JUNIOR CERTIFICATE SCIENCE

Exam Questions by Topic

Junior Certificate Science

Coursework A: 10%

Coursework B: 25%

Written paper: 65%

Exam papers 2006-2014

Loreto Secondary School

Balbriggan

Contents

Biology

Living Things

2011

Name one invertebrate animal and one vertebrate animal.

Invertebrate _____

Vertebrate _____

The Cell

2014

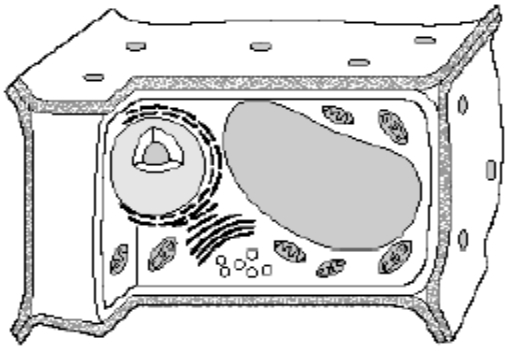
The diagram shows a sketch of a cell.
Is this a plant cell or an animal cell?

_____

Give a reason for your answer.

_____

_____



2013

Humans are composed of cells, tissues, organs and systems.
What is meant by each of these terms? (12)

Cell _____

_____

Tissue _____

_____

Organ _____

_____

System _____

_____

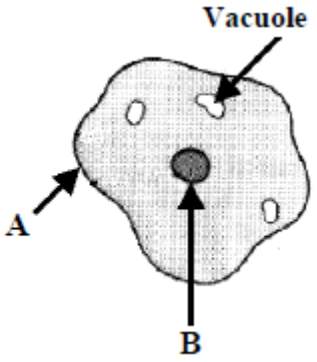
2011

The diagram shows an animal cell. Name part **A**.

Name of **A** _____

What important structures are located in **B**?

What? _____

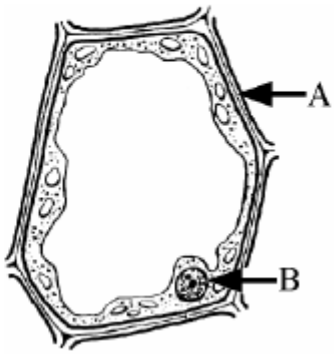


2010

The diagram shows a plant cell.
Name **the *parts*** of the cell labelled **A** and **B**.

A _____

B _____



2009

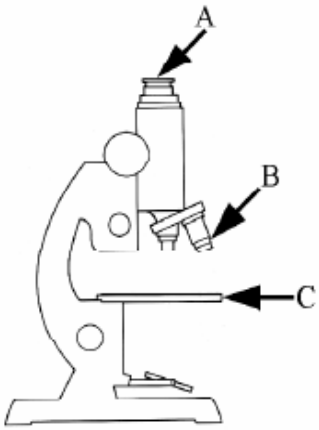
The parts labelled **A** and **B** in the diagram of the microscope work together to perform a single function.

(*i*) What is the ***combined function*** of **A** and **B**?

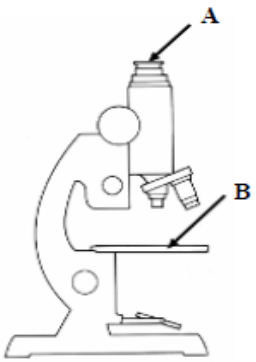
What? _____

(*ii*) Name the ***part labelled*** **C** in the diagram.

Name _____



The diagram shows a laboratory microscope.



(*i*) What are the ***functions*** of parts labelled **A *and* B**? (6)

Function of A _____

_____

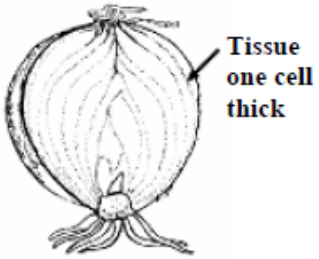
Function of B _____

_____

(*iii*) Draw a ***labelled diagram***, in the box provided, of a ***plant cell***. (9)

Labelled diagram

Onion epidermis is a tissue only one cell thick. It is used in school laboratories on microscope slides to investigate plant cell structure using a microscope.



Describe how to ***prepare a microscope slide*** from a plant tissue. (6)

_____

_____

_____

_____

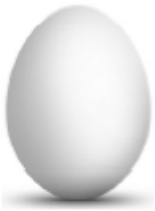
_____

_____

_____

2014

In an experiment to test for the presence of protein in egg-white (albumen), chemicals are added to the egg-white.



(*i*) Name a chemical used.

_____

(*ii*) What colour would confirm the presence of protein in the egg-white?

_____

2012

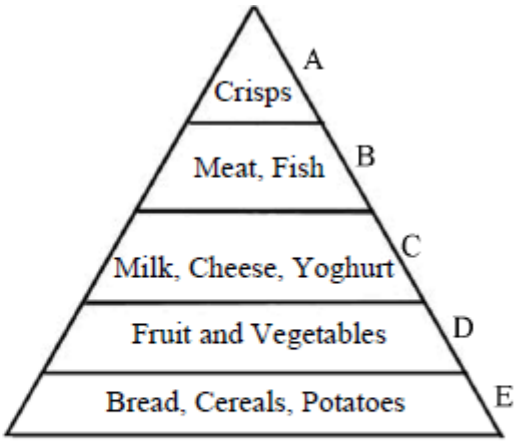
Eggs can form part of a balanced diet and provide a good source of some food types. Name two of these food types.

1 _____

2 _____

2011

The diagram is of a food pyramid.



(*i*) Name one other food from level **B**.

Food _____

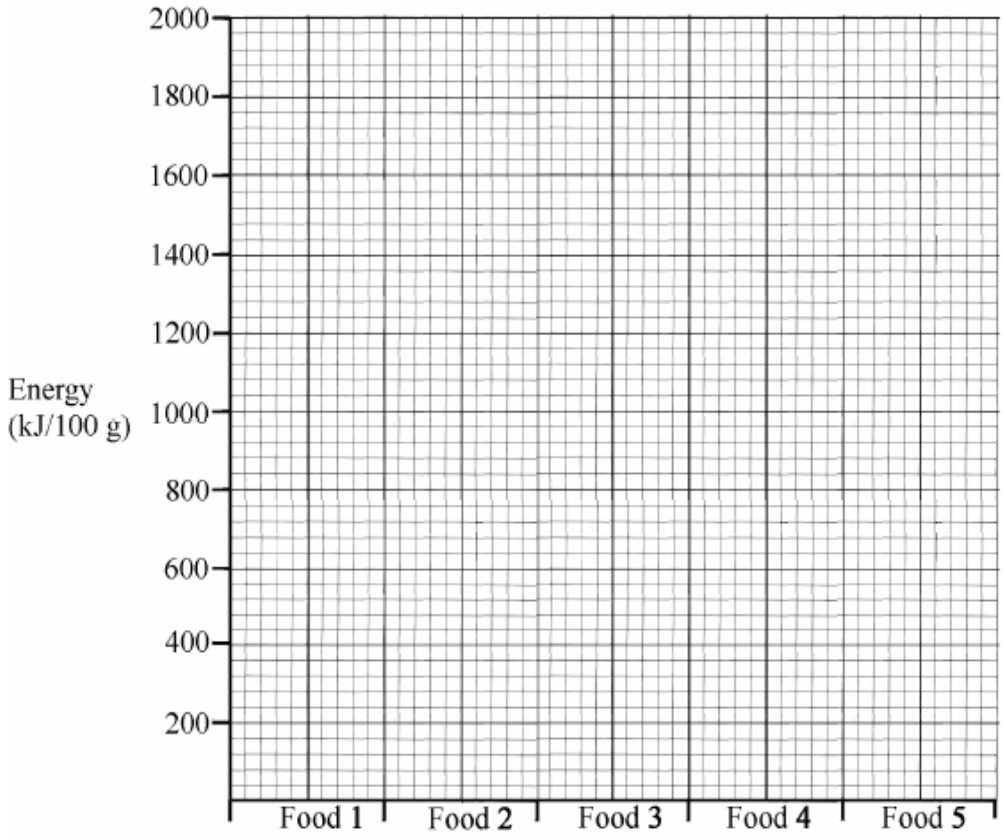
(*ii*) What is the dietary reason why the area of level **A** is much less than the area of level **E** in the food pyramid?

Why? _____

Protein, carbohydrate and fat can all be used to provide energy in our bodies. The table gives the amount of these food constituents, in grams per 100 grams for five common foods. The energy content per 100 g of each food has also been given. The energy values have been rounded off to the nearest 100 kJ.

Food Constituent	Protein	Carbohydrate	Fat	Energy kJ/100 g
Food 1-Baked beans	4.0	17.5	0.4	400
Food 2-Cooked chicken	26.2	nil	1.6	500
Food 3-Eggs	12.5	nil	11.2	600
Food 4-Bread (wholemeal)	9.0	45.0	2.2	1000
Food 5-Cheddar cheese	25.4	0.1	34.9	1700

(*i*) Draw a ***bar chart***, in the grid below, to ***compare the energy content*** of 100 g of foods 1-5 given in the table above. (9)



(*ii*) Which ***food constituent*** is primarily responsible for the high energy content of cheese? What ***evidence*** does the table provide to support your answer? (6)

Which? _____

What? _____

_____

(*iii*) Describe how to ***test a food*** for the presence of ***fat***. (6)

_____

_____

_____

_____

_____

2008

The postage stamp shown commemorates the awarding of the Nobel Prize to Dorothy Hodgkin (1910-1994) for her work on vitamin B_{12} in 1964. Vitamins are part of a balanced diet. Give **one *function each*** for (*i*) vitamins (*ii*) minerals in our bodies. (Two *different functions* are required.)

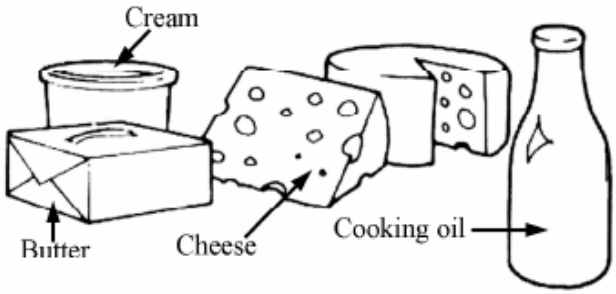
(*i*) _____

(*ii*) _____

2007

Name the principal ***food type (nutrient)***, which is present in all of the foods shown.

Name _____



Describe a ***test*** to show the ***presence of the food type*** that you have named in food samples.

Test _____

_____

_____

This nutritional information was given on a packet of wheat bran. Wheat bran is used with breakfast cereals and is added to brown bread.

Nutritional Information per 100 g	
Energy	872 kJ / 206 kcal
Protein	15 g
Carbohydrate	26.8 g
(of which sugars)	3.8 g
Fat	2.5 g
(of which saturates)	0.5 g
Fibre	36.5 g
Sodium	0.028 g

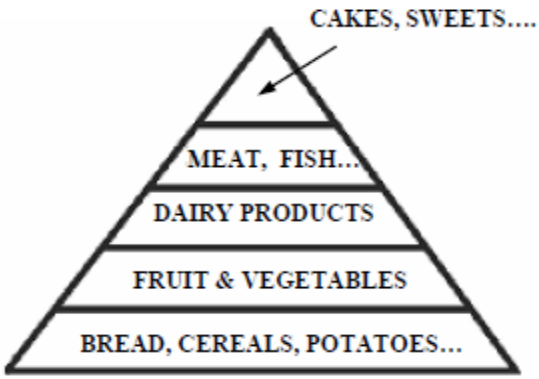
(*i*) Select **any two** ***nutrients*** from the list given and say what ***role*** each one has in maintaining health. (6)

Nutrient 1 _____ **Role of 1** _____

Nutrient 2 _____ **Role of 2** _____

(*ii*) The diagram shows a food pyramid.

Explain how to use a food pyramid to plan a healthy diet. (6)



_____

_____

_____

_____

(*iii*) Tests were carried out on three foods by a pupil in a school laboratory.

The results of these tests are given in the table.

A plus (+) sign means a positive result to a test.

A minus (–) sign means a negative result to a test.

Food Tested	Food Tests			
	Starch	Reducing sugar	Protein	Fat
Food A	+	–	–	+
Food B	–	–	+	+
Food C	+	–	+	+

Which **one** of the foods, **A**, **B** or **C** would most likely be cheese, meat, or fish? _____ (3)

Which **one** of the foods, **A**, **B** or **C** would most likely be crisps, or chips? _____ (3)

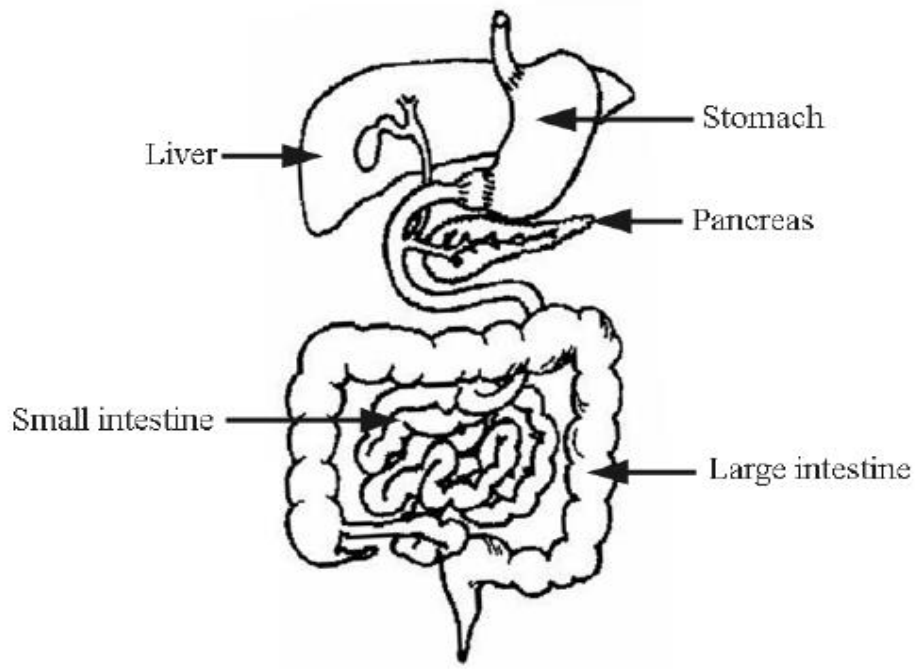
Most of the food we eat requires digestion.

(*i*) What is meant by digestion? State clearly why we need to digest food. (6)

What? _____

Why? _____

The labelled diagram shows most of the organs involved in digestion and associated processes in our bodies.



(*ii*) Give one function for each of the five organs labelled in the diagram. The word 'digestion' alone will not merit marks; if it is used in an answer it must be qualified in some way. (15)

Stomach _____

Liver _____

Pancreas _____

Small intestine _____

Large intestine _____

2012

Without enzymes we would not be able to exist. Enzymes release energy from food, help build the molecules that our bodies are composed of and break down structures and wastes that we no longer need.

(*i*) Name an enzyme. (3)

Name _____

(*ii*) Name the substrate that the enzyme you have named acts on. (3)

Name _____

(*iii*) Name the product of the action of this enzyme. (3)

Name _____

(*iv*) What reagent might you use, in a laboratory, to test that the reaction has taken place? (3)

Name _____

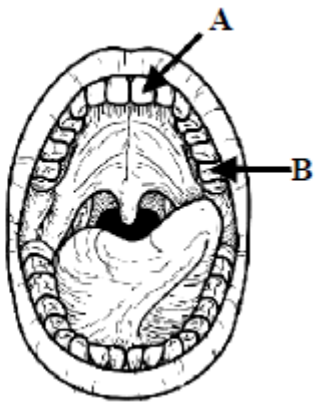
2011

The diagram shows the inside of a human mouth.
Give the name of tooth type **A**.

Name _____

What is the function of tooth type **B**?

Function _____



2010

The diagram of the human digestive system has been simplified for clarity.

(*i*) What is ***digestion***? (3)

What? _____

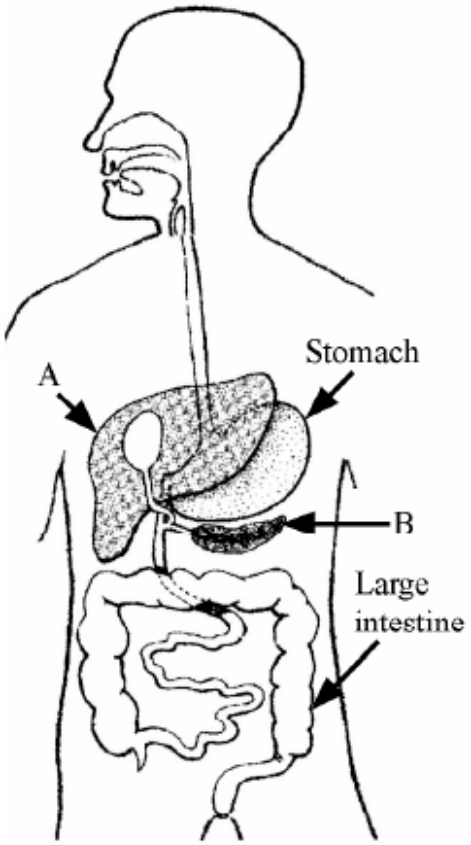
(*ii*) Why is ***digestion necessary***? (3)

Why? _____

(*iii*) Name the ***organs*** labelled **A** and **B**. (6)

Organ **A** _____

Organ **B** _____



(*iv*) Give **one *function*** of the stomach. (3)

Give _____

_____

(*v*) Give **one *function*** of the large intestine. (3)

Give _____

_____

A pupil performed an experiment in a school laboratory to show the action of a ***digestive enzyme*** on a ***food substance***.

(*i*) Name an ***enzyme*** suitable for such an experiment. (3)

(*ii*) Name a ***food substance*** on which the enzyme that you have named will act. (3)

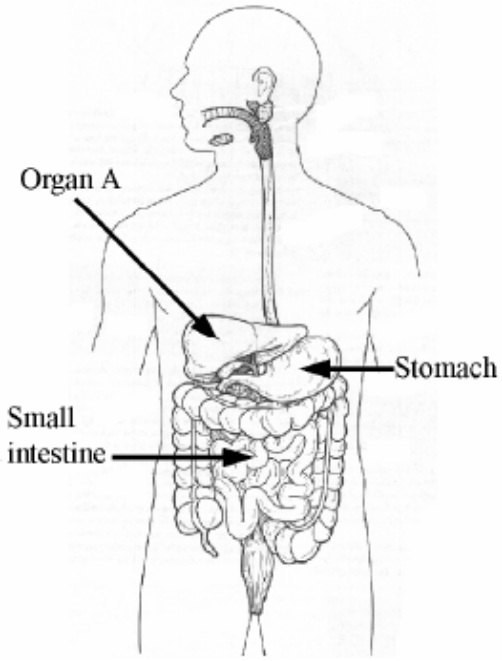
(*iii*) Describe any ***preparation*** of the food required before the experiment is performed. If no preparation is required state why. (3)

(*iv*) Give the ***temperature*** at which the enzyme-food mix should be maintained for the experiment to work. (3)

(*v*) How much ***time*** is needed for digestion of the food in this experiment? (3)

(*vi*) Describe a ***test*** to confirm that digestion has occurred. (6)

The diagram shows the human digestive system.



(*i*) Give a ***digestive function*** of organ **A**. (3)

Function _____

_____

(*ii*) In the small intestine **starch** is broken down to **maltose** by **amylase**.

Identify the ***enzyme***, and the ***substrate*** named in the reaction above. (6)

Enzyme _____

Substrate _____

(*iii*) Give a ***function*** of the small intestine other than digestion. (3)

Function _____

(*iv*) Describe a simple laboratory experiment to show the ***release*** of ***chemical energy*** from food as ***heat***. (6)

_____

_____

_____

_____

_____

2013

When a cigarette burns it releases smoke that contains about 4,000 chemicals. Hundreds of these chemicals are highly dangerous.

Tar, nicotine and carbon monoxide are three of these harmful substances. Describe the damaging effect of one of these three substances on a named organ. (6)

Substance _____

Organ _____

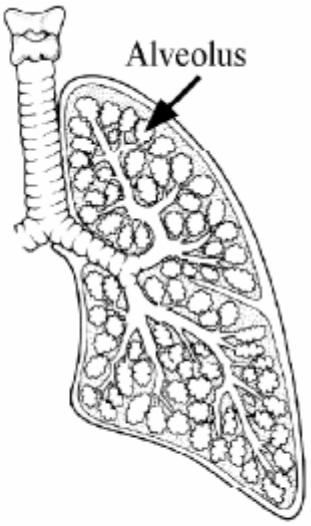
Effect _____

Name an appliance in the house that may produce carbon monoxide. (3)

Name _____

2010

The diagram shows the internal structure of a human lung. There are about 350 million alveoli per lung.



Describe ***exchange of gases*** that occur between the ***air in the alveoli*** and the ***bloodstream***.

Describe _____

_____

_____

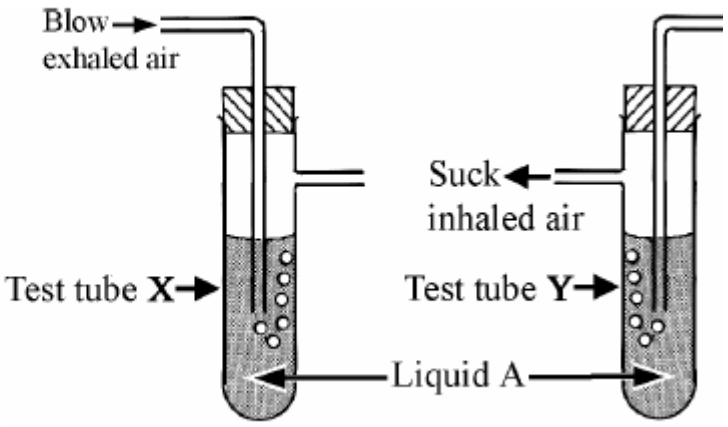
_____

_____

The diagram shows the apparatus used by a pupil when performing an experiment in a school laboratory.

The pupil blew (exhaled) air into test tube **X**.

The pupil sucked (inhaled) air from test tube **Y**.



The pupil continued, alternately, blowing and sucking air, as above, until ***liquid* A** in ***one*** of the test tubes ***turned milky***.

(*i*) Name ***liquid* A**. (3)

Name _____

(*ii*) In ***which test tube***, **X** or **Y**, did the ***liquid turn milky***? (3)

Which? _____

(*iii*) Why did ***liquid* A *turn milky*** in ***one*** of the test tubes? (3)

Why? _____

(*iv*) What ***conclusion*** can be made from the ***result of this experiment*** regarding the ***difference in composition between exhaled and inhaled air***? (3)

Conclusion? _____

(*v*) Complete the ***word equation***, below, for ***aerobic respiration***. (6)

Food + _____ ⟶ _____ + energy + water

2007

(*i*) Complete the following ***word equation*** for aerobic respiration. (6)

Glucose (Food) + _____ ⟶

Energy + _____ + **Water**

(*ii*) State how you would show the presence of **one** of the ***products*** of aerobic respiration by means of a ***chemical test***. (9)

_____

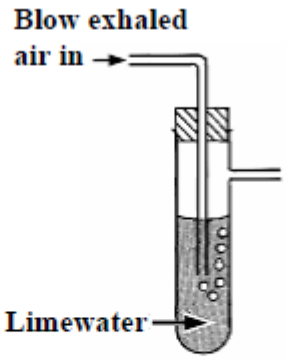
_____

_____

_____

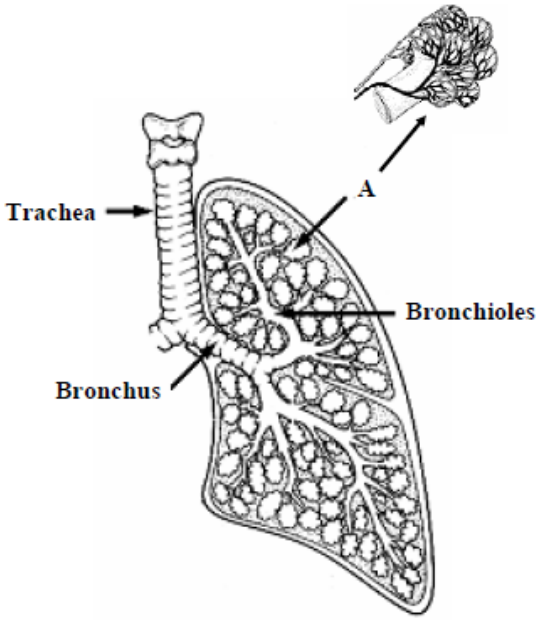
2006

The diagram is of an apparatus used to show that ***exhaled air contains carbon dioxide***. When performing this experiment ***a control is required*** to show that inhaled air contains ***less*** carbon dioxide than exhaled air. ***Describe, using a labelled diagram, a suitable control procedure.***



Labelled diagram

The diagram shows the structure of a human lung. Air passes in and out of the lungs, via the trachea, bronchi and bronchioles. ***Gaseous exchange*** takes place in the structures labelled **A**.



(*i*) Name ***structure* A**. (3)

_____

(*ii*) How does ***gaseous exchange*** take place in the structures labelled **A**? (6)

_____

_____

_____

_____

_____

_____

_____

Circulatory System

2014

(*i*) State the function of white blood cells.

_____

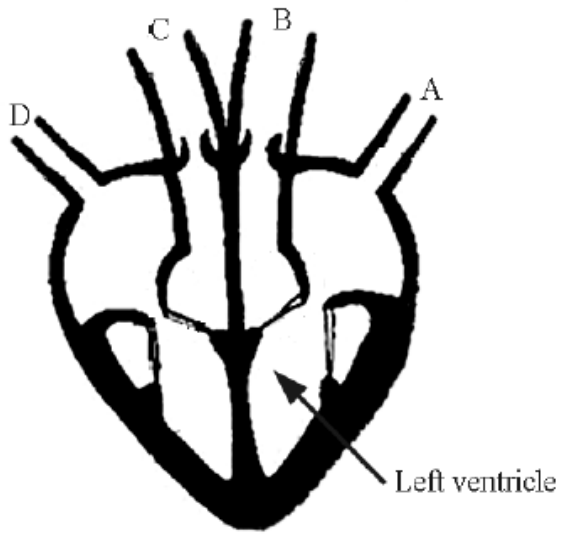
_____

(*ii*) State the function of red blood cells.

_____

_____

Four blood vessels are attached to the heart. These blood vessels are labelled A, B, C and D in the diagram.



Select any two of the blood vessels A, B, C or D from the diagram.
Identify your selection in each case by using the appropriate letter.
Name the blood vessels selected.
Give the direction of movement of blood into *or* out of the heart in each case.
State if the blood is oxygenated *or* deoxygenated in each case. (18)

Identify _____

Name _____

Direction _____

Oxygenated *or* deoxygenated _____

Identify _____

Name _____

Direction _____

Oxygenated *or* deoxygenated _____

2012

Why is blood considered to be a tissue?

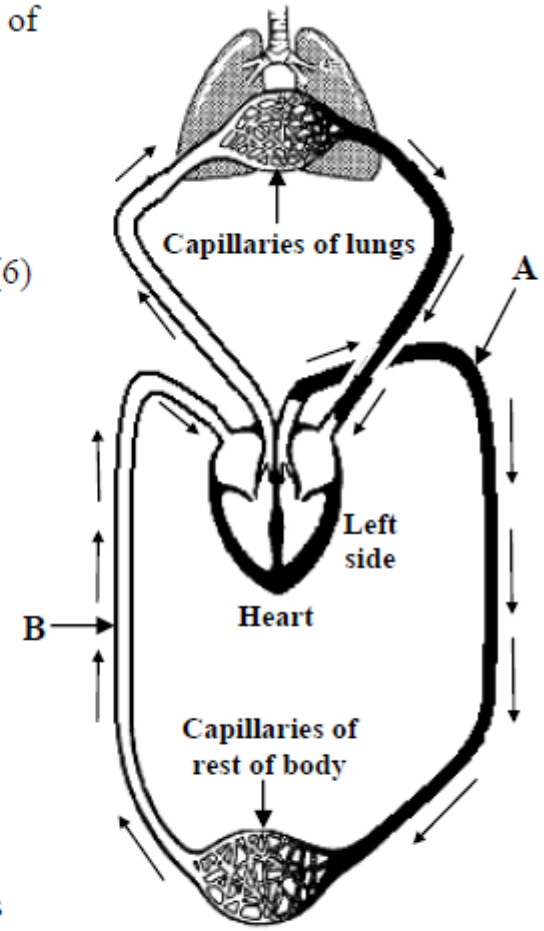
Why? _____

Name a substance transported by blood.

Name _____

2011

The simplified diagram shows the flow of blood through the lungs, heart and the rest of the body.



(*i*) Name the blood vessels labelled **A** and **B**. (6)

A _____

B _____

Capillaries are small blood vessels.

(*ii*) Describe **two** changes in the composition of blood after it has passed through the capillaries of the lungs shown. (6)

1 _____

_____

2 _____

_____

What feature of capillaries allows these changes to happen? (3)

_____

(*iii*) Name the chamber of the heart that pumps blood to the lungs. (3)

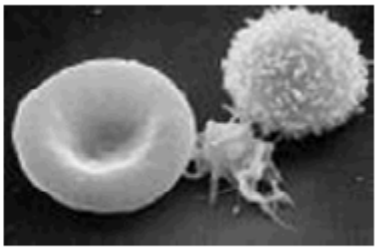
_____

2009

Label clearly the ***pulmonary artery with an A,*** and the ***pulmonary vein with a V*** in the diagram of the heart.

2008

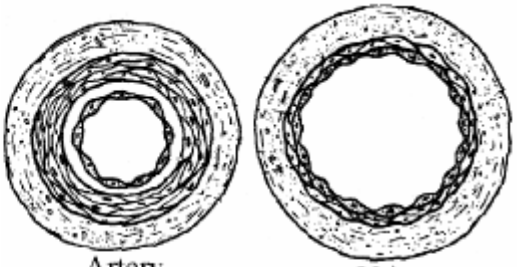
The photograph shows a red blood cell and a white blood cell taken using an electron microscope. Give **one *function*** for each type blood cell.



Red blood cell _____

White blood cell _____

The diagram shows cross sections of an artery and of a vein. Why do ***arteries have much thicker walls*** than veins?



Why? _____

Give **one** other ***structural difference*** between arteries and veins.

Difference _____

Blood is a liquid tissue. The diagram shows blood viewed through a microscope.

(*i*) Name **any two** components of blood shown in the diagram. (6)

Component 1 _____

Component 2 _____

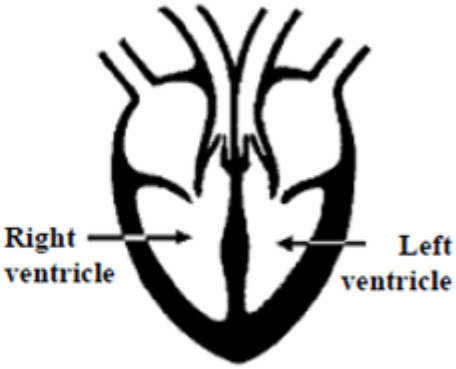
(*ii*) Give the ***function*** of **each** of the components of blood you have named. (6)

Function of 1 _____

Function of 2 _____

(*iii*) The diagram shows the human heart.

Why has the left ventricle got a ***thicker wall*** than the right ventricle? (3)



_____

_____

_____

(*c*) The diagram shows a person's ***pulse rate*** being taken.

(*i*) ***What*** causes a ***person's pulse***? (3)

_____

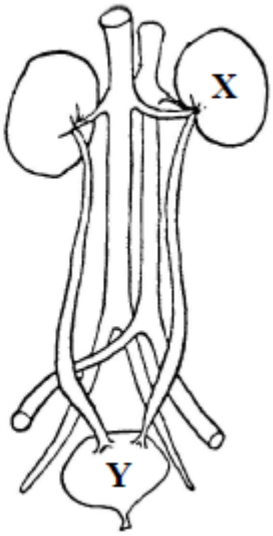
_____

(*ii*) ***How*** is a person's ***pulse rate measured*** using this method? (6)

(*iii*) An athlete's resting pulse rate is 58. After 10 minutes strenuous exercise their pulse rate was 120. After resting for 5 minutes their pulse rate reduced to 63. ***Clearly account for the rise and fall in pulse rate*** experienced by the athlete. (6)

Excretory System

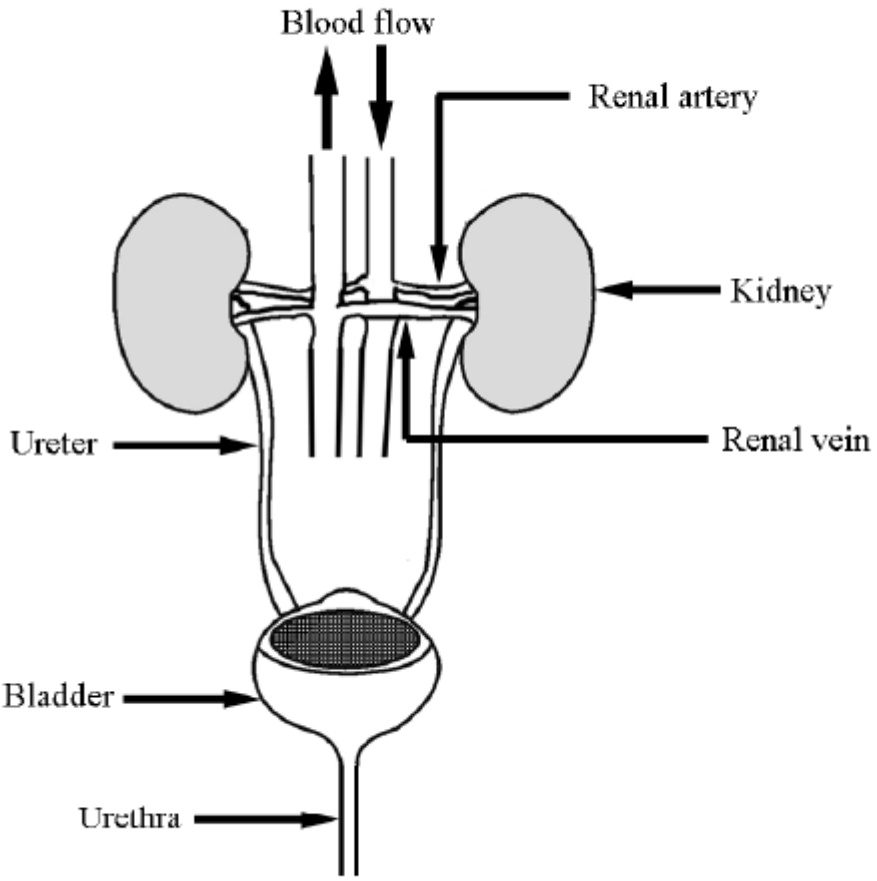
2014



(*i*) In the diagram of the human urinary system, state the function of the organ labelled **X**.

(*ii*) Name a product of excretion which is stored in the organ labelled **Y**.

The diagram is of the urinary system. Give the function of **five** of the six parts labelled. (15)



Renal artery _____

Kidney _____

Renal vein _____

Ureter _____

Bladder _____

Urethra _____

2010

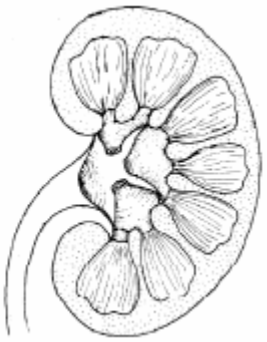
Name **two *waste products*** that are excreted by our kidneys.

One _____

Two _____

2009

(*i*) Name the ***organ*** shown in the diagram.



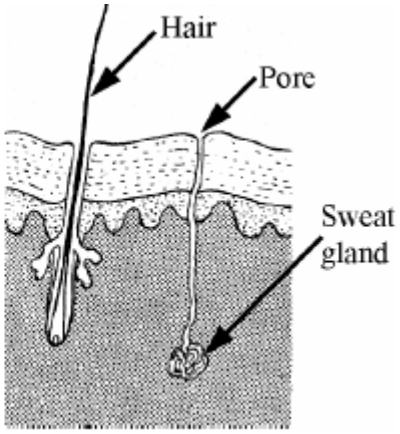
Name _____

(*ii*) Give the ***function*** of the organ shown.

Function _____

2007

The diagram shows some of the structures in human skin. The skin has many functions. One of them is excretion. Skin excretes sweat. Name **two *substances*** excreted in sweat.

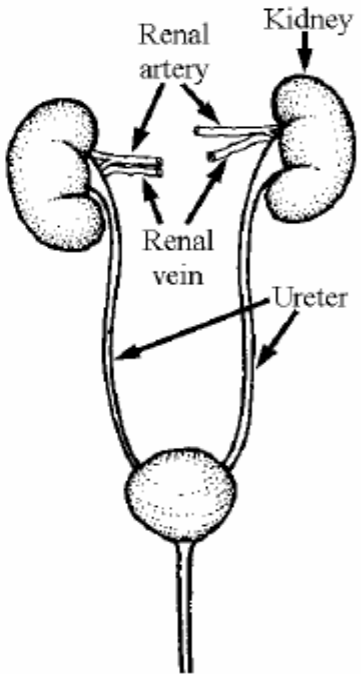


Substance 1 _____

Substance 2 _____

2008

The diagram shows the *human urinary system*.



(*i*) How does the ***composition of the blood*** in the ***renal arteries differ*** from the composition of the blood in ***the renal veins***. Make reference ***waste products*** in your answer. (6)

_____

_____

_____

_____

(*ii*) Account for this ***difference in the composition*** of the blood entering and leaving the kidneys. (6)

_____

_____

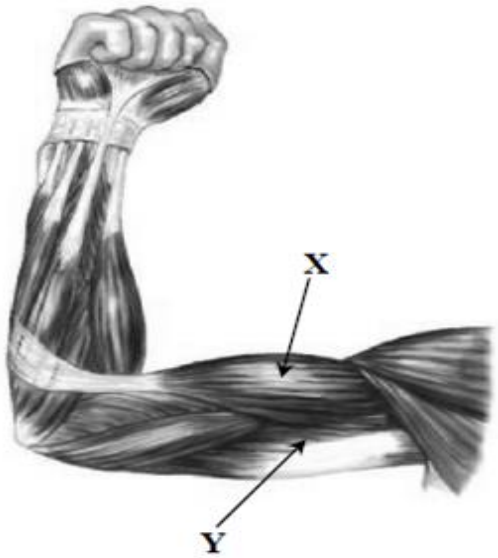
(*iii*) What is the ***function*** of the ureters? (6)

_____

Skeletal and Muscular System

2014

Important parts of the human arm include muscles, bones, ligaments, tendons and joints. (24)



(*i*) Name the two major bones found in the lower part of the human arm, i.e. between the elbow and the wrist.

Bone 1 _____

Bone 2 _____

(*ii*) The muscles labelled **X** and **Y** in the diagram form an antagonistic pair of muscles, which work together to move the lower arm up and down.

With reference to these muscles, explain how the lower arm is raised.

_____

_____

With reference to these muscles, explain how the lower arm is lowered.

_____

_____

(*iii*) Distinguish between ligaments and tendons.

_____

_____

_____

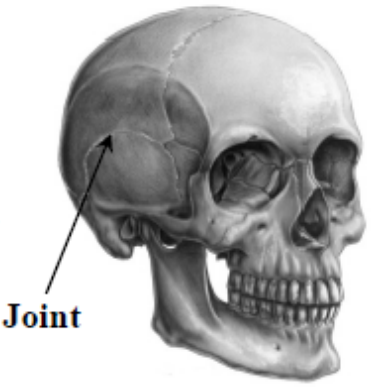
_____

(*iv*) Name the type of joint that is located at the human elbow.

_____

(*v*) Name the type of joint that is indicated on the diagram of the human skull.

_____



2013

Muscles can only cause movement by getting shorter (contracting).

(*i*) How many muscles are needed to move a bone forward and back in a joint?

How many? _____

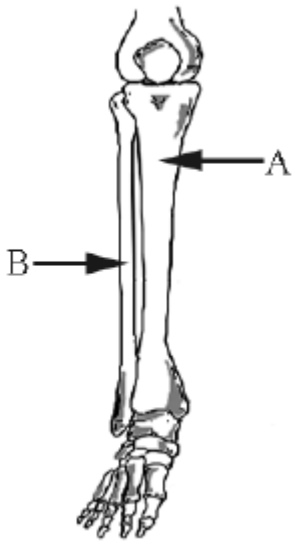
(*ii*) Give an example.

Example _____

Name bone A and bone B of the lower leg.

Bone A _____

Bone B _____



2012

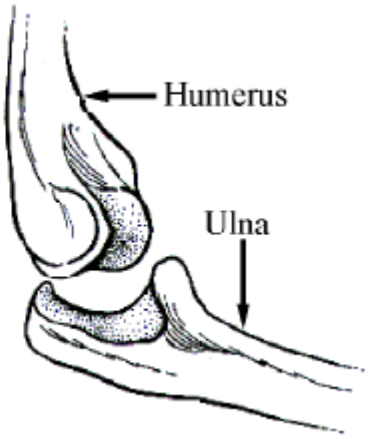
Name the **type** of joint shown in the diagram.

Name _____

Describe the movements that this type of joint can make.

Describe _____

_____



_____

Explain how muscles cause the movements of this joint.

Explain _____

_____

_____

2010

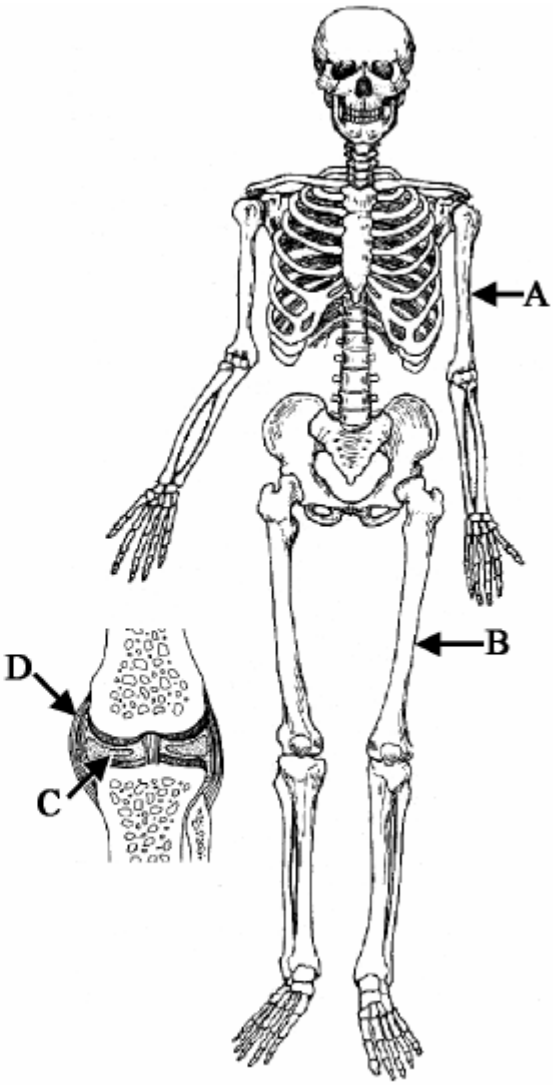
Name **two *organs*** that the human skull protects.

One _____

Two _____

2009

The diagram shows a human skeleton with a detailed drawing of the structure of the knee joint. The kneecap is not shown.



(*i*) Name the ***bones*** labelled **A** and **B**. (6)

Bone **A** _____

Bone **B** _____

(*ii*) What ***type of joint*** is the knee? (3)

Type _____

C is synovial fluid. **D** is a ligament.

(*iii*) Give the ***functions*** of the parts labelled **C** and **D** in the knee. (6)

C _____

_____

D _____

(*iv*) Explain the ***action of antagonistic pairs of muscles*** in causing the ***movement*** of limbs. You may use a labelled diagram in your answer if you wish. (6)

_____

_____

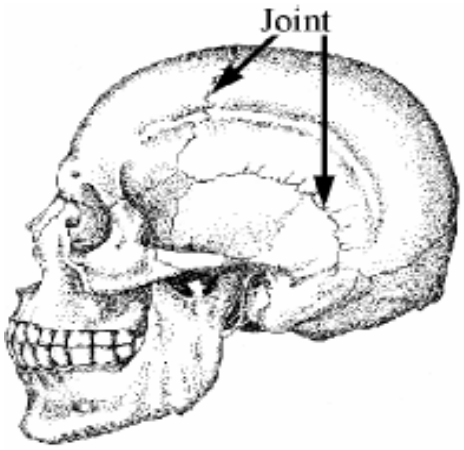
_____

_____

_____

2007

Different types of joints hold together the bones of our skeleton. Name the ***type of joint*** labelled in the diagram of the human skull.



Name _____

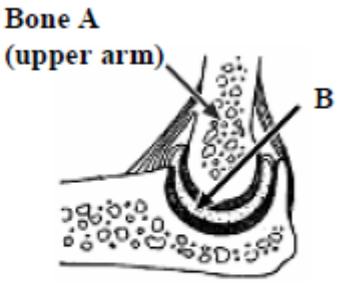
How does this type of joint ***differ*** from other types of joints found in our bodies?

Difference _____

2006

The diagram shows the structure of an elbow.

Name ***bone*** **A** and identify the ***type*** of moveable ***joint*** **B.**

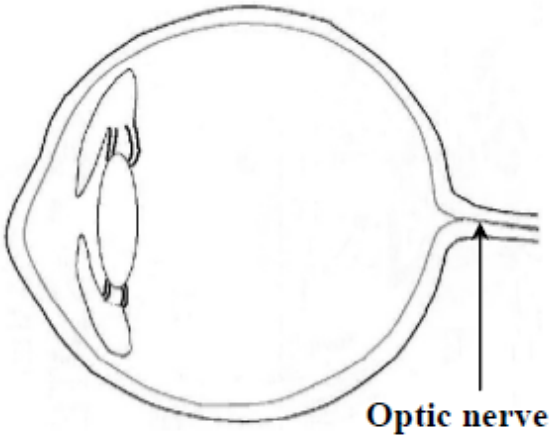


Name of bone A _____

Type of joint B _____

2014

The diagram is of the human eye. (15)



(*i*) Mark on the diagram the locations of the ciliary muscle.

(*ii*) Explain how the ciliary muscle works to help eyesight.

_____

_____

_____

(*iii*) Describe the function of the pupil.

_____

_____

(*iv*) The optic nerve, labelled on the diagram, carries information from the eye to the brain.

Is the optic nerve an example of a sensory nerve or a motor nerve?

_____

2013

Nerves can carry messages in one direction only.

Clearly distinguish between sensory and motor nerves.

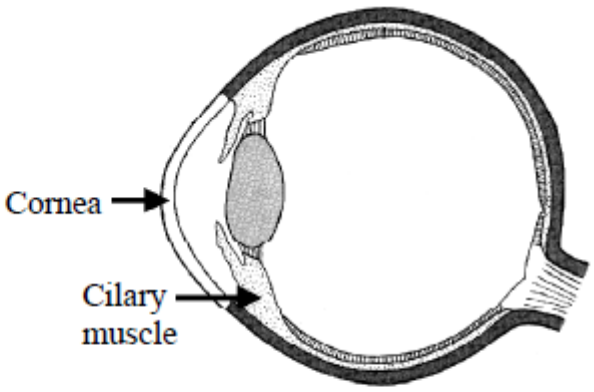
Distinction _____

_____

2011

The diagram shows the human eye.

Give the functions of the cornea and of the cilary muscle.



Function of cornea _____

_____

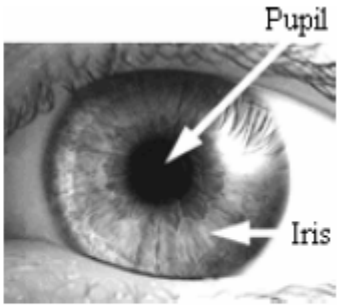
Function of cilary muscle _____

_____

_____

2008

Give the ***function*** of (*i*) the iris (*ii*) the pupil.



(*i*) _____

(*ii*) _____

The pupil is transparent. Why does the ***pupil appear to be black*** in most situations? (Note: the pupil may appear red in photographs taken in the dark using a flash).

Why…black? _____

2007

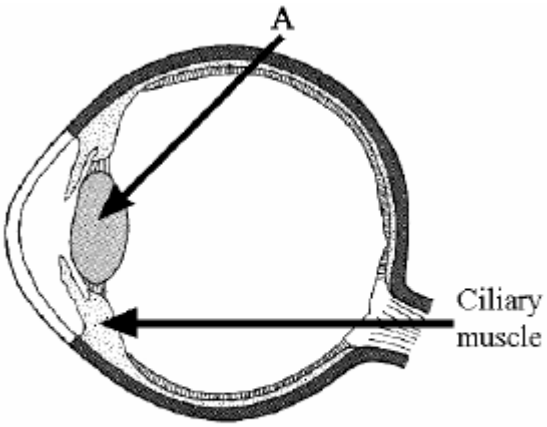
Nerves carry electrical messages around our bodies. Nerves have motor functions and sensory functions. Explain the ***underlined terms***.

Motor function _____

_____

Sensory function _____

The diagram is of the human eye.
Name the ***part*** labelled **A**.



A _____

What ***function*** has the ciliary muscle?

Function _____ _____

Reproductive System and Genetics

2014

The genetic information of an organism is contained in chromosomes that are located in the nucleus of every cell of the organism.

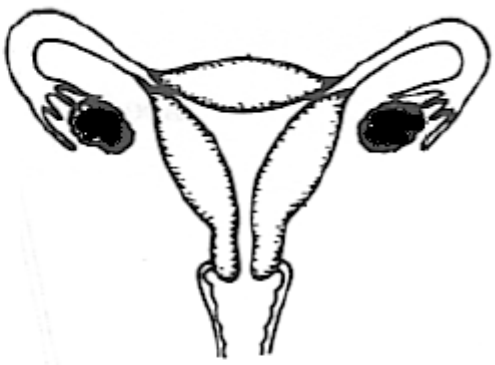
(*i*) How many <u>pairs</u> of chromosomes are in most human cells?

_____

(*ii*) What are the major chemical components of chromosomes?

_____

The diagram is of the human female reproductive system.



(*i*) Mark with the letter **A** the place where <u>fertilisation</u> most commonly occurs.

(*ii*) Mark with the letter **B** the place where successful <u>implantation</u> of the zygote occurs.

(*iii*) Explain how one named form of contraception prevents conception.

Named form of contraception _____

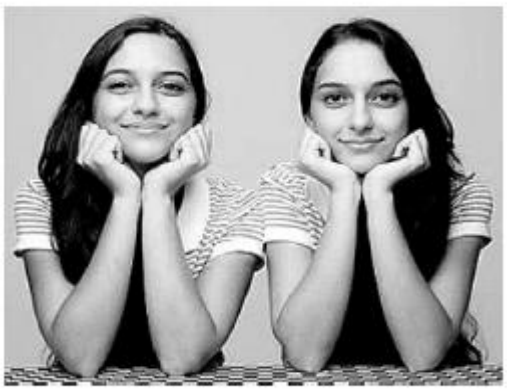
Explanation _____

_____

_____

2013

The twins in the photo are described as identical. What does this tell us about their genetic makeup?

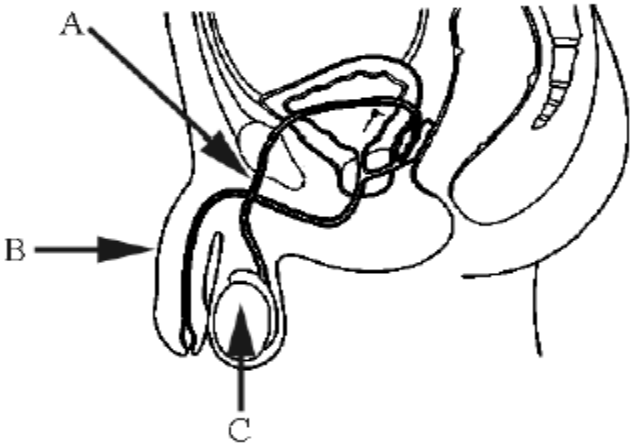


What? _____

_____

_____

The diagram is of the male reproductive system.



Give the role played by each of parts labelled A, B and C in reproduction.

Role of A _____

_____

Role of B _____

_____

Role of C _____

A sperm has a head and a tail. State the role of each.

Head _____

Tail _____

2012

What is contraception?

What? _____

_____

Name one form of contraception.

Name _____

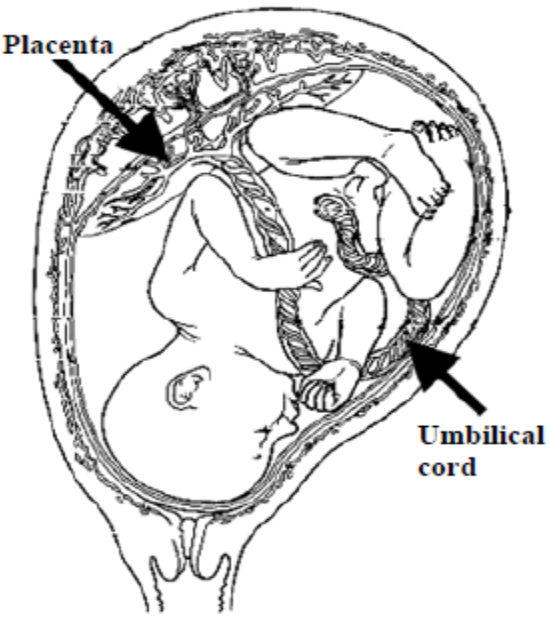
Name the two substances that chromosomes are made of.

Substance one _____

Substance two _____

2011

The diagram shows a baby in the womb. The placenta and umbilical cord are labelled.



(*i*) Give **two** functions of the placenta. (6)

1 _____

_____

_____

_____

_____

2 _____

_____

(*iii*) Describe, briefly, **four** events that occur at the end of pregnancy (i.e. just before birth, at birth and just after birth). (12)

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

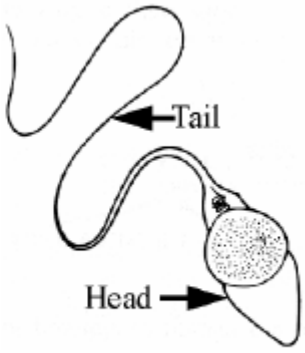
2010

Name the **two *principal substances*** that chromosomes are composed of.

One _____ Two _____

2009

The diagram shows a sperm. The tail enables the sperm to swim.



(*i*) Why does the sperm need to be able to swim?

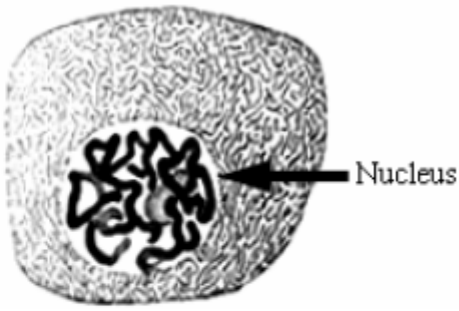
Why? _____

(*ii*) Where does fertilisation occur?

Where? _____

2008

At certain stages in the life of a cell ***thread-like structures*** that contain genes can be seen in the nucleus.
What are these thread-like structures called?

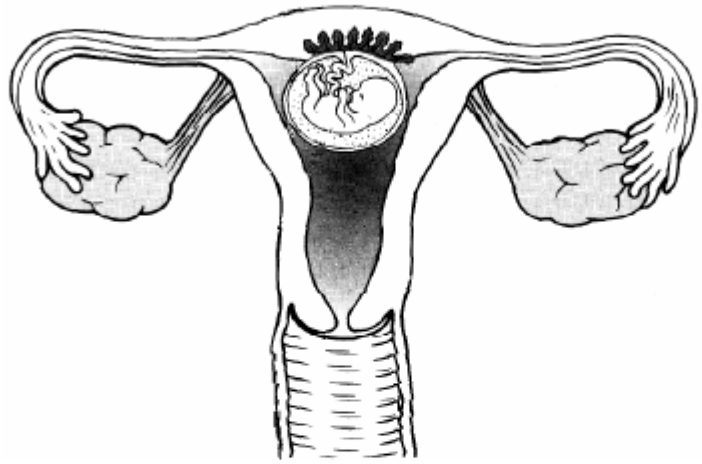


What? _____

Genes are located on these thread-like structures. Give a ***role*** that genes play in life processes.

Role _____

The diagram shows a *human female's reproductive system with an eight week embryo (foetus)* which is clearly recognisable as human. The organs of the foetus are formed and will grow and mature for the next seven months.



(*i*) Mark clearly on the diagram, **using an arrow and the label *S*, *where the semen*** (liquid containing sperm) ***was released*** into the female. (3)

(*ii*) Mark clearly on the diagram, **using an arrow and the label *F*, *where fertilization*** took place. (3)

(*iii*) Explain the term ***fertilisation***. (6)

_____

(*iv*) State **two *events*** that occur ***in the hours before birth*** and **one *event*** that takes place shortly ***after the baby is born***. (9)

Before

1 _____

2 _____

After

1 _____

2007

The photograph is of James Dewey Watson who together with Francis Crick published the molecular structure of DNA in 1953.
Where is DNA ***located*** in cells?

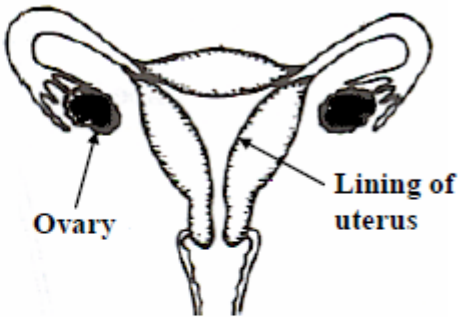
Location _____

Name a second ***substance*** associated with DNA.

Second substance _____

2006

The diagram shows the female reproductive system during the ***fertile period*** of the menstrual cycle. What happens in the ovary during this time? What happens to the lining of the uterus during this time?



What happens in the ovary? _____

_____

What happens to the lining of the uterus? _____

_____

Eye colour, hair texture and many other human characteristics are controlled by ***genes***. Name the ***structures*** in the ***nuclei*** of our cells where ***genes*** are located. Name the ***substance*** that genes are made of.

Name of structures _____

Name of substance _____

2014

In the diagram, a plastic bag is placed around the stem of a plant. After some time, droplets of water are seen on the inside of the plastic bag. (15)

(*i*) Describe how the droplets could be tested to show that they contain water.

_____

_____

_____

(*ii*) Explain why the plastic bag is tied around the stem of the plant, rather than placed over both the plant and the pot.

_____

_____

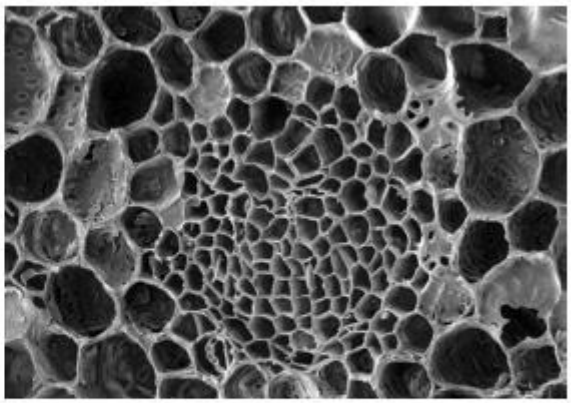
(*iii*) What name is given to the movement of water through a plant and the evaporation of water from its leaves? _____

(*iv*) What type of tissue does the plant use for the transport of water?

_____

2012

The photograph, made by a scanning electron microscope, shows two types of plant vascular tissue, **xylem** and **phloem**.
Give the function of each tissue.



Xylem _____

_____

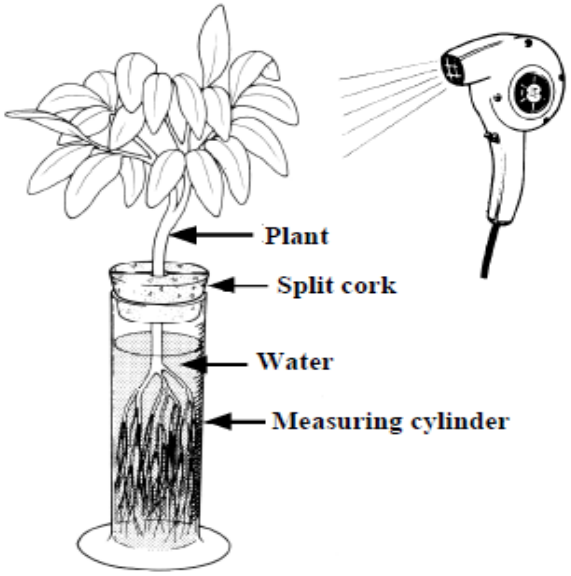
Phloem _____

Water vapour leaves plants through pores in their leaves into the atmosphere.

(*i*) What is this loss of water by plants called? (3)

_____

A pupil did an experiment to investigate this loss of water by plants.
The apparatus that she used is shown in the diagram.
The rate at which the water level fell (water loss) in the measuring cylinder was measured at regular time intervals, first for a plant without the hair dryer (normal plant) and then for a plant with a hair dryer blowing warm air over the leaves (blown plant).



The pupil used the data obtained to draw the graph below.

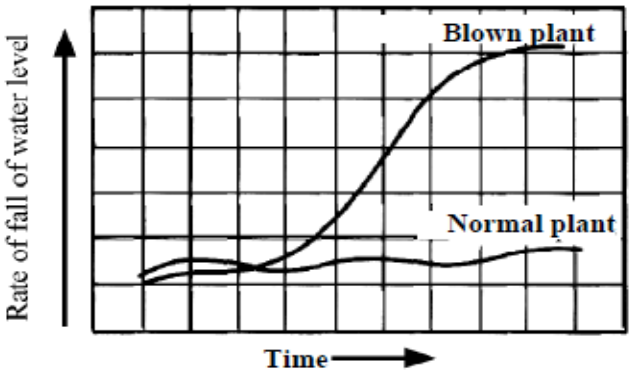
(*ii*) Examine the graph and comment on the rate of water loss by the 'normal plant'. (3)

_____

_____

_____

_____



(*iii*) Examine the graph and comment on the rate of water loss by the 'blown plant'. (3)

_____

_____

(*iv*) What **two factors** were different for the 'blown plant'? (6)

1 _____

2 _____

(*v*) Name the tissue that transports water up the plant from roots to leaves. (3)

_____

2009

Name ***two processes*** that the ***leaves*** of ***green plants*** carry out.

(*i*) _____

(*ii*) _____

2008

Phloem and xylem are plant transport tissues. Name a ***substance***, other than water, that is transported in (*i*) phloem (*ii*) xylem.

(*i*) phloem _____

(*ii*) xylem _____

2006

Water vapour evaporates from cells in the leaves of plants and exits the leaves by way of tiny pores in their leaves. What is this ***process*** called? How would you ***test*** the drops of liquid inside the plastic bag covering the shoot of the plant shown in the diagram to ***show that the drops are water***?

Name of process _____

Test for water _____

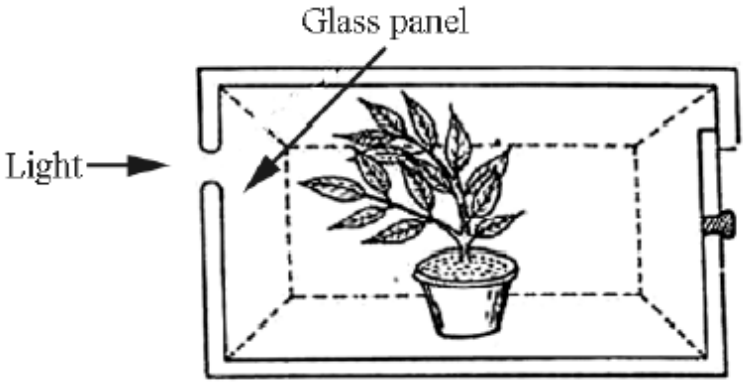
_____

2013

(*i*) What advantage does the plant get from bending towards the light?

What? _____

_____



(*ii*) Name this movement (growth response).

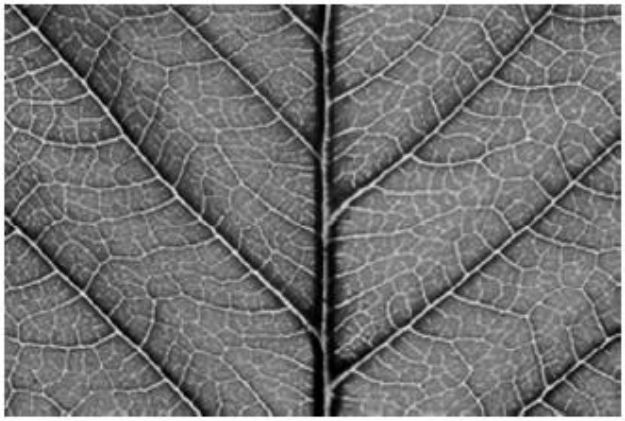
Name _____

Describe, using a word equation, how green plants make food from simple non-food substances.

Equation _____

2012

The photograph shows part of a leaf of a green plant.



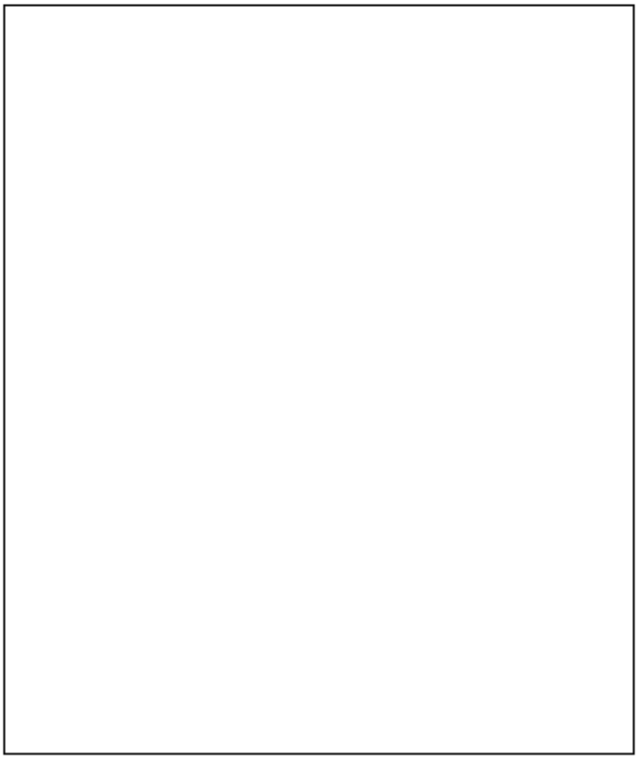
(*i*) Name a gas that moves into and a gas that moves out of a green leaf during active photosynthesis. (6)

Gas in _____

_____

Gas out _____

(*ii*) Outline an experiment to show that photosynthesis produces starch.
Use the box provided for an **optional** labelled diagram. (18)

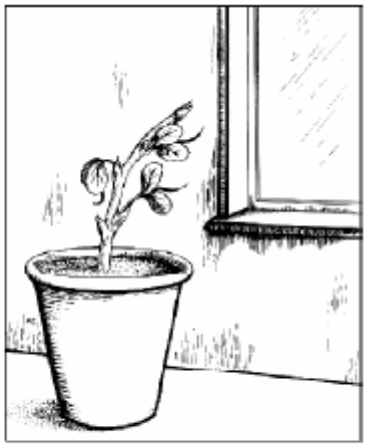


2011

Complete the word equation for photosynthesis.

carbon dioxide + _____ ⟶ _____ + oxygen

A plant in an otherwise dark room bends towards the light from a window.



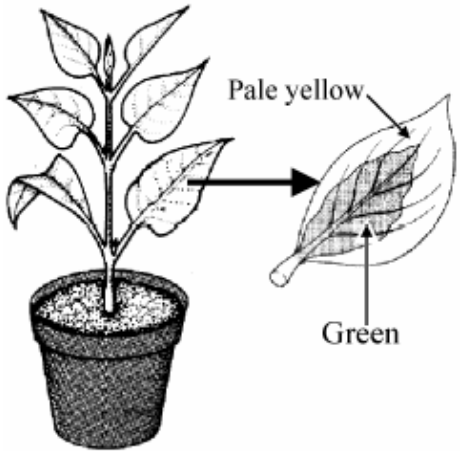
(*i*) What is the ***growth response*** of a ***plant to light*** called?

What? _____

(*ii*) What ***benefit*** does the plant get from this response?

What? _____

The diagram shows a plant with variegated leaves i.e. the leaves have areas with different colours. The leaves of this plant have a green centre with pale yellow margins. This plant was used in an experiment to investigate the production of starch by photosynthesis.



(*i*) Why was the plant left in darkness for a day at the start of the experiment? (3)

Why? _____

_____

(*ii*) The plant was then exposed to bright light for some hours after which a leaf was removed and boiled in water for a few minutes.
Why was the leaf boiled in water? (3)

Why? _____

(*iii*) Draw a labelled diagram, in the box, showing the apparatus and named liquid used to remove the green pigment from the leaf. (6)

(*iv*) The leaf was finally covered with a solution that turned the area which was previously green to blue-black while the leaf margins did not turn blue-black.
Name the solution used. (3)

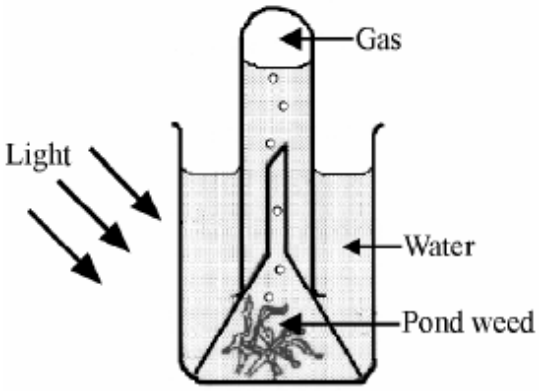
Name _____

(*v*) Suggest a reason why the leaf margins did not turn blue-black. (3)

Suggest _____

2007

Pondweed is a green plant that lives in water. In the presence of light pondweed undergoes photosynthesis and a gas is produced as one of the products. Name the ***gas*** produced. (3)



Name of gas _____

The pondweed, and all green plants, take in and use another gas, from their environment during photosynthesis. (3)

Name of gas used _____

How might the ***rate of production*** of bubbles, by the pondweed, be increased? (3)

How? _____

2006

The plant shown in the diagram was left in total darkness overnight and then exposed to strong sunlight for four hours. The ***leaf*** with the foil was removed from the plant and ***tested for starch***. Clearly state the ***result*** you would expect from this test? What conclusion can be drawn?

Result _____

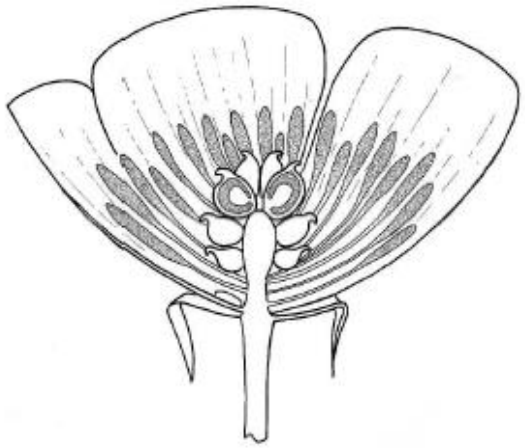
Conclusion _____

Plant Reproduction

2014

Sexual reproduction in a flowering plant, such as the buttercup, involves pollination, fertilisation, seed formation, seed dispersal and seed germination.

(*i*) The diagram below is of the flower of the buttercup plant.



Mark with the letter **X** the part of the flower where pollen is produced.
Mark with the letter **Y** the part of the flower where fertilisation occurs. (6)

(*ii*) The petals of the buttercup flower are usually coloured bright yellow.

Explain why having brightly coloured petals can assist sexual reproduction in some plants. (6)

_____

_____

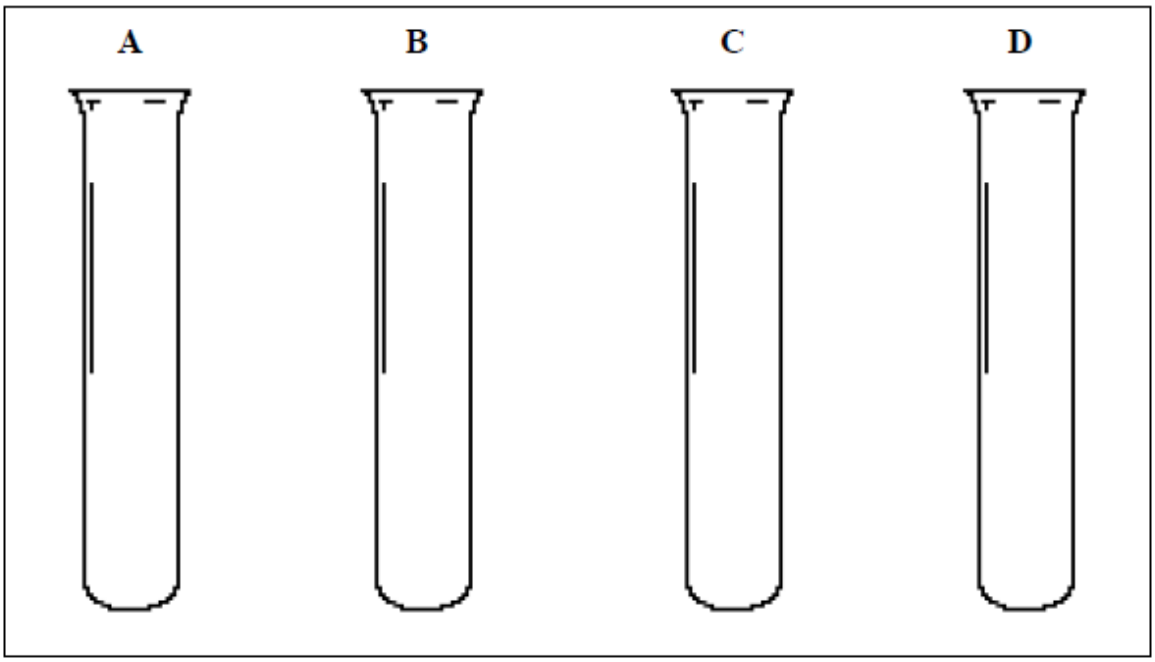
_____

(*iii*) In an experiment to investigate the conditions necessary for germination, a student placed some seeds on cotton wool in each of four test tubes, labelled **A**, **B**, **C** and **D**.

The student set up the test tubes so that in each test tube the seeds were exposed to different conditions.

After a period of time, the student noticed that only the seeds in test tube **D** had germinated.

Describe, with the aid of labelled diagrams, how the student might have set up each of the four test tubes. (12)



Asexual and sexual reproduction occur in plants. State how a named plant can reproduce asexually.

Name _____

How? _____

An insect feeds on a flower and picks up pollen. When the insect visits another flower of the same species it leaves some of the original pollen behind.

(*i*) Give a second way in which transfer of pollen between plants occurs. (3)

Give _____

(*ii*) Draw a labelled diagram of a suitable flower showing the stigma, style, ovary, anther and filament in the box provided. (15)

(*iii*) Name the part of the flower that produces the male gamete. (3)

Name _____

(*iv*) Name the part of the flower that produces the female gamete. (3)

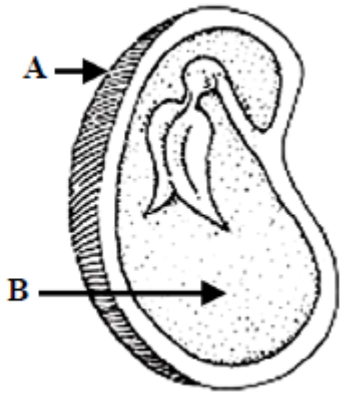
Name _____

(*v*) What follows fertilisation in flowering plants? (3)

What? _____

2011

The diagram is of a section through a seed showing its structure.



Name the parts labelled **A** and **B** in the diagram.

Name of **A** _____

Name of **B** _____

2010

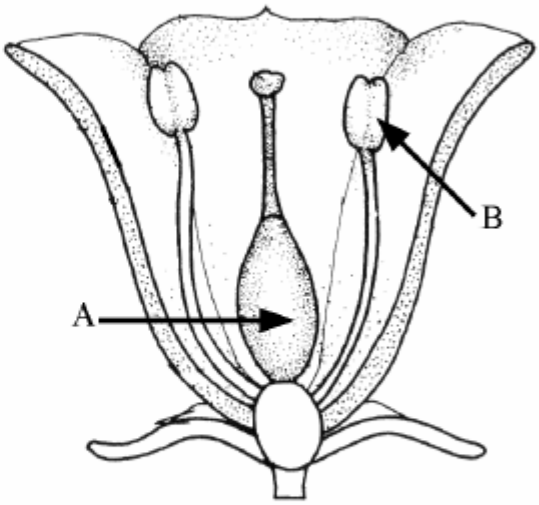
The female part of the flower is called the carpel and the male part is called the stamen. The diagram is a cross section through a flower.

(*i*) Name ***part*** A of the carpel and give its ***role*** in the sexual reproduction of plants. (6)

Name _____

Role _____

_____



(*ii*) Name ***part*** B of the stamen and give its ***role*** in the sexual reproduction of plants. (6)

Name _____

Role _____

_____

(*iii*) Give a ***way*** in which the pollen from the flower of one plant can be transferred to the flower of another plant. (3)

Give _____

(*iv*) Name the ***cell*** that is formed when a male gamete (sperm) and a female gamete (egg) combine. (3)

Name _____

(*v*) What does the ***cell*** formed by the fusion of the male and female gametes of a flowering plant ***grow and develop*** into? (3)

What? _____

2009

The child in the photograph is helping a dandelion to disperse its seeds.

(*i*) Why is ***seed dispersion*** important for plants?

Why? _____

_____

(*ii*) Give a ***second way***, excluding wind, by which ***plants disperse seeds***.

Give _____

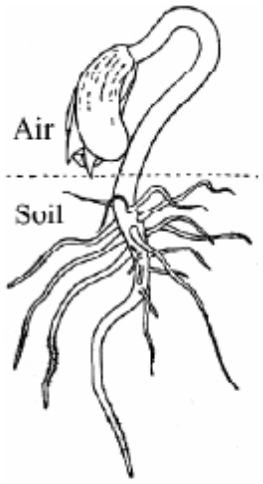
(*i*) Name a ***plant*** that can reproduce ***asexually***.

Name _____

(*ii*) Describe ***the way the plant*** that you have named ***reproduces asexually***.

Describe _____

The diagram shows a young seedling grown from a germinated seed.



(*i*) List **three** ***conditions necessary*** for seeds to germinate. (9)

Condition 1 _____

Condition 2 _____

Condition 3 _____

(*ii*) Describe, using labelled diagrams in the box provided, an investigation to show that any **two** of the ***conditions*** that you have given are required for seeds to germinate. The investigation must have a ***suitable control***. (12)

_____

_____

_____

_____

_____

2014

The picture shows a raven. The raven is classified as a vertebrate.

(*i*) Explain why the raven is classified as a vertebrate.

_____

_____

(*ii*) In ecological terms, is the raven classified as a producer, a consumer or a decomposer?

_____

2013

An ecosystem will have **producers**, **consumers** and **decomposers** present. Pick any two groups from the list and explain their role in the ecosystem.

Name of first group _____

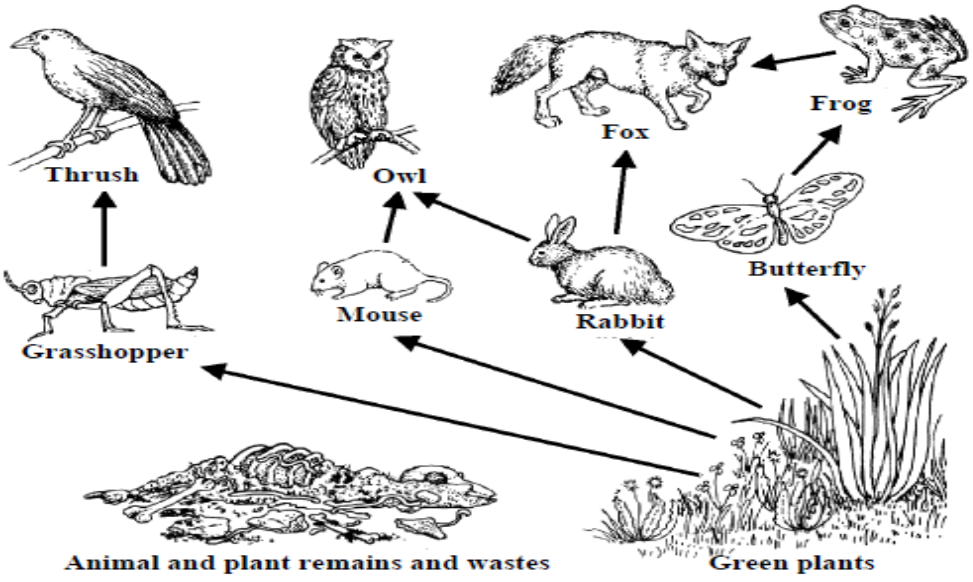
Role of first group _____

Name of second group _____

Role of second group _____

2011

The diagram shows a simplified food web from a mixed habitat.



Answer the following questions using only <u>items from the diagram</u> above in your answers. (21)

(*i*) Write a food chain with three members.

_____

(*ii*) Decomposers are not shown in the diagram.
What would decomposers feed on?

_____

(*iii*) Give **one** example of adaptation.

_____

(*iv*) Name **two** animals that might be in competition.

1 _____ **2** _____

(*v*) What is meant by the term interdependence?
Give an example of interdependence.

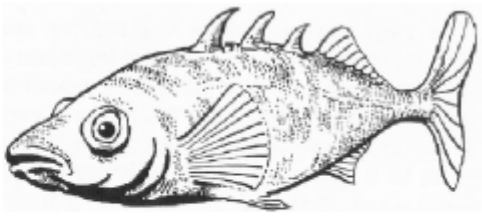
_____

_____

_____

2010

The diagram shows a stickleback, a small fish, that lives in our fresh water habitats. Give **two *adaptations*** that fish have to help them to live in water.



One _____

Two _____

The study of a habitat requires the use of sampling instruments, as it is not possible to count every individual organism living there.

The photograph shows a pupil and teacher using a quadrat. The quadrat is placed randomly in a number of sites in the habitat being studied.

(*i*) How is ***random sampling*** achieved when using a quadrat? (3)

How? _____

_____

_____

(*ii*) Give ***two different types of data collected*** (***two different tasks performed***) at each site in the habitat when using the quadrat. (6)

One _____

_____

Two _____

_____

Line transects are also used to sample habitats.

(*i*) What is a ***line transect***? (3)

What? _____

_____

(*ii*) Describe how to ***sample a habitat*** using a ***line transect***. (6)

_____

_____

_____

The photograph shows a pupil with a sweep net. The sweep net is used to collect small animals e.g. insects from vegetation in a habitat so that they can be identified.

(*i*) Name a ***second item*** of equipment ***used to collect small animals*** for identification. (3)

Name _____

(*ii*) Draw a ***labelled diagram***, in the box provided, ***of the item*** that you have named in (*i*) above. (6)

(*iii*) Describe how to ***use the item*** that you have named and drawn. (6)

_____

_____

_____

Give ***two reasons*** why the ***groups of organisms*** living together ***can vary*** greatly ***from one part of a habitat to another.*** (6)

One _____

_____

Two _____

_____

The diagram shows part of a *food web from a mixed habitat* with meadows, streams and hedges.

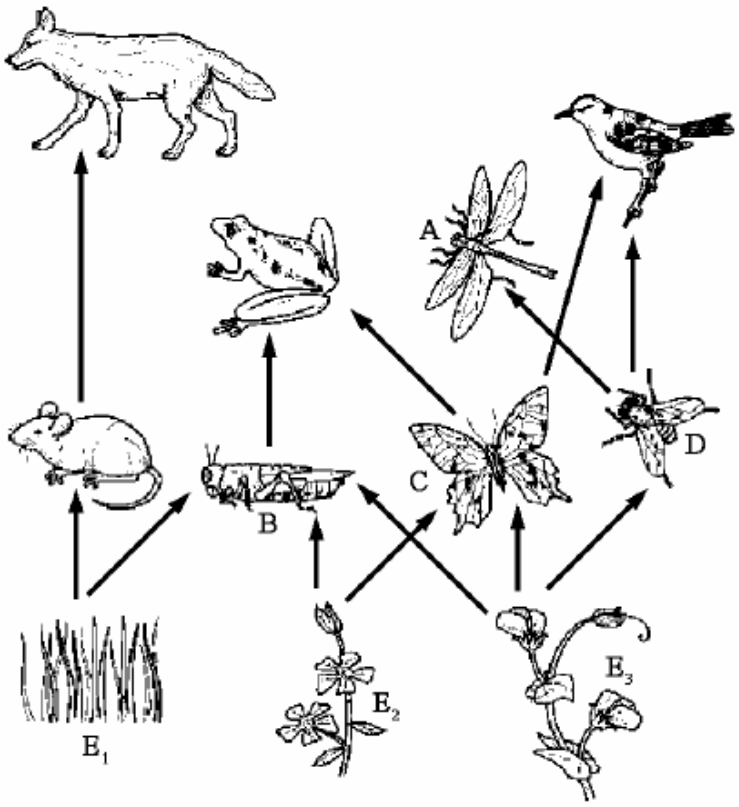
A is a dragonfly

B is a grasshopper

C is a butterfly

D is a house fly

E_1, **E_2** and **E_3** are plants.



(*i*) Write down a ***food chain*** from the food web shown. (6)

_____

(*ii*) Select an ***organism*** from this habitat *or* name another organism from a habitat you have studied and state **one** ***adaptation*** that the organism has that makes it suited to its habitat. (3)

Organism _____ **Adaptation** _____

_____

(*iii*) What is meant by ***competition*** in a habitat? (3)

_____

_____

(*iv*) Give an example of ***interdependence*** from the food web shown. (6)

_____

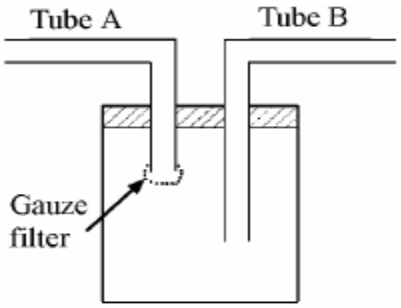
_____

2007

The diagram shows a pooter. It is used, when studying a habitat to collect small animals e.g. insects, for identification. Describe ***how to use a pooter***. _____

_____

_____



2006

Decomposers are living things that release useful materials, from the waste products of plants and animals and from dead plants and animals, for reuse by living organisms. Name **two *kinds of decomposers*** found in the ***soil***.

Names _____

Conservation, Pollution and Waste Management

2013

In 1800 the population of the earth was about one billion people. Two hundred years later the human population on earth is more than seven billion people. Humans have both positive and negative impacts on the environment.

(*i*) Identify two areas of human activity that have affected the environment negatively.

1 _____ 2 _____

Explain how one of the areas you have identified has a negative impact. (9)

_____

(*ii*) Identify two areas of human activity that have affected the environment positively.

1 _____ 2 _____

Explain how one of the areas you have identified has a positive impact. (9)

_____

2012

The cartoon represents global warming.
How can human activity give rise to global warming?

How ? _____

_____

Give one effect of global warming.

Give _____

2011

Four methods of waste management are: **composting**, **incineration**, **landfill** and **recycling**.

(*i*) Pick **two** from the list and state how each works. The name of the selected method must be given with each.

First name _____

How it works _____

_____

Second name _____

How it works _____

_____

(*ii*) Give **one** advantage and **one** disadvantage of a named method.

Method _____ Advantage _____

Disadvantage _____

2008

The photograph of 'spaceship earth' was taken by a member of the crew of Apollo 17.
Give **two *ways*** in which we can care for our planet.

1 _____

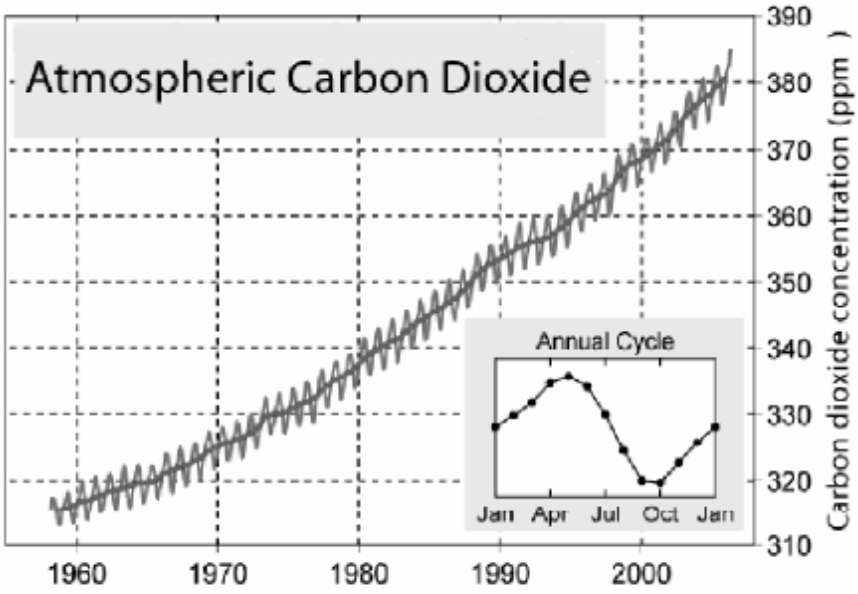
_____

2 _____

_____

2007

The increase in carbon dioxide concentration in the Earth's atmosphere is currently causing concern. The ***use of fossil fuels*** and ***deforestation*** have been identified as major contributors to this increase in carbon dioxide concentration. The graph shows a continual increase in the carbon dioxide concentration for the last fifty years. The data was collected at a site in Europe.



(*i*) Explain how ***either*** the **use of fossil fuels** *or* **deforestation** could have contributed to the increase in atmospheric carbon dioxide. (3)

Explain _____

_____

(*ii*) Suggest **one** possible ***effect*** of continued increase in carbon dioxide concentration in the Earth's atmosphere. (3)

Effect _____

Though there is an overall increase in carbon dioxide concentration there is an annual ***rise and fall*** in carbon dioxide concentration as shown in the box in the diagram.

(*iii*) Suggest **one** ***reason*** why the carbon dioxide concentration decreases between April and October each year. (3)

Reason _____

(*iv*) How could the reason that you have given in (*iii*) be used in a ***practical way*** to slow down and even reverse the overall increase in carbon dioxide levels in the atmosphere? (6)

How? _____

2006

Waste management includes: composting, incineration, landfill and recycling. Pick **one** of the underlined methods of managing waste and say ***how it works*** and give one advantage ***or*** disadvantage of using the method that you have selected.

How it works _____

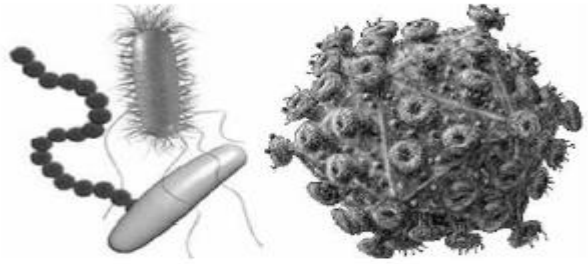
_____

Advantage/Disadvantage _____

_____

2014

Both bacteria and viruses can cause illness in humans and other animals.



(*i*) Name one illness caused by bacteria.

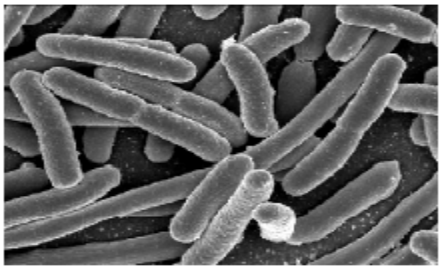
_____

(*ii*) Name one illness caused by viruses.

_____

2010

The image shown was produced using a scanning electron microscope. It shows the bacteria Escherichia Coli.



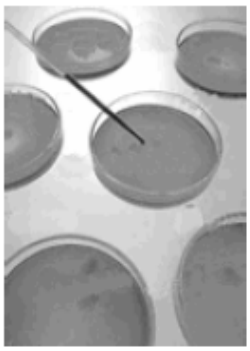
Give **one *beneficial*** and **one *harmful effect*** of bacteria.

Beneficial _____

Harmful _____

2009

The photograph shows petri dishes containing agar being exposed to the air for 5 to10 minutes before being covered. One petri dish containing agar was left covered. All of the dishes were kept warm for some days and inspected daily.



(*i*) What is the ***function*** of the agar?

What? _____

(*ii*) Why was ***one petri dish left covered***?

Why? _____

(*iii*) Describe and explain the ***appearance of the agar*** in the ***exposed dishes*** after some time passed.

Describe _____

Explain _____

2008

The photograph shows Amanita Phalloides, a poisonous fungus, whose common name is *'Death Cap'*. Fungi are decomposers.
Explain the ***underlined term***.

_____

_____

_____

2007

The photograph shows a stage in the industrial production of cheese. This is an example of the use of biotechnology in industry.
Give **two** other ***examples*** of the use of biotechnology in industry or medicine.

1 _____

2 _____

Chemistry

Materials

2013

Matter occurs in different states.

(*i*) Name a state of matter that has no fixed shape.

Name _____

(*ii*) Name a state of matter that has no fixed volume.

Name _____

2009

There are three states of matter: solid, liquid and gas.

(*i*) Give ***one property*** that liquids and gases ***have in common***.

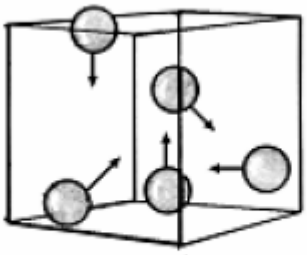
Give _____

(*ii*) Give ***one property*** in which liquids and gases ***differ***.

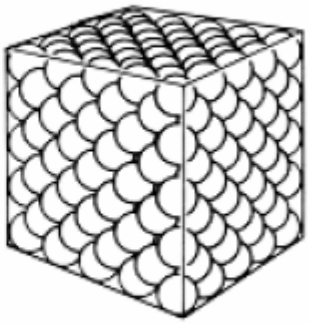
Give _____

2006

Study the diagram carefully. It ***shows the ways that the particles of gases and solids occupy space***.



Particles of a gas



Particles of a solid

The particles of ***gas*** have ***lots of space*** and ***move randomly*** at high speeds in three dimensions and ***collide*** with each other and with their container. The arrows represent the velocities of the gas particles.
The particles of a ***solid*** are ***packed closely together*** and ***cannot move around*** but they can ***vibrate***.

Give **one *property of a gas*** and **one *property of a solid***, that you have observed, and is consistent with (matches) this micro-view of these states of matter. (6)

One property of a gas _____

One property of a solid _____

2013

(*i*) Distinguish between an element and a compound. (6)

Element _____

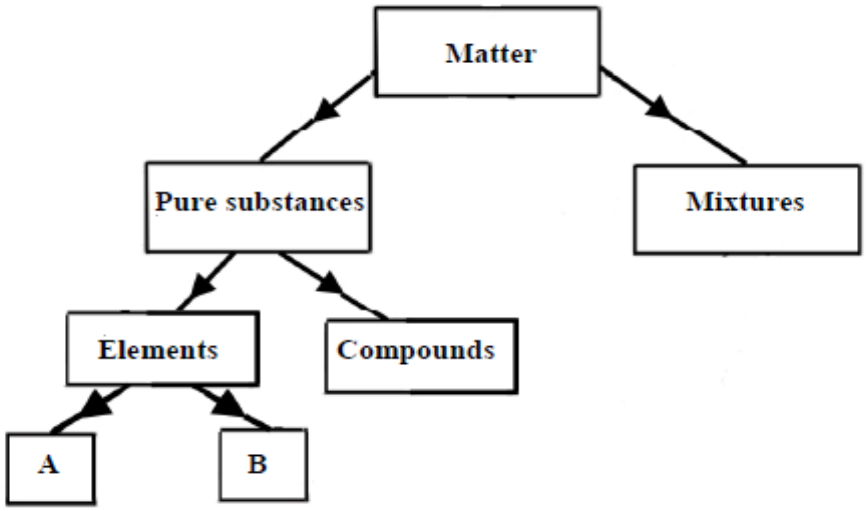
Compound _____

(*ii*) Iron and sulfur react to produce iron sulfide.
Complete the table below. (9)

Property	Iron	Sulfur	Iron sulfide
Colour			
Attracted by magnet			

2011

Matter is the 'stuff' that all things are made of, including us.
The diagram shows how some types of matter are classified.
The diagram is not complete.



(*i*) Distinguish between elements and compounds. (6)

_____

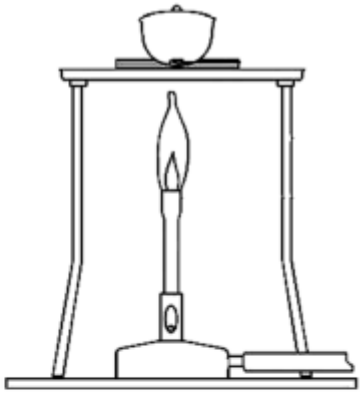
_____

(*ii*) Elements are often divided into two sub-groups.
Name these two sub-groups. (6)

_____ & _____

The apparatus shown in the diagram was used to strongly heat 2.4 g of magnesium in a crucible. The lid of the crucible was lifted a little during the heating.

A white powder, with a mass of 4.0 g, was produced.



(*i*) Why was there an increase in mass? (3)

_____

_____

(*ii*) Where did the extra mass come from? (3)

_____

(*iii*) Give the name or formula of the white powder. (3)

_____

2010

Give **two *different properties*** of the element magnesium compared to the compound magnesium oxide.

One _____

Two _____

2007

The photograph is of Maire Curie (1867-1934). She showed the existence of the element radium and she produced 0.1 g of the compound radium chloride in 1902 by processing tons of pitchblende ore obtained from mines in Bohemia.

Explain the underlined terms. (12)

Element _____

_____

_____

_____

Compound _____

_____

_____

Solutions

2014

In the school laboratory, a student made up a hot saturated solution of copper sulfate.

(*i*) What is a saturated solution? _____

_____

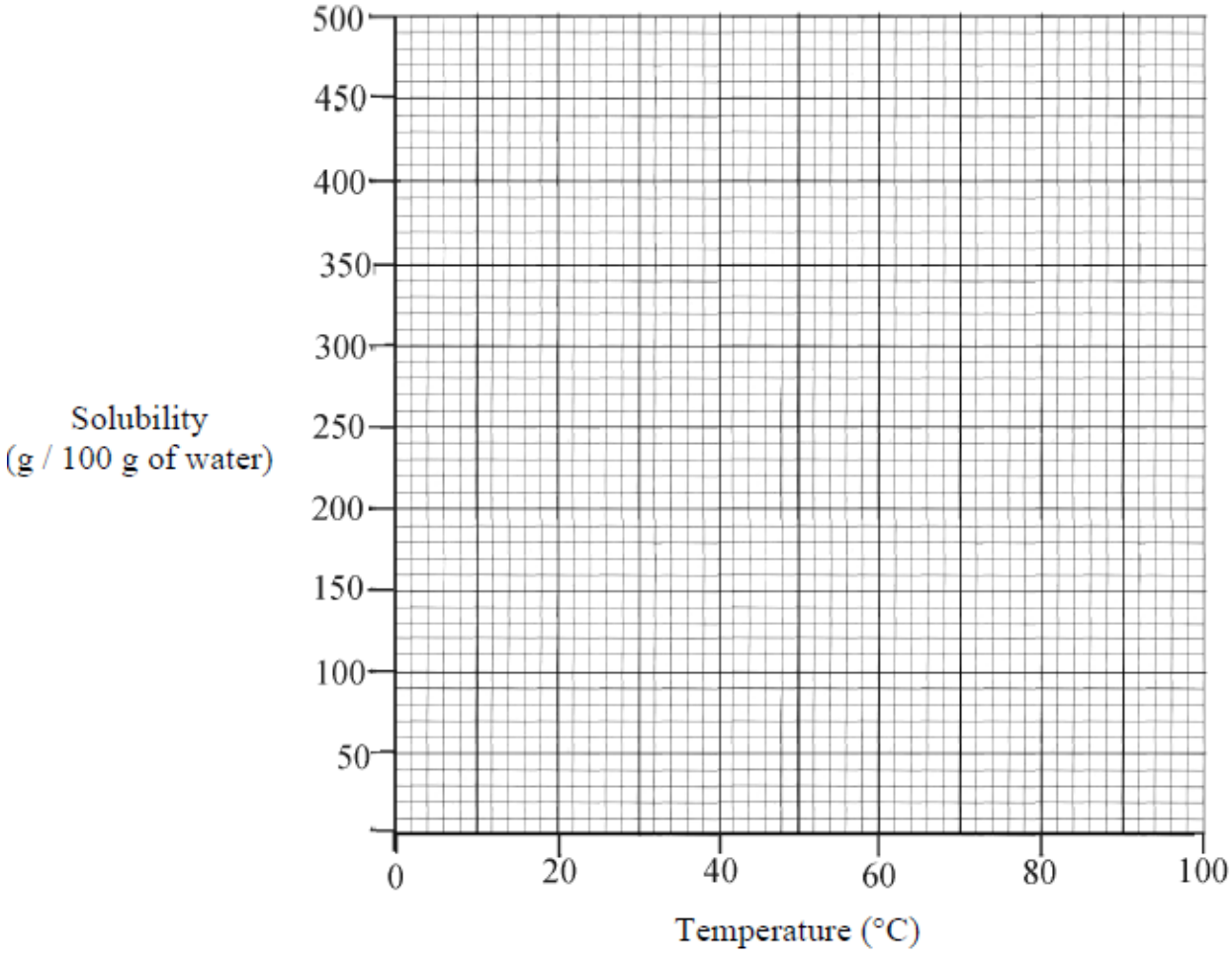
(*ii*) What would the student observe if this solution was cooled down slowly?

_____

A science student investigated the solubility of two common substances, sugar and salt, in water for a range of temperatures. The data for sugar are given in the table. Salt maintained a constant solubility of 40 g / 100 g of water for the temperature range investigated, 0 °C to 100 °C.

Sugar (g / 100 g of water)	175	200	240	290	370	480
Temperature (°C)	0	20	40	60	80	100

(*i*) Draw a graph of the effect of temperature on the solubility of sugar in the grid below. (9)



(*ii*) Use the graph to estimate the increase in the solubility of sugar if the temperature of the solution is raised from 50 °C to 70 °C. (9)

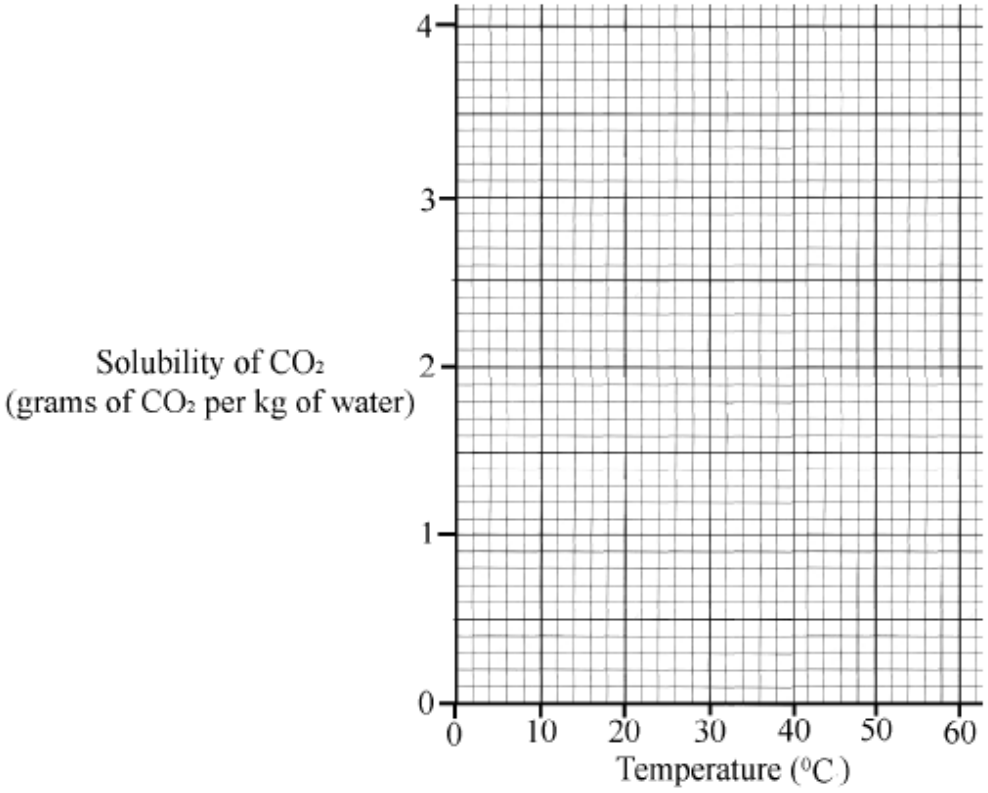
_____

(*iii*) Using the same grid, draw a graph of the effect of temperature on the solubility of salt. (3)

An experiment was performed to investigate the effect of temperature on the solubility of carbon dioxide in water. The data obtained from this experiment is given in the table below.

Solubility of CO_2 (grams of CO_2 per kg of water)	3.4	2.5	1.7	1.4	1.0	0.8	0.6
Temperature (°C)	0	10	20	30	40	50	60

(*i*) Draw a graph of solubility against temperature in the grid below using the data from the table. A smooth curve is required. (9)



(*ii*) Usually the solubility of a solid increases with increasing temperature. The solubility of a gas decreases as the temperature increases. Suggest a reason why this decrease happens. (3)

Suggest _____

_____

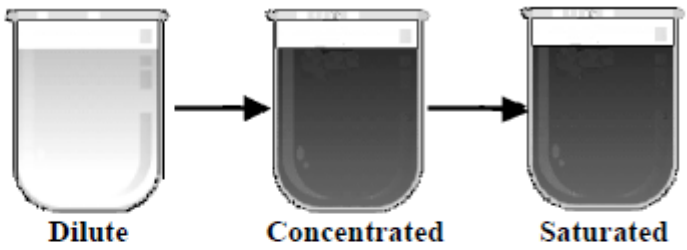
_____

(*iii*) From the graph estimate the temperature at which the solubility of CO_2 is 2 g per kg of water. (3)

_____

2011

The diagram shows three solutions of copper sulfate.



Starting with a dilute solution state how to make it more concentrated.

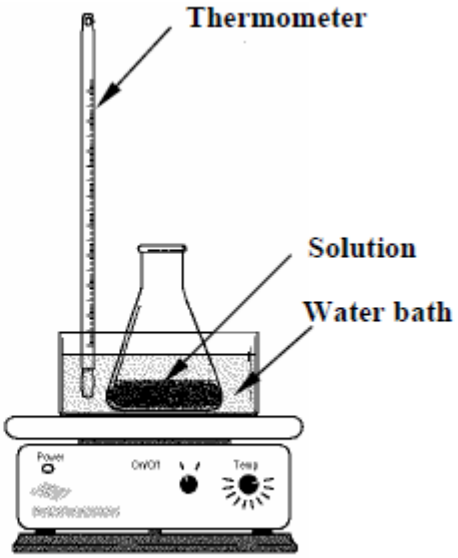
State _____

How do you know when a saturated solution has been produced?

How? _____

2010

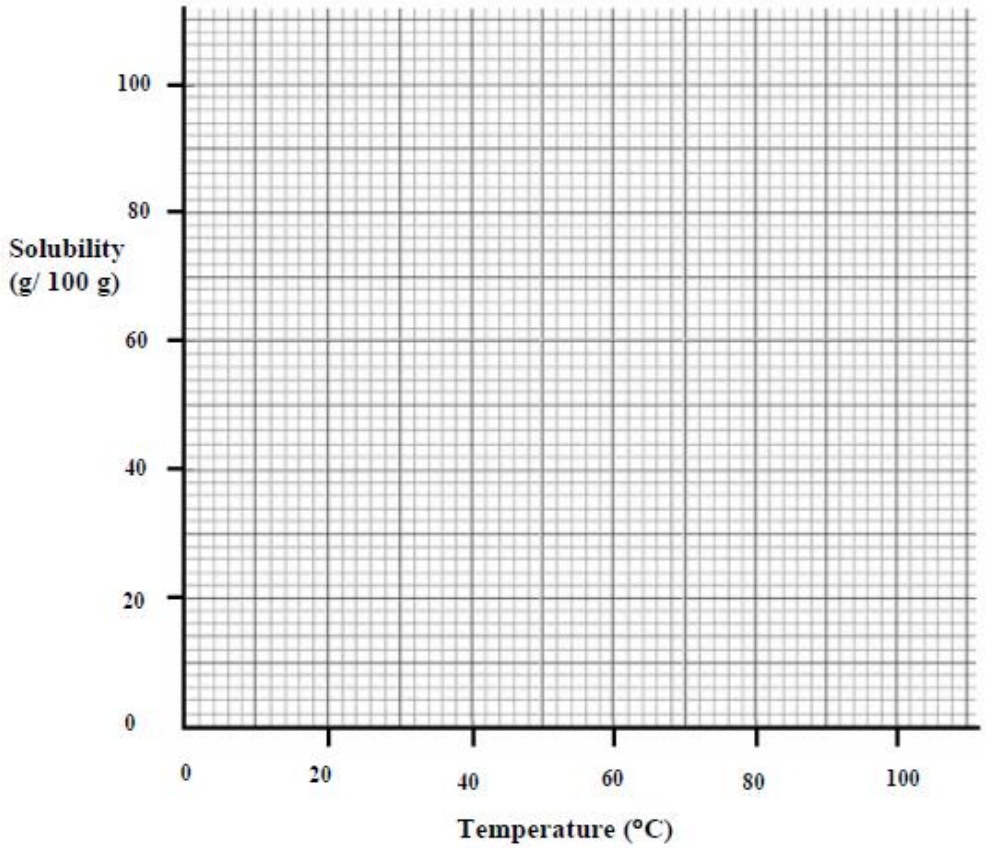
A pupil used the apparatus shown in the diagram to quantitatively investigate the effect of temperature on the solubility of copper sulfate crystals in water.
100 g of water in the conical flask was brought to the required temperature using the water bath.
Copper sulfate crystals were added to the water until no more would dissolve. The mass of the copper sulfate crystals that dissolved was noted.



The data was recorded and is given the table.

Temperature (°C)	0	20	40	60	80	100
Mass of copper sulfate crystals dissolved (g/ 100 g)	14	21	29	40	55	75

(*i*) Draw a ***graph*** of mass of copper sulfate crystals dissolved (solubility) against temperature in the grid below. A ***smooth curve*** through the plotted points is required. (9)



(*ii*) Use your graph to ***estimate the solubility*** of copper sulfate crystals at 10 °C. (3)

_____

(*iii*) Describe, using an appropriate labelled diagram in the box provided, how to ***grow and collect crystals*** of copper sulfate from the solution produced at 100 °C. (12)

_____

_____

_____

_____

_____

_____

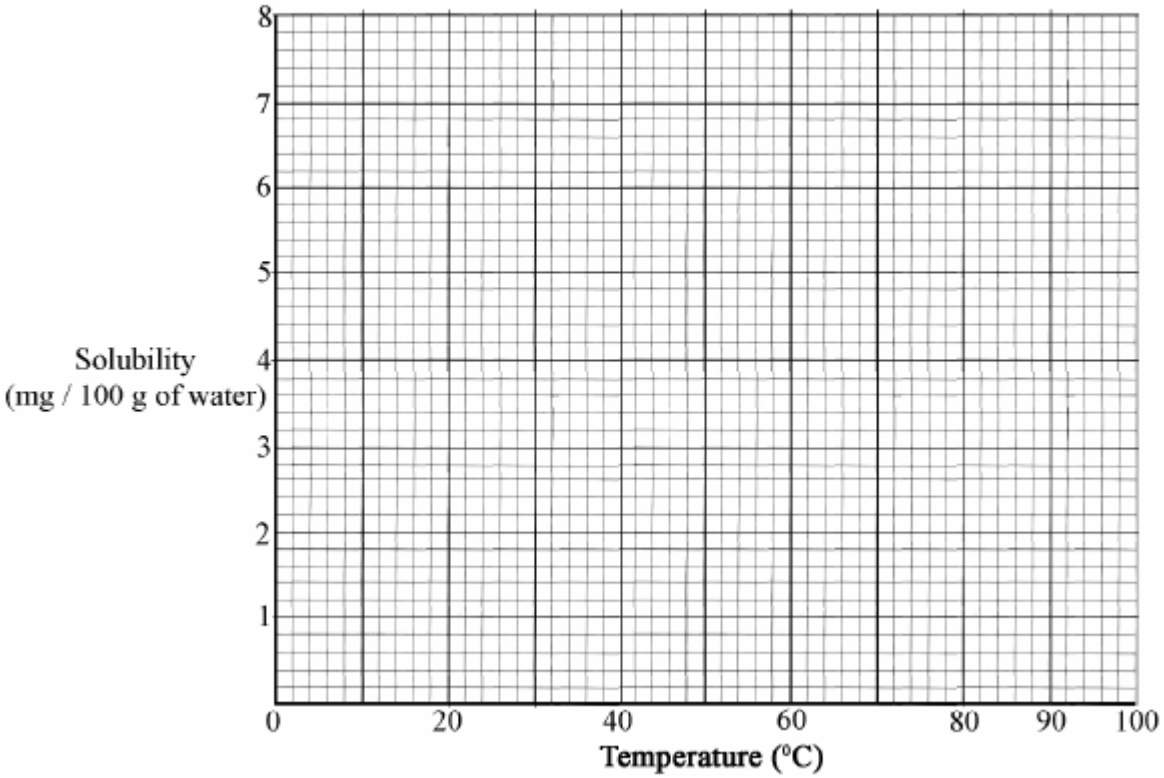
_____

_____

(*a*) The *limit of solubility* (maximum solubility) of *oxygen* gas (O_2) in *water* was measured, in *mg of oxygen per 100 g of water*, at a number of *different temperatures*. These measurements are given in the table.

Solubility (mg / 100 g water)	7.0	4.3	3.0	2.3	1.4	0.8	0.0
Temperature (°C)	0	20	40	60	80	90	100

(*i*) Draw a ***graph*** of ***solubility (y-axis) against temperature (x-axis)*** in the grid provided below. (6)



(*ii*) Use the graph to ***estimate the solubility*** of oxygen at 30 °C. (3)

_____

(*iii*) What ***effect has temperature*** on the ***solubility*** of oxygen in water? (6)

_____

(*iv*) Global warming has many implications. What ***implication***, which could be inferred (concluded) from the information in the graph, might ***global warming*** have ***for animals that live in water*** e.g. fish? (6)

_____

_____

_____

Distinguish between a ***concentrated*** and a ***dilute*** solution? (3)

_____

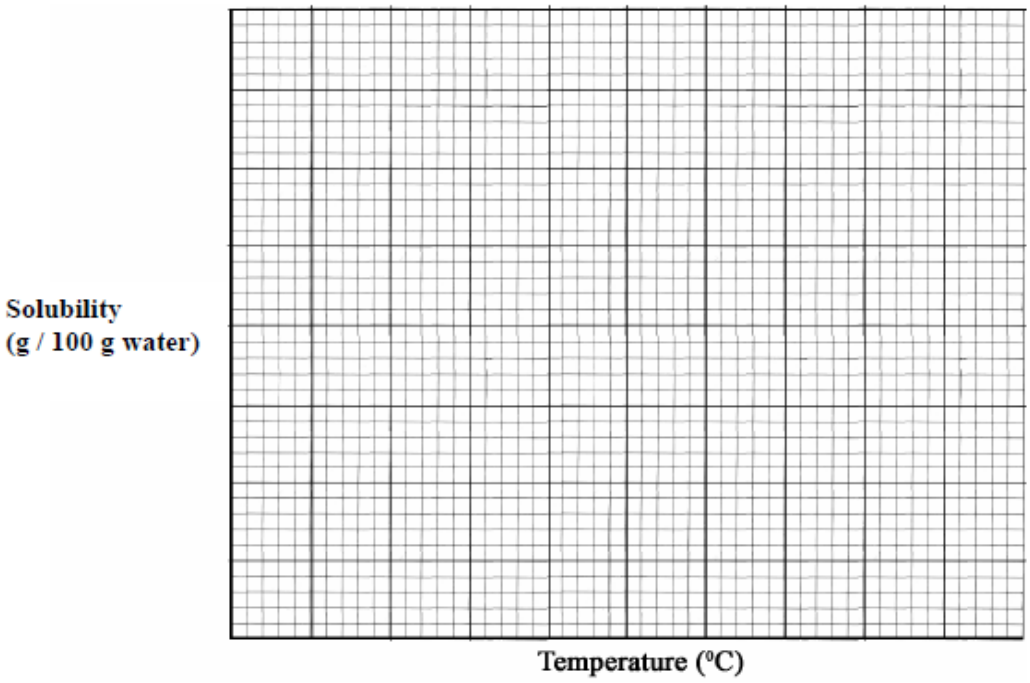
_____

_____

A pupil investigated the ***effect of temperature on the solubility*** of the salt ammonium chloride in water. She determined the maximum mass, in grams, of the salt that would dissolve in 100 g of water at various temperatures. The data from this experiment are given in the table.

Solubility (g / 100 g water)	29	37	46	55	66	77
Temperature (°C)	0	20	40	60	80	100

Plot a graph of solubility against temperature in the grid below. (9)



Use the graph to ***estimate the solubility*** of ammonium chloride at 70 °C. (3)

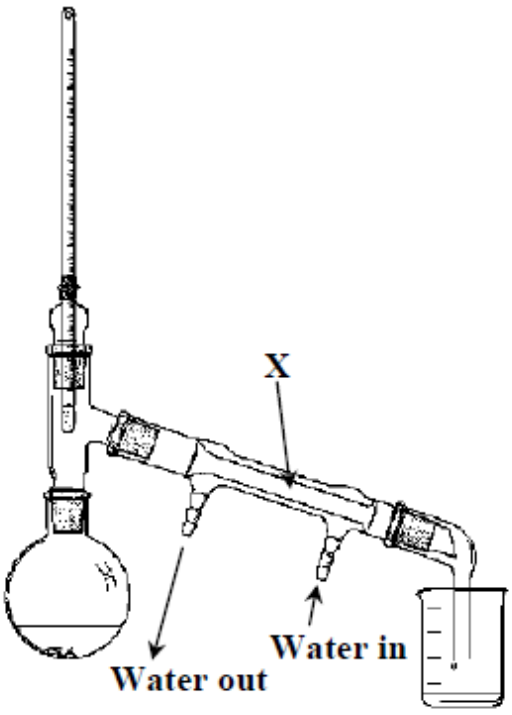
Solubility _____

What ***conclusion*** about the solubility of ammonium chloride can be drawn from analysis of the graph? (3)

Conclusion _____

2014

The diagram below shows a student's arrangement of the glassware for carrying out a distillation experiment. (12)



(*i*) Name the piece of apparatus labelled **X** in the diagram.

_____

(*ii*) What is the purpose of the water that is flowing in to and out of the piece of apparatus labelled **X**?

_____

_____

(*iii*) What general name is given to the liquid collected in the beaker?

_____

(*iv*) Name an additional piece of laboratory equipment that is needed to carry out this experiment.

_____

2013

The two science students have just separated seawater from sand.

(*i*) Name a suitable method for this separation.

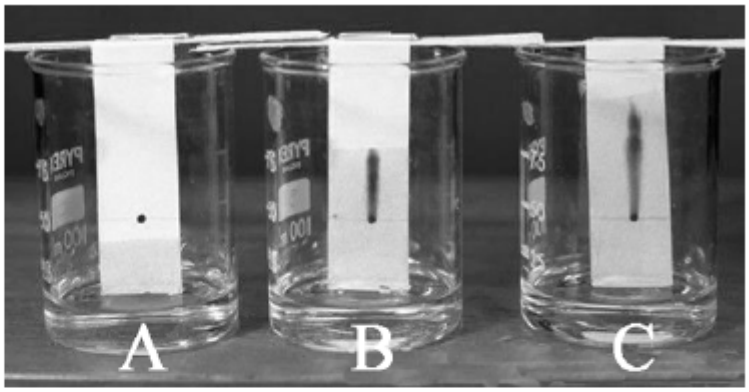
Name _____

(*ii*) How could the salt be separated from the seawater?

How? _____

2012

Paper chromatography was used to find the composition of brown ink in a pen. The same liquid, paper and pen were used in each of the three experiments shown. They were started at different times, **C** first then **B** and finally **A.**



(*i*) Why is the ink dot above the level of the liquid in each beaker?

Why? _____

(*ii*) What caused the dots of ink on the papers **B** and **C** to spread upwards?

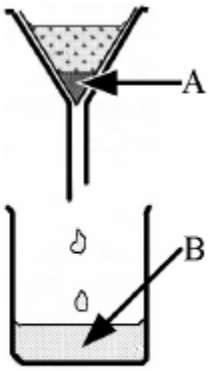
What? _____

(*iii*) Why were colours, other than brown, seen in **B** and **C** as the ink moved up the paper?

Why? _____

2010

A mixture of sand and salt was stirred up with water and then filtered as shown in the diagram.



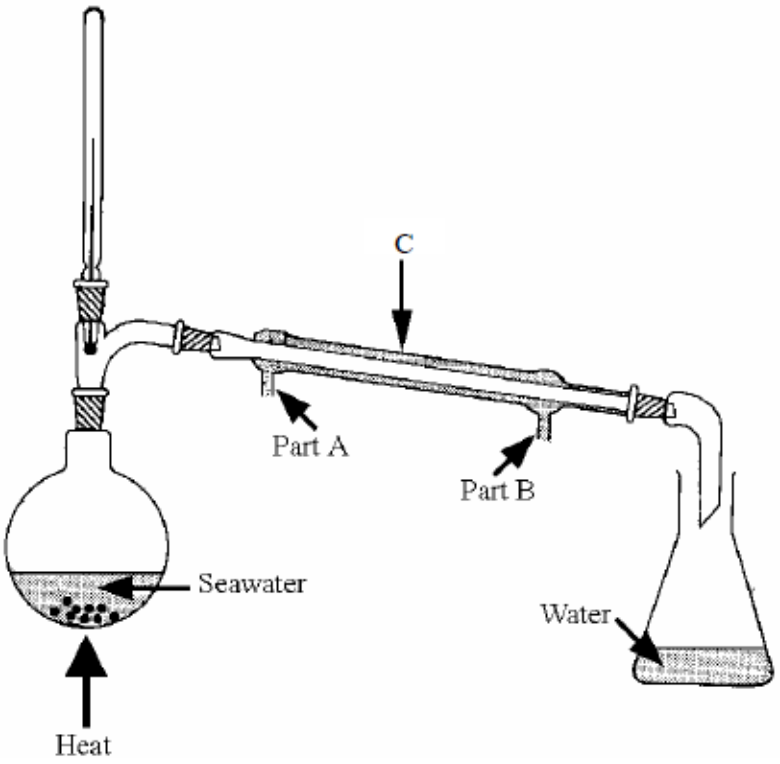
(*i*) Substance **A** was retained by the filter paper. Name **A**.

A _____

(*ii*) Substance **B** was passed through the filter paper. Name **one *constituent*** of **B**.

B _____

Draw a ***labelled diagram***, in the box provided, of an ***apparatus*** that could be used to ***separate an insoluble solid from a liquid***.



(*i*) Name the ***separation process*** shown in the diagram. (3)

Name _____

(*ii*) Name the ***item labelled*** **C** in the diagram. (3)

Name _____

(*iii*) Identify the ***part* A *or* B *of item* C** which is connected to the cold tap. (3)

Identify _____

(*iv*) How could you show that the water collected contains no salt? (3)

How? _____

2008

(*i*) Describe an experiment, using a labelled diagram in the box provided, to investigate the ***composition of inks in markers containing water-soluble inks***, to see if they are a ***single-colour*** ink or a ***mixture*** of coloured inks. (9)

_____

_____

_____

_____

_____

_____

_____

_____

_____

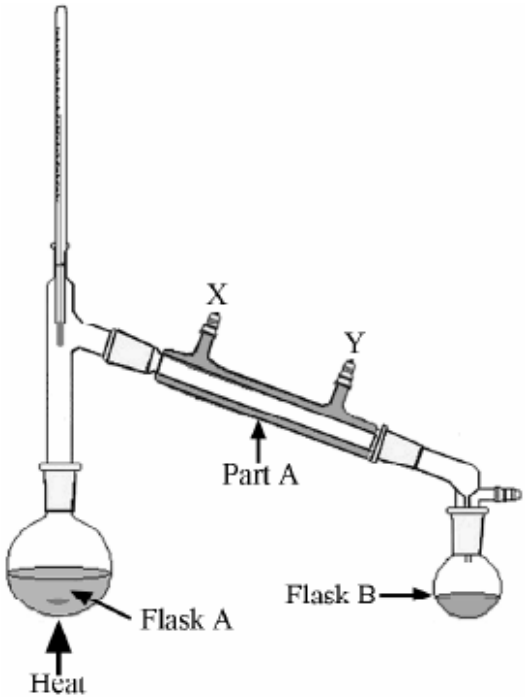
(*ii*) On completion of the experiment how is it possible to distinguish between a marker containing a ***pure single-colour*** ink and a marker containing ***mixture*** of coloured inks. (3)

_____

_____

2007

The apparatus shown in the diagram can be used to separate mixtures.



Name ***part* A**.

Part A _____

Which connection, **X** ***or*** **Y**, is attached to the cold tap?

X *or* Y? _____

Flask **A** contains seawater. Name the ***liquid*** that collects in flask **B**.

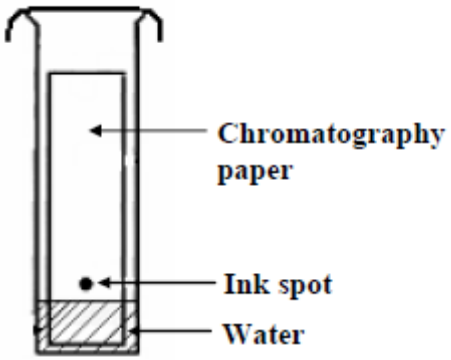
Liquid _____

Name a ***constituent*** of seawater that does not move from flask **A** to flask **B**.

Name _____

2006

A spot of water-soluble ink was put on a piece of chromatography paper and set up as shown in the diagram. The ink used was a ***mixture*** of different coloured dyes.



(*i*) What happens to the ink spot as the water moves up the paper? (3)

_____

_____

(*ii*) What would happen to a spot of water-soluble ink consisting of a ***single coloured dye*** if it were used in the above experiment? (3)

_____

2014

Name any two of the substances that are produced when hydrochloric acid (HCl) reacts with calcium carbonate ($CaCO_3$).

Substance 1 _____

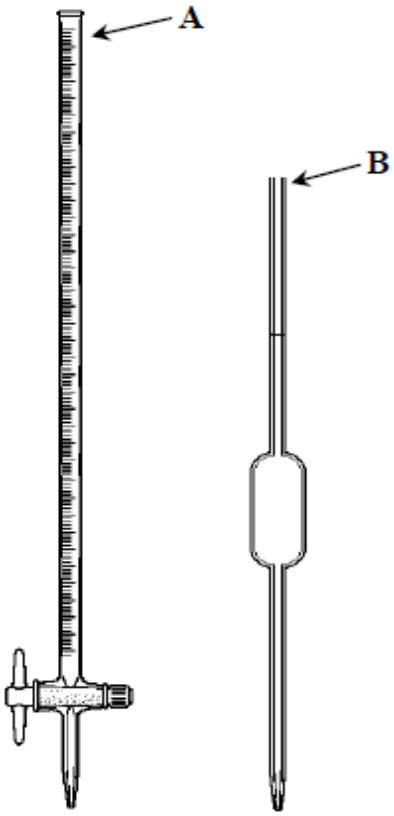
Substance 2 _____

In a school laboratory, a student carried out a titration of hydrochloric acid (HCl) against sodium hydroxide (NaOH). The student used the pieces of apparatus labelled **A** and **B** in the diagram. (18)

(*i*) Name the two labelled pieces of apparatus.

A _____

B _____



(*ii*) Name an indicator suitable for use in this titration.

_____

What colour is this indicator in hydrochloric acid?

_____

What colour is this indicator in sodium hydroxide?

_____

(*iii*) Write out a balanced chemical equation for the reaction between hydrochloric acid and sodium hydroxide.

_____

2013

The pH scale is used to measure the acidity and the alkalinity of substances.

(*i*) Give the range of pH for acids. _____

(*ii*) Give the range of pH for bases. _____

Carbon dioxide dissolves in water to give an acidic solution. Other gases dissolve to give solutions that are more acidic and give rise to acid rain.

(*i*) Name two gases that react in the atmosphere to produce acid rain. (6)

Gas 1 _____

Gas 2 _____

(*ii*) Give a source of one of the gases that you have named above. (6)

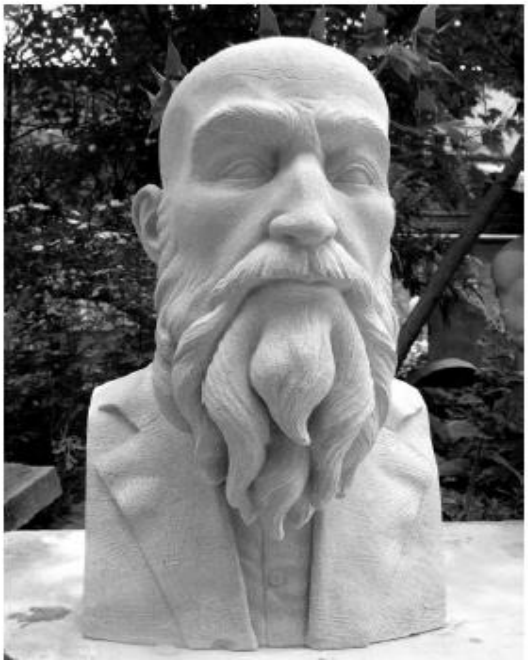
Name of gas _____

Source of gas _____

(*iii*) The sculpture, carved from limestone, of a bearded man in the photograph is new. How would you expect its appearance to change after years of exposure to acid rain? (3)

How? _____

_____



(*iv*) Limestone is calcium carbonate.
Write a balanced chemical equation for the reaction of calcium carbonate with an acid of your choice. (9)

_____

2012

Select a substance from the list with a pH less than 7 and one with a pH greater than 7: orange juice, rain water, toothpaste, bread soda, vinegar, sour milk, milk of magnesia, cola, washing soda.

pH less than 7 _____

pH greater than 7 _____

The table gives the % by volume of five gases/ vapours found in our atmosphere.

Formula	% Volume
N_2	78.08
O_2	20.95
H_2O	0 to 4
Ar	0.93
CO_2	0.036

(*i*) Which two of these gases/ vapours are produced when a fossil fuel is burned? (6)

1 _____ 2 _____

(*ii*) The amount of water vapour present in air is the most variable. Suggest a reason for this. (3)

Reason _____

2011

Describe how to measure the pH of lemon juice.

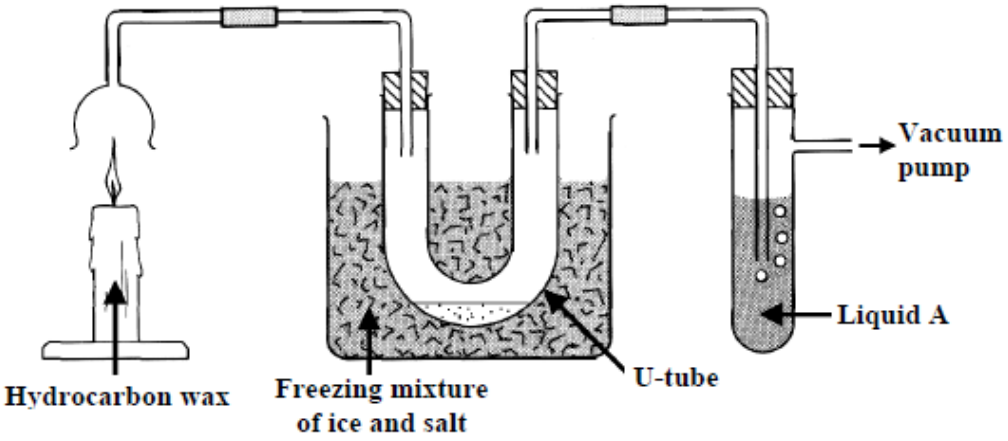
Describe _____

_____

_____

The experiment shown in the diagram was carried out to investigate the products of the combustion of a hydrocarbon wax produced from the fossil fuel oil.

In the experiment the products of the combustion were drawn through the apparatus by the vacuum pump.



A colourless liquid formed at the bottom of the U-tube after a while. Liquid A was clear and colourless at the start of the experiment and it slowly became milky.

(*i*) What do you think the liquid that formed in the U-tube was? Give a test that could be used to confirm your identification. (9)

What? _____

Test _____

_____

_____

(*ii*) Identify **liquid A** and state why it went milky. (6)

Liquid A _____

State _____

(*iii*) Name a fossil fuel other than oil. (3)

Name _____

2010

What ***effect*** has acid rain on limestone? Explain this ***effect***.

What? _____

Explain _____

What is the ***pH scale***? How can ***pH be measured***? (9)

What? _____

_____

How? _____

(*ii*) Look at the table and name a ***strong acid*** and a ***weak alkali*** from it. (6)

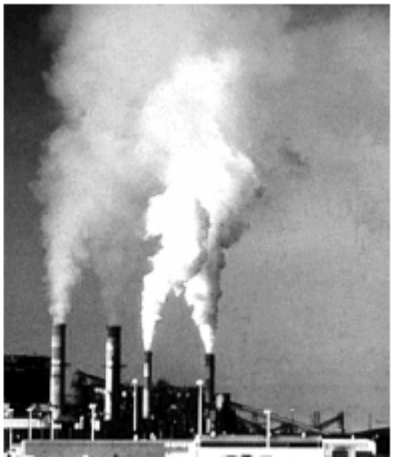
Substance	Pure water	Household ammonia	Urine	Gastric juice (stomach)	Blood
Ph	7	12	6	1.4	7.4

Strong acid _____

Weak alkali _____

2009

The photograph shows the emissions from a coal burning electricity generating station.
Name a ***pollutant*** present in the emissions and describe its ***effect*** on the environment.



Name _____

Effect _____

_____

(*i*) What is ***item* A *used for*** in the titration of an acid with a base?

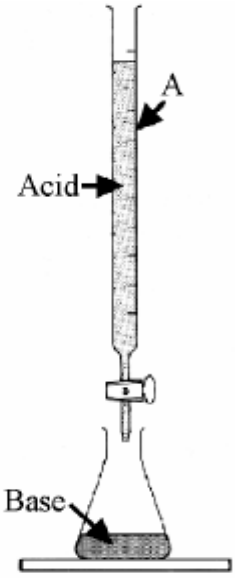
What? _____

_____

(*ii*) What ***happens when an acid reacts with a base***?

What? _____

_____

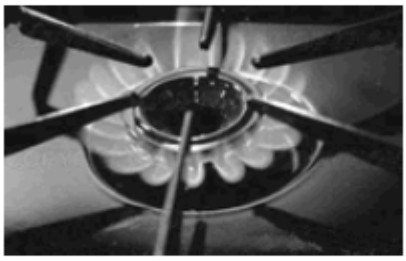


2008

Natural gas is a fossil fuel. What is a ***fossil fuel***?

What? _____

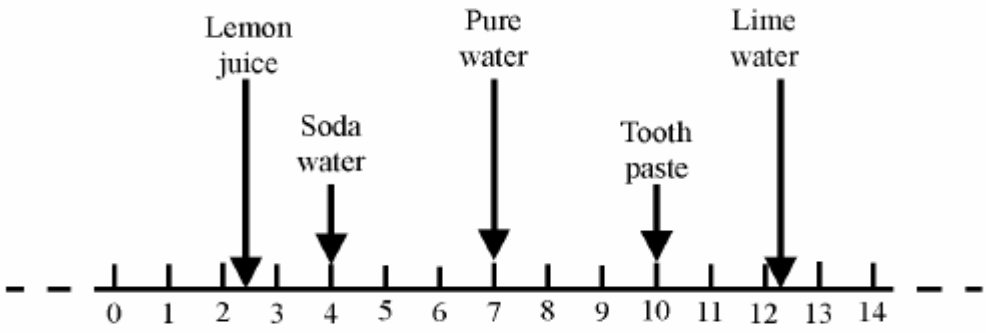
_____



Name the ***main constituent*** of natural gas.

Name _____

The diagram shows the *positions* of some common substances *on the pH scale*.



(*i*) Classify the ***substances*** shown as ***acidic, basic or neutral***. (9)

Acidic _____

Basic _____

Neutral _____

2007

Give the ***formula*** of a common base.

Formula _____

Alkalis are water-soluble bases. Name a substance, which is ***alkaline***.

Name _____

Describe how to ***investigate the pH*** of everyday substances e.g. antacid (indigestion powder), lemon juice, oven cleaner, vinegar etc. (6)

Description _____

_____

_____

_____

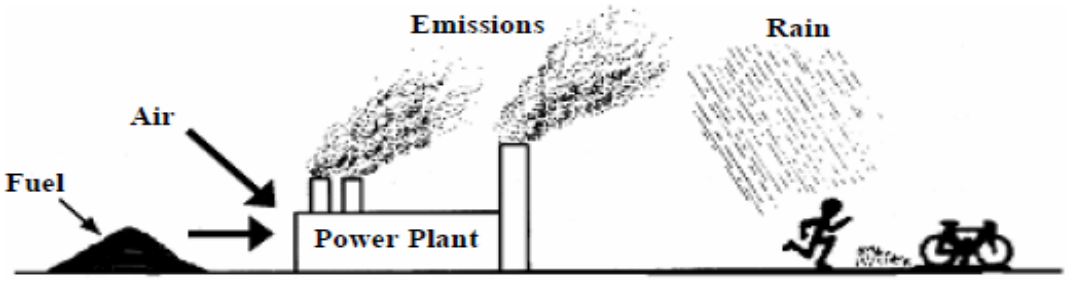
_____

_____

Name an everyday substance with a ***pH of less than 7***. (3)

Name _____

2006



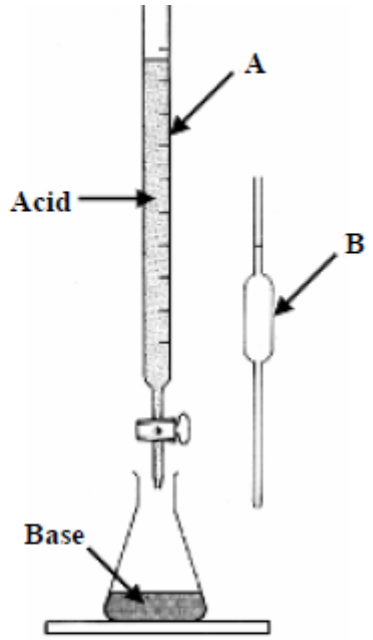
Fossil fuels are burnt to provide energy to generate electricity.
Give the **name** *or* **formula** of a compound of ***sulfur*** formed when a sulfur containing fossil fuel ***burns in air***.

Name *or* **formula** _____

Acid rain is formed when this sulfur compound dissolves in and reacts with water in the atmosphere. Describe the ***effect of acid rain*** on limestone.

Effect on limestone _____

The pieces of laboratory equipment shown, together with some other items, were used to ***prepare a sample of sodium chloride***.



(*i*) Name item **A** *or* item **B** (3)

A _____ ***or*** **B** _____

(*ii*) There were 25 cm^3 volumes of base used in this experiment. Describe how the piece of equipment **A** was used to ***measure the volume of acid*** required to neutralise this amount of base. (6)

_____

_____

_____

_____

(*iii*) Name a ***suitable acid*** and name a ***suitable base*** for the preparation of sodium chloride by this method. (6)

Acid _____ **Base** _____

(*iv*) Write a ***chemical equation*** for the reaction between the ***acid*** and the ***base*** that you have named. (6)

_____

Air and Oxygen

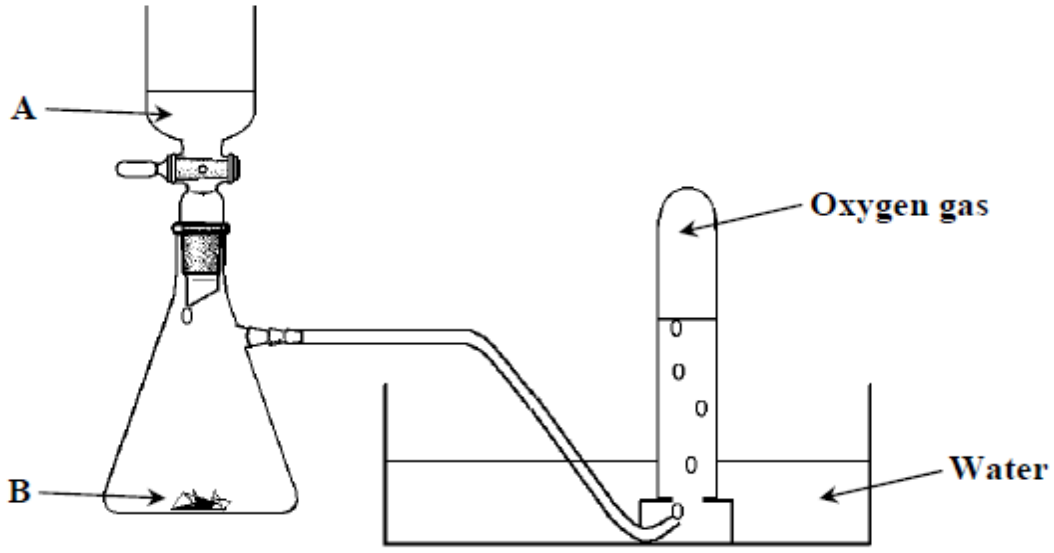
2014

Oxygen gas makes up approximately one-fifth of the Earth's atmosphere. (6)

(*i*) Name the gas that makes up most of the Earth's atmosphere. _____

(*ii*) Name a gas, other than oxygen and the gas that you have named in part (*i*) above, which is also found in the Earth's atmosphere. _____

The diagram below shows the setup of the apparatus for the preparation of oxygen gas in the laboratory. (18)



(*i*) Name liquid **A**. _____

(*ii*) Solid **B** is a catalyst for this reaction. What is a catalyst?

_____

_____

Name solid **B**. _____

What colour is solid **B**? _____

(*iii*) Oxygen gas is collected over water, as shown in the diagram. What property of oxygen gas makes it suitable for collection by this method?

_____

Describe how a student could test for the presence of oxygen gas.

_____

_____

_____

2012

What substance is formed when carbon is burned in oxygen?
Give the effect of this substance on moist litmus paper.

Substance _____

Effect on litmus _____

Describe an experiment, using a labelled diagram in the box provided to show the presence of carbon dioxide in air. (9)

2011

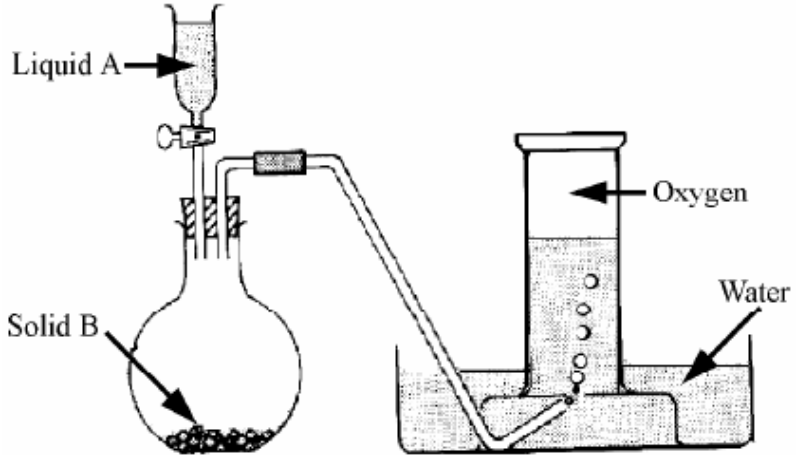
Name a catalyst that you have used in the school laboratory and give a reaction that it catalyses.

Catalyst _____

Reaction _____

2009

Oxygen can be prepared by decomposing liquid **A** using solid **B** as a catalyst. This preparation is shown in the diagram.



(*i*) Name ***liquid* A**. (3)

Name _____

(*ii*) Name ***solid* B**. (3)

Name _____

(*iii*) What is a ***catalyst***? (3)

What? _____

Carbon was burned in oxygen and the products tested with pieces of moist red and blue litmus paper.

(*iv*) Give the ***result of the litmus test*** described above and make a ***conclusion*** based on this result. (6)

Result and conclusion _____

_____

2008

Magnesium was burned in oxygen as shown in the diagram.

(*i*) What ***colour*** was the flame?

_____

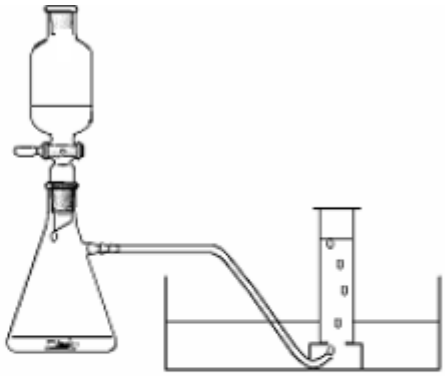
(*ii*) Pieces of *moist blue* and *red litmus paper* were mixed with the product of the combustion. What ***result*** was seen?

_____

(*iii*) What ***conclusion*** can be made from the result of the litmus test?

_____

In 1774 Joseph Priestley, an English chemist, discovered oxygen.
Name the **two *chemicals*** that you reacted together to ***prepare oxygen*** in the school laboratory. One of the chemicals acted as a ***catalyst***.



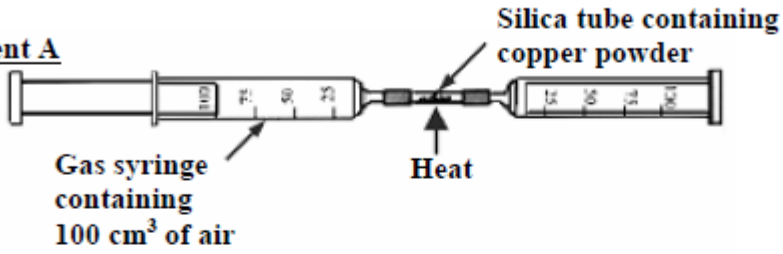
Names of chemicals _____

Which one of the two chemicals used was the ***catalyst***?

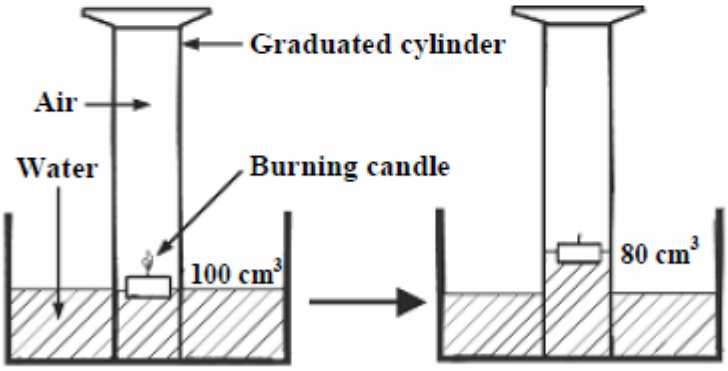
_____

The composition of air can be investigated in different ways.
Two experiments are shown in the diagram.

Experiment A



Experiment B



In **Experiment A** the air was pushed repeatedly over the heated copper powder and only 79 cm^3 of gas remained at the end of the experiment.

(*i*) Why is it necessary to let the apparatus cool down before measuring the volume of the remaining gas? (3)

_____

(*ii*) Why did the volume of gas decrease and then remain steady? (3)

_____

(*iii*) What is the remaining gas mainly composed of? (3)

_____

(*iv*) Experiment **B** is less accurate than Experiment **A**.
Give a reason why this is so. (6)

_____

Carbon Dioxide

2013

(*i*) Describe, using a labelled diagram in the box provided, an experiment to show that carbon dioxide gas (CO_2) is more dense than air. (12)

(*ii*) Explain how the conclusion that CO_2 gas is denser than air can be drawn from your experiment. (6)

2011

Complete the equation:

$$2HCl + CaCO_3 \longrightarrow$$

2009

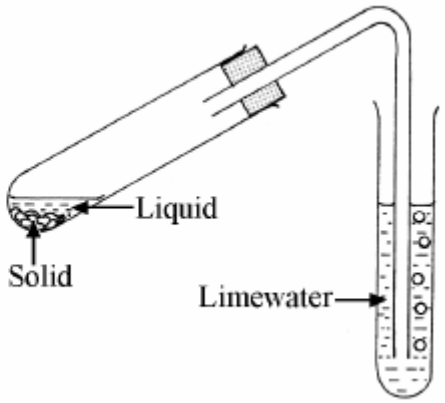
Give ***two uses*** of carbon dioxide.

Use one _____

Use two _____

2008

The *liquid and solid* shown in the diagram *react* together to produce a *gas that turns limewater milky*. Name a ***liquid*** and a ***solid*** that react together in this way. Names of ***specific substances*** are required.

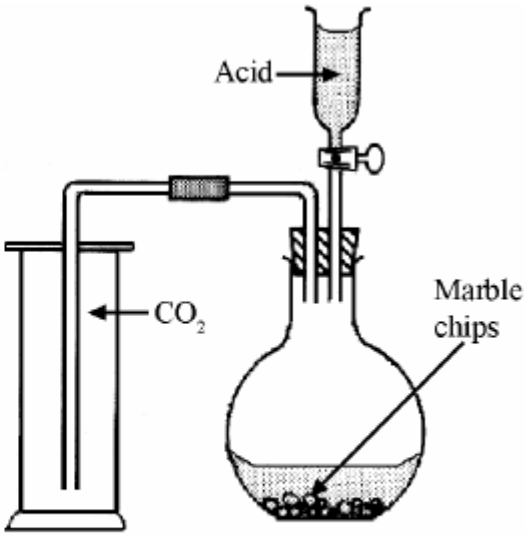


Liquid _____

Solid _____

2007

The diagram shows an apparatus that can be used for the preparation and collection of carbon dioxide.



Give the ***formula*** of a ***suitable acid***. (3)

Formula _____

Give the ***chemical name*** for marble. (3)

Name _____

(Note If you used some substance other than marble to react with the acid to give carbon dioxide, then give the ***chemical name*** of that substance.)

What ***physical property*** of carbon dioxide allows the gas to be collected in the manner shown in the diagram? (3)

Physical property _____

_____

If a strip of moist blue litmus paper and a strip of moist red litmus paper are put into a jar of carbon dioxide what ***effect***, if any, does the gas have on them? (3)

Effect _____

_____

Give ***two uses*** of carbon dioxide. (6)

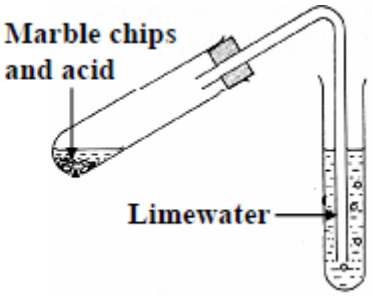
Use 1 _____

Use 2 _____

2006

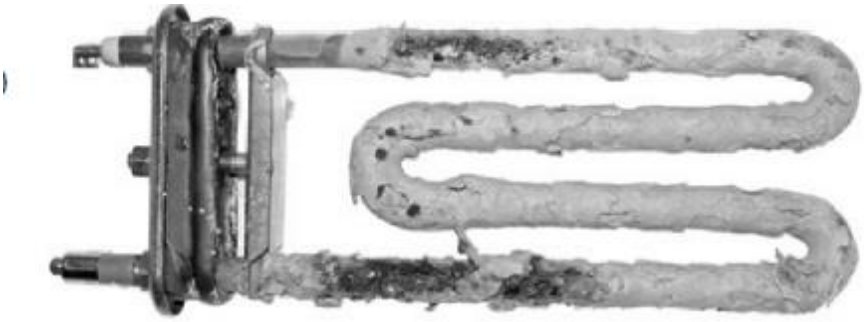
Carbon dioxide turns limewater milky. Complete the ***chemical equation*** for the reaction of carbon dioxide with limewater.

$Ca(OH)_2 + CO_2 \longrightarrow$



Water

2014



Hard water causes a build-up of limescale on heating elements, as in the picture on the left.

(*i*) What is hard water? _____

_____

(*ii*) State one method of removing the hardness from water.

_____

(*i*) In an early stage of the treatment of water for domestic use a flocculating agent (such as alum) is added to the water.
What is the purpose of adding this substance?

_____

(*ii*) In a later stage of water treatment fluoride is added to the water.
What is the purpose of adding this substance?

_____

2013

The writer Jules Verne (1828-1905) said "Water decomposed into its elements will be the fuel of the future". The photograph shows a car that uses hydrogen as a fuel.

(*i*) How can hydrogen be produced from water?

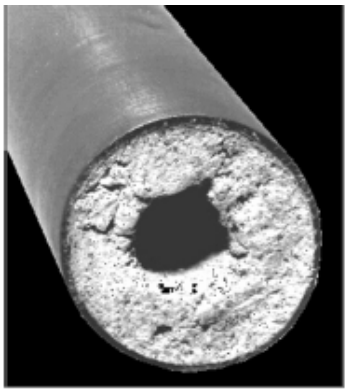
How? _____

(*ii*) Why is the exhaust emission from such a car environmentally safe?

Why? _____

2012

Water had been flowing through the pipe shown in the photograph for some time. The pipe originally had no internal deposit. Give a possible reason for the formation of the deposit. What do you think the deposit is?



Reason _____

_____

_____

Deposit _____

Give a test to show that the droplets formed on the outside of a glass containing a cold drink are water. (6)

_____

_____

_____

_____

_____

The photograph shows a water treatment plant that produces water fit for domestic consumption. Name and describe four processes used in this treatment of water. (24)

(*i*) Name _____

Describe _____

_____

(*ii*) Name _____

Describe _____

_____

(*iii*) Name _____

Describe _____

_____

(*iv*) Name _____

Describe _____

2011

Water hardness is a common problem.

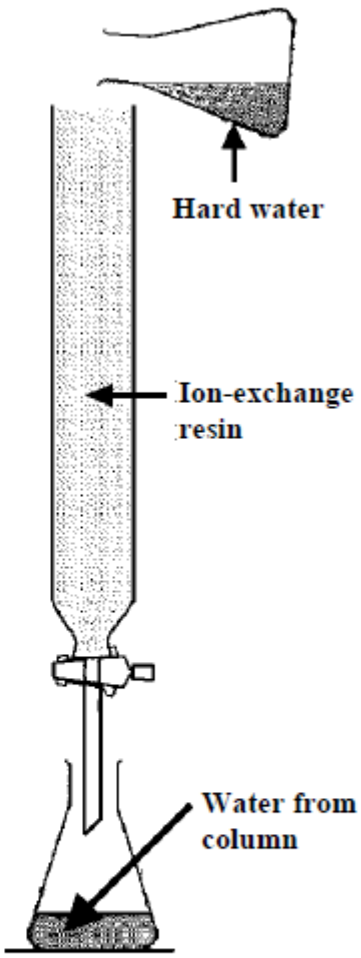
(*i*) Describe a test that distinguishes between hard and soft water. (6)

_____

_____

_____

_____



(*ii*) Name a compound that causes hardness when it dissolves in water. (3)

_____

(*iii*) Examine the diagram.
Would you expect the water from the column of resin to be hard or soft?
Justify your answer. (3)

_____

_____

How could you test the water to confirm this answer?
What result would you expect? (6)

_____

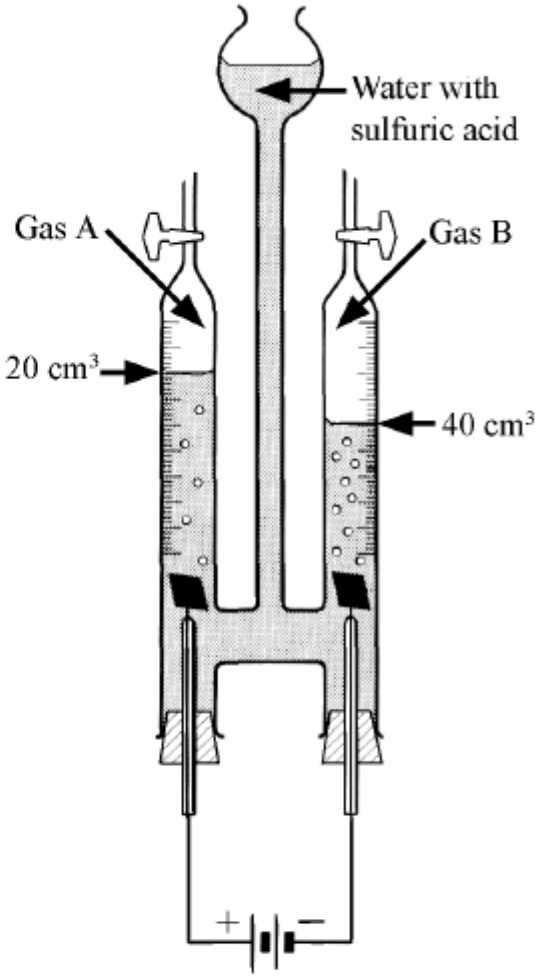
_____

_____

_____

2010

The diagram shows an apparatus used to decompose water by passing an electric current through it. The volumes of gases released by this process can be measured as shown.



(*i*) Name the ***process*** which decomposes a substance when electric current is passed through it. (3)

Name _____

(*ii*) Why is a small amount of ***sulfuric acid added*** to the water? (3)

Why? _____

_____

(*iii*) Name ***gas*** **A** and give a ***test*** to confirm your answer. (6)

Name _____

Test for gas **A** _____

(*iv*) Name ***gas*** **B** and give a ***test*** to confirm your answer. (6)

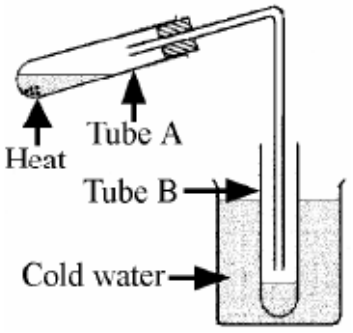
Name _____

Test for gas **B** _____

(*v*) Water is a compound formed by the chemical combination of elements **A** and **B**. In what ***proportion*** do **A** and **B** ***combine*** to form water? (3)

What? _____

Hard water in test tube A was heated and some water evaporated from it and condensed in test tube B. Is the water in test tube B ***hard or soft***? Give a ***reason*** for your answer,



Is? _____

Reason _____

Name **two** ***processes*** used in the treatment of water for safe use in our homes.

Process one _____

Process two _____

2009

(*i*) State how to ***test*** water to ***confirm the presence of hardness***? (6)

Test _____

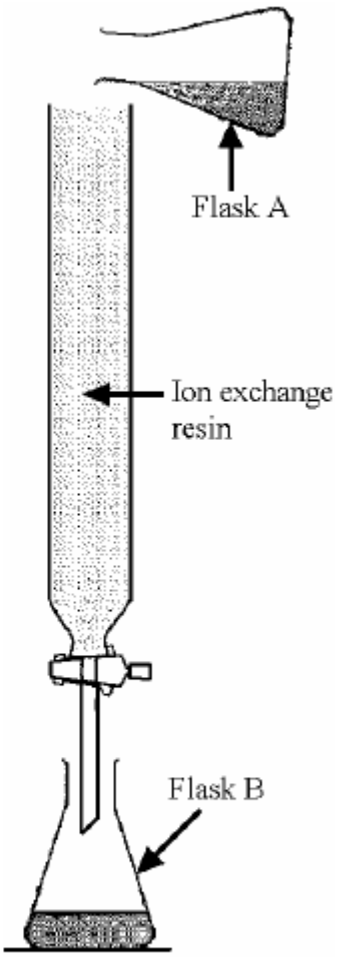
(*ii*) Name a ***metallic element*** some of whose compounds ***cause hardness*** in water. (3)

Name _____

(*iii*) Give one ***effect*** of hard water. (3)

Give _____

Flask **A** contains hard water. Some of this water was poured into the tube containing an ion exchange resin. The water that passed through the ion exchange resin was collected in flask **B**.



(*i*) Describe a ***test*** that you could perform on water samples from flask **A** and from flask **B** to compare their hardness?
What result would you expect from this test? (12)

Test _____

_____

_____

Result _____

_____

(*ii*) What ***causes*** hardness in water? (3)

Cause _____

Water supplied to domestic consumers has undergone five or more different processes in a water treatment plant.

(*i*) Name **one** of the ***processes*** carried out on water in a treatment plant. (3)

Process _____

(*ii*) Give a ***reason*** why the treatment that you have named is carried out. (3)

Reason _____

_____

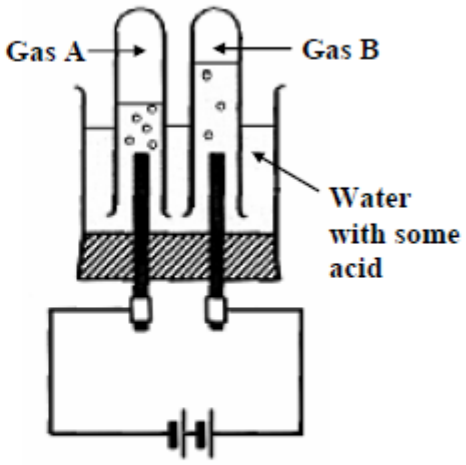
2006

How would you show that ***water contains dissolved solids***?

_____

_____

The diagram shows the electrolysis of water.



Why is ***some acid added*** to the water?

Why? _____

Give a ***test*** for ***gas*** **A**.

Test _____

The volume of gas **A** is twice that of gas **B**. What does this tell us about the composition of water?

What? _____

Atomic Structure and the Periodic Table

2014

Oxygen–16 and oxygen–17 are two <u>isotopes</u> of the element oxygen.

(*i*) What is meant by the term *isotopes*?

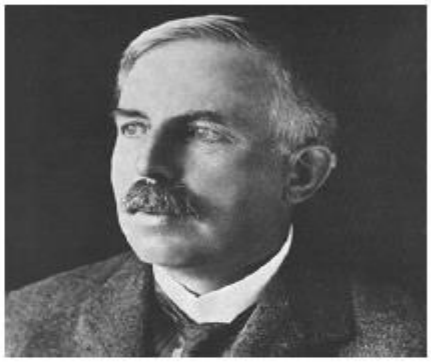
_____

_____

(*ii*) How many protons are in an atom of oxygen–17? _____

2013

Ernest Rutherford (1871-1937) suggested the existence of the atomic nucleus in 1911.



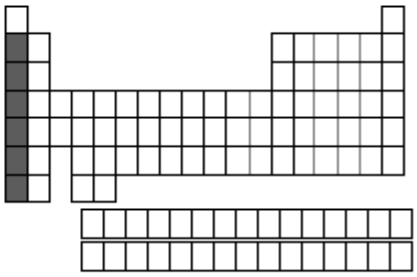
Give two properties of the atomic nucleus.

1 _____

2 _____

2011

The diagram is an outline periodic table. One area, a group of elements, is shaded.



Name this group of elements and give one chemical property that they have in common.

Group _____

Property _____

What are *isotopes*?

What? _____

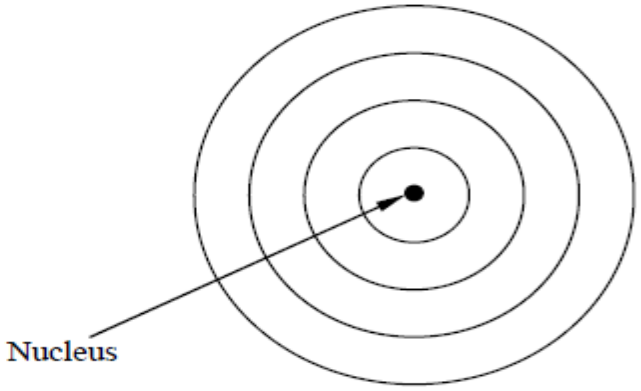
_____

_____

2010

A potassium atom has atomic number 19 and a mass number of 39.

Complete the diagram using dots or crosses to clearly show the arrangement of electrons in the potassium atom.



2009

Approximately 98.89% of carbon on the surface of the earth and in the atmosphere is carbon-12 the remaining approximately 1.11% is carbon-13. The numbers 12 and 13 are mass numbers. The atomic number of carbon is 6.

(*i*) ***How many neutrons*** are in the nucleus of a carbon-13 atom?

How? _____

(*ii*) Enter the ***missing word*** in the following sentence.

Carbon-12 and carbon-13 are _____ of carbon.

2008

Sir Joseph John Thomson (1856-1940) announced his *discovery of the electron in 1897* following extensive experimental work. He was awarded the Nobel Prize in 1906. Compare the ***charge and the mass*** of an ***electron*** with the ***charge and the mass*** of a ***proton***.

Charge _____

Mass _____

(*b*) The diagram shows the *first twenty elements* in their positions in the *periodic table*. The number given with each element is the *atomic number* of that element.

1	2										3	4	5	6	7	8/0
^{1}H																^{2}He
^{3}Li	^{4}Be										^{5}B	^{6}C	^{7}N	^{8}O	^{9}F	^{10}Ne
^{11}Na	^{12}Mg										^{13}Al	^{14}Si	^{15}P	^{16}S	^{17}Cl	^{18}Ar
^{19}K	^{20}Ca															

(*i*) Define ***atomic number***. (3)

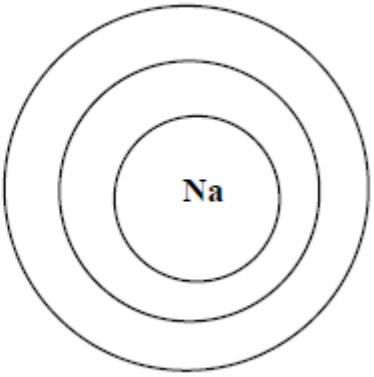
(*ii*) Naturally occurring lithium is a mixture of two isotopes. Explain the ***underlined term***. (6)

(*iii*) By what ***name*** are group two metals known? (3)

(*iv*) Why are the ***noble gases***, group 8/0, ***very chemically unreactive***? (6)

2007

The diagram represents a sodium atom.
The circles are electron orbits and the 'Na' represents the nucleus. The atomic number of sodium is 11.
Using **dots** or **X**s to represent electrons in the orbits give the ***electronic structure*** of sodium.



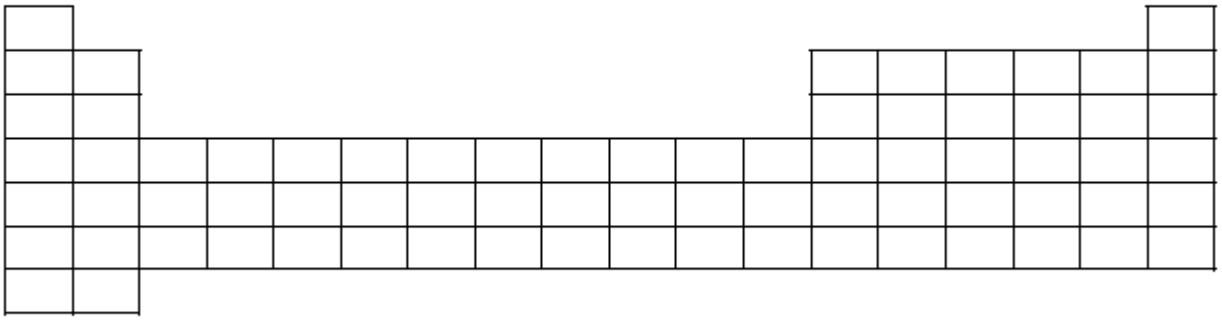
2006

Define the term '***isotope***'.

Niels Bohr received the Nobel Prize for physics in 1922 for his model of the electronic structure of the atom. Potassium has an atomic number of 19. Give the arrangement of the electrons in an atom of potassium.

_____

(i) Show, clearly using shading and labelling, the ***location*** of the ***alkaline earth metals*** on the blank periodic table given. (3)



(ii) Name an ***alkaline earth metal***. **Name** _____ (3)

Chemical Bonding, Formulas and Equations

2014

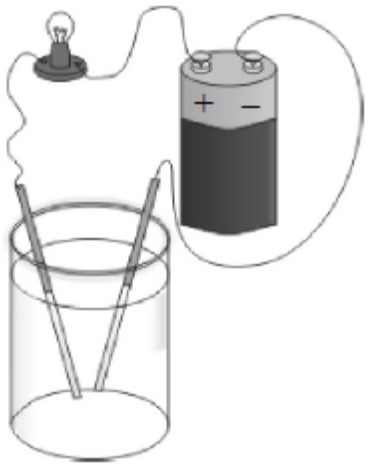
An ionic substance is dissolved in water and its ability to conduct electricity is tested, as in the diagram on the right.

(i) Name an ionic substance. _____

(ii) Why can an ionic substance conduct electricity when it is dissolved in water?

_____

_____

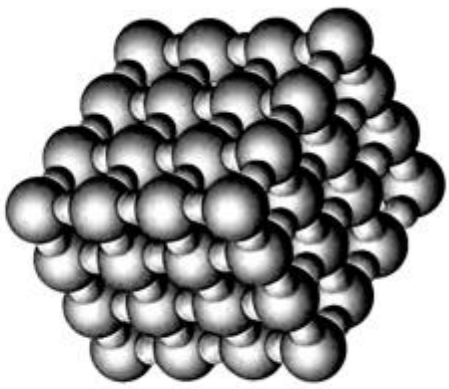


Oxygen gas consists of molecules of oxygen. Each molecule contains two oxygen atoms.

In the space below, draw a diagram of a molecule of oxygen, clearly showing the locations of all of the electrons.

2012

The diagram shows part of a crystal of sodium chloride. Name the type of bonding in sodium chloride. Describe this type of bonding.

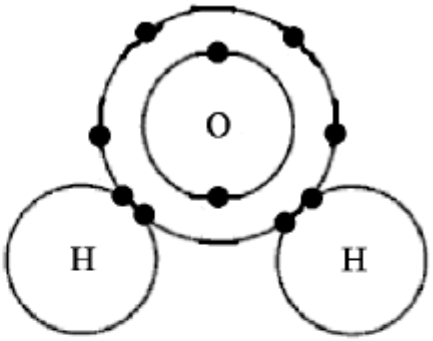


Name _____

Describe _____

_____

The diagram shows the way the atoms bond together in a molecule of water.



(*i*) What is a molecule? (3)

_____

_____

_____

(*ii*) Each hydrogen atom shares two electrons with the oxygen atom. What name is given to the type of bonding that involves the sharing of pairs of electrons? (3)

_____

(*iii*) In the space below, draw a diagram of a methane molecule, CH_4, showing the bonding between its atoms. (6)

(*iv*) Describe a second type of chemical bonding and name a compound which has this type of bonding. (9)

Describe _____

_____

_____

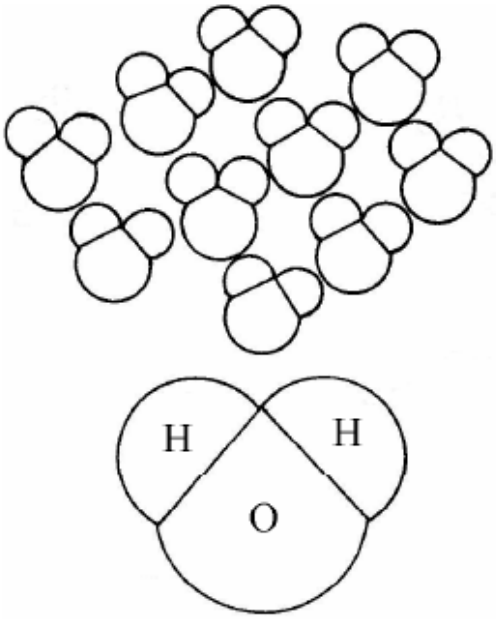
_____

Compound _____

2009

Atoms of elements can combine to form compounds using chemical bonds between their atoms. There are different types of chemical bonds.

(*a*) The diagram shows a group of water molecules with one enlarged below with its constituent atoms identified by their atomic symbols. Water molecules are very tiny, one teaspoon of water contains approximately 2×10^{23} molecules.



(*i*) Name the ***type of bonding*** in the water molecule. (3)

Name _____

(*ii*) ***Describe*** this ***type of bond***. (6)

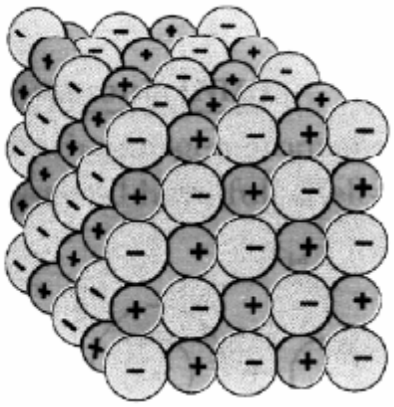
Describe _____

_____

(*iii*) Name ***one other*** compound with this ***type of bonding***. (3)

Name _____

The diagram shows sodium ions (+) and chloride ions (-) in part of a crystal of table salt, sodium chloride.



(*i*) How are ***sodium ions*** and ***chloride ions formed*** from their atoms? (6)

How? _____

_____

(*ii*) What ***force*** holds the ions together in sodium chloride? (3)

_____

(*iii*) Name ***one other*** compound that is ***composed of ions***. (3)

_____

2008

Some atoms join together by *sharing pairs of electrons*.
This is called *covalent bonding*. Draw a ***diagram*** in the box below showing the ***covalent bonding in a molecule of water***.

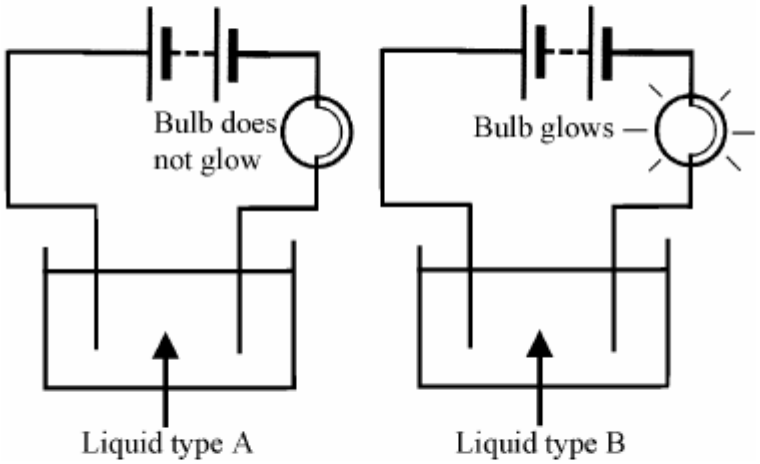
(*a*) Atoms of *different elements* can form *compounds* by *bonding* together.

(*i*) What is an ***ionic bond***? (6)

_____

_____

A pupil investigated the *ability of covalent and ionic substances to conduct electricity*. Four substances were selected. One was a liquid. The other three substances were solids and these were dissolved in pure water before testing. The apparatus used in the investigation is drawn below. When the liquids were tested the bulb did not glow in some cases (Liquid type A) and the bulb glowed in other cases (Liquid type B).



The results of the investigation are given in the table.

Liquid	Cooking oil	Table salt	Table sugar	Copper sulphate
Liquid type	A	B	A	B

(*ii*) Name the ***ionic substances*** in the table.
Give a ***reason*** for your answer. (9)

Name _____

Reason _____

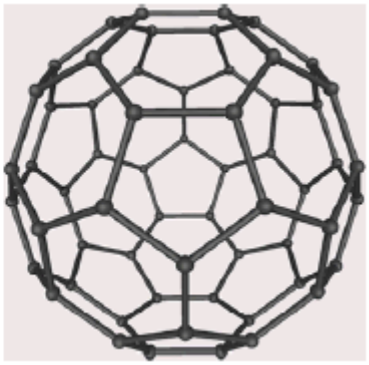
(*iii*) **Three** of the *substances tested* are *solid at room temperature*. Why were these ***substances dissolved in water*** before the investigation? (3)

_____

_____

2007

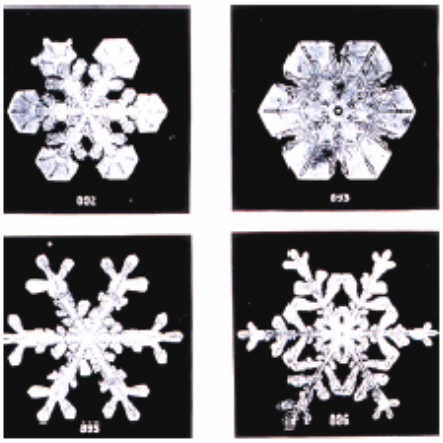
The diagram shows a molecule of C_{60}. It has 60 carbon atoms covalently bonded together. This molecule is nick-named the 'Buckey Ball'. Explain the underlined term.



_____

_____

The photographs are of four snowflakes. The photographs were taken by Wilson Bently (1865-1931). He photographed 5000 snowflakes and never found two that were identical.
Snowflakes are crystals of water.



Name a ***substance***, other than water, that ***forms crystals***.

Name _____

Give **one *difference*** between crystalline and non-crystalline solids.

Difference _____

_____

Metals and Plastics

2014

State any two reasons why the recycling of plastics is considered to be of benefit to the environment.

Reason 1 _____

_____

Reason 2 _____

_____

The process of galvanising is named after the Italian scientist Luigi Galvani, pictured on the right. Galvanising involves coating iron or steel with a layer of zinc.

(*i*) What is the purpose of galvanising?

_____

_____

(*ii*) What is the chemical symbol for zinc? _____

Sodium is an alkali metal which is usually stored in a container of oil, as in the picture on the right.

(*i*) Why is sodium stored in a container of oil?

_____

_____

(*ii*) Name one other alkali metal. _____

(*iii*) Sodium reacts with water to produce a colourless gas. Name the gas produced. _____

(*iv*) Describe how a student could test for the presence of the gas produced when sodium reacts with water. _____

_____

Throughout history, gold and alloys of gold have been used in the making of jewellery. (9)

(*i*) What is an alloy?

_____

_____

_____

(*ii*) One of the reasons why gold is so valuable to jewellers is that it is the most malleable of metals. What is meant by the term *malleable*?

_____

(*iii*) In the middle-ages jewellers tested the purity of a piece of gold by pouring acid onto a small sample of it.
This was the so-called "acid test" for gold.

Of the following four metals, underline the one which is <u>least</u> reactive with acid.

Calcium Copper Magnesium Zinc

2013

(*i*) Name a metal that can be cut with a knife as shown in the photograph.

Name _____

(*ii*) What happens if a piece of this metal is dropped into water?

What? _____

Explain what a 'biodegradable plastic' means.

Explanation _____

_____

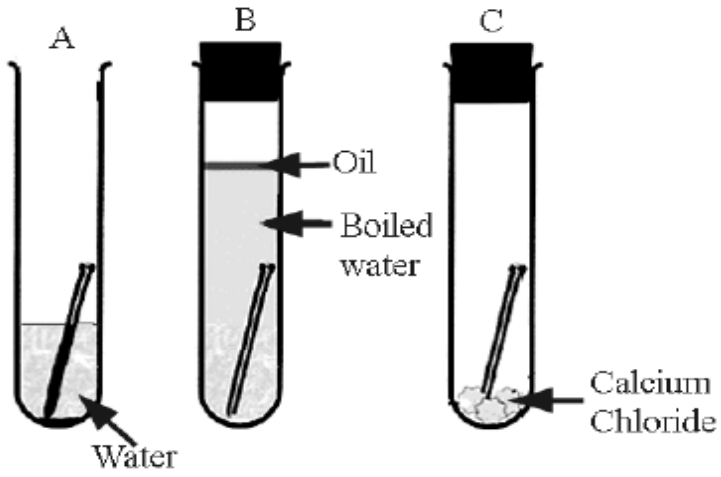
A science student investigated the conditions for the rusting of iron nails.
A diagram of the apparatus used is given below.

(*i*) Why did the iron nail rust only in test tube A?

_____

_____

_____



(*ii*) Why did the iron nail not rust in test tube B?

_____

(*iii*) Why did the iron nail not rust in test tube C?

_____

2012

Alloy car wheels are made from an alloy of aluminium or magnesium. Name another alloy and give a use for it.

Alloy _____

Use _____

_____

Using their atomic symbols, arrange the metals, copper, calcium, zinc and magnesium in order of decreasing reactivity with dilute hydrochloric acid.

_____

Name two non-metallic elements.

1 _____ 2 _____

Describe the reaction of a named alkali metal with water and name a product of the reaction. (9)

_____

_____

_____

_____

_____

The photograph shows severe rusting of the steel body of a motorcar.
Give one condition necessary for rusting to occur. Describe one method of preventing rust happening.

Condition _____

_____

Method _____

_____

Pollution by non-biodegradable plastics, produced from petroleum, has a significant damaging effect on the environment.
Give **two** of these damaging effects.

1 _____

2 _____

Explain the term *non-biodegradable*.

Explain _____

A biodegradable bottle is shown in the image.

Some are made from starch, vegetable oil etc., and are called bioplastics.

Others are made from petroleum with additives.

Suggest an advantage of bioplastics over petroleum-based biodegradable plastics.

_____

_____

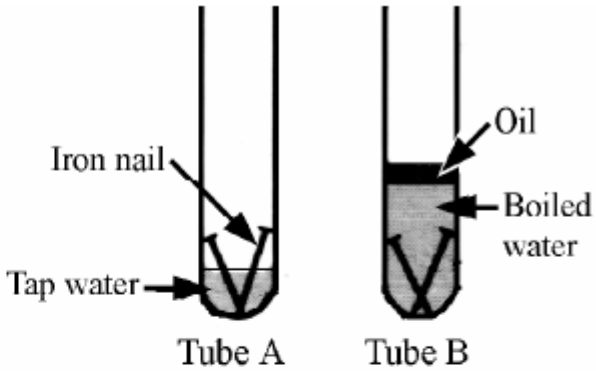
2010

Metals conduct two forms of energy very well. Name the **two *forms of energy***.

Energy one _____

Energy two _____

A pupil performed an experiment on the rusting of iron using the apparatus shown in the diagram. The iron nails in one of the tubes rusted after a few days, while the nails in the other test tube did not rust.



(*i*) In ***which tube*** did the nails ***rust***?

Which? _____

(*ii*) Why was ***boiled water*** used in tube B?

Why? _____

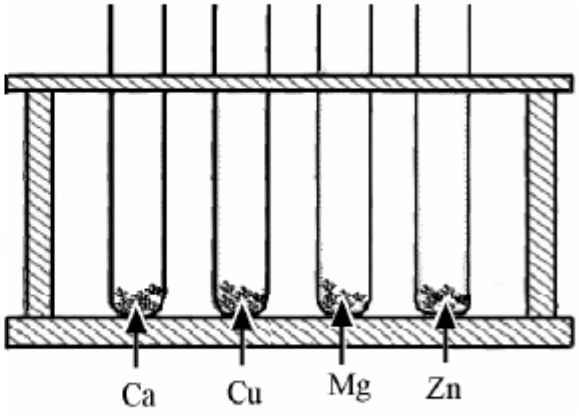
(*iii*) What is the ***function*** of the oil in tube B?

What? _____

(*iv*) What ***conclusion*** can be drawn from this experiment?

What? _____

A investigation was carried out to see how different metals react with water and dilute acid. The diagram shows the metals used in this investigation. When a metal reacts with water or a dilute acid it produces a gas. The water in this experiment was added to the metal at room temperature.



(*i*) Name the ***gas*** produced by the reaction of a metal used in this experiment with water or a dilute acid. (3)

Name _____

(*ii*) Name a ***dilute acid suitable*** for use in this experiment. (3)

Name _____

(*iii*) Name a ***metal***, used in this experiment that ***reacts with water*** at room temperature. (3)

Name _____

(*iv*) Name a ***metal***, used in this experiment that ***does not react*** with the ***dilute acid*** that you have named above. (3)

Name _____

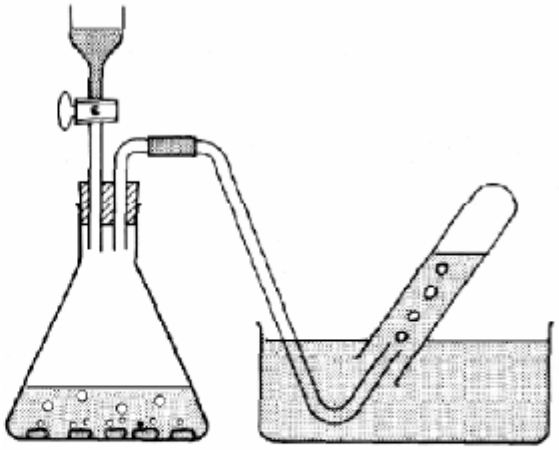
(*v*) List the ***metals*** used in this experiment in ***decreasing order of reactivity with the dilute acid*** named (most reactive first). (3)

List _____

(*vi*) Give **one** ***safety precaution*** that you would take when performing this experiment. (3)

Give _____

The apparatus shown in the diagram was used to investigate the reaction of zinc with hydrochloric acid. Hydrogen gas is produced.



(*i*) Describe a ***test for hydrogen***.

_____

_____

(*ii*) Write a ***chemical equation*** for the reaction of zinc with hydrochloric acid.

_____

The photograph shows a statue that was cast in the alloy bronze.

(*i*) What is an ***alloy***? (3)

What? _____

_____

(*ii*) Name an ***alloy***, other than bronze, and give ***one use*** for it. (6)

Name _____

Use _____

(*iii*) Metals are <u>malleable</u> and <u>ductile</u>. Explain the underlined terms. (6)

Malleable _____

Ductile _____

2008

The following *metals* were reacted with *dilute acid*: **copper**, **magnesium**, **calcium** and **zinc**. The *reactivity* of *each metal* was noted. List these metals in ***order of decreasing reactivity***.

List _____

Name a ***method*** of treating iron that helps ***prevent rusting***.

Name _____

How does the ***method*** that you have named ***work***?

How? _____

2007

Name a ***raw material*** used to make plastics.

Raw material _____

Some plastics are <u>non-biodegradable</u>. Explain the underlined term.

Explain _____

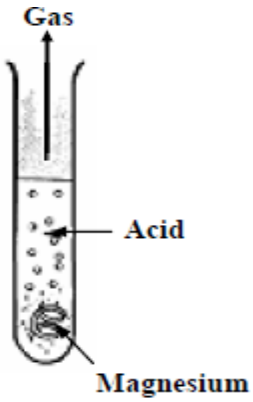
Give **two** properties of alkali metals.

Property 1 _____

Property 2 _____

2006

Reactivity tests were carried out on calcium, copper, magnesium and zinc in four test tubes containing an acid. The test carried out using magnesium is shown.



State ***one thing*** you would do ***to make the tests fair***.

List the **four** ***metals in order of reactivity with the acid***, starting with the ***most reactive***.

State one thing _____

_____

Metals in order of reactivity _____

Different plastics have different properties.

The dust pan and brush set shown is made from ***two different plastics***. The bristles are made of ***type* A** and the other parts are made of ***type* B** plastic. Give **one *property*** of ***type* A** and **one *property*** of ***type* B** plastic that that make them suitable for their use in this product. (6)

Property of type A _____

Property of type B _____

The millennium spire, in Dublin, is made from steel. Iron and steel are can suffer from ***corrosion***.

Iron and steel show ***visible signs of corrosion***.

Give one visible sign of corrosion.

_____

_____ (3)

Oxygen and water together are necessary for the corrosion of iron or steel.
Describe, with the aid of labelled diagrams, experiments to show that:

(*i*) ***oxygen alone***, will ***not*** lead to the ***corrosion of iron (or steel)***

(*ii*) ***water alone*** will ***not*** lead to the ***corrosion of iron (or steel)***. (15)

_____

_____

_____

_____

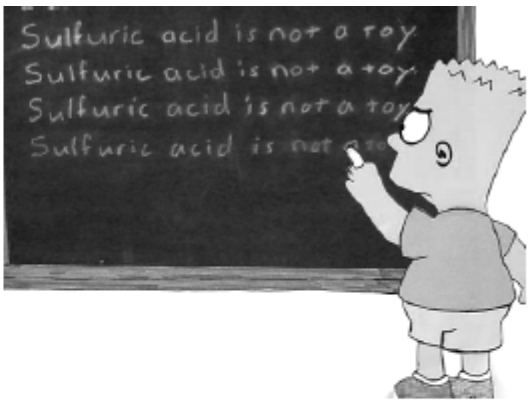
_____

Labelled diagram

Lab Safety and Equipment

2012

Bart is doing lines.
Most Junior Certificate candidates have three years experience of working in a school laboratory. Give two important safety rules, that must be followed at all times by everyone in the laboratory. (6)



Rule 1 _____

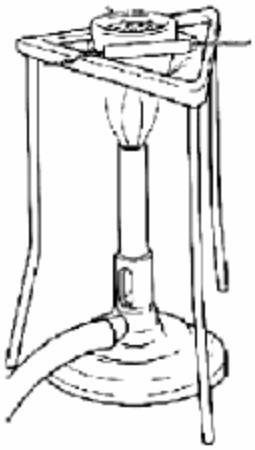
_____

Rule 2 _____

_____

2009

Name any ***two items of laboratory equipment*** shown in the diagram.



Item one _____

Item two _____

2008

Give **one *safety precaution*** taken by the pupil, shown in the photograph, while doing an experiment in a school laboratory.

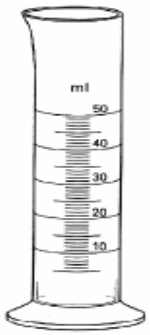
Precaution _____

Describe a ***precaution*, *not shown*** in the photograph, that you would take when ***heating a substance*** in a test tube in a school laboratory.

Precaution _____

2007

Name the ***item*** of laboratory equipment shown in the diagram and name a ***second item*** of laboratory equipment which enables more accurate measurements of volume to be made.



Item shown _____

Second item _____

Physics

Measurement and Units, Area, Volume and Speed

2014

Bobbing for apples is a traditional Hallowe'en game. A large basin is filled with water and apples are put into the water. Players try to catch the floating apples with their teeth. (18)

(*i*) Why do the apples float in the water?

_____

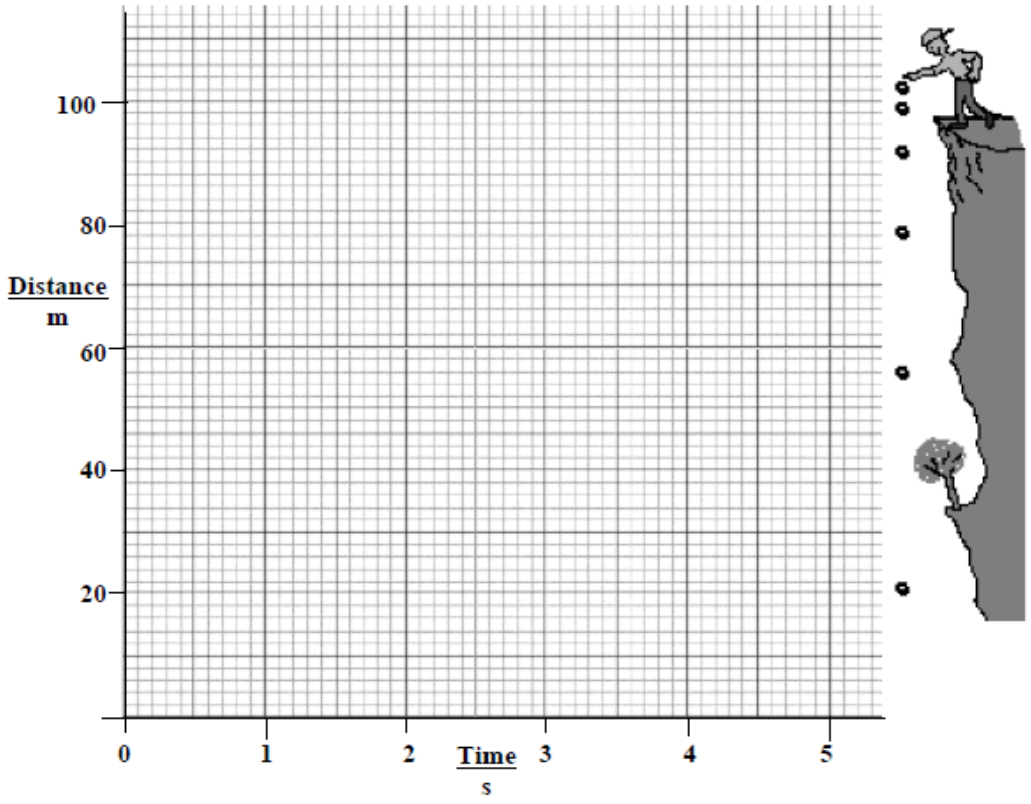
_____

(*ii*) Describe, with the aid of a labelled diagram, an experiment to measure the density of an apple.

A stone was dropped from the top of a cliff and the distance that it fell was measured at the intervals of time as given in the table below.

Distance (m)	0	5	20	45	80	**100**
Time (s)	0	1	2	3	4	**4.5**

(*i*) Draw a graph of distance against time in the grid below.
A smooth curve through the plotted points is required. (9)



(*ii*) Use the graph to find how far the stone had fallen in 3.5 s. (3)

_____

(*iii*) Calculate the average speed of the falling stone between the second and the fourth second. Give the unit with your answer. (6)

_____

(*iv*) In this experiment is distance fallen directly proportional to time? Justify your answer. (6)

_____

_____

2010

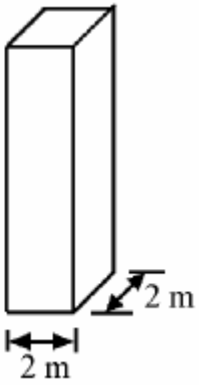
Why do icebergs ***float*** on water?

Why? _____

_____

_____

The diagram shows a tank full of water. The mass of the water in the tank is 48 000 kg. Calculate the ***approximate pressure*** that it exerts on the base of the tank. Give the ***units*** of pressure with your answer.

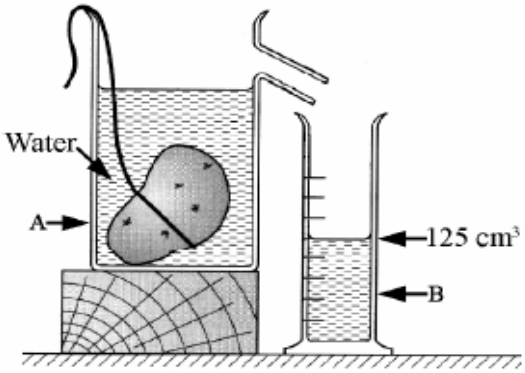


Calculate _____

_____

2009

A pupil measured the volume of a potato using the items of laboratory equipment, labelled **A** and **B** as shown in the diagram. (6)



(*i*) Name ***the items labelled*** **A** ***and*** **B**.

A _____

B _____

(*ii*) The potato had mass 175 g and volume 125 cm^3.
Calculate the ***density*** of the potato.
Give the ***units of density*** with your answer. (6)

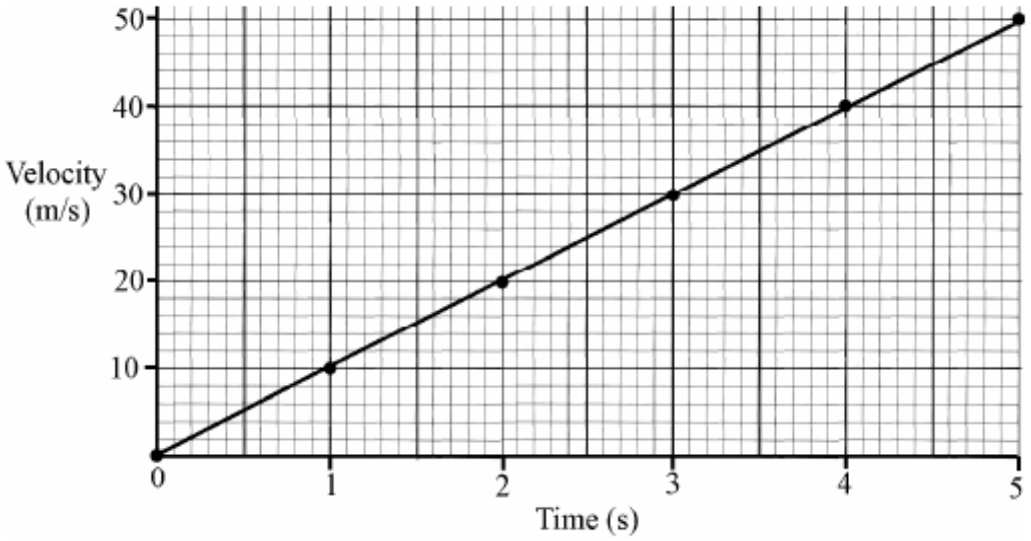
_____

_____

(*iii*) Why did the potato ***sink*** in the water? (3)

_____

A stone was dropped from the top of a tall cliff. The stones approximate velocity was measured each second as it fell. The data collected during this experiment is given in the graph.



(*i*) Define ***velocity***. (6)

(*ii*) Use data from the graph to ***estimate the acceleration of the stone*** as it fell. Give the ***units of acceleration*** with your answer. (6)

(*iii*) Name the ***force*** that caused the stone to fall. (3)

Name _____

(*iv*) The stone had a mass of 2 kg.
What was the ***weight*** of the stone on earth? Give the unit. (6)

2007

Ice floats on water but ice sinks in ethanol (an alcohol).
Use this information to compare the ***density*** of ***ice*** with
(*i*) the ***density*** of ***water***; (*ii*) the ***density*** of ***ethanol***.

(*i*) _____

(*ii*) _____

2006

Define ***temperature*** and give a ***unit*** used to express temperature measurements.

Definition _____

Unit _____

Force and Work

2014

The picture shows the *London Eye*, a giant Ferris wheel of radius 60 m.

(*i*) Calculate the work done when the wheel carries a person of weight 800 N from its base to the top.

_____

_____

(*ii*) A person moves with a speed of 0.25 m s^{-1} while travelling on the *London Eye*. Calculate the time it takes for the person to travel one full circle.

_____

_____

The picture shows the brake of a bicycle. When the cyclist wishes to slow down, she pulls a lever which pushes the rubber brake-pad against the rim of the wheel.

Explain why the brakes may not work as well after it has been raining. (6)

_____

_____

_____

_____

_____

2013

When one surface in contact with another surface moves, frictional forces arise. Friction makes movement more difficult. Sometimes friction is useful, other times it is unhelpful.

(*i*) Give one example where friction can be useful.

Example _____

(*ii*) Give one example where friction can be unhelpful.

Example _____

(*iii*) How can unhelpful friction be reduced?

How? _____

(*iv*) How can friction between air and a moving vehicle be reduced?

How? _____

(*i*) Distinguish between mass and weight. (6)

Mass _____

Weight _____

2012

Parts (*b*) and (*c*) of this question show examples of forces that can act without contact. Name a third different force that can act without contact. Give one important effect of the force that you have named. (6)

Name _____

Effect _____

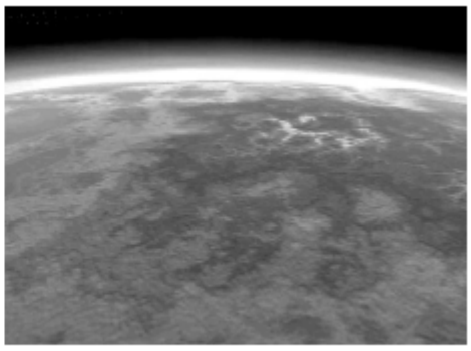
2011

Explain the term *friction*. How can friction be reduced?

Explain _____

How? _____

The Earth's atmosphere seen from space is the thin curve at the top of the photo.

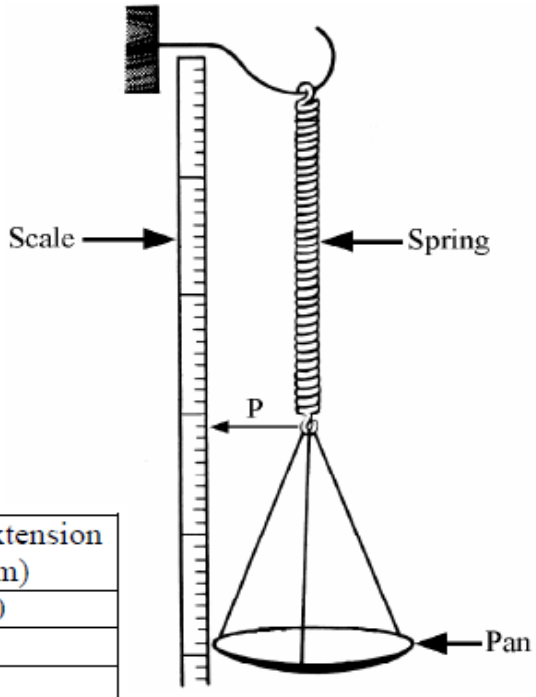


(*i*) Name the force that holds the atmosphere to the Earth.

Name _____

This force gives the atmosphere weight and causes atmospheric pressure.

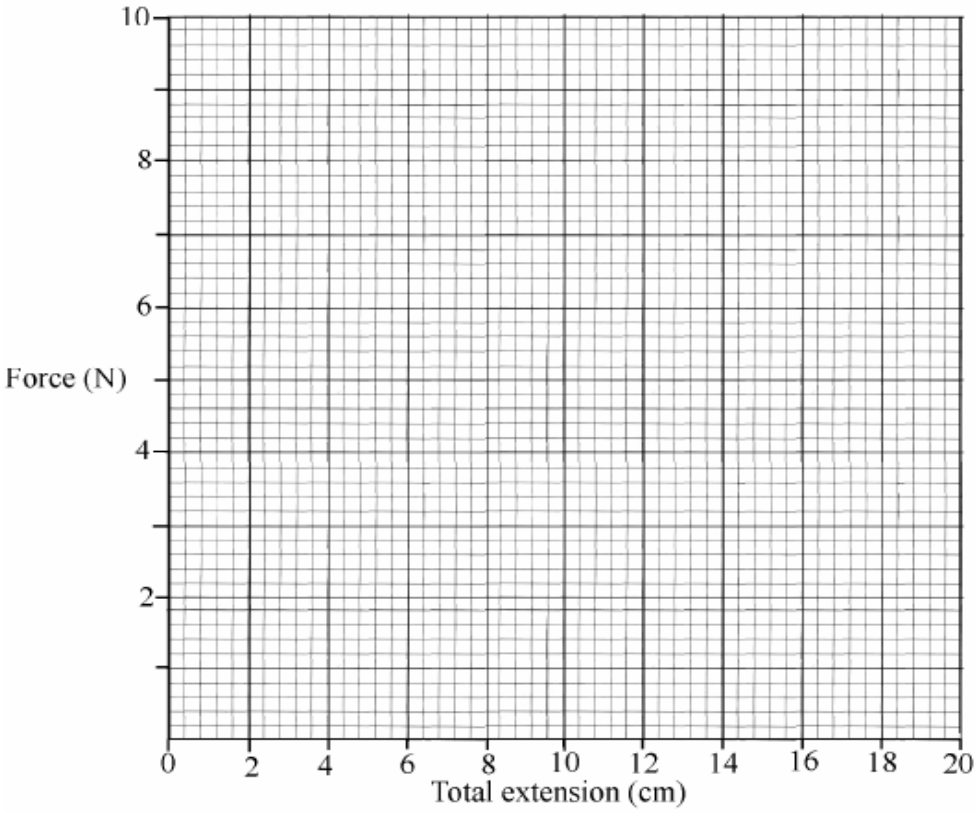
(*a*) A pupil used the apparatus shown in the diagram to investigate the relationship between the force applied and the extension produced in the spring by that force.
Pointer, P, was used to read the scale.
Weights were added to the pan to apply forces to the spring.
The data recorded is in the table.



(*i*) Calculate the ***total extension*** for each force and enter them in the table. (6)

Force (N)	Scale reading (cm)	Total extension (cm)
0	31.0	0
2	35.0	
4	39.0	
6	43.0	
8	47.0	
10	51.0	

(*ii*) Draw a ***graph*** of force against total extension in the grid below. (6)



(*iii*) What ***conclusion*** can be drawn from the graph regarding the relationship between the force applied to the spring and the extension produced by it? (6)

What? _____

(*iv*) Use the graph to ***determine the weight*** of a stone that produced an extension of 14 cm in the spring. (3)

Use _____

2008

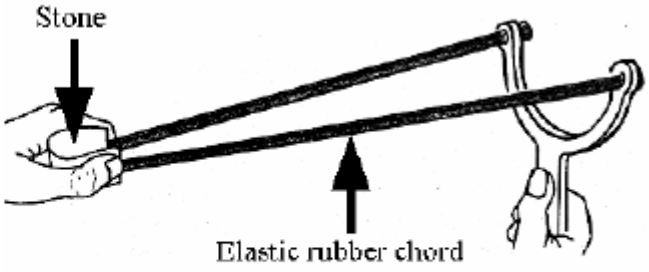
Fill in the ***missing words*** in both sentences.

(*i*) The ***stretched rubber chord***

has _____ energy.

(*ii*) If the ***stone is released*** it will

have _____ energy.

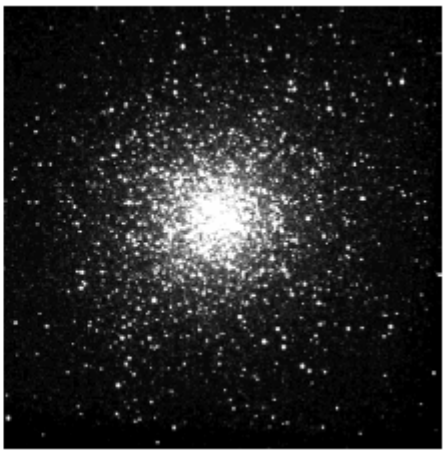


The globular cluster shown is a group of stars (like a small galaxy). ***Gravity is the force that holds the stars together*** in this formation.

Give **two *effects*** that gravity has on your everyday life.

1 _____

2 _____



2007

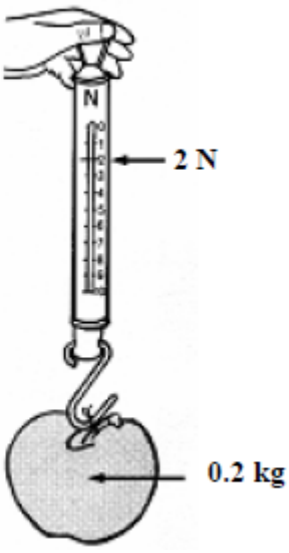
The driver of a moving car applied the brakes. The brakes produced an average stopping force of 8 kN (8000 N) and the car stopped having travelled 20 m after the brakes were applied. Calculate the ***work done*** in stopping the car. (6)

When work is done energy is converted from one form to another. Identify one ***energy conversion*** that occurred when the car braked. (6)

2006

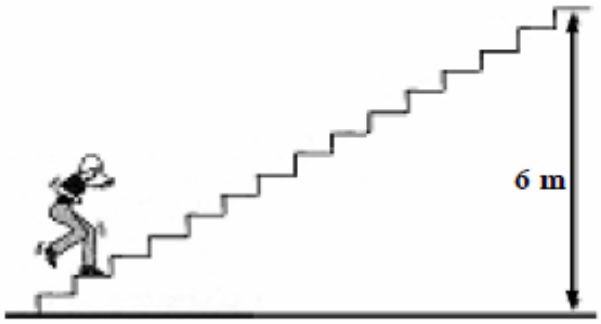
A pupil measured the ***weight*** of an apple of ***mass*** 0.2 kg using a spring balance and got a reading of 2 N.

Distinguish between ***weight*** and ***mass***.



A girl of mass 60 kg (weight 600 N) climbed a 6 m high stairs in 15 seconds.

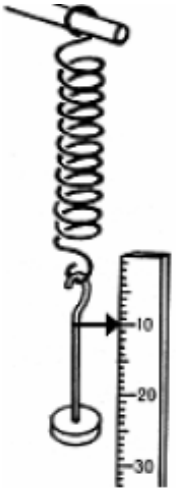
Calculate the ***work*** she did and the average ***power*** she developed while climbing the stairs.



Work _____

Power _____

Robert Hooke (1635-1703) made a number of discoveries including the effect of force on elastic bodies now known as Hooke's law. ***State Hooke's law***. (6)



Hooke's law _____

_____

A student was given a box of identical springs and asked to analyse them so that they could be used as newton meters.

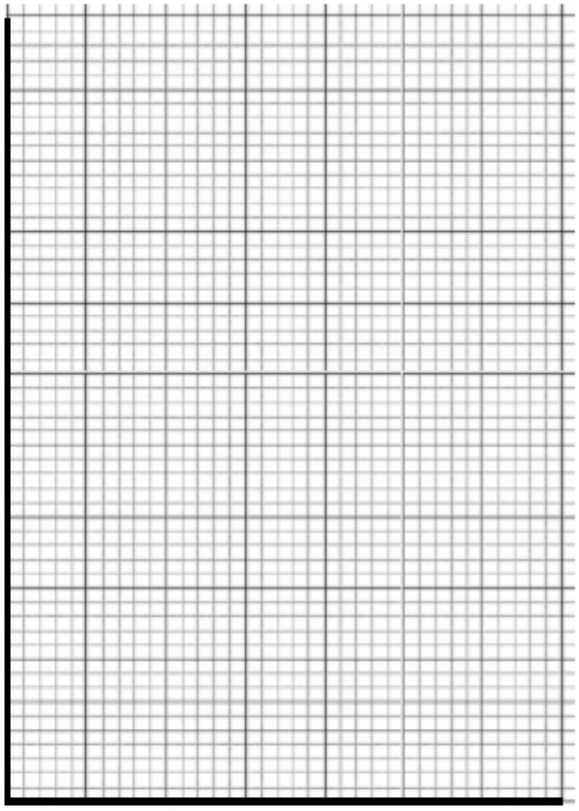
The student performed an experiment, using the apparatus shown in the diagram, on one of the springs.

In the experiment the student measured the increase in length of the spring caused by a number of weights. The spring was tested to destruction (that is weights were added until the spring was damaged).

The data from the experiment is given in the table.

Weight (N)	0.0	0.4	0.8	1.2	1.6	2.0	2.4
Extension (cm)	0.0	2.0	4.0	6.0	8.0	8.5	8.6

(*i*) Plot a ***graph of extension*** (increase in length) ***against weight*** (*x*-axis). in the grid provided on the right. (9)



(*ii*) Use the graph to find the ***weight*** that would produce an ***extension*** of 5 cm in the spring. (3)

Weight _____

(*iii*) Study your graph carefully. The spring obeys Hooke's law for the earlier extensions and then when the spring becomes damaged it does not appear to do so.
Estimate, from your graph, ***the weight after the addition of which the law seems no longer to apply***. (3)

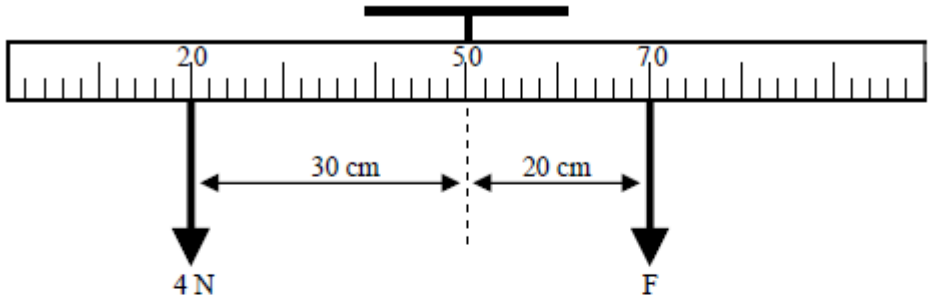
_____

Moments and Centre of Gravity

2013

(*ii*) Define moment of a force. (6)

Definition _____



The diagram shows a metre stick suspended from its centre of gravity.
A force of 4 N acts on the stick at the 20 cm mark and a force of F N acts on the stick at the 70 cm mark. The metre stick is balanced horizontally.
Calculate force F. (6)

_____

_____

(*iii*) Give one everyday application of levers. (3)

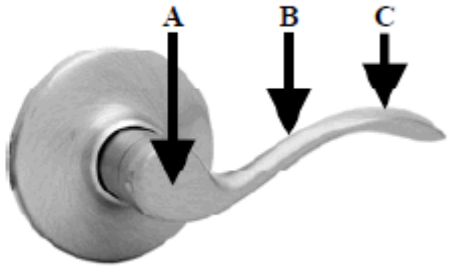
Application _____

2011

The door handle is an application of a lever.

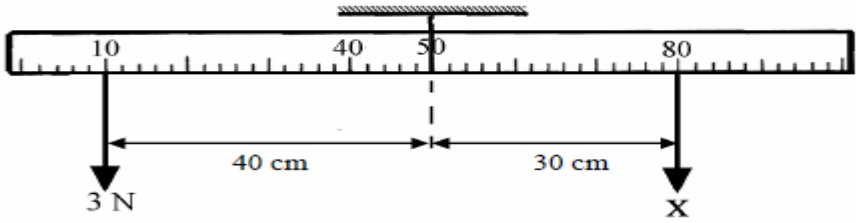
The labels and arrows show three points.

Which of the points **A**, **B** or **C** represent
(*i*) the fulcrum (turning point),
(*ii*) the point where the smallest force will open the door lock.



(*i*) _____ (*ii*) _____

2010



A uniform metre stick, suspended at its mid-point is balanced as shown.
Calculate ***force*** X.

Calculate _____

2008

State the ***law of the lever***.

_____

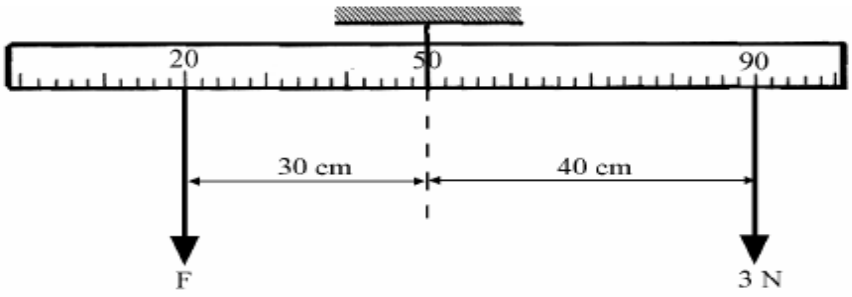
_____

_____

2007

Define ***moment of a force***. (6)

_____



The diagram shows a metre stick suspended from its centre of gravity.
A force of 3 N acts on the stick at the 90 cm mark and a force of **F** N acts on the stick at the 20 cm mark. The metre stick is balanced horizontally.
Calculate ***force F***. (6)

_____

_____

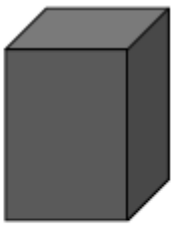
_____

Give an ***everyday example of an application of the lever***, using a labelled diagram, showing the ***fulcrum*** and at least ***one force*** acting on the lever. Use the box provided for your labelled diagram. (6)

Pressure

2014

A block of metal of weight 240 000 N has sides of length 2 m, 3 m and 5 m. Calculate the maximum pressure the block can exert when it is resting on a level surface.



_____

_____

_____

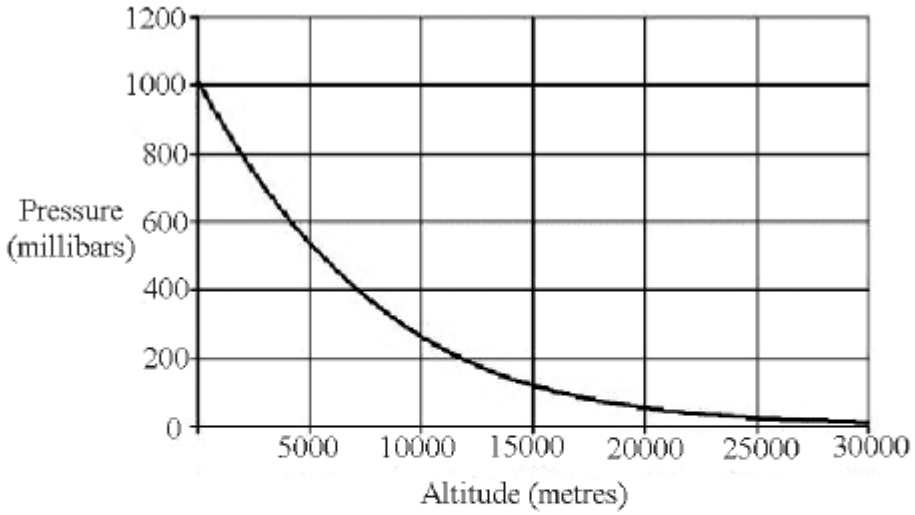
2013

Barometers are used to predict weather. What kind of weather would you expect if the pressure was (*i*) high *or* (*ii*) low?

High _____

Low _____

The graph is of pressure *versus* altitude for our atmosphere.



(*i*) Look carefully at the graph of pressure *versus* altitude. Two conclusions can easily be drawn: (1) that atmospheric pressure depends on altitude, and (2) that the dependence of atmospheric pressure on altitude is not a direct one. Explain why each conclusion can be drawn from the graph. (6)

Pressure depends on altitude _____

Not direct _____

(*ii*) Give two reasons why atmospheric pressure is greatest near the earth's surface. (6)

Reason 1 _____

Reason 2 _____

(*iii*) What is the effect of increased pressure on the boiling point of water? (6)

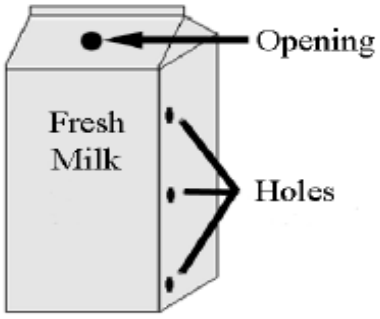
_____

Give a reason for your answer.

Reason _____

_____

Three holes were made in a carton of milk at the same time. From which hole will the milk pour out at the greatest rate? Give a reason for your answer.



Which? _____

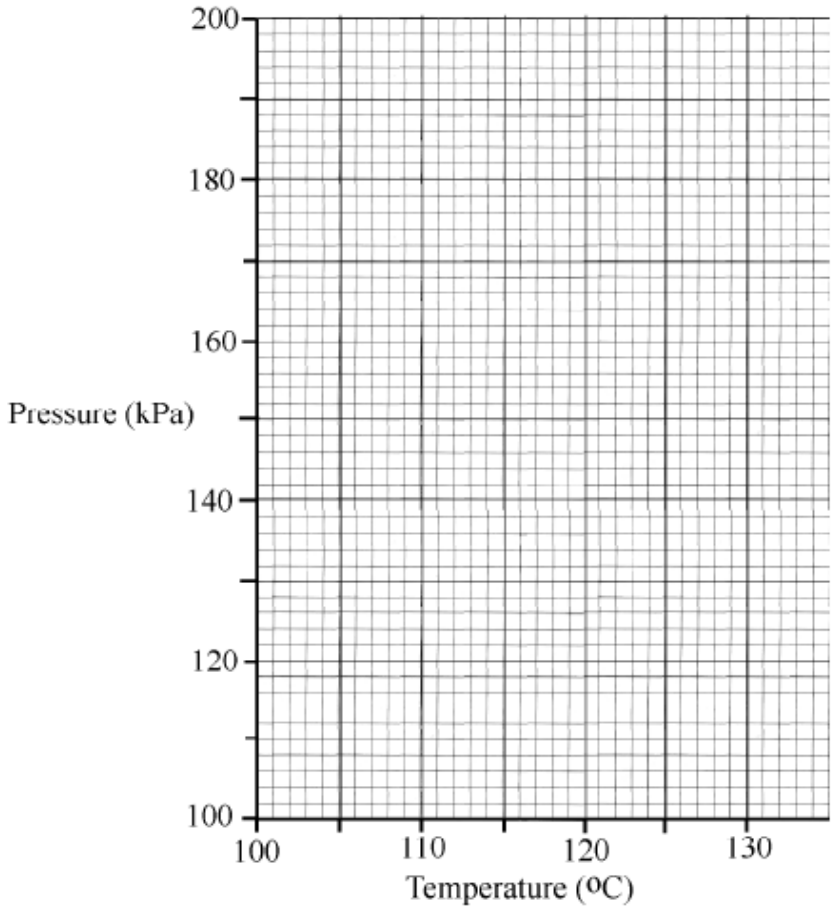
Reason _____

Define pressure._____ (3)

An experiment was performed to investigate the effect of pressure on the boiling point of water. The data from the experiment is given in the table below.

Pressure (kPa)	100	120	140	160	180	200
Temperature (°C)	100	105	109	114	119	124

(*i*) Draw a graph of pressure against temperature using the grid below. (9)



(*ii*) What two pieces of information can be drawn from the graph about the relationship between the boiling point of water and pressure. (6)

1 _____

2 _____

(*iii*) What effect would reducing the pressure on water below normal atmospheric pressure, about 100 kPa, have on its boiling point? (3)

What? _____

2011

Define pressure and give the unit for pressure.

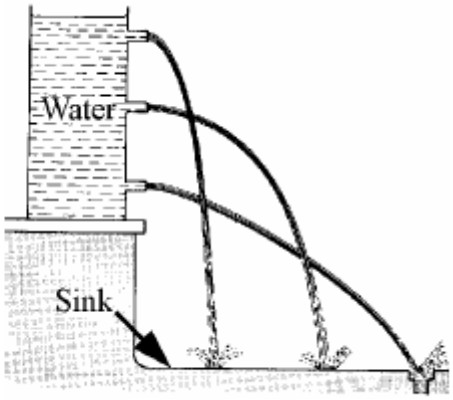
Define _____ Unit _____

Why does atmospheric pressure decrease with height?

Why? _____

2009

The diagram shows a container with three spouts. The container is filled with water. Jets of water pour out of the spouts. Why does the ***jet of water from the bottom spout travel the furthest out from the container***?



Why? _____

_____

2007

The diagram is an Atlantic weather chart. Use the chart to predict **two *weather conditions*** that you might expect for Ireland.

Condition 1 _____

Condition 2 _____

Explain why low atmospheric pressure ***causes*** **one** of the weather conditions that you have given.

Explanation _____

_____

Energy

2014

Explain why the Sun is considered the primary source of energy for (*i*) biofuel and (*ii*) hydroelectricity. (9)

Biofuel _____

_____

_____

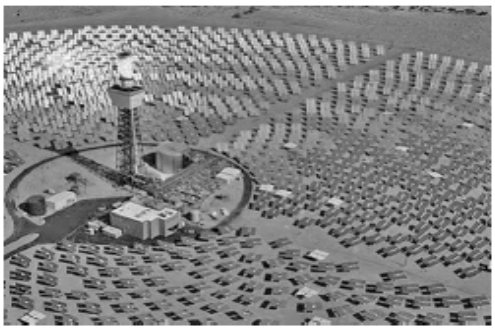
Hydroelectricity _____

_____

_____

2013

The photograph shows a solar array in Germany which produces electricity equivalent to the power output of 20 nuclear reactors working at full capacity.



(*i*) By what method of energy transfer does the sun's energy get to the solar array?

Method _____

(*ii*) Compare, giving a reason, the safety of the solar array with the safety of 20 nuclear reactors.

Compare _____

_____

The conversions of chemical energy to kinetic energy to potential energy occurs when you walk up a stairs. Give two more everyday examples of energy conversions and the contexts in which they occur.

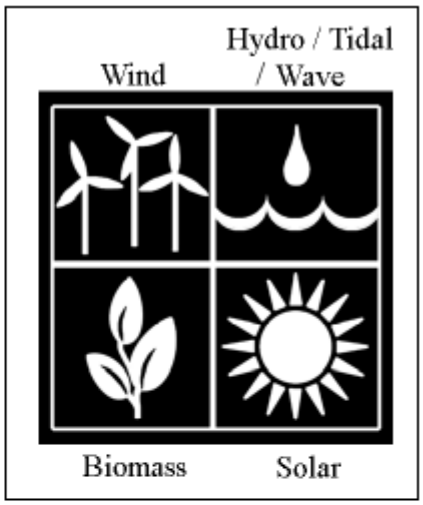
1 _____

_____

2 _____

_____

Renewable energies are shown in the picture.



Pick any two of the energies shown in the picture and name your selection.

Energy one _____

Energy two _____

(*i*) Give one advantage associated with each energy you've selected.
Two **different** reasons must be given.

Energy one _____

Energy two _____

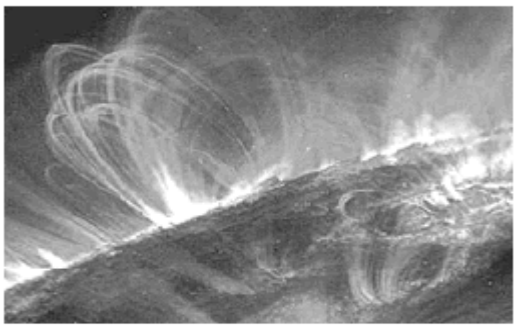
(*ii*) Give one disadvantage associated with each energy you've selected.
Two **different** reasons must be given.

Energy one _____

Energy two _____

2011

The photo shows part of the surface of sun. Give **two** examples showing that the sun is our primary source of energy.



1 _____

_____

2 _____

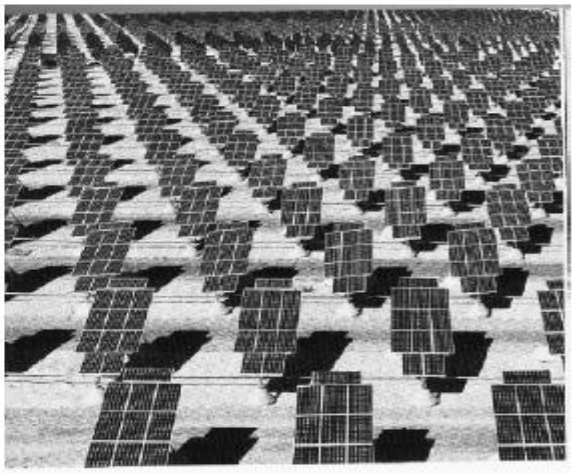
_____

2010

The photograph shows part of a very large array of photovoltaic cells that convert light, from the sun, directly into electrical energy.

Light, from the sun is a renewable source of energy.

Ireland only uses about 2% renewable sources to meet current energy needs.



(*i*) Name **two** ***renewable energy sources***, excluding sunlight, that are available in Ireland. (6)

Source one _____

Source two _____

(*ii*) Give **two** ***benefits*** that Ireland would get from increasing the use of renewable energy sources to meet our energy requirements. (6)

Benefit one _____

Benefit two _____

2009

Give ***two <u>useful</u> energy conversions*** that occur when the drill shown in the diagram is being used.

(*i*) _____

(*ii*) _____

The photograph shows a solar panel being installed. Water passing through the panel is heated by the sun.

(*i*) How does ***heat*** from the ***sun travel***, through the ***vacuum of space***, to the earth? (3)

How? _____

(*ii*) Give ***one advantage <u>or</u> one disadvantage*** of fitting solar panels to your home? (3)

Advantage _____

<u>Or</u>

Disadvantage _____

2008

The Pelamis, shown in the photograph, *converts the energy of waves* in seas into *electrical energy*. Give **one *advantage*** and **one *disadvantage*** of generating electrical power in this way.

Advantage _____

Disadvantage _____

The top two photographs show the front (left) and the rear (right) of a sign warning motorists approaching a school to take care. The photograph underneath shows the *lights flashing* amber alternately. This happens when the *pupils are coming to school* and are *going home from school*.
The *rectangular panel* above the sign is a *solar (photovoltaic) panel*. It *changes energy from the sun* into *electrical energy*.

(*i*) Name the ***energy from the sun*** that the panel changes into electricity. (3)

_____

The electrical energy is then changed into a ***form of energy*** that can be ***stored*** in a ***battery***.

(*ii*) Name the ***form of energy*** that can be stored in a ***battery***. (3)

_____

In *winter* it may be *dark* when the pupils are going to or coming from school.

(*iii*) Give **two *energy conversions*** that occur to produce the flashes of light warning motorists approaching the school on dark mornings. (6)

_____

_____

2007

Give **one *advantage*** and **one *disadvantage*** of using nuclear energy to generate electricity.

Advantage _____

Disadvantage _____

2006

In Ireland ***90% of electricity*** is generated ***by burning fossil fuels*** compared to other European countries who have an average of 50% use of fossil fuels and a 30% use of fossil fuels in the USA.

(*i*) List **two *disadvantages***, excluding acid rain, of this heavy reliance on fossil fuels for the production of electricity. (6)

Disadvantage one _____

Disadvantage two _____

(*ii*) Suggest **two *alternative sources*** of energy for the generation of electricity in Ireland. (6)

Source one _____

Source two _____

Heat

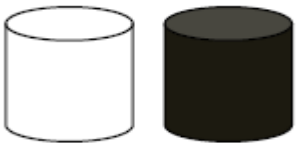
2014

A standard laboratory thermometer contains liquid alcohol which has been dyed red so as to make it easier to see. Describe what would be observed if the thermometer were moved from a warm region to a colder region. Explain this observation.

Observation _____

Explanation _____

_____



The diagram shows two aluminium cans, one painted white and the other painted black, which are otherwise identical.

Each can contains 100 cm^3 of water at 60 °C.

In which of these cans will the water remain warmer for longer? Explain your answer.

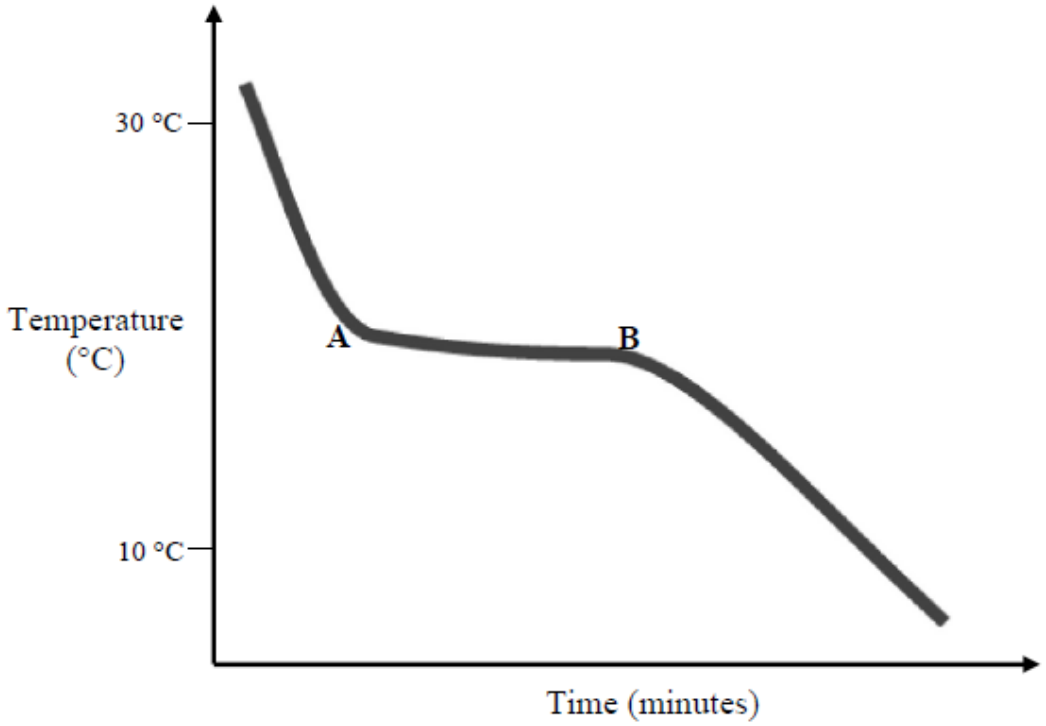
Which can? _____

Explanation _____

_____

_____

The diagram below shows the cooling curve for chocolate. (12)



(*i*) Which state of matter describes the chocolate when it is at 30 °C?

_____

(*ii*) Which state of matter describes the chocolate when it is at 10 °C?

_____

(*iii*) In terms of heat loss *or* heat gain, describe and explain what happens to the chocolate between position **A** and position **B** on the diagram.

_____

_____

_____

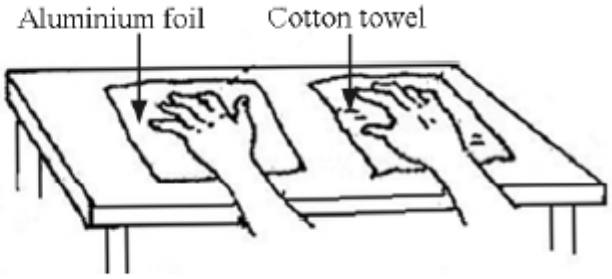
2013

Two identical beakers, one holding 50 cm^3 of water and the second holding 100 cm^3 of water, are at the same temperature of 80 °C. Which contains the most heat energy? Give a reason.

Which? _____

Reason _____

The foil and the towel were both at a temperature of 10 °C.
Why did the foil feel colder?

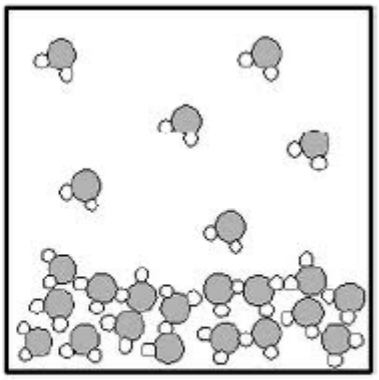


Why? _____

_____

2012

The diagram shows the evaporation of water.
What is evaporation?



What? _____

_____

What do water molecules have to gain in order to evaporate from liquid water?

What? _____

The damage to the railway tracks shown in this image was caused by an environmental factor. Name the factor and explain how it caused the damage.

Name _____

Explain _____

_____

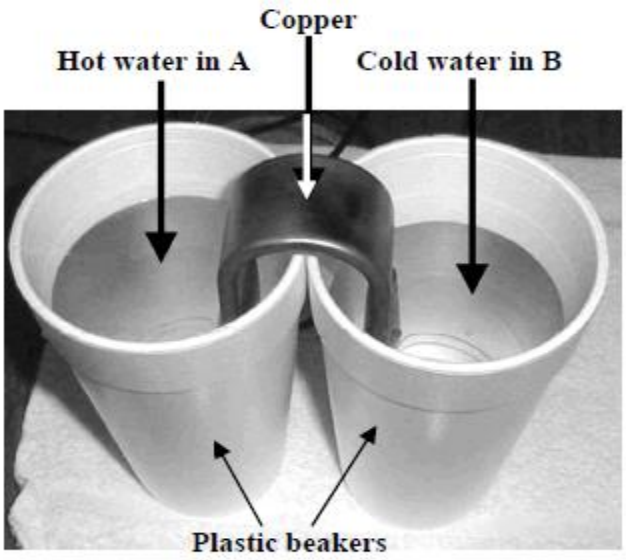
The photo shows a hot air balloon.

Why does the balloon rise when the air inside is heated?

Why? _____

_____

The experiment shown in the photograph was set up by a student.



(*i*) What changes take place to the water in the beakers **A** and **B** as time passes? (3)

_____

_____

_____

(*ii*) Explain why these changes occur. (6)

_____

_____

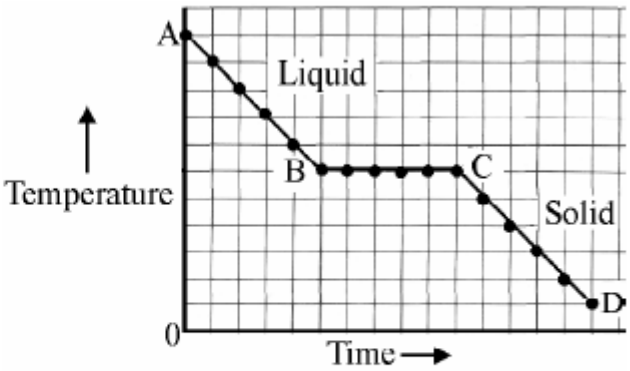
(*iii*) What instrument would be used, in this experiment, to monitor the changes? (3)

_____

(*iv*) Name a material to replace copper in this experiment that will not allow these changes to occur. (3)

_____

A substance that is a solid at room temperature was heated above its melting point and then allowed to cool at a steady rate. The temperature was taken at regular intervals. The data is in the graph. Why is ***there no drop in temperature*** between B and C?



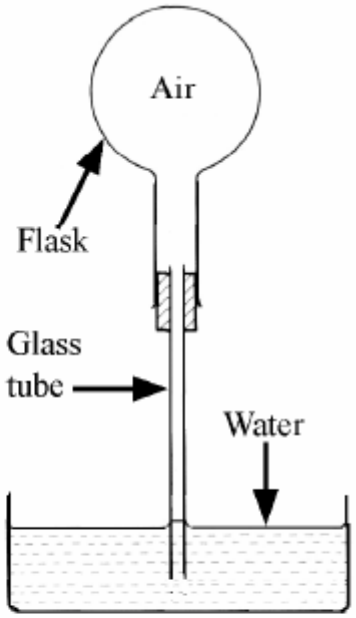
Why? _____

Give **two *differences*** between heat and temperature.

One _____

Two _____

The apparatus shown in the diagram was used to investigate the expansion and contraction of a gas.



(*i*) What is ***observed*** when the flask is ***heated***? (3)

What? _____

_____

(*ii*) Explain your ***observation*** when the flask is ***heated***? (3)

Explain _____

_____

(*iii*) What is ***observed*** when the flask is allowed to ***cool***? (3)

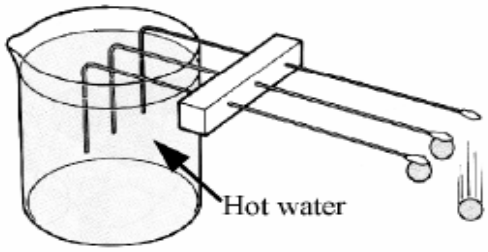
What? _____

(*iv*) Explain what you ***observe*** as the flask ***cools***. (3)

Explain _____

2009

Copper, aluminium and iron rods are set-up as shown in the diagram. A metal ball is attached by wax to the end of each rod. Hot water is poured into the beaker. The ball falls from the copper rod first. What ***conclusion*** can be drawn from this observation?



Conclusion _____

The ***boiling point of water*** can be determined using the apparatus shown in the diagram.

(*i*) Why are ***boiling (anti-bumping) chips*** added to the water? (3)

Why? _____

(*ii*) At what ***temperature*** does ***water boil***, at ***standard*** (normal) ***atmospheric pressure***? (3)

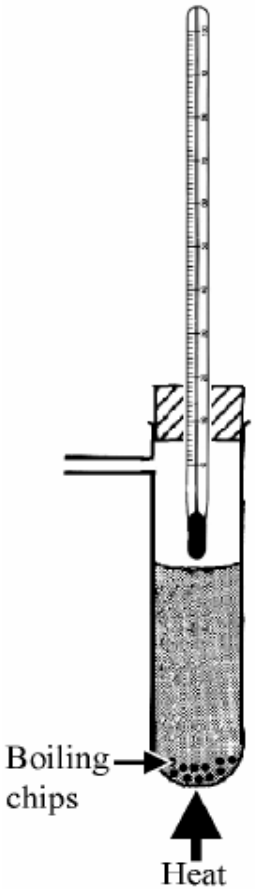
What? _____

(*iii*) What ***effect*** does the ***raising of pressure*** have on the ***boiling point*** of water? (3)

Effect of raising pressure _____

(*iv*) What ***effect*** does the ***lowering of pressure*** have on the ***boiling point*** of water? (3)

Effect of lowering pressure _____



Give **two *differences*** between heat and temperature.

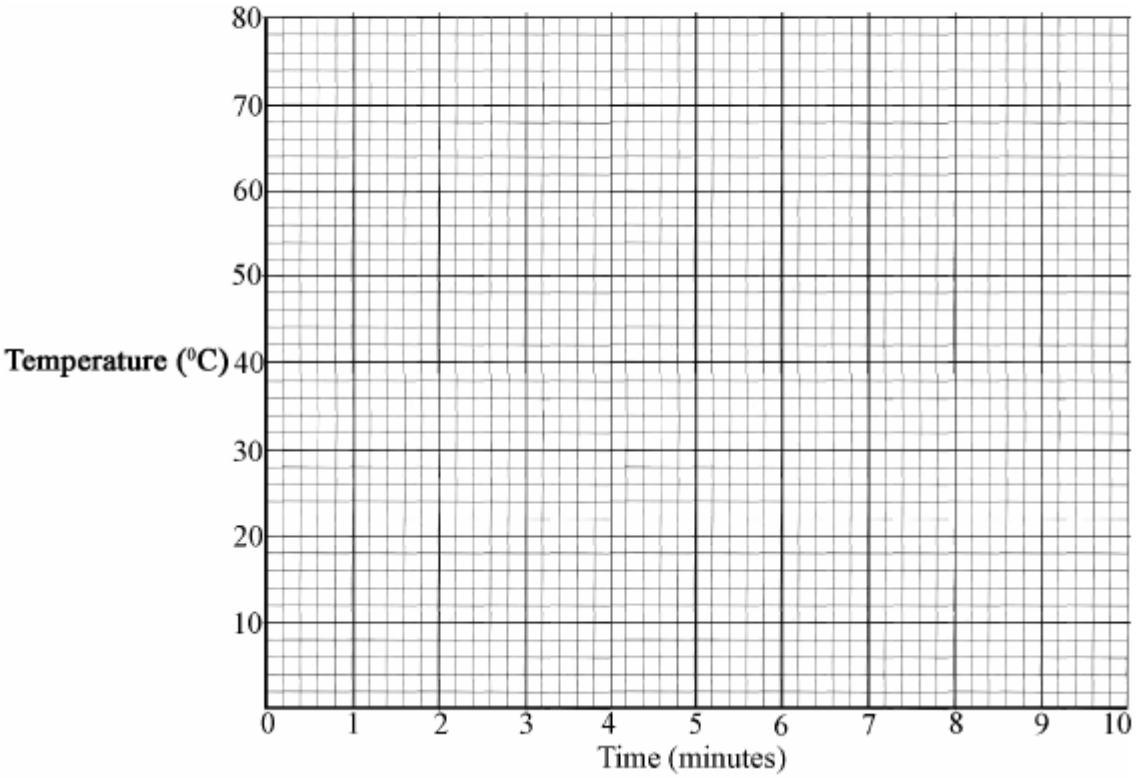
1 _____

2 _____

(*a*) A pupil *heated* some *lauric acid*, which is a *solid* at room temperature, until it turned into a *liquid*. The lauric acid was then allowed to *cool* at a *uniform* rate. The *temperature* of the lauric acid was taken *every minute*.
The data from this experiment is given in the table.

Temperature (°C)	75	64	54	43	43	43	43	43	32	22	10
Time (minutes)	0	1	2	3	4	5	6	7	8	9	10

(*i*) Draw a ***graph***, using this data, of ***temperature against time (x-axis)*** in the grid provided below. (9)



(*ii*) Explain the ***shape of the graph*** that you obtain. (9)

_____

_____

_____

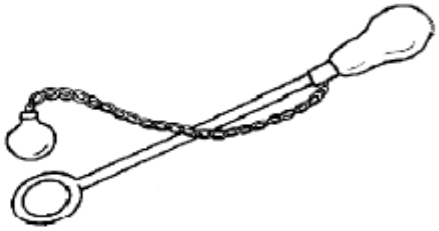
_____

(*iii*) Use the graph to estimate the ***melting point*** of lauric acid. (3)

_____

2007

The diagram shows a "ball and ring" apparatus. When the ball and ring are both cold the ball just passes through the ring.



How would you use this apparatus to show
(*i*) the ***expansion*** of a solid on heating
(*ii*) the ***contraction*** of a solid on cooling?

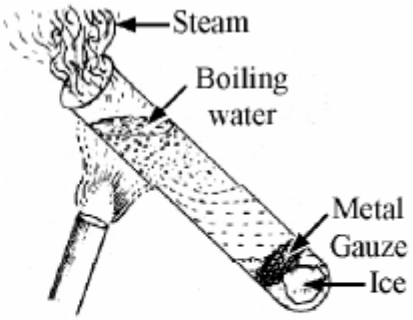
(*i*) _____

_____

(*ii*) _____

_____

What does the experiment shown in the diagram tell us about the ***transfer of heat*** energy in water?



What? _____

_____

If you wanted to warm all of the water why would the ***bottom*** of the test tube be the ***best place to heat*** with the Bunsen flame?

Why? _____

Name the mode of ***heat transfer*** from the hot liquid, through the ***spoon***, to the hand.

Name _____

Heat moves in liquids by convection. Give **one** ***difference*** between convection and the way heat moves along the spoon.

Difference _____

Describe an experiment to show the ***expansion of water*** when it ***freezes***. You may include a labelled diagram if you wish. (9)

_____

_____

_____

_____

_____

_____

_____

_____

Optional labelled diagram

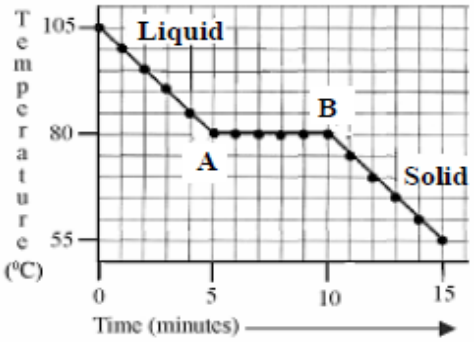
The graph is a ***cooling curve***. The substance used in this experiment was naphthalene. Naphthalene has a melting point of 80 °C. The rate of heat loss was constant throughout the experiment.

(*i*) What is ***happening*** to the naphthalene between points **A** and **B** on the graph? (3)

_____

_____

_____

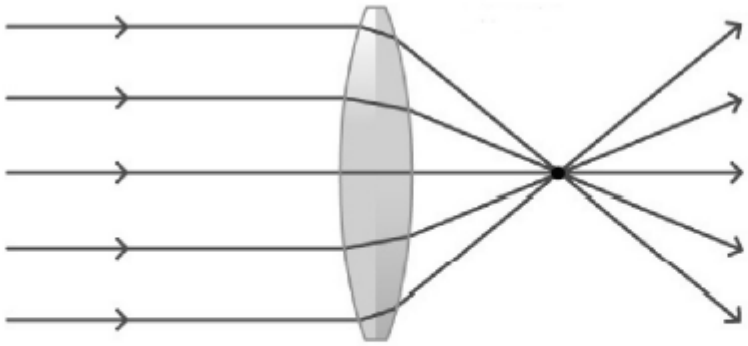


(*ii*) What is the ***heat loss***, between points **A** and **B**, on the curve called? (3)

_____

Light

2014



The picture shows a converging lens with rays of light passing through it.

What two properties of light are illustrated in this picture?

Property 1 _____

Property 2 _____

2013

(*i*) What happens to white light when it is dispersed?

What? _____

(*ii*) What part of white light is refracted most by a triangular prism?

What? _____

2012

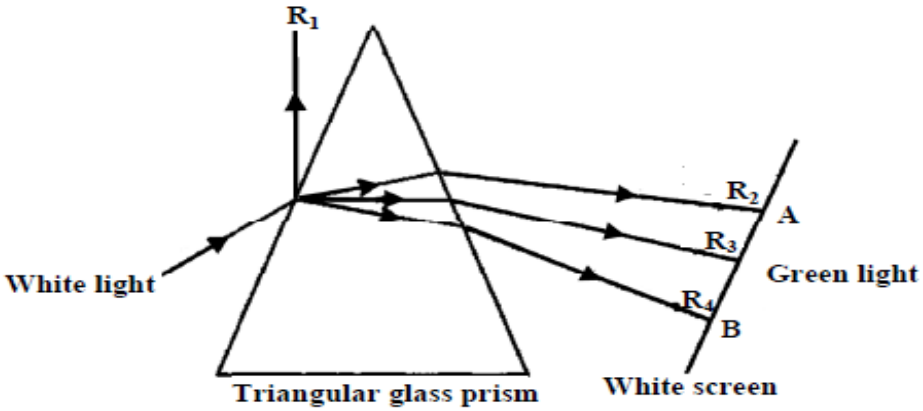
What causes the appearance of a 'second' drinking straw in the drink in the glass shown in the photograph?

What? _____

_____

_____

A narrow beam (ray) of white light is directed onto a triangular glass prism as shown in the diagram.



The paths of four rays: **R_1**, **R_2**, **R_3** and **R_4** produced from this ray of white light are shown in the diagram.

(*i*) Ray one (R_1) is deflected off the prism as shown in the diagram. What word is used to describe the deflection of ray one (R_1)? (3)

_____

(*ii*) Rays two, three and four (R_2, R_3, and R_4) enter and leave the prism and change direction each time. What is this change of direction of light called? (3)

_____

(*iii*) A single ray of white light enters the prism and a band of light of many colours leaves the prism. Just three of the emergent rays are shown in the diagram. The coloured rays are produced from the white light. What is this separation of white light into coloured light called? (3)

_____

(*iv*) Give the colour of light that can be seen at the extreme ends **A** and **B** on the white screen. (6)

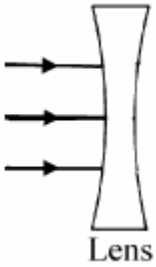
A _____ **B** _____

(*v*) Name a natural phenomenon that produces a band of coloured light from sunlight. (3)

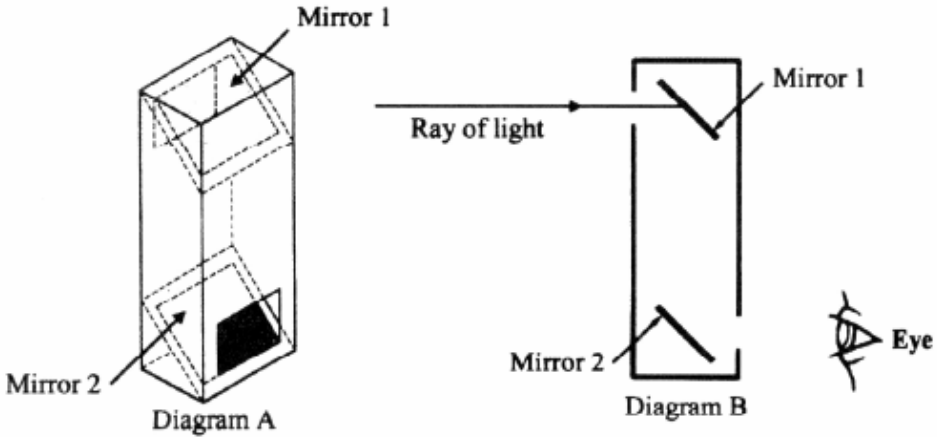
Name _____

2010

The diagram shows three narrow beams of light (rays) hitting a lens. Draw **one *ray*** that passes through the lens ***without refraction*** and **one *ray that is refracted*** by the lens in the diagram.



(*i*) Diagram A is of a simple periscope. Complete diagram B ***showing the reflections of the ray of light at both mirrors***. (6)

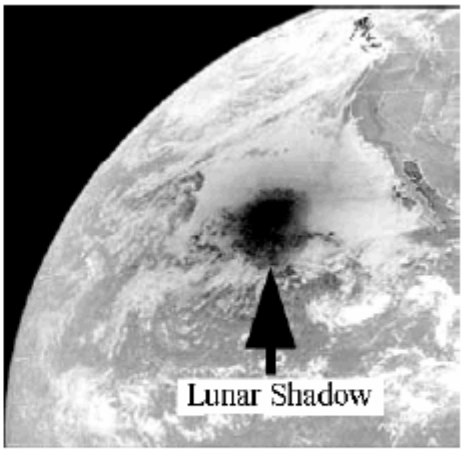


(*ii*) Give **one *use*** for a periscope. (3)

Give _____

2009

The photograph, taken from a satellite above the earth, shows the shadow of the moon on the earths surface.



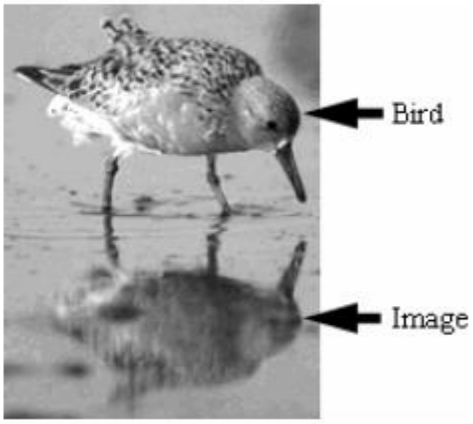
(*i*) Where does the ***light*** falling on the earths surface come from?

Where? _____

(*ii*) What ***property of light*** enables the formation of shadows?

What? _____

The photograph shows a wader i.e. a bird that feeds in shallow water. Is the ***image*** of the bird produced by ***reflection*** or by ***refraction***? Give a ***reason*** for your answer.



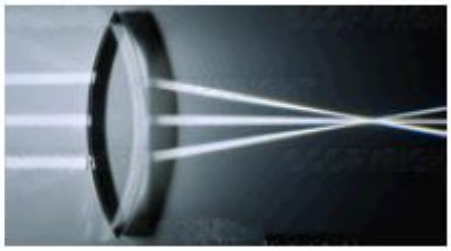
Is? _____

Reason _____

_____

_____

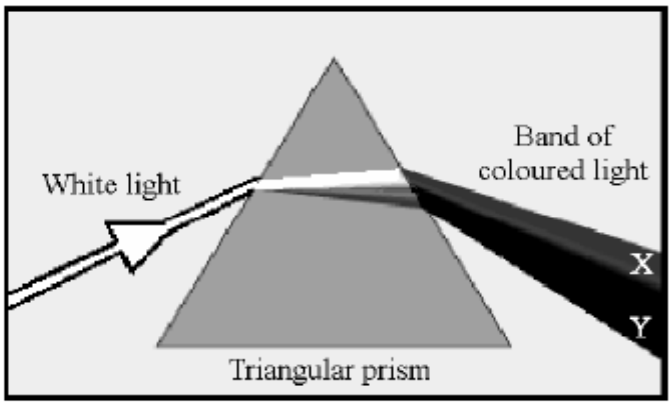
The photograph shows narrow beams of light (rays) passing through a lens-shaped piece of transparent material. *Parallel rays of light enter* the material from the left and when they *leave* the material *they converge and pass through a common point*, before moving apart.



Give a ***use*** for a lens having this effect on light. (3)

_____

The diagram shows a *ray of white light entering* a triangular glass prism. The light passes through the prism and *emerges* as a *band of coloured light*.



(*i*) What does this experiment ***show*** about the ***composition of white light***? (3)

_____

(*ii*) What is this ***separation*** of white light into different colours called? (3)

_____

(*iii*) What ***name*** is given to the ***band*** of coloured light produced? (3)

_____

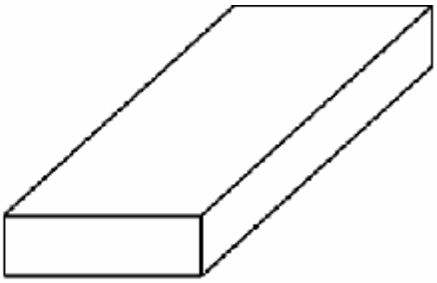
(*iv*) State the ***colour of the light labelled*** **X** and the ***colour of the light labelled*** **Y** at the extreme ends of the band of light illustrated in the diagram. (6)

X _____

Y _____

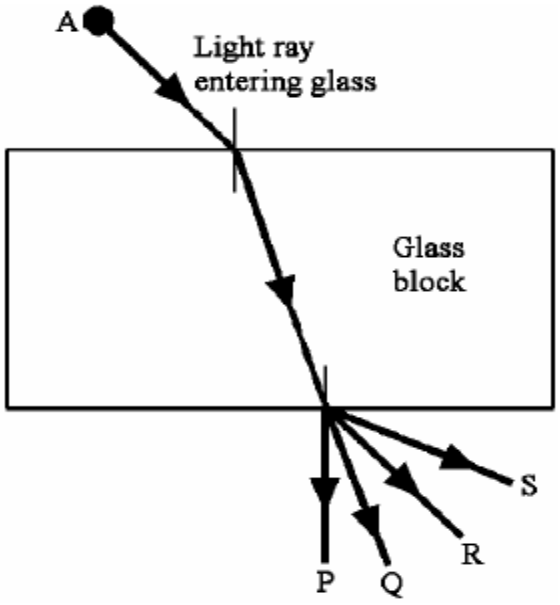
2007

A glass block like the one shown in the diagram was used in an experiment in which a narrow beam (ray) of light was shone through it. The light passed from air to glass, on entry, and glass to air, on exit.



The path of this light ray is shown in the second diagram.

The light ray from **A** bends both on entering and on leaving the glass block.



(*i*) What is this ***bending of light*** called? (3)

What? _____

(*ii*) Pick, from '***rays***' **P**, **Q**, **R** or **S** the path taken by the light ray leaving the glass. (3)

Ray _____

(*iii*) Give an ***application*** of this bending of light. (3)

Application _____

(*iv*) Name ***another way*** in which the direction of a light ray can be changed. (3)

Name _____

2006

What is ***refraction*** of light?

Give an everyday example of an effect caused by refraction.

What? _____

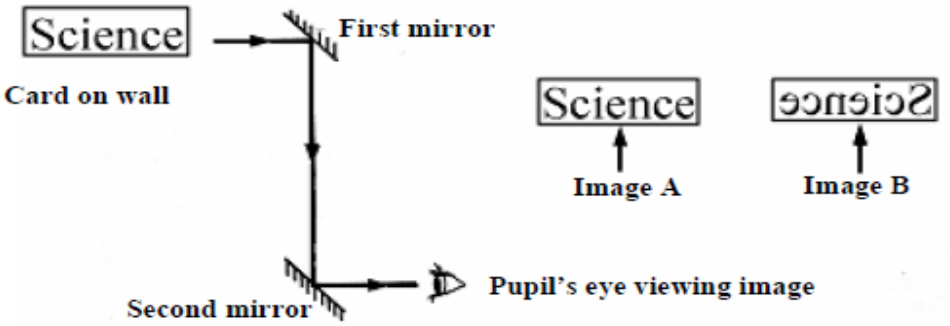
Example _____

(*i*) Why is the word **Ambulance** painted in reverse on the front of many ambulances? (3)

Why? _____

_____

(*ii*) A pupil made a ***simple periscope*** using two plane (flat) mirrors. The mirrors were arranged as shown in the diagram. The pupil looked through the periscope at the word 'Science' written on a card pinned to the laboratory wall.



Did the pupil see **image A** ***or*** **image B** when she looked through the periscope? Give a ***reason*** for your answer. (9)

Image? _____

Reason _____

_____

Sound

2014

The 1979 science-fiction film *Alien* was promoted by use of the slogan: "In space no one can hear you scream." With reference to the properties of sound, explain the physics of this slogan.

_____

_____

2013

(*i*) What are echoes? (3)

_____

(*ii*) A man stood 250 metres from a wall and fired a starting pistol.
1.5 seconds later he heard the echo of the shot.
Use this data to calculate the speed of sound in air. (6)

_____

_____

_____

_____

2011

Describe a simple experiment to show that sound is a form of energy.

Describe _____

_____

2010

Why is it that if you are viewing a fireworks display from a distance that you ***see the fireworks explode before you hear the sound*** of the explosions? (6)

_____

2009

What causes an ***echo***?

What? _____

2007

Thunder and lightning occur during electric storms. Explain why we ***see*** the lightning ***before*** we ***hear*** the thunder.

Why? _____

_____

_____

Describe, using a labelled diagram in the box, an investigation you could carry out to show that ***sound requires a medium*** in which to travel. (12)

_____

_____

_____

_____

_____

_____

2006

How are ***echoes*** produced?

_____

_____

_____

Magnetism

2014

A wire, which is wrapped around an iron nail, is attached to a battery, as shown in the diagram.

(*i*) What happens to the nail when an electric current flows through the wire?

_____

(*ii*) How could this effect be demonstrated? _____

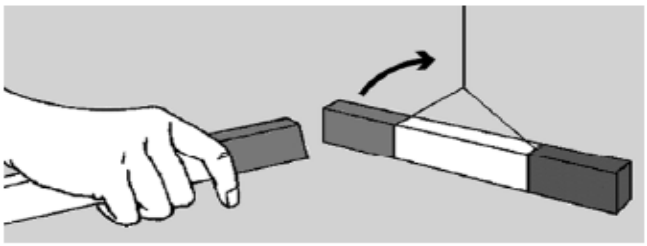
_____

2013

The diagram is of a bar magnet. Draw the pattern of the magnetic field.

2012

The diagram shows the interaction between two magnets. Explain why this happens. (6)



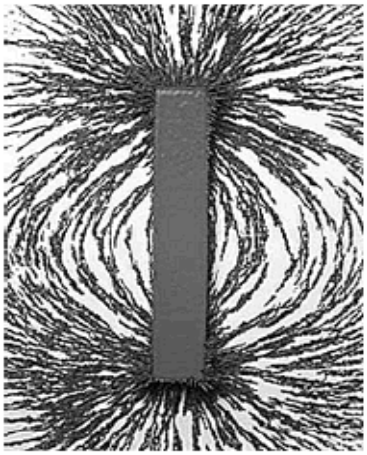
Explain _____

_____

_____

2011

What causes the iron filings to form the pattern around the magnet seen in the photograph?



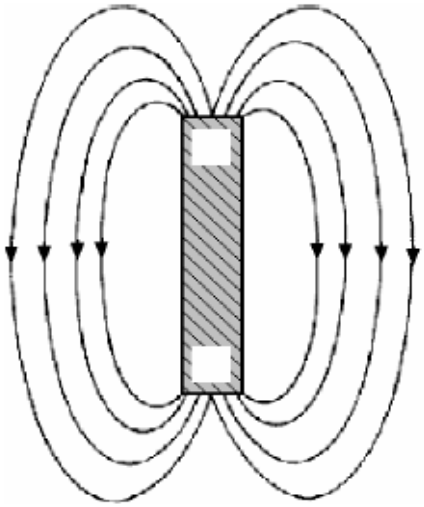
What? _____

_____

How would you determine the position of the north pole of the magnet?

How? _____

The diagram shows a bar magnet with magnetic field lines on both sides.



(*i*) Label the ***north pole*** (N) ***or*** the ***south pole*** (S) of the magnet in the diagram. (3)

(*ii*) What information is given by the arrows on the magnetic field lines? (3)

What? _____

_____

(*iii*) Describe, using a labelled diagram in the box provided, a simple experiment to show that ***like magnetic poles repel each other***. (6)

_____

_____

_____

_____

_____

_____

(*iv*) Name a ***material*** that is attracted by magnets. (3)

Name _____

(*v*) How would you ***show*** that the Earth exerts ***magnetic forces***? (3)

How? _____

2007

The diagram shows the outline of a bar magnet.
Draw **two *magnetic field lines*** one on each side of the bar magnet. (6)

What are the ***parts*** labelled **N** and **S** in the diagram called? (3)

What? _____

Static Electricity

2012

The plastic comb has been used to comb hair and it now picks up small plastic balls. Why does this happen? (6)

Why? _____

_____

_____

_____

2011

The boy in the photo is touching a charged globe that is at high voltage. He is insulated from the earth.

What property of electric charge causes the boy's hair to stand on end and apart?

What? _____

_____

_____

2009

A plastic pen when rubbed with a dry cloth can ***attract small pieces of paper*** which 'stick' to it.

(*i*) Why does this happen?

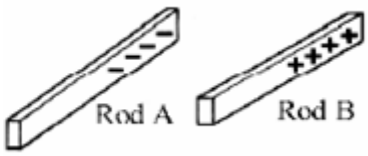
Why? _____

(*ii*) Explain why the ***pieces of paper fall*** from the pen after some time.

Explain _____

2008

Two rods **A** and **B**, made from *different plastics*, were given the *static electrical charges* shown in the diagram.



(*i*) How could you have ***charged*** the rods as shown? (6)

_____

_____

(*ii*) Describe with the help of a labelled diagram in the box provided, how the ***force between the two charged rods*** **A** and **B** could be ***investigated***. What ***result*** would you expect from this investigation? (9)

Description _ _____

_____

_____

_____

Result _____

_____

_____

(*iii*) In dry weather you can sometimes get an electric shock from a supermarket trolley. This is caused by the build-up of static electricity on the trolley.

Explain clearly why this only happens in dry weather. (6)

_____

_____

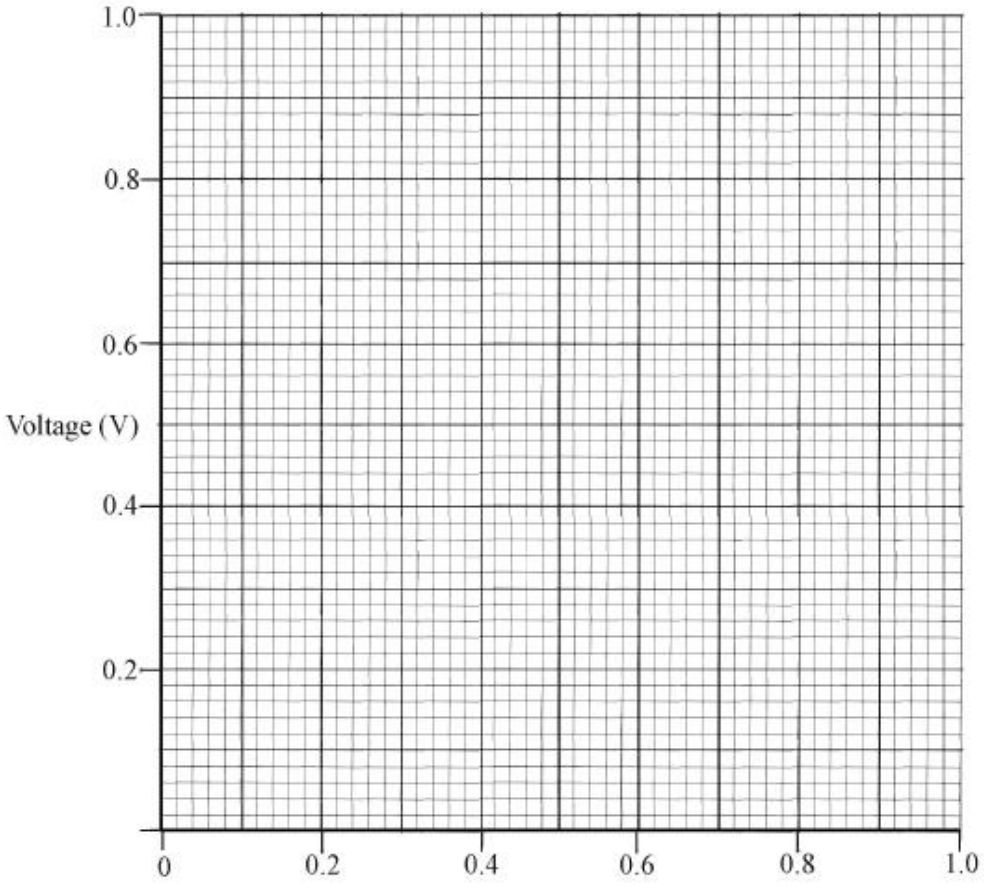
_____

2013

A science student investigated the relationship between voltage and current for a resistor. The data are given in the table below.

Voltage (V)	0	0.22	0.40	0.58	0.80
Current (A)	0	0.20	0.40	0.60	0.80

(*i*) Draw a graph in the grid below of voltage *versus* current. (9)



(*ii*) Describe clearly the relationship between voltage and current shown by the graph that you have drawn. (6)

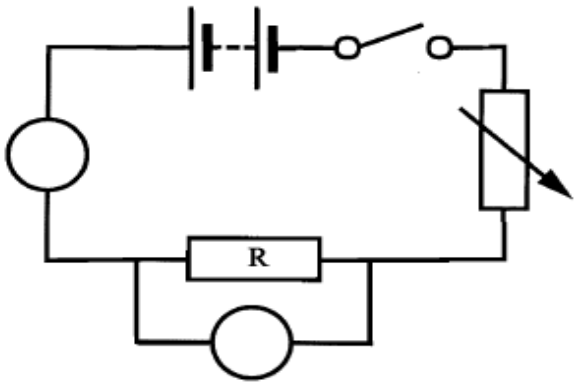
_____

(*iii*) Use the graph to calculate the resistance of the resistor used in this experiment. (6)

_____

_____

(*iv*) The diagram shows the circuit used by the student to perform this experiment. Two meters were used, one to measure voltage and the second to measure current. Enter the symbols for both meters in the circuit diagram, each one in the appropriate circle. (6)



(*v*) How was the voltage/current varied when doing this investigation? (3)

_____

2012

Explain the difference between direct current (dc) and alternating current (ac).

Explain _____

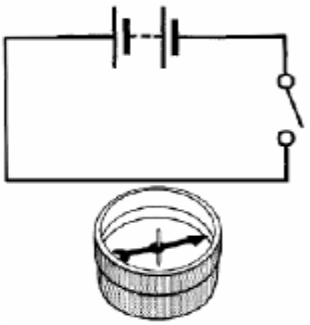
_____

Fuses are used in some electrical circuits for safety.
How does a fuse work for our protection?

How? _____

2009

The diagram shows a circuit with a wire over a compass.



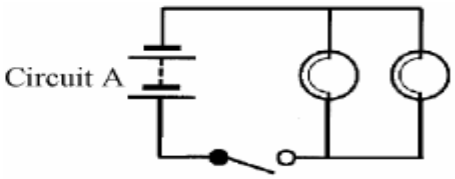
(*i*) What ***happens to the compass needle*** when the switch is closed?

What? _____

(*ii*) Which ***effect of electric current*** is demonstrated by this experiment?

Which? _____

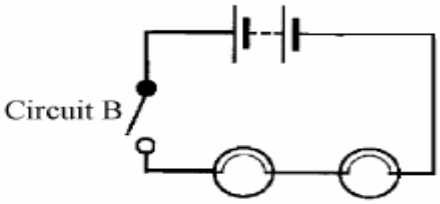
(*i*) If a ***bulb 'blows'*** (fails) in ***circuit*** **A** does the ***second bulb stay on*** (glowing)? Give a ***reason*** for your answer.



Does? _____

Reason _____

(*ii*) If a ***bulb 'blows'*** (fails) in ***circuit*** **B** does the ***second bulb stay on*** (glowing)? Give a ***reason*** for your answer.



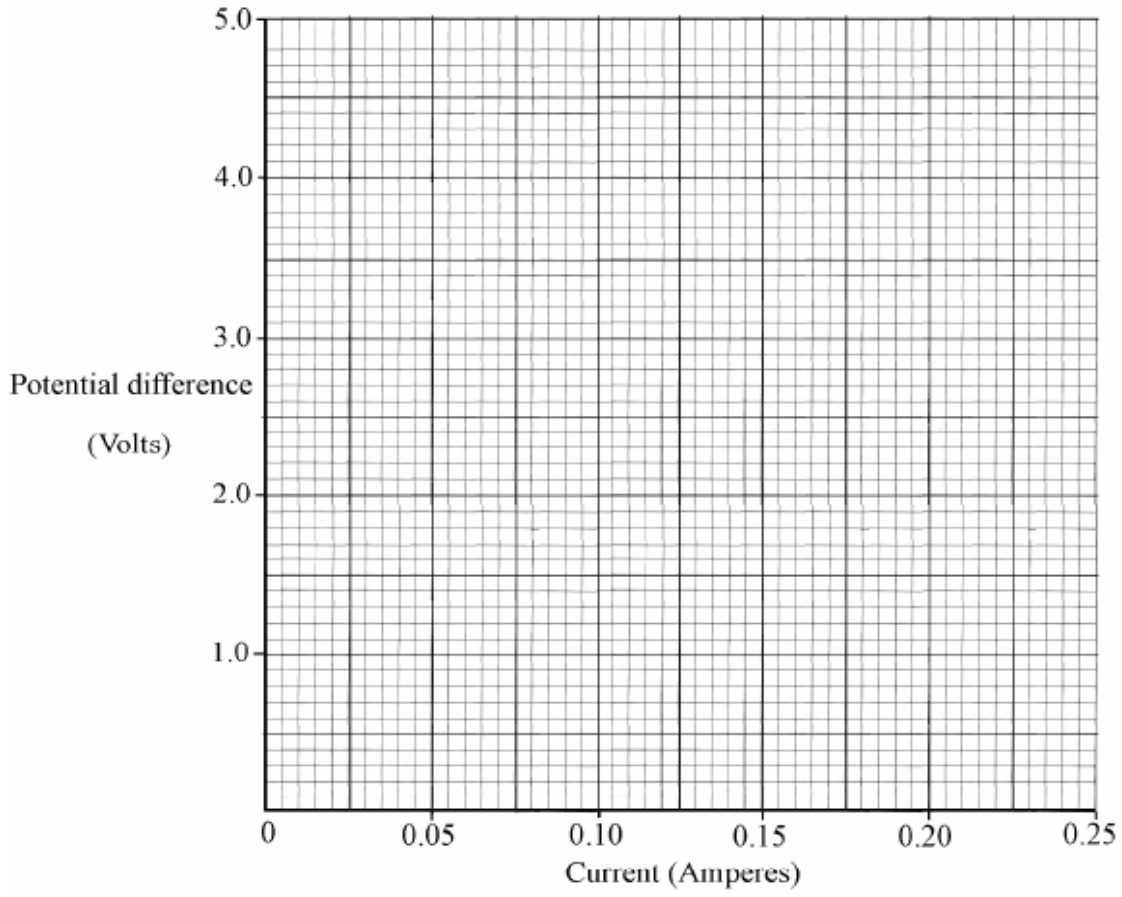
Does? _____

Reason _____

A pupil performed an experiment on a resistor to ***investigate the relationship between potential difference*** (voltage) applied to the resistor and the ***current*** flowing through the resistor. The data from this experiment is in the table.

Potential difference (Volts)	0	1	2	3	4	5
Current (Amperes)	0.00	0.05	0.10	0.15	0.20	0.25

(*i*) Draw a ***graph*** of potential difference (voltage) on the y-axis against current on the x-axis in the grid below. (6)



(*ii*) Calculate the ***resistance*** of the resistor used in this experiment. (3)

Calculate _____

(*iii*) What is the evidence from the graph that potential difference (voltage) is ***directly proportional*** to current in this case? (3)

What? _____

2008

Nikola Tesla (1856-1943) showed at the Frankfurt Fair in 1891 that *alternating current* could be *transmitted* over much *longer distances* than *direct current*. This is why the electricity supply to our homes is alternating current. Distinguish between ***alternating and direct current***.

Distinction _____

_____

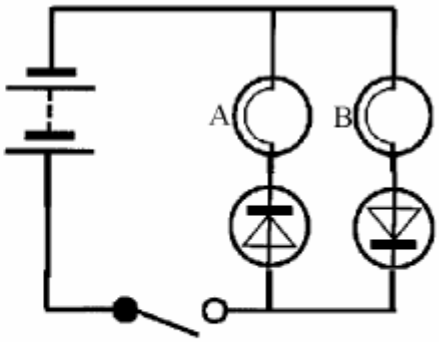
_____

What is the ***average voltage*** of domestic alternating current in Ireland?

Average voltage _____

2007

Look carefully at the circuit diagram and then state ***which bulb/s***, ***if any***, ***light*** when the switch is closed.
Give a ***reason*** for your answer.



Which? _____

Reason _____

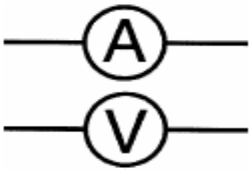
_____

Give **one *application*** of the ***magnetic effect*** and **one *application*** of the ***chemical effect*** of electric current.

Magnetic effect _____

Chemical effect _____

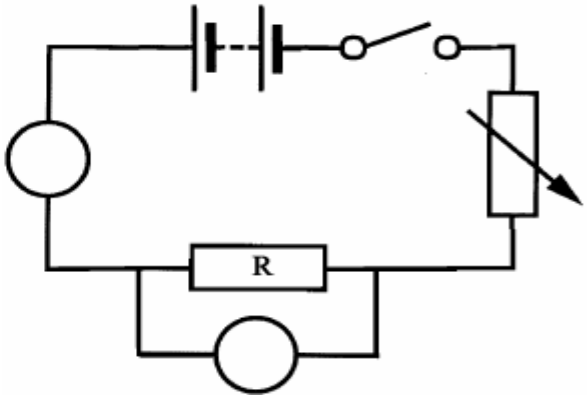
The symbols for two electrical meters are given in the diagram. The symbol  is for a meter that measures potential difference, often called 'voltage'.



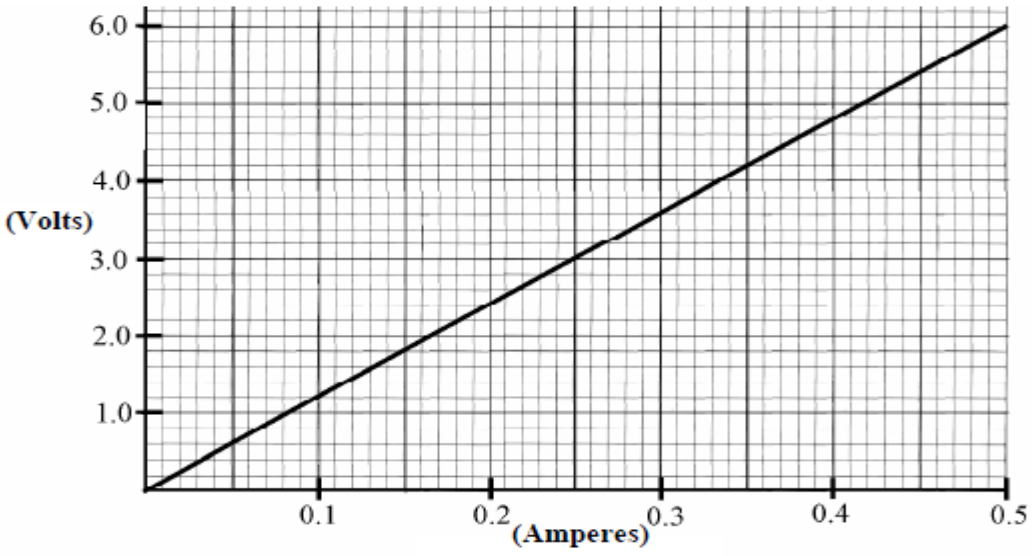
What ***electrical quantity*** can be measured using the meter with the symbol  ? (3)

What? _____

Meters  and  are used in the circuit shown. Enter '**A**' into the ***appropriate circle of one of the meter symbols*** in the circuit diagram so as to clearly identify its correct position. (3)



A pupil used this circuit to get a set of readings from both meters for different values and then plotted this data in the graph shown.

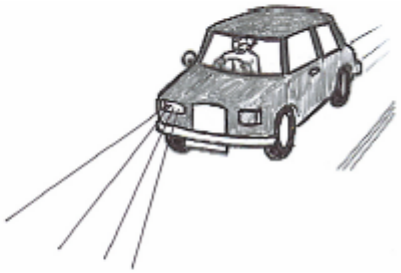


Use this graph to ***calculate the resistance*** of resistor **R** shown in the diagram. Give the unit of resistance with your answer. (9)

_____

Components, e.g. bulbs, in electrical circuits can be connected in ***series*** or in ***parallel***.

(*i*) It is noticed that, when one headlight fails (blows) in a car, the second remains lighting.



State ***the way the headlights are connected*** and give a ***reason*** why this mode of connection is used. (6)

State the way _____

Reason _____

_____

(*ii*) All of the bulbs go out in an old set of Christmas tree lights, when one of bulbs fails (blows). In ***what way are the bulbs connected*** in this set of lights?

Explain why, when ***one bulb blows, they all go out***. (6)

What way? _____

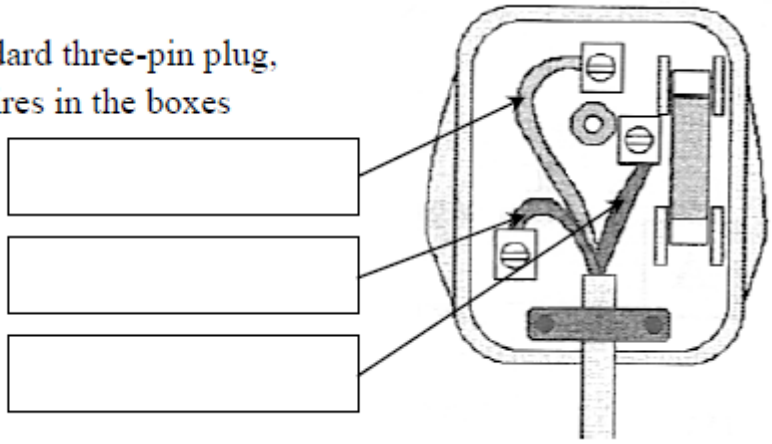
Explain _____

(*iii*) Calculate the ***resistance of the filament*** of a car headlamp when 12 V produces a current of 5 A in it.
In what unit is resistance measured? (6)

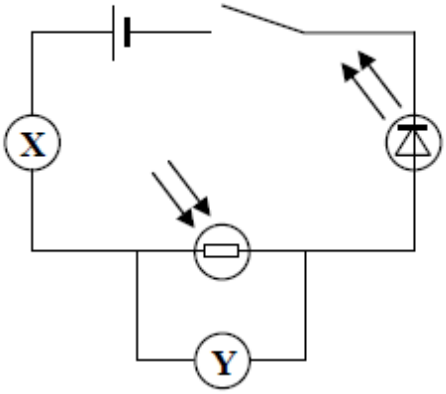
Resistance _____

Unit of resistance _____

On the diagram of a standard three-pin plug, name each of the three wires in the boxes provided.



The circuit in the diagram contains an LED in series with a light-dependent resistor (LDR). (9)



(*i*) Name the device labelled **X** which is used to measure electric current.

_____

(*ii*) Name the device labelled **Y** which is used to measure potential difference.

_____

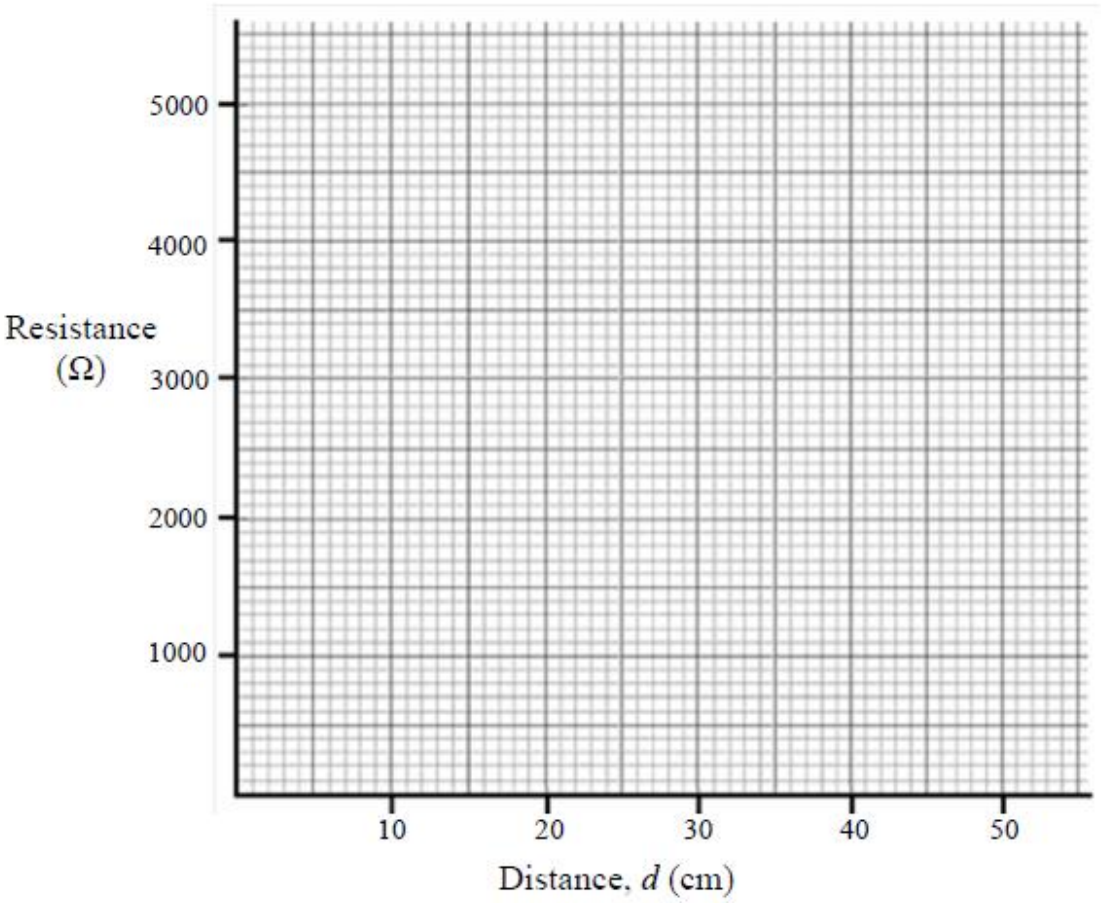
(*iii*) What do the letters LED stand for?

_____

A lamp is placed a distance *d* from the LDR in the circuit described in part (*b*).
The switch is closed and the resistance of the LDR is calculated.
This process is repeated for a number of different values of *d*.
The results are given in the table. (24)

Resistance (Ω)	200	800	1800	3200	5000
Distance, *d* (cm)	10	20	30	40	50

(*i*) Draw a graph in the grid below of resistance *versus* distance, *d*.



(*ii*) From your graph, describe what happens to the resistance of the LDR as the lamp is moved away.

_____

(*iii*) Use your graph to estimate the resistance of the LDR when the lamp is placed 25 cm from it.

_____

(*iv*) Calculate the current that flows through the LDR when the lamp is placed 25 cm from it and device **Y** reads 6 V.

_____

_____

(*v*) Explain why an LED is more efficient than a standard light bulb.

_____

_____

2013

Calculate the cost of using a washing machine rated at 1 kW for 5 hours per week for 7 weeks. (The net cost of one unit is 20 cent.)

Calculate _____

2012

The kilowatt-hour is the unit of electrical energy used by electricity suppliers. The photograph shows a kWh (kilowatt-hour) meter. This meter is connected into the electricity consumer's domestic circuit and it can measure energy consumption in a selected part of the circuit, the total energy used and cost it. The meter can be wall-mounted in a convenient place.

(*i*) Give two advantages to the consumer of having this type of meter. (6)

1 _____

2 _____

(*ii*) Define the Watt, the unit of power. (6)

Define _____

(*iii*) Give one application of the chemical effect and one application of the the magnetic effect of electric current. (6)

Chemical effect _____

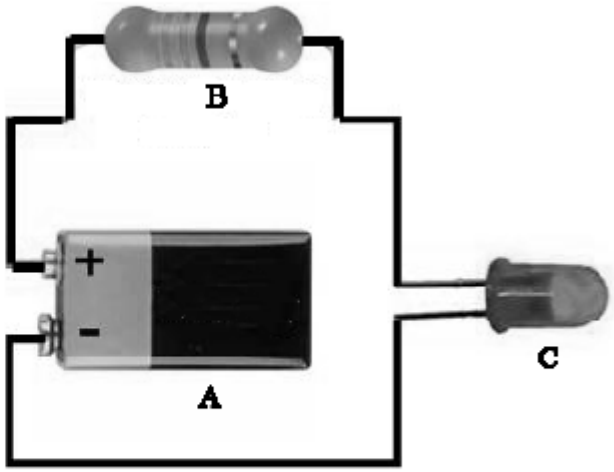
_____

Magnetic effect _____

_____

The circuit shown in the diagram was set-up by a pupil.
Component **C** gave out light.

(*i*) Name components **B** and **C** labelled and shown in the diagram. (6)



B _____

C _____

(*ii*) Give the function of component **A** and the function of component **B**. (6)

A _____

B _____

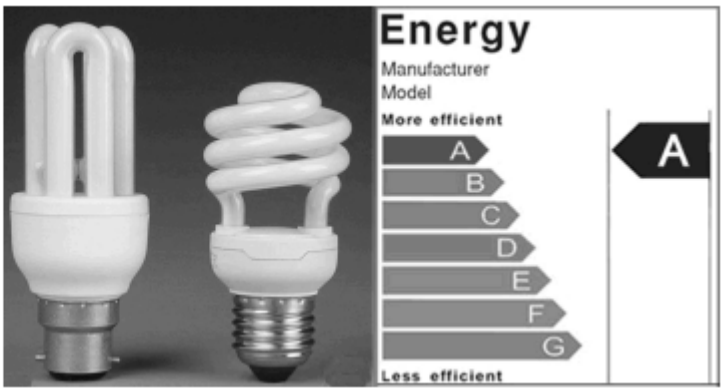
(*iii*) Draw a diagram of a circuit that could be used to measure the resistance of a light-dependent resistor (LDR) when exposed to light of varying brightness. (9)

Compact fluorescent lamps (**CFL**s) are more energy efficient than incandescent (tungsten filament) bulbs. A 20 W (0.02 kW) CFL bulb has the same light output as a 115 W (0.115 kW) incandescent bulb.

If incandescent (tungsten filament) bulbs were replaced by compact fluorescent lamps (**CFL**s) in Ireland it is estimated that this would reduce our CO_2 emissions by 700,000 tonnes each year and reduce our household electricity bills by €185,000,000.

(*i*) Why would replacing incandescent bulbs lower our CO_2 emissions? (3)

_____



Compact fluorescent lamps (**CFL**s), shown in the photograph, have a **Grade A** rating (efficiency rating).

Electrical energy is converted into light and one other form of energy in bulbs.

(*ii*) Name this second form of energy. (3)

_____

(*iii*) Which form of energy does the more efficient bulb produce more of? (3)

_____

A 20 W (0.02 kW) CFL bulb is equivalent to 115 W (0.115 kW) incandescent bulb. Electricity costs 15 cent per kW h.

(*iv*) Calculate the cost of using each of these bulbs for 100 hours. (9)

Cost for the CFL _____

_____

Cost for the incandescent bulb _____

_____

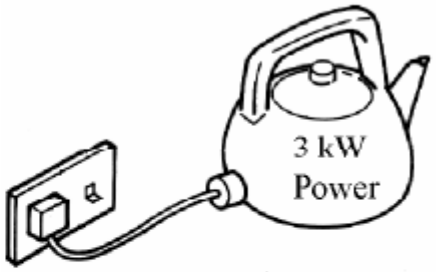
(*v*) Name another electrical appliance where checking the energy efficiency rating would be important to save money on running costs. (3)

_____

2010

Name the ***unit of electrical energy*** that companies supplying electricity use to bill their consumers.

Name _____

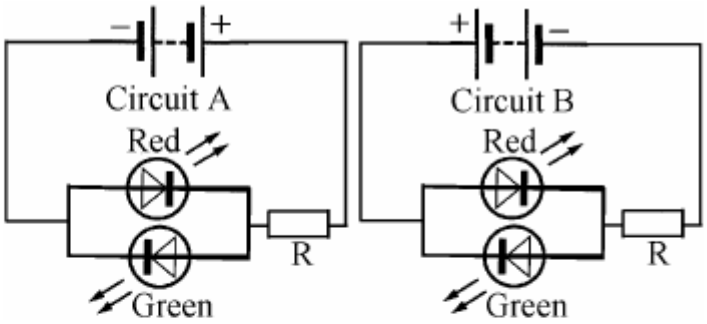


Calculate the ***cost*** of using of using the electric kettle, shown in the diagram, for ten hours if a unit of electricity costs 15 cent.

Calculate _____

_____

Look carefully at circuits A and B, then answer the questions.



(*i*) In ***which circuit*** does the red LED light up?

Which? _____

(*ii*) Give a ***reason*** for your answer to (*i*) above.

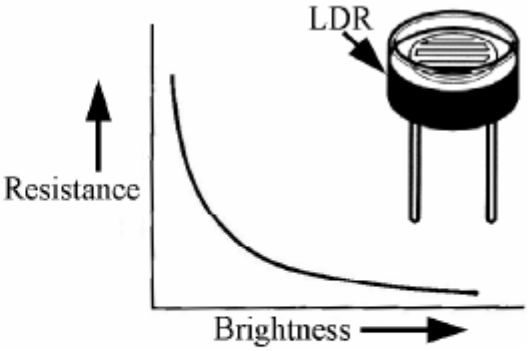
Reason _____

(*iii*) Why is the ***resistor*** 'R' ***needed*** in ***both*** circuits?

Why? _____

2009

The diagram shows a light dependent resistor (LDR) and a graph of the resistance of the LDR against the brightness of light falling on it.



(*i*) Give an everyday use for an LDR. (3)

_____

(*ii*) Describe an experiment to ***measure the resistance of an LDR under varying degrees of brightness of light***. Draw the ***circuit diagram*** in the box provided. Explain how you would vary the brightness of the light. You do not have to state how the brightness of the light was measured. (9)

_____

_____

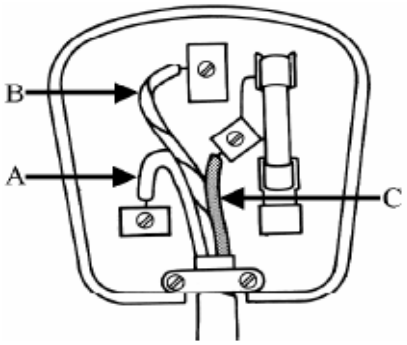
_____

_____

_____

2008

Wiring a plug correctly is most important. Give the ***colour/s*** of **any two** of the plastic insulations on the wires labelled **A**, **B** and **C**.

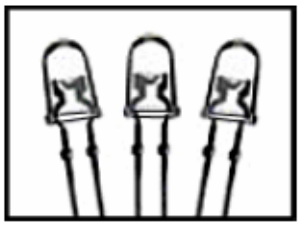


A _____

B _____

C _____

(*iv*) Identify the ***devices*** shown in the diagram. (There are three in the diagram; when operating they give out light).



Devices _____ (3)

This device is often used instead of bulbs. Give a ***reason*** for this wide application. (3)

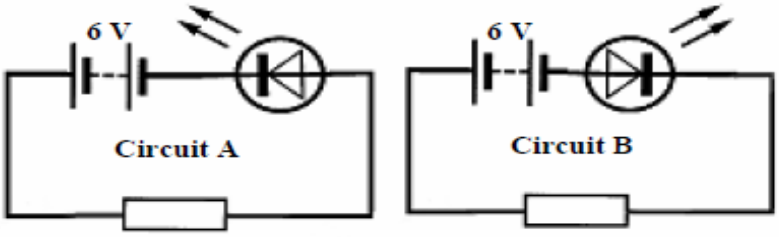
Reason _____

2006

Explain, clearly, the ***safety role*** of ***fuses*** in household electrical circuits.

_____

A pupil carried out an investigation into ***the effect of a diode on d.c. and on a.c.*** circuits using an LED. The following circuits were initially set up.



What is ***observed*** in circuit **A** and in circuit **B**?

Circuit A _____

Circuit B _____

When the batteries in circuits **A** and **B** were replaced by 6 V a.c. supplies the LEDs glowed dimly in both circuits. Explain this ***observation***.

Explanation _____

_____