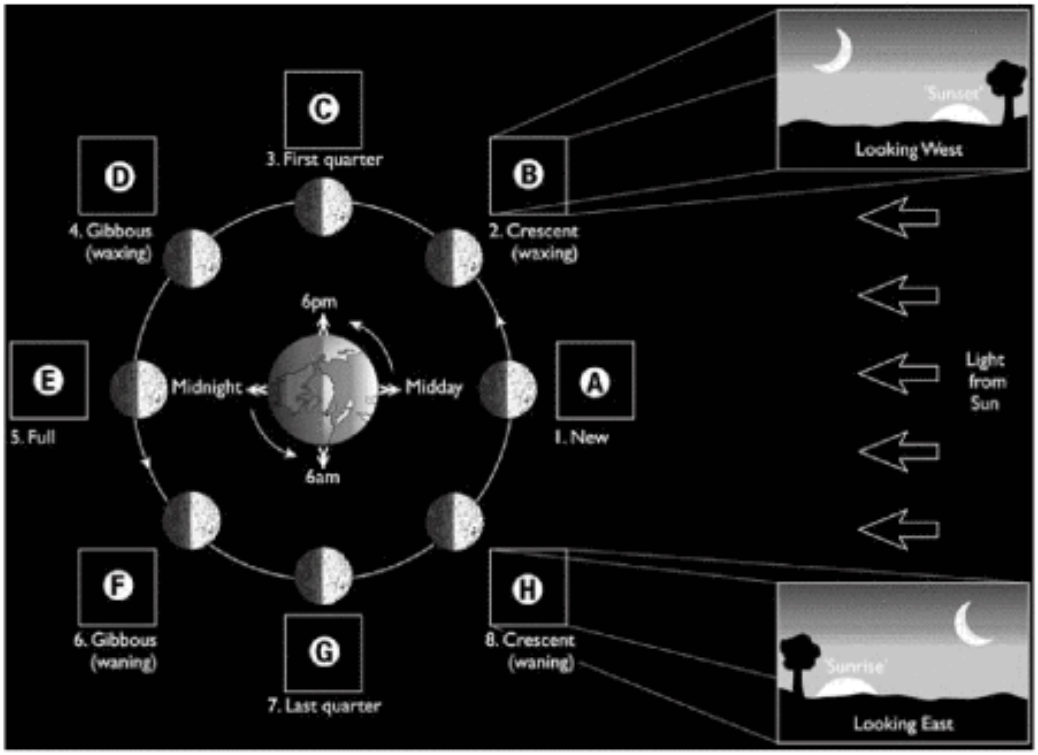
[11 MARKS]

9 The Earth orbits the Sun once every:

(a) **four years**
(b) **24 hours**
(c) **365.25 days**

[1 MARK]

10 Correctly draw the phases of the Moon as they would be seen from the Earth in the boxes labelled **A** to **H** in the following diagram.



[8 MARKS]

11 The Moon orbits the Earth about:

(a) **once every 24 hours**
(b) **once a month**
(c) **once a year**

[1 MARK]