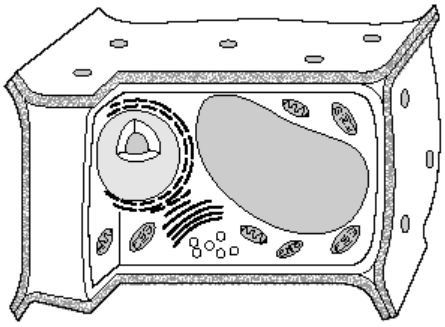
Biology

For examiner use only

(1) (2)

Question 1 (52)

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



_____

Give a reason for your answer.

_____

_____

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

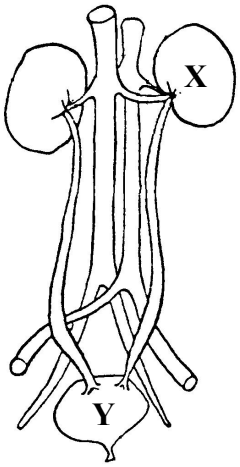
_____

_____

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

_____

_____



(*c*)(*i*) In the diagram of the human urinary system, state the <u>function</u> of the organ labelled **X**.

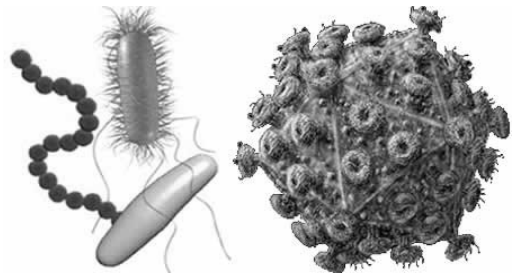
_____

_____

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

_____

(*d*) Both bacteria and viruses can cause illness in humans and other animals.



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

_____

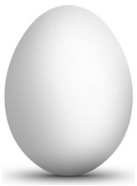
(*ii*) Name one illness caused by viruses.

_____

For examiner use only

(1) (2)

(*e*) In an experiment to test for the presence of <u>protein</u> 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?

_____

(*f*) 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?

_____

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

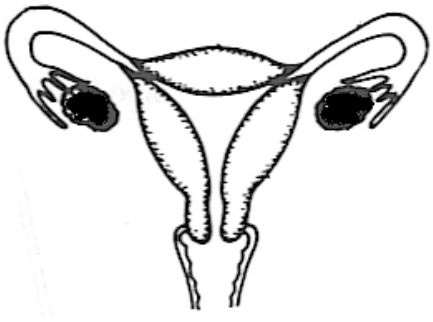
(*i*) How many <u>pairs</u> of chromosomes are in most human cells?

_____

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

_____

(*h*) 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 _____

_____

_____

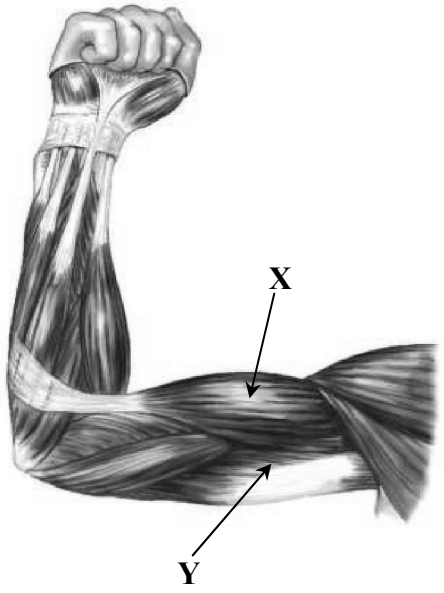
(7 × 6 + 1 × 10)

Question 2 (39)

For examiner use only

(1) (2)

(*a*) 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 <u>raised</u>.

_____

_____

With reference to these muscles, explain how the lower arm is <u>lowered</u>.

_____

_____

(*iii*) Distinguish between ligaments and tendons.

_____

_____

_____

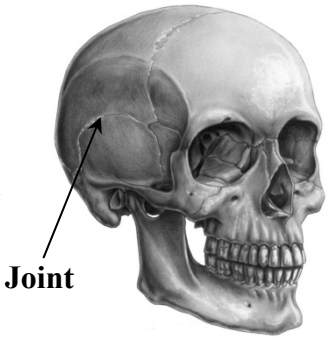
_____

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

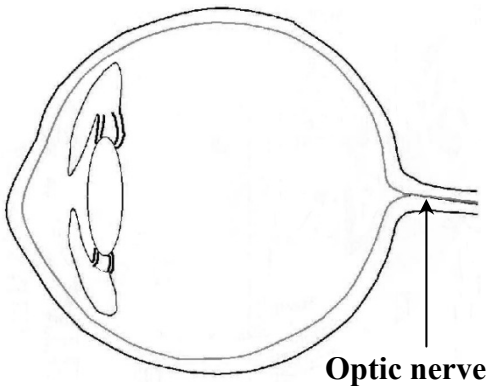
_____

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

_____



(*b*) 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?

_____

For examiner use only

(1) (2)

Question 3 (39)

For examiner use only

(1) (2)

(*a*) 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.

_____

_____

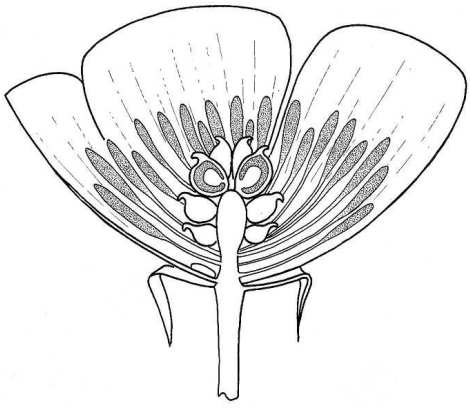
(*iii*) What name is given to the movement of water through a plant and the evaporation of water from its leaves? _____

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

_____

(*b*) 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)

For examiner use only

(1) (2)

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

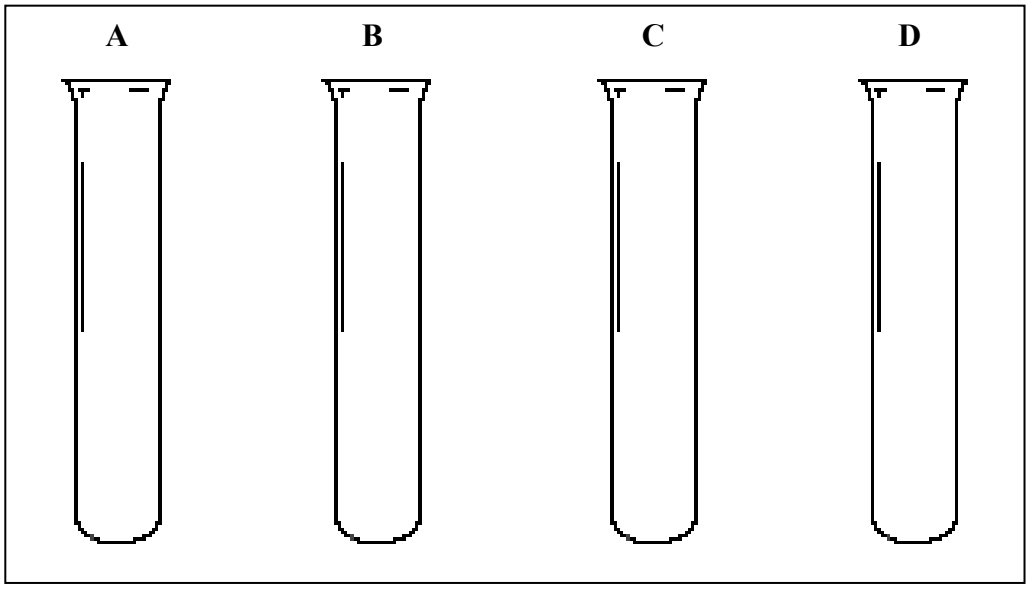
Explain why having brightly coloured petals can assist sexual reproduction in some plants. (6)

(*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)



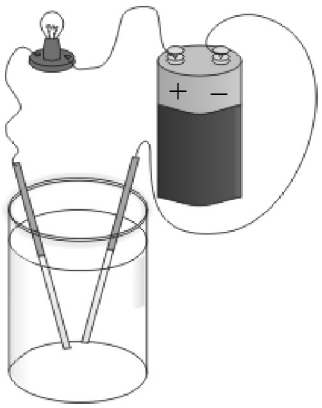
Chemistry

For examiner use only

(1) (2)

Question 4 (52)

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



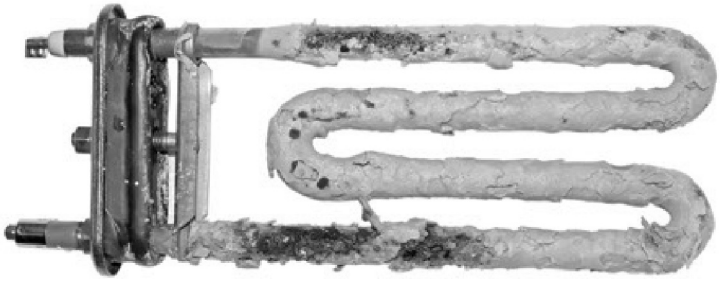
(*i*) Name an ionic substance. _____

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

_____

_____

(*b*)



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.

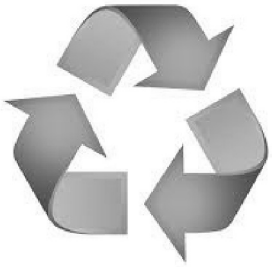
_____

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

Substance 1 _____

Substance 2 _____

(*d*)



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

Reason 1 _____

_____

Reason 2 _____

_____

For examiner use only

(1) (2)

(*e*)(*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?

_____

(*f*) 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? _____

(*g*) 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?

_____

(*h*) 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. _____

_____

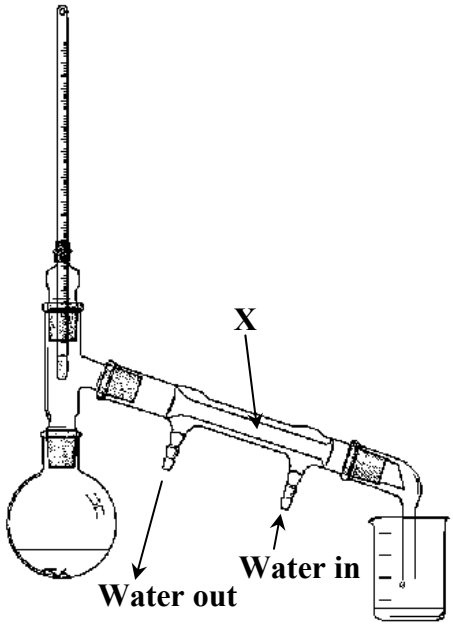
(7 × 6 + 1 × 10)

Question 5 (39)

For examiner use only

(1) (2)

(*a*) 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.

_____

(*b*) 

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 least reactive with acid.

Calcium Copper Magnesium Zinc

For examiner use only

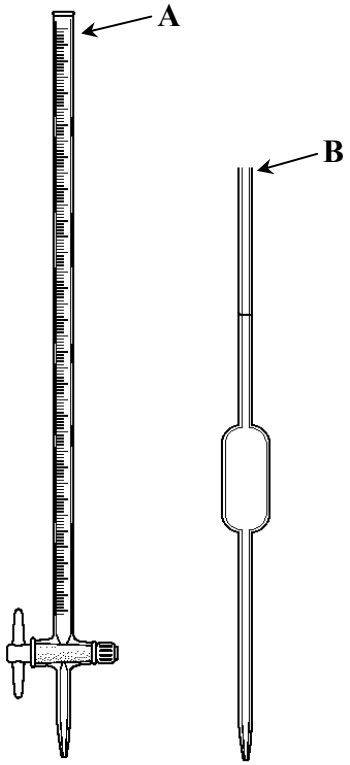
(1) | (2)

(*c*) 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.

_____

Question 6 (39)

For examiner use only

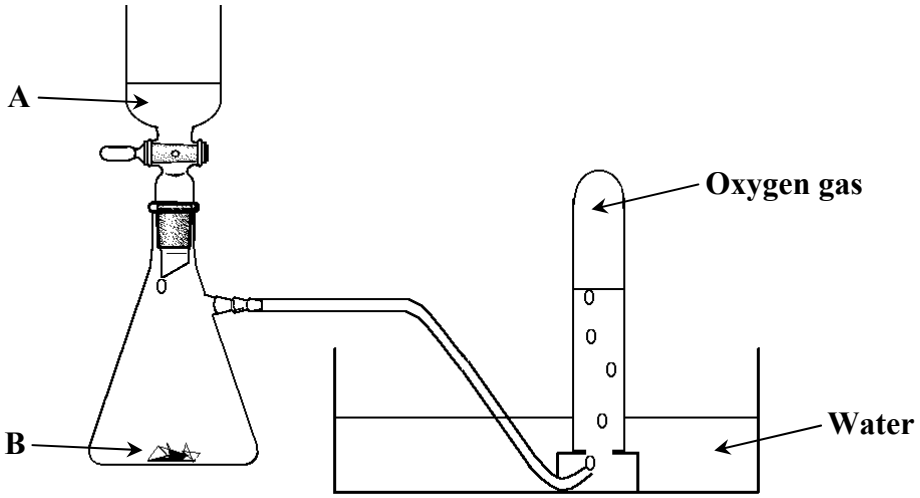
(1) (2)

(*a*) 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. _____

(*b*) 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 <u>catalyst</u> 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.

_____

_____

_____

(*c*) Oxygen–16 and oxygen–17 are two isotopes of the element oxygen. (15)

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

_____

_____

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

(*iii*) 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.

For examiner use only

(1) (2)

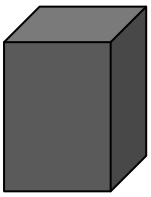
Physics

For examiner use only

(1) (2)

Question 7 (52)

(*a*) 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.



_____

_____

_____

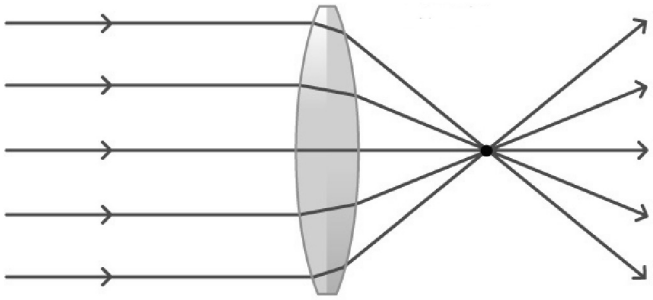
(*b*) A standard laboratory thermometer contains liquid alcohol which has been dyed red so as to make it easier to see. Describe what would be observed if the thermometer were moved from a warm region to a colder region. Explain this observation.

Observation _____

Explanation _____

_____

(*c*)



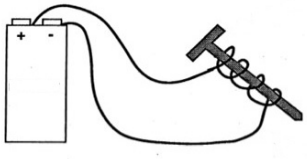
The picture shows a converging lens with rays of light passing through it.

What two properties of light are illustrated in this picture?

Property 1 _____

Property 2 _____

(*d*) 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? _____

_____

For examiner use only

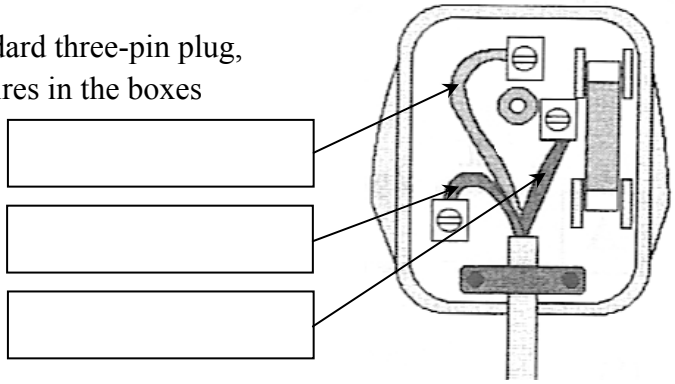
(1) (2)

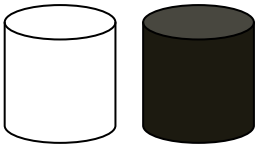
(*e*) The 1979 science-fiction film *Alien* was promoted by use of the slogan: "In space no one can hear you scream." With reference to the properties of sound, explain the physics of this slogan.

_____

_____

(*f*) On the diagram of a standard three-pin plug, name each of the three wires in the boxes provided.



(*g*) 

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 _____

_____

_____

(*h*) 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.

_____

_____

(7 × 6 + 1 × 10)

Question 8 (39)

For examiner use only

(1) (2)

(*a*) 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.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

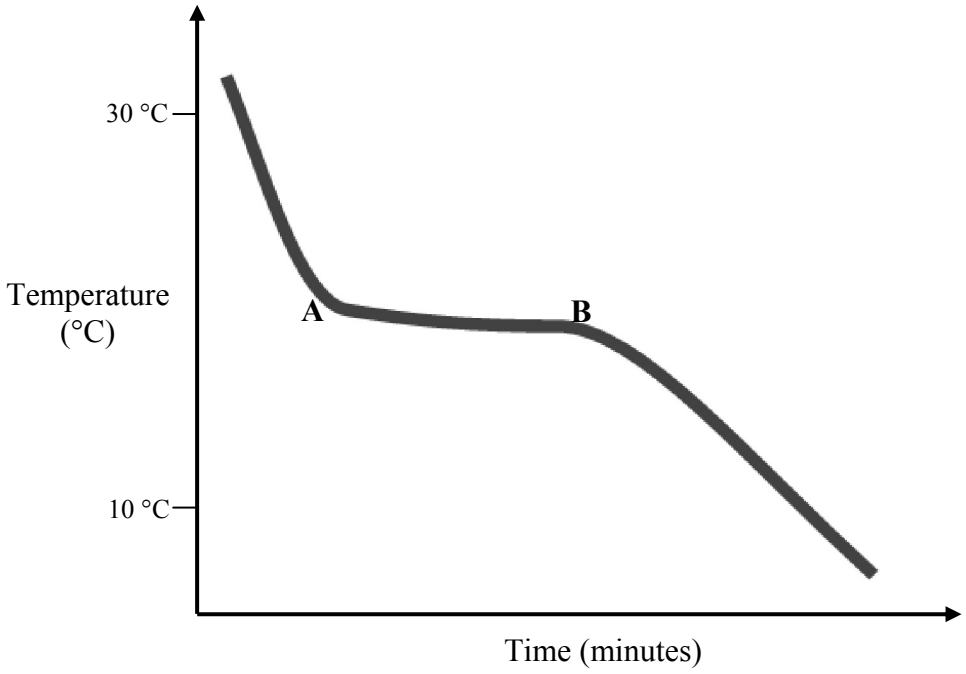
_____

_____

For examiner use only

(1) (2)

(*b*) 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.

_____

_____

_____

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

Biofuel _____

_____

_____

Hydroelectricity _____

_____

_____

Question 9 (39)

For examiner use only

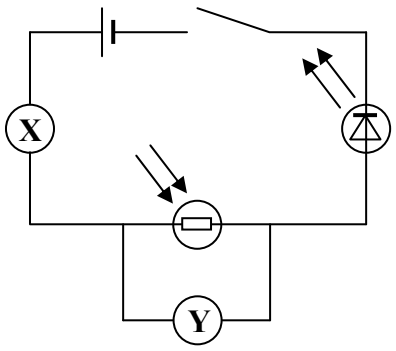
(1) (2)

(*a*)

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)

(*b*) 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?

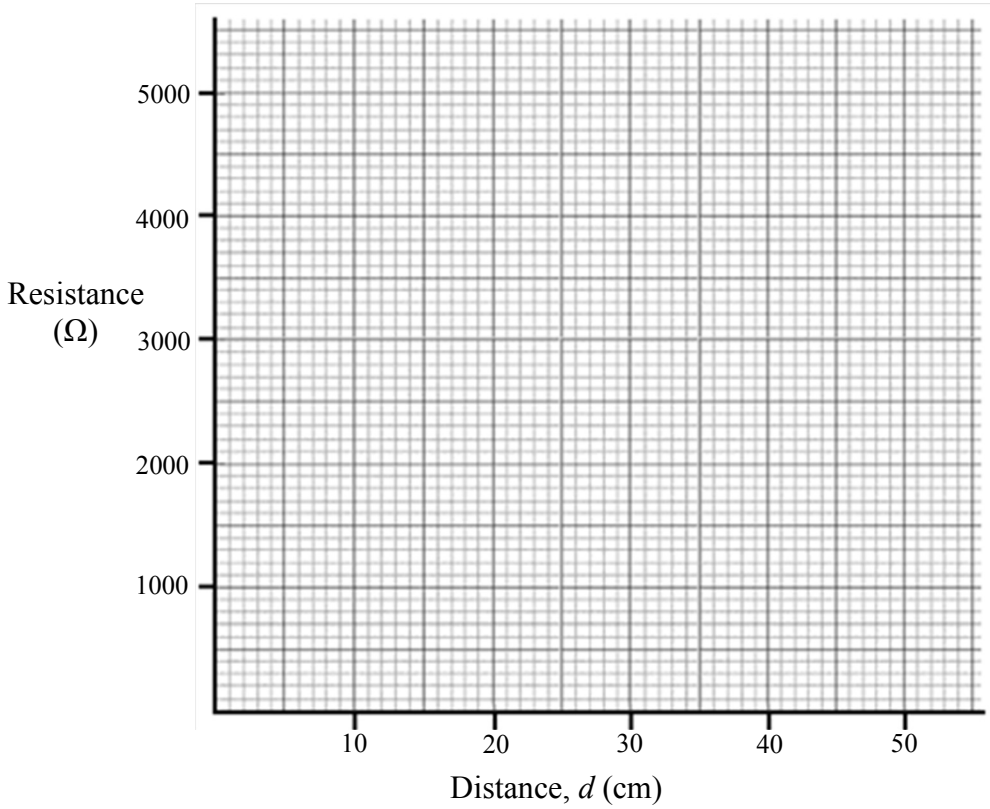
(*c*) A lamp is placed a distance *d* from the LDR in the circuit described in part (*b*). The switch is closed and the resistance of the LDR is calculated. This process is repeated for a number of different values of *d*. The results are given in the table. (24)

Resistance (Ω)	200	800	1800	3200	5000
Distance, *d* (cm)	10	20	30	40	50

For examiner use only

(1) (2)

(*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.

_____

_____