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WARNING
You must return this paper with your answer-book, otherwise marks will be lost.

Coimisiún na Scrúduithe Stáit State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2007

SCIENCE – HIGHER LEVEL
(N.B. Not for Science – Local Studies Candidates)

THURSDAY, 14 JUNE – MORNING, 09.30 to 12.00

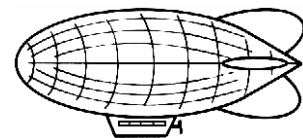
SECTION A (144 marks) TO BE ANSWERED BY ALL CANDIDATES.

(See separate sheet for Sections B, C, D and E.)

Answer *each* of the questions 1, 2 and 3. There are **TEN** parts in each question. Answer any **EIGHT** parts. All questions carry equal marks. Answer the questions in the spaces provided. Return this Section of the examination paper. Enclose it in the answer-book you use in answering the other Sections.

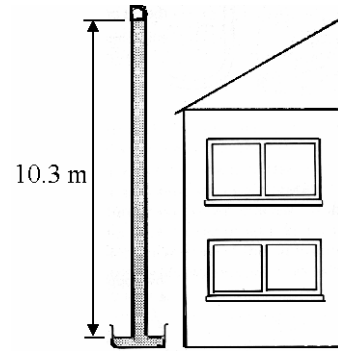
1. Answer **eight** of the following, (a), (b), (c), etc.

- (a) What *condition/s* must be satisfied for a balloon to *float* in air?



[Turn over

- (b) Atmospheric pressure can support, on average, a column of water 10.3 m high.
Give **one** reason why a water barometer might not be a practical instrument to measure atmospheric pressure. Name an *alternative instrument* to measure atmospheric pressure.

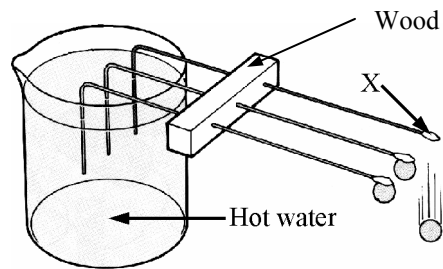


Reason _____

Alternative _____

- (c) Distinguish between *speed* and *velocity*.

- (d) The rods, shown in the diagram, are made of three different metals. Steel ball bearings are attached to the rods with a *substance 'X'*. Name a *suitable substance 'X'*.



X _____

What *property* of the rods is being compared in this experiment?

Property _____

- (e) Give **two** ways in which the clinical mercury-in-glass thermometer is *designed* to fulfil its purpose.

1 _____

2 _____

- (f) The photo shows a nuclear power plant. Water vapour is released from the cooling towers. Give **one advantage** and **one disadvantage** of using nuclear energy to generate electricity.



Advantage _____

Disadvantage _____

- (g) Calculate the *total resistance* of the pair of resistors, in series, shown in the diagram.

100 Ω

330 Ω

Draw a *diagram* of the same pair of resistors in *parallel* in the box opposite.

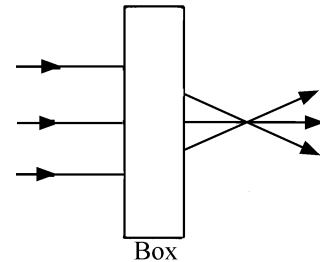


- (h) The diagram shows a 13 A plug with the cover removed. Name wire A and give the *function* of part B.

Name of A _____

Function of B _____

- (i) Draw the *shape of a lens* i.e. a cross section of a lens in the box that would cause light rays to converge as shown in the diagram. Name the *type of lens* that causes parallel rays of light to move apart.



Name _____

- (j) The photo shows waves in the sea. The energy of these waves has been suggested as a source of renewable energy.

Give a second *example* of a source of renewable energy.

Example _____

Name **one** other *kind* of energy that is transmitted (sent) as a wave.

Name _____



(8 × 6)

!Turn over

2. Answer **eight** of the following, (a), (b), (c), etc.

- (a) Name the *property* of water that enables it to form drops like the one shown in the photo.



- (b) A sodium atom has 11 protons and 11 electrons.
How does a sodium *atom* become a sodium *ion*?

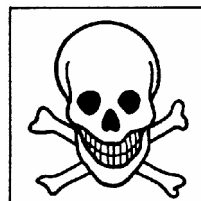
How? _____

Give the formula (symbol) for a sodium ion. _____

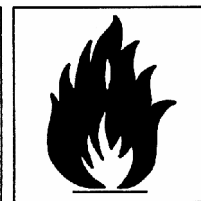
- (c) Explain the hazard symbols A and B shown.

A _____

B _____



Symbol A



Symbol B

- (d) Zinc metal reacts with and dissolves in sulphuric acid.
Name *or* give the formulas of the **two** products of this reaction.

- (e) The diagram shows sodium burning in air.
What is the *colour* of the flame?

Colour _____

What *effect* would the combustion product have on moist litmus paper/ pH paper?

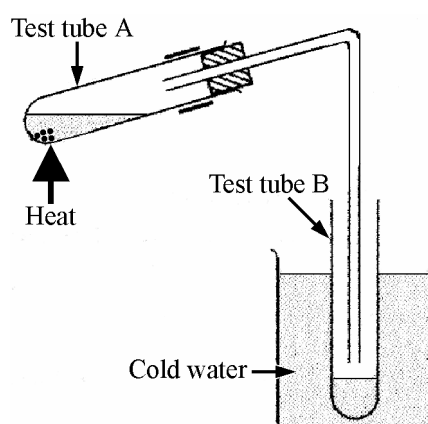
Effect _____



(f) Complete the diagram to show how the separating funnel, illustrated, can be used to *separate* a mixture of *oil and water*. Label the diagram.

(g) List the following elements in order of chemical *reactivity*: Fe, Mg, Cu, K and Ca.

(h) Test tube A contains *hard* water and boiling chips. When the water in A is heated some of it evaporates and condenses in test tube B. Is the water in B still *hard* or is it *soft*? Give a *reason* for your answer.



Hard/soft? _____

Reason _____

(i) Give **two** differences between a *mixture* of iron and sulphur powders and a *compound* of iron and sulphur (iron sulphide).

Difference one _____

Difference two _____

(j) Name **one** kind of fire extinguisher. Name a *burning material* or other *item* that the kind of extinguisher that you have named can be safely used on.

Extinguisher _____

Burning material/item _____



[Turn over]

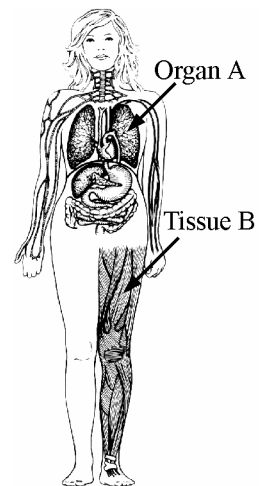
3. Answer **eight** of the following, (a), (b), (c), etc.

(a) Give the *function* of the organ labelled A in the diagram.

Function of A _____

Give the *function* of the tissue labelled B in the diagram.

Function of B _____



(b) Name an *enzyme* and name a *substrate* (substance) on which it acts.

Name of enzyme _____

Name of substrate (substance) _____

(c) Seeds of the sycamore are shown in the diagram.
How are sycamore seeds *dispersed*?

How? _____

Why is seed dispersal *important* to plants?

Why? _____

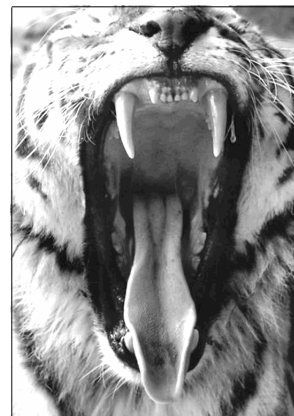
(d) Give **two** reasons why *cells divide*.

Reason one _____

Reason two _____

(e) The photo shows the open mouth of a tiger.
Different types of teeth are clearly visible in the photo.

Name and label, using arrows,
two types of teeth
clearly visible in the photo.

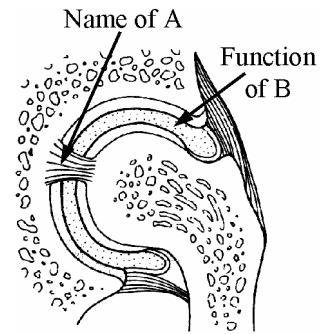


- (f) The diagram shows the structure of the hip joint.
Name the *part* labelled A in the diagram.

A _____

Give the *function* of the part labelled B in the diagram.

B _____



- (g) What is transported in the *phloem* tissue of plants?

What? _____

Name a second type of plant transport (vascular) tissue.

Name _____

- (h) Give the *function* of the organ shown in the diagram.

Function _____

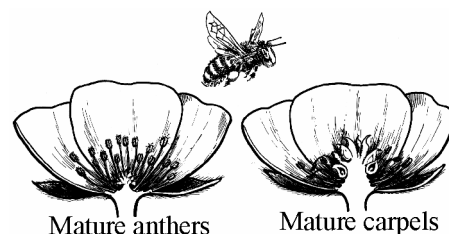
Name the *tube* shown in the diagram.

Name _____

- (i) Give a simple *food chain*, with at least three levels, beginning with a *named* plant.

Food chain _____

- (j) A bee visits a flower with *mature anthers* and then visits a flower, of the same species, with *mature carpels*. Why do bees *visit* flowers? What *role* does the bee play in the life of this plant?



Why? _____

What? _____

(8 × 6)

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Section A is on a separate sheet, which provides spaces for your answers.
The completed sheet should be enclosed in your answer-book.

SECTIONS B, C, D, E

These sections should be answered in your answer-book.

Answer **ONE** question from each of the Sections **B, C and D**.

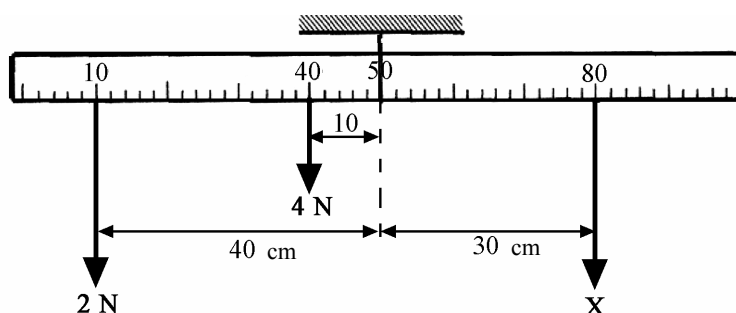
All questions carry equal marks.

Answer **TWO** questions from **Section E**. All questions carry equal marks.

SECTION B - PHYSICS (48 marks)

Answer **either** Question 4 **or** Question 5.

4. (a)



State the *law of the lever*. (9)

The metre stick shown in the diagram was suspended from its centre of gravity at the 50 cm mark. Three weights were then hung from the stick as shown and the stick balanced horizontally.

Explain the underlined term. (6)

Calculate *weight X*. Clearly show your calculations. (15)

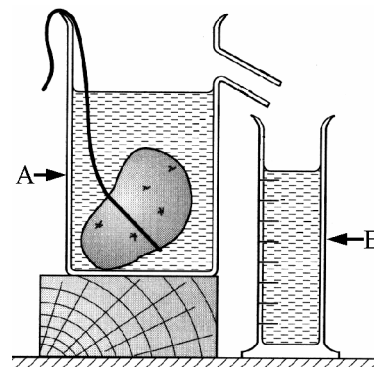
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(b) A pupil measured the volume of a potato using the apparatus shown. Name *items A and B*. (6)

How might the pupil measure the *mass* of the potato? (3)

The mass of the potato was found to be 175 g and its volume was 125 cm³.

Calculate the *density* of the potato. (9)

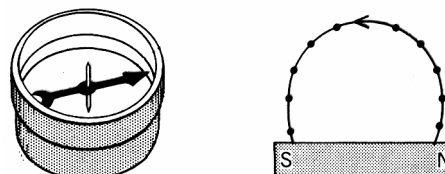


5. (a) The diagram shows a magnetic compass and a bar magnet with a magnetic field line plotted using this compass.

How does a magnetic compass *work*? (6)

Why can magnetic compasses be used for *navigation*? (6)

Describe how the magnetic field line shown was *plotted* using the compass or by using an alternative method. (9)



(b) What is *electric current*? (6)

Name a *substance* that does not conduct electric current. (3)

Outline, using a labelled diagram, an experiment to show the *chemical* effect of electric current. (9)

The hob of an electric cooker has four ‘burners’. When all four ‘burners’ are turned on the power rating is 6.9 kW. What is the *current* into the hob when all four ‘burners’ are turned on if the supply voltage is 230 V? (9)

SECTION C - CHEMISTRY (48 marks)

Answer **either** Question 6 **or** Question 7.

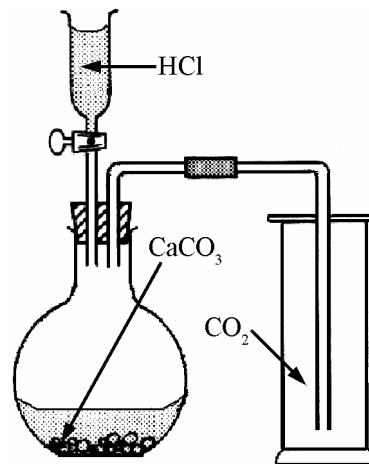
6. (a) The diagram shows an apparatus that is used for the preparation of carbon dioxide in a school laboratory.

Write a *chemical equation* for the reaction that takes place. (6)

Why can carbon dioxide be *collected* in the way shown in the diagram? (3)

Give a *chemical test* for carbon dioxide. (6)

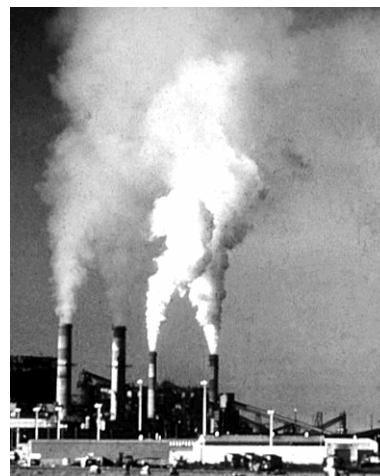
Produce a diagram showing the *covalent bonding* between the carbon atom and the two oxygen atoms in a molecule of carbon dioxide. (9)



- (b) The photo shows a coal burning power plant. The smoke (emissions) released into the air includes carbon dioxide and sulphur dioxide.

What happens when these *gases react* with water vapour in the air? (3)

Give **two** examples of the *effects* of the products of this reaction on the environment. (6)



- (c) Describe, using a labelled diagram, how *electric current* can be produced by a *chemical reaction*. (12)

Name a consumer product that is powered by a battery or cell based on a chemical reaction. (3)

[Turn over

7. (a) The diagram shows the 'set-up' used to prepare a salt by neutralising a base by the addition of an acid.

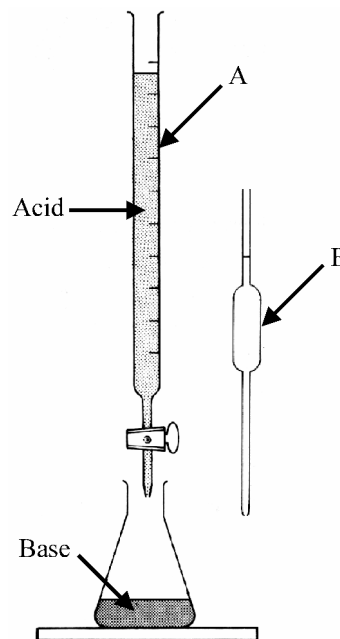
If the salt to be prepared is sodium chloride and the acid is hydrochloric acid name a suitable base. (3)

Name *items* A and B. (6)

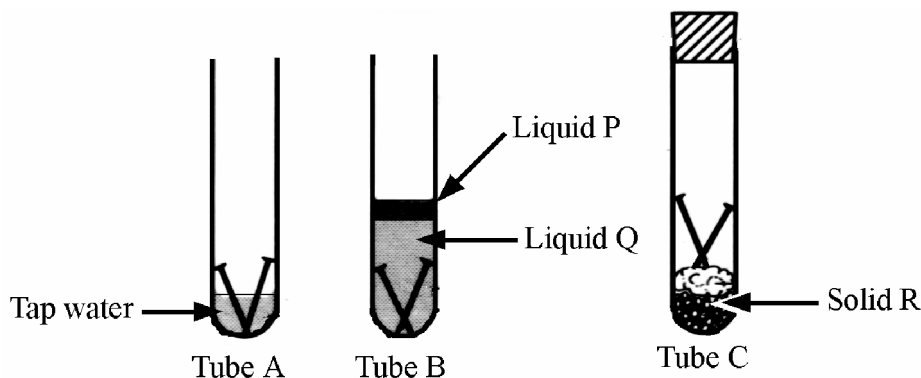
What is *added* to the base to show when it has been *neutralised*? (3)

Write an *equation* for this neutralisation. (6)

What has to be done to the neutral solution, at the end of the experiment, to get *colourless salt* crystals? (6)



(b) A pupil investigated the conditions necessary for the rusting of iron nails using the experiment shown in the diagram. Two iron nails were placed in each of three test tubes with different conditions in each one.



Name *liquids* P and Q in test tube B. Why are these **two liquids** used? (9)

Name and give the *function* of solid R in test tube C. (6)

What *result* would you expect from this experiment i.e. in which test tube/s did the nails rust *or* not rust? (3)

What *conclusion* can you make from the result of this experiment? (3)

Rusting is corrosion of iron. If iron, or some other metal, is exposed to the conditions required for corrosion to occur, as in the experiment above, what *other factor* might influence the rate of corrosion? (3)

SECTION D - BIOLOGY (48 marks)

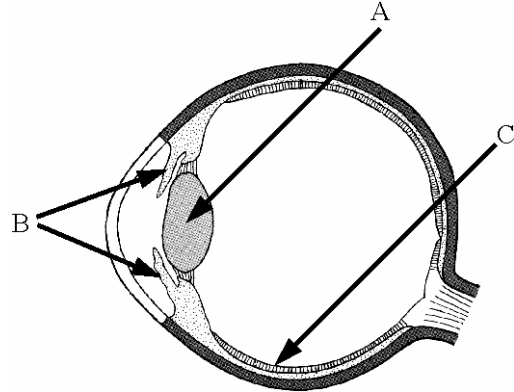
Answer **either** Question 8 **or** Question 9.

8. (a) The diagram shows the eye.

Give the *name* and the *function* of each of the labelled parts:

A, B and C. (18)

Distinguish between *sensory* and *motor* nerves. (6)



(b) There are *two separate paths* for blood in our bodies. There is a path through our *lungs* and a path through the *rest of our body*. Blood passes through the heart *twice* in one complete circulation.

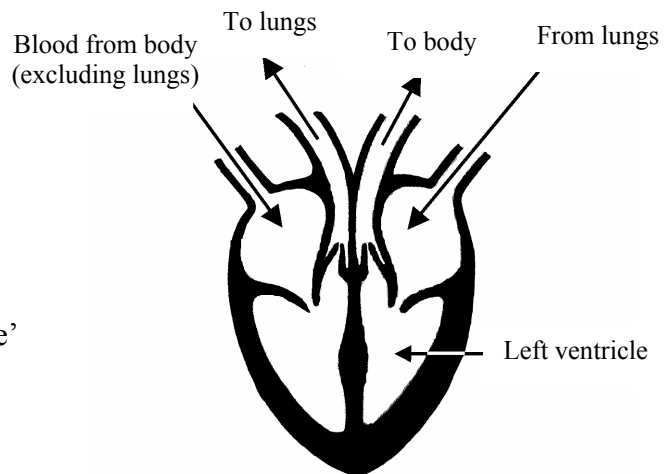
(i) Give a *reason* for this ‘double’ circulation of blood. (6)

(ii) Name the *chambers* into which the blood returns before being pumped out again. (3)

(iii) There are four *valves* in the heart. What *role* is played by these valves in the *pumping* action of the heart? (6)

(iv) Compare the *structure* of the blood vessels that carry blood *from the heart* with those that carry blood *to the heart*. Give **two** differences. (6)

(v) Give **one** way of *caring for your heart*. (3)



[Turn over

9. (a) The photo shows a leaf with light coming from behind it (backlit). Leaves are very thin.



(i) Why have leaves a *large surface area* and are very *thin*? (6)

(ii) Name **two** *processes* that occur in the leaf. (6)

(iii) Select **one** of the *processes* that you have named and describe an *experiment* to illustrate it using a labelled diagram. (12)

(b) (i) Name **three** *constituents* of fertile good *soil*. (9)

(ii) Describe an *experiment* to investigate **one** of the following:

- The pH of a soil sample
- The presence of micro-organisms in soil
- The humus content of soil. (9)

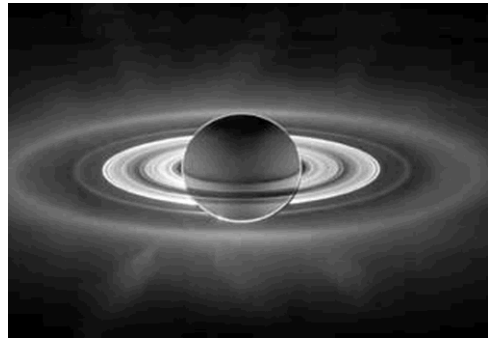
(iii) Give **two** ways in which we can *protect* our environment from *pollution*. (6)

SECTION E - APPLIED SCIENCE (72 marks)

Answer **TWO** questions from this section.

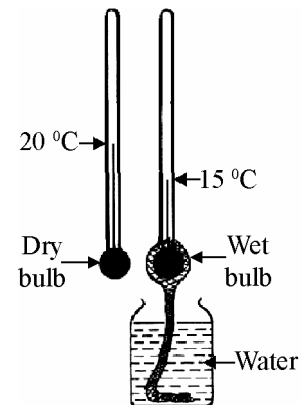
10. EARTH SCIENCE. Answer any **two** of the following, (a), (b), (c).

- (a) The photograph shows the planet Saturn. Pick **one** planet, you can pick Saturn if you like. Compare the planet with Earth for (i) *size*, (ii) *distance*, from the sun, (iii) *surface temperature* (iv) *surface gravity*. (12)



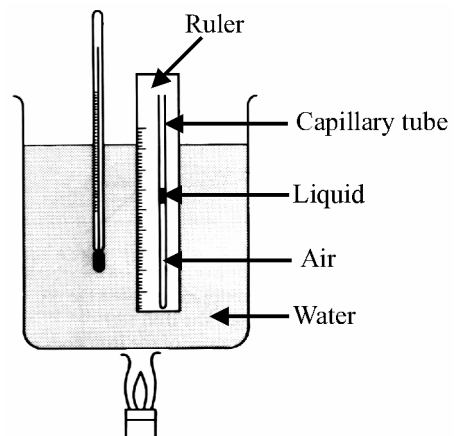
Give **two** reasons why the Earth can support life. (6)

- (b) The diagram shows a wet and dry bulb hygrometer. This instrument is used to *measure humidity*. It has two mercury-in-glass thermometers, one dry and the second wet. The water travels up cloth to the wet bulb. The *difference* in temperature, using a *table*, gives the *humidity*.



- What is *humidity*? (6)
 How can the *temperature* of the *wet bulb* be *lower* than that of the *dry bulb*? (6)
 If both thermometers showed the *same* temperature what would it tell us? (6)

- (c) A pupil used the apparatus shown in the diagram to investigate the *variation* of the *volume* of a gas (air) with *temperature*.



- (i) What *measurements* would be made during the experiment? (6)
 (ii) How would these measurements be *used*? (6)
 (iii) What *result* or *conclusion* might be made? (6)

[Turn over

11. HORTICULTURE. Answer any **two** of the following, (a), (b), (c).

- (a) The photo shows a *grafted* apple tree.
Name a plant, other than the apple, that can be
propagated by grafting. (3)

Describe, using a labelled diagram, *the grafting procedure* for the plant you have named. (12)

Name the *plant tissue* whose growth is essential for a successful graft. (3)



- (b) (i) Tell how to *grow* a named *vegetable* to maturity. (12)

(ii) Give **two reasons** why mulches are used. (6)

- (c) (i) The photo shows lettuces and scallions being grown using hydroponics.

Explain the underlined term. (6)

Give **one advantage** of using hydroponics to produce salad vegetables. (3)



- (ii) Give **three** things that need to be done when *harvesting* and then *caring* for cut flowers. (9)

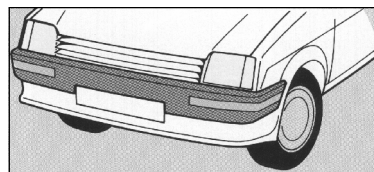
12. MATERIALS SCIENCE. Answer **both** parts, (a) and (b).

(a) Plastics, metals, textiles and sometimes timber are used in the manufacture of cars.

Select **three** of the *materials* named above and

(i) name a *part* of a car, that is made from each of the materials selected,

(ii) give a *property* of each material you have selected that makes it *suitable* for its use.



(18)

(b)

(i) PLASTICS

Outline the **two** stages in the *production* of plastics from oil. (6)

Describe an experiment to show that plastics are good heat *insulators*. (12)

(ii) METALS

Name **two** *unreactive metals* that can be found as *elements* in the Earth's crust. (6)

Describe an experiment to compare the *hardness* of two metals. (12)

(iii) TEXTILES

What is meant by *absorbency*?
Name a textile with good absorbency. (6)

Describe an experiment to compare the *absorbency* of two different textiles. (12)

(iv) TIMBER

Give **two** ways of *protecting* timber. (6)

Describe an experiment to compare the *bending strength* of two timber laths. (12)

[Turn over

13. FOOD. Answer any **two** of the following, (a), (b), (c).

- (a) An average cheddar cheese is about 25% protein, 0.1% carbohydrate and 34.4% fat, and supplies 88% of the recommended daily amount (RDA) of calcium per 100 g of cheese.



Select **two** *food types*, present in cheese, and state their *roles* in promoting health. (6)

Outline the main stages in the *manufacture* of cheese. (12)

- (b) (i) Chemicals, known as *additives*, are often added to food.

Give **one** *advantage* and **one** *disadvantage* of the use of additives in food. (6)

A supermarket spice mixture for use in marinating meats and fish contains E 110 and E 124.

What does the 'E' prefix mean? (3)

What *type* of additives are E 110 and E 124? (3)

- (ii) Give **one** *cause* and **one** *effect* of famine. (6)

- (c) The photo shows a selection of *preserved* foods.

Give **two** reasons why foods are preserved. (6)

Describe *pasteurisation*. (12)



14. ELECTRONICS. Answer **both** parts, (a) and (b).

- (a) The circuit diagram shows a battery, a bulb and component A.

Name *component A* and state what electrical quantity it allows to be *changed* in this circuit. (6)

What *effects*, if any, do adjustments to A have on the *brightness* of the bulb? (3)

Give an *everyday use* for this type of circuit. (3)

Are the components in this circuit in *series* or in *parallel*? (3)

If the battery polarity were *reversed*, in the circuit, would it have any *effect* on the operation of the circuit? (3)

- (b) The component shown in the diagram is a transistor (NPN). Draw a *diagram* of the *underside* of this component with the *tag* shown and **two terminals** clearly labelled. (6)

The circuit diagram is for a *frost* warning in a greenhouse. Component B is a *type* of resistor with a *particular* property.

Name this *type* of resistor and state its *particular* property. (6)

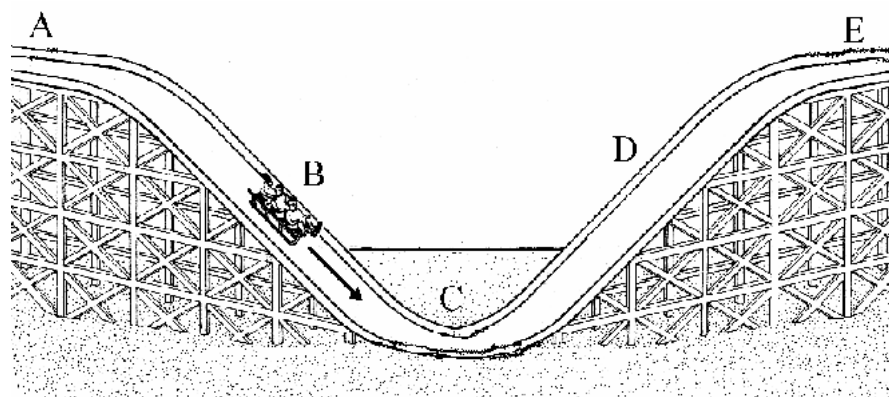
Name component C. (3)

What happens to component C when the temperature falls to frost temperature? (3)

[Turn over

15. ENERGY CONVERSIONS. Answer **both** parts, (a) and (b).

- (a) The diagram shows a fairground amusement.
People ride in a vehicle along a track that falls and rises.



Identify the point (A, B etc. on the diagram) where the vehicle and passengers have:

- (i) mostly *potential energy*
- (ii) roughly *equal* amounts of *kinetic energy* and *potential energy*
- (iii) *mostly* kinetic energy
- (iv) kinetic energy *changing* into potential energy. (12)

(Note: only **one** point is required, in your answer, for each of the above.)

The potential energy in this example is called gravitational potential energy.
Name **two other types** of potential energy (stored energy). (6)

- (b) The diagram shows an electric bell.

Give the *energy changes* that occur when (i) electric current passes through the electromagnet, (ii) the hammer hits the gong. (12)

Why does the hammer continue to strike the gong as long as there is a supply of electricity? (6)