

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

COMBINED SCIENCE

0653/01

Paper 1 Multiple Choice

October/November 2006

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

This document consists of **16** printed pages.

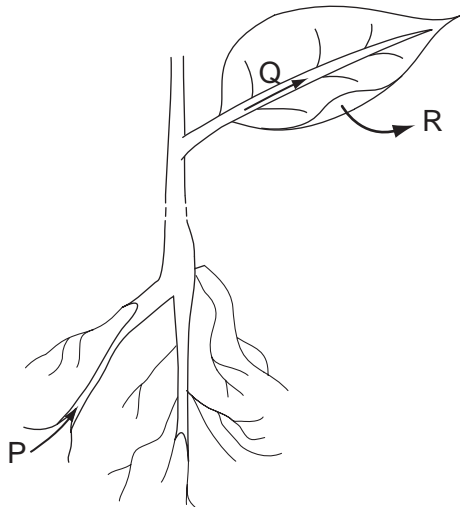


- 1 Living and dead plant cells are placed in a dilute solution of red dye. After a few minutes the cells are observed using a microscope. Only the dead cells are stained red.

Which part of the living cells stops the uptake of the red dye?

- A cell membrane
 B cell wall
 C cytoplasm
 D nucleus
- 2 Which type of chemical is the enzyme catalase?
- A fat
 B protein
 C starch
 D sugar

- 3 The diagram shows the pathway taken by water as it passes through a plant.



In which state is the water at positions P, Q and R?

| | P | Q | R |
|---|--------|--------|--------|
| A | liquid | liquid | liquid |
| B | liquid | liquid | vapour |
| C | liquid | vapour | vapour |
| D | vapour | vapour | vapour |

4 Four foods are each tested separately with Benedict's, biuret and iodine solutions.

Which food contains starch and reducing sugar?

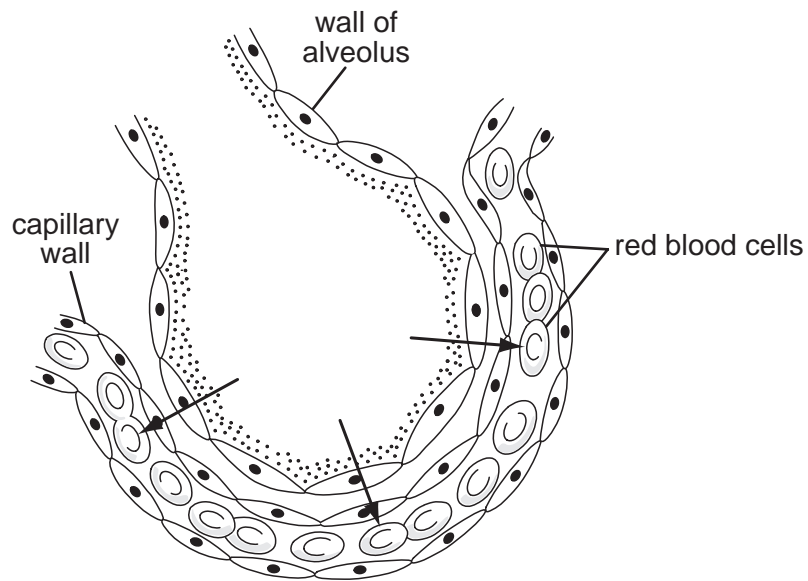
| food | Benedict's test | biuret test | iodine test |
|----------|-----------------|-------------|-------------|
| A | ✓ | ✓ | ✗ |
| B | ✓ | ✗ | ✓ |
| C | ✗ | ✗ | ✓ |
| D | ✗ | ✓ | ✗ |

key

✓ = positive result

✗ = negative result

5 The diagram shows an alveolus and one of its capillaries.

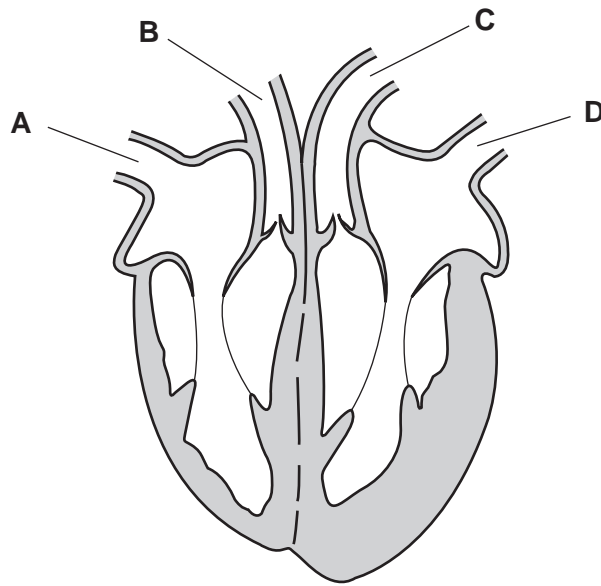


What moves in the direction shown by the arrows?

- A** carbon dioxide
- B** hydrogen
- C** oxygen
- D** water

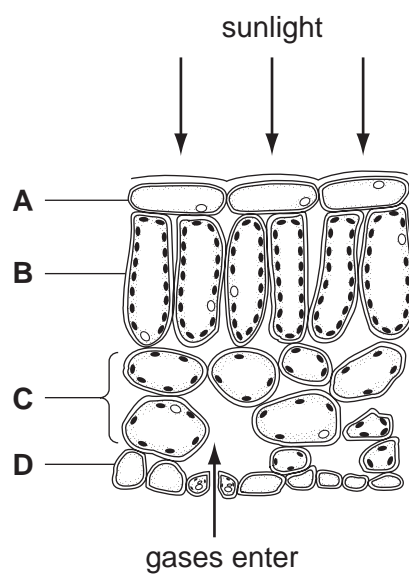
6 The diagram shows a section through the human heart.

Which vessel is a vein containing oxygenated blood?



7 The diagram shows some cells in a leaf of a green plant.

In which layer of cells does most photosynthesis occur?



- 8 In a healthy person, which shows the correct relationship between blood sugar level, insulin level in the blood, and liver activity?

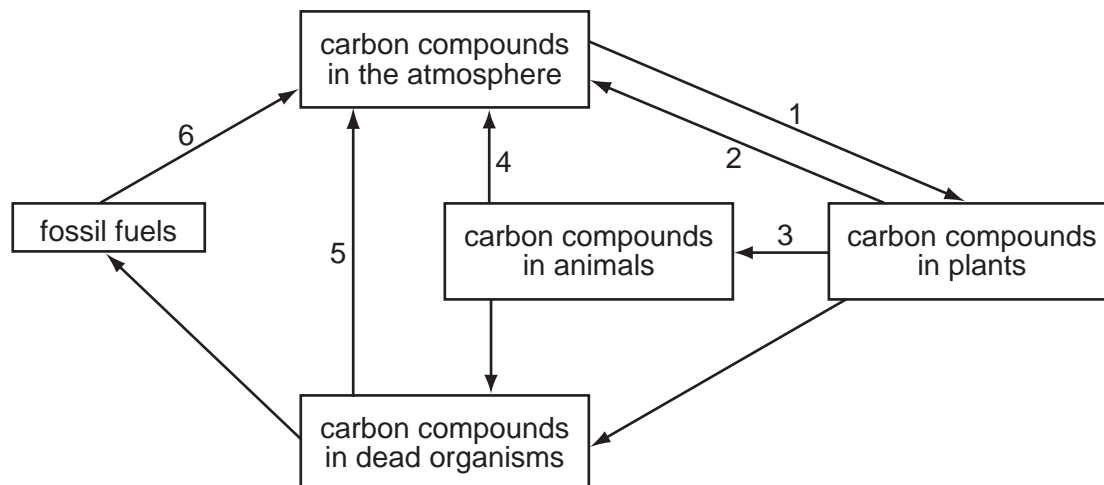
| | blood sugar level | insulin level | liver activity |
|----------|-------------------|---------------|---------------------------------|
| A | high | high | removes glucose from the blood |
| B | high | low | releases glucose into the blood |
| C | low | high | releases glucose into the blood |
| D | low | low | removes glucose from the blood |

- 9 A variety of potato plant produces red tubers ('potatoes') that grow into new potato plants which then produce red 'potatoes' the following year.

Why is this?

- A** Asexual reproduction produces identical potato plants.
 - B** Asexual reproduction results in different coloured 'potatoes'.
 - C** Sexual reproduction requires the potato plant to produce flowers.
 - D** Sexual reproduction produces only red coloured 'potatoes'.
- 10 After it has been fertilised, which part of a flower develops into a seed?
- A** egg
 - B** ovary
 - C** ovule
 - D** pollen
- 11 Which pairs of human features are inherited and **not** affected by the environment?
- A** blood group and body mass
 - B** blood group and sex
 - C** hair colour and height
 - D** sex and body mass

12 The diagram shows the carbon cycle.



Which of the numbered processes represent respiration and photosynthesis?

| | respiration | photosynthesis |
|----------|-------------|----------------|
| A | 3 | 1 |
| B | 4 | 1 |
| C | 5 | 2 |
| D | 6 | 3 |

13 Which statement describes species diversity?

- A** the number of different types of habitat in which species are found
- B** the total number of habitats in which a species is found
- C** the number of species in a community
- D** the number of variations within a species

14 Which substance is an element?

- A** air
- B** brass
- C** iron
- D** water

15 Atoms of four different elements are shown.

Which atom contains six neutrons?

- A** ${}^4_2\text{He}$
- B** ${}^6_3\text{Li}$
- C** ${}^{11}_5\text{B}$
- D** ${}^{14}_6\text{C}$

16 Which substance is an ionic compound?

| | melting point | electrical conductivity when melted |
|----------|---------------|-------------------------------------|
| A | high | high |
| B | high | low |
| C | low | high |
| D | low | low |

17 Which property of an element **cannot** be predicted from its position in the Periodic Table?

- A** the charge on its ion
- B** the melting point of the element
- C** the metallic/ non-metallic character of the element
- D** the number of protons in its nucleus

18 The diagram shows some elements in Groups III, IV and V of the Periodic Table.

| | | |
|-----|----|----|
| III | IV | V |
| Al | Si | P |
| Ga | Ge | As |
| In | Sn | Sb |
| Tl | Pb | Bi |

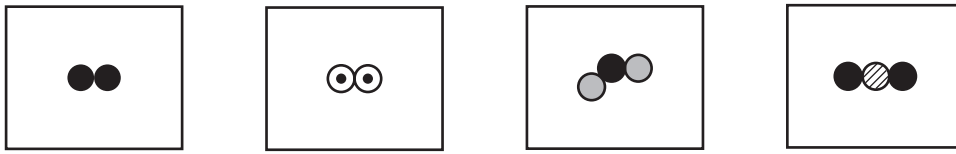
Which two elements would be expected to form an oxide of the type XO_2 ?

| | In and Sn | Sn and Pb |
|----------|-----------|-----------|
| A | ✓ | ✓ |
| B | ✓ | x |
| C | x | ✓ |
| D | x | x |

19 Which element, present in fossil fuels, is responsible for causing 'acid rain'?

- A** carbon
- B** hydrogen
- C** oxygen
- D** sulphur

- 20 The diagrams show some molecules of substances present in air. Different circles represent atoms of different elements.



Which elements could be shown as \odot and \bullet ?

| | \odot = nitrogen | \bullet = oxygen |
|----------|--------------------|--------------------|
| A | ✓ | ✓ |
| B | ✓ | x |
| C | x | ✓ |
| D | x | x |

- 21 Three metals are listed.

copper

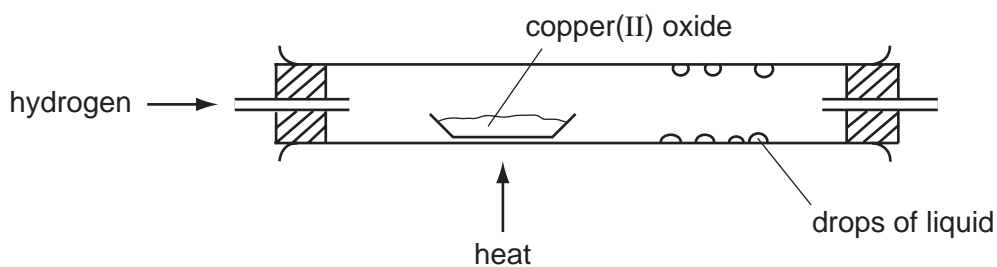
magnesium

zinc

Which of these metals react with dilute sulphuric acid?

- A** copper and magnesium only
B copper and zinc only
C magnesium and zinc only
D copper, magnesium and zinc

22 Hydrogen is passed over heated copper(II) oxide as shown.



The copper(II) oxide is reduced.

Which other statement also describes a change that occurs during the reaction?

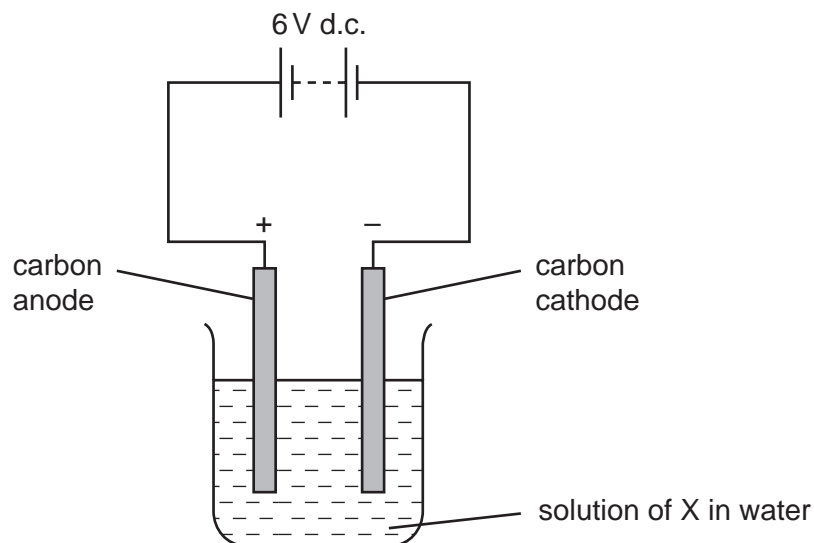
- A Copper is distilled.
- B Copper(II) oxide is thermally decomposed.
- C Hydrogen is condensed.
- D Hydrogen is oxidised.

23 Sodium chloride is an ionic salt that is used industrially as an electrolyte.

Under which conditions does sodium chloride behave as an electrolyte?

| | solid | molten | in aqueous solution |
|----------|-------|--------|---------------------|
| A | no | no | yes |
| B | no | yes | yes |
| C | yes | no | no |
| D | yes | yes | no |

24 A substance, X, is dissolved in water and electrolysed as shown.



A yellow-green gas is given off at the anode and the cathode becomes brown.

What is X?

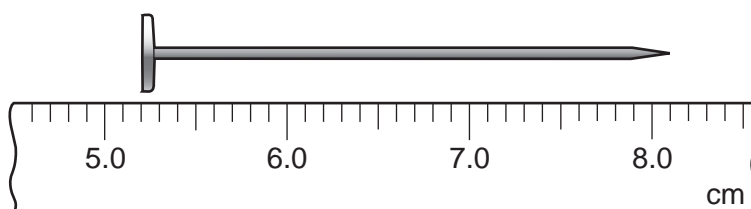
- A copper(II) chloride
 - B lead(II) bromide
 - C sodium bromide
 - D sodium chloride
- 25 Which fuel burns to form only one product?
- A coal
 - B hydrogen
 - C methane
 - D petrol
- 26 Why is water often used to extinguish fires?
- A Water is a compound.
 - B Water is neutral.
 - C Water reacts with most fuels.
 - D Water removes heat from the fire.

27 Some man-made plastics are made from small molecules which join together by covalent bonds.

What is the main source of these small molecules and what is the structure of the plastics?

| | <i>source of small molecules</i> | <i>structure</i> |
|----------|--------------------------------------|---|
| A | coal | $\begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{H} \\ \\ \text{H} \end{array}$ |
| B | coal | $\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\ & & & \\ \cdots - \text{C} & - \text{C} & - \text{C} & - \text{C} - \cdots \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array}$ |
| C | oil | $\begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{H} \\ \\ \text{H} \end{array}$ |
| D | oil | $\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\ & & & \\ \cdots - \text{C} & - \text{C} & - \text{C} & - \text{C} - \cdots \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array}$ |

28 A ruler is used to measure the length of a nail.



What is the length of the nail?

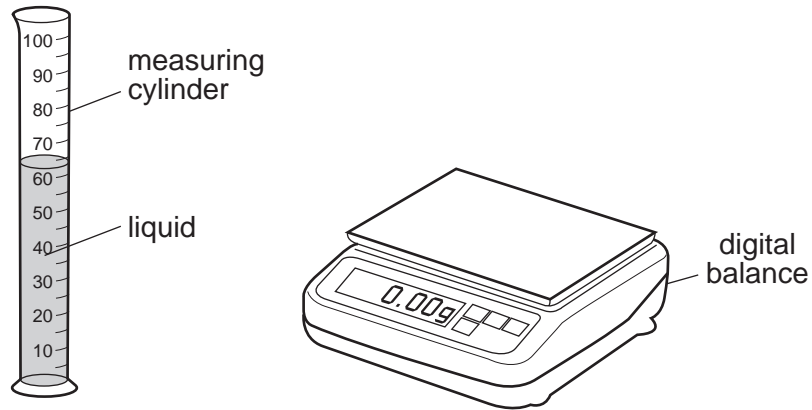
- A** 1.3 cm **B** 2.9 cm **C** 5.2 cm **D** 8.1 cm

29 A newton is a unit of force.

Which quantity is measured in newtons?

- A** acceleration
B density
C mass
D weight

30 A student pours liquid into a measuring cylinder.



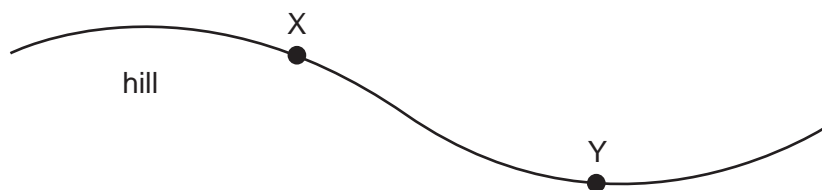
The student records the volume of the liquid from the scale on the measuring cylinder. He then puts the measuring cylinder containing the liquid on a balance and records the mass.

What else needs to be measured before the density of the liquid can be calculated?

- A the depth of the liquid in the measuring cylinder
 - B the mass of the empty measuring cylinder
 - C the temperature of the liquid in the measuring cylinder
 - D the volume of the empty measuring cylinder
- 31 Which source of energy uses the production of steam to generate electricity?
- A hydroelectric
 - B nuclear
 - C tides
 - D waves

32 A cyclist travels down a hill from rest at point X without pedalling.

The cyclist applies his brakes and the cycle stops at point Y.



Which energy changes have taken place between X and Y?

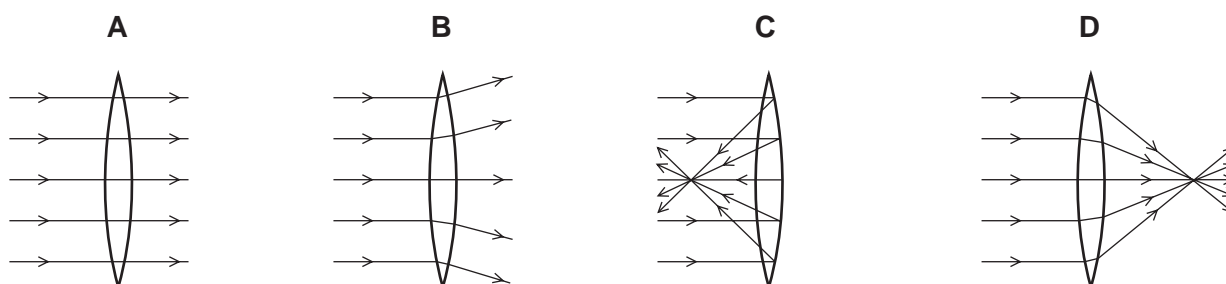
- A kinetic \rightarrow heat \rightarrow potential
- B kinetic \rightarrow potential \rightarrow heat
- C potential \rightarrow heat \rightarrow kinetic
- D potential \rightarrow kinetic \rightarrow heat

33 Which line in the table is correct about conduction and convection?

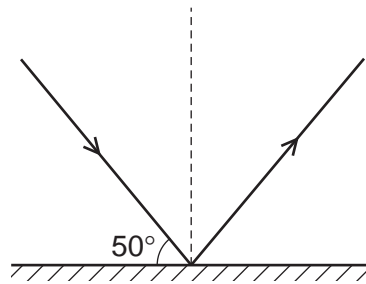
| | conduction | convection |
|---|------------------------|------------------------|
| A | can happen in a solid | can happen in a solid |
| B | can happen in a solid | only happens in fluids |
| C | only happens in fluids | can happen in a solid |
| D | only happens in fluids | only happens in fluids |

34 A parallel beam of light falls on a converging lens.

Which diagram shows what happens to the beam of light?



35 The diagram shows a ray of light striking a plane mirror.



What is the angle of reflection?

- A** 40° **B** 50° **C** 80° **D** 130°

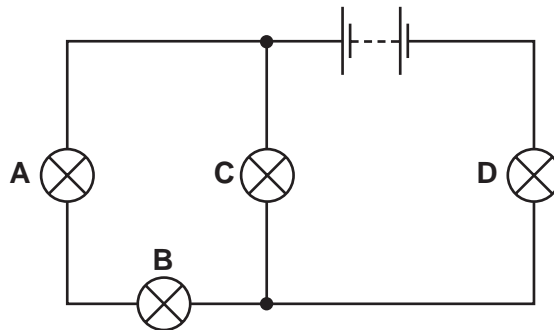
36 When electricity is transmitted over long distances energy is wasted.

How can the wasted energy be kept as small as possible?

- A** Keep the current in the transmission lines as large as possible.
B Keep the power supplied to the transmission lines as large as possible.
C Keep the resistance of the transmission lines as large as possible.
D Keep the voltage supplied to the transmission lines as large as possible.

37 In the circuit below, one of the lamps breaks, causing all the other lamps to go out.

Which lamp breaks?

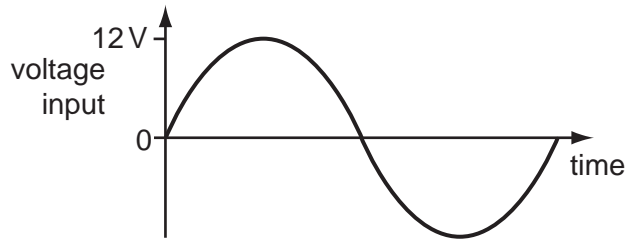


38 An electric heater is connected to the mains using insulated copper wires. The wires become very warm.

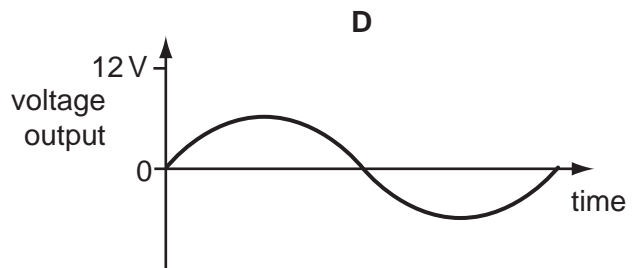
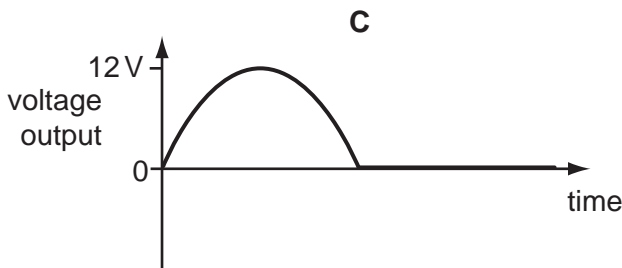
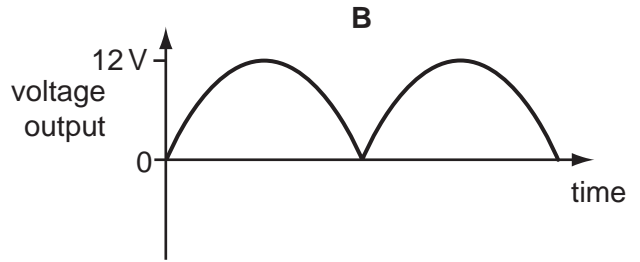
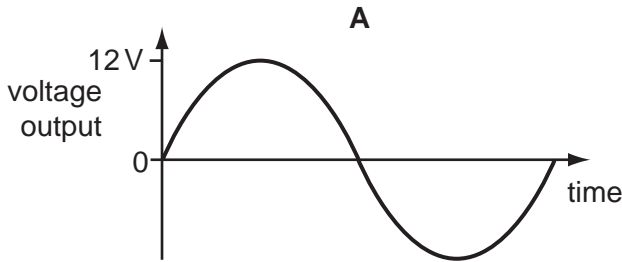
What can be done to prevent so much heat being produced in the connecting wires?

- A** Use thicker copper wires.
B Use thinner copper wires.
C Use thicker insulation.
D Use thinner insulation.

39 The graph shows the voltage input to a step-down transformer.



Which diagram shows the voltage output from the transformer?



40 Which line in the table describes the nature of an alpha-particle and of a gamma-ray?

| | alpha-particle | gamma-ray |
|----------|----------------|---------------------------|
| A | helium nucleus | electromagnetic radiation |
| B | helium nucleus | electron |
| C | proton | electromagnetic radiation |
| D | proton | electron |

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DATA SHEET
The Periodic Table of the Elements

| | | Group | | | | | | | | | | | |
|-----------------------------------|------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|--|--|--|--|---------------------------------------|-------------------------------------|
| I | II | III | IV | V | VI | VII | 0 | | | | | | 0 |
| | | 1 H Hydrogen 1 | | | | | | | | | | | 4 He Helium 2 |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | | | 20 Ne Neon 10 | |
| 23 Na Sodium 11 | 24 Mg Magnesium 12 | 27 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulphur 16 | 35.5 Cl Chlorine 17 | 40 Ar Argon 18 | | | | | | 84 Kr Krypton 36 |
| 39 K Potassium 19 | 40 Ca Calcium 20 | 70 Ga Gallium 31 | 73 Ge Germanium 32 | 75 As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 131 Xe Xenon 54 | | | | | | 227 Ac Actinium 89 |
| 85 Rb Rubidium 37 | 88 Sr Strontium 38 | 101 Ru Ruthenium 44 | 106 Pd Palladium 46 | 103 Rh Rhodium 45 | 108 Ag Silver 47 | 127 I Iodine 53 | 209 Bi Bismuth 83 | | | | | | 86 Rn Radon 86 |
| 133 Cs Caesium 55 | 137 Ba Barium 56 | 190 Os Osmium 76 | 195 Pt Platinum 78 | 192 Ir Iridium 77 | 197 Au Gold 79 | 207 Pb Lead 82 | | | | | | 175 Lu Lutetium 71 | |
| 226 Ra Radium 88 | 227 Ac Actinium 89 | | | | | | | | | | | 169 Tm Thulium 69 | |
| | | 115 In Indium 49 | 112 Cd Cadmium 48 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 153 Sn Tin 50 | 167 Er Erbium 68 | | | | | | 102 No Nobelium 102 |
| | | 204 Tl Thallium 81 | 201 Hg Mercury 80 | 209 Pb Lead 82 | 207 Pb Lead 82 | 208 Po Polonium 84 | | | | | | 103 Lr Lawrencium 103 | |
| | | 65 Zn Zinc 30 | 64 Cu Copper 29 | 63 Ni Nickel 28 | 65 Zn Zinc 30 | 66 Dy Dysprosium 66 | | | | | | 100 Fm Fermium 100 | |
| | | 59 Co Cobalt 27 | 59 Co Cobalt 27 | 58 Ni Nickel 28 | 59 Co Cobalt 27 | 60 Gd Gadolinium 64 | | | | | | 99 Es Einsteinium 99 | |
| | | 56 Fe Iron 26 | 56 Fe Iron 26 | 55 Mn Manganese 25 | 56 Fe Iron 26 | 61 Eu Europium 63 | | | | | | 98 Cf Californium 98 | |
| | | 52 Cr Chromium 24 | 52 Cr Chromium 24 | 50 Tc Technetium 43 | 51 Mn Manganese 25 | 62 Sm Samarium 62 | | | | | | 97 Bk Berkelium 97 | |
| | | 51 V Vanadium 23 | 51 V Vanadium 23 | 48 Ti Titanium 22 | 50 Tc Technetium 43 | 63 Eu Europium 63 | | | | | | 96 Cm Curium 96 | |
| | | 48 Ti Titanium 22 | 48 Ti Titanium 22 | 45 Sc Scandium 21 | 48 Ti Titanium 22 | 61 Pm Promethium 61 | | | | | | 95 Am Americium 95 | |
| | | 45 Sc Scandium 21 | 45 Sc Scandium 21 | 40 Zr Zirconium 40 | 45 Sc Scandium 21 | 62 Sm Samarium 62 | | | | | | 94 Pu Plutonium 94 | |
| | | 39 K Potassium 19 | 39 K Potassium 19 | 38 Sr Strontium 38 | 39 Y Yttrium 39 | 62 Sm Samarium 62 | | | | | | 93 Np Neptunium 93 | |
| | | 37 Rb Rubidium 37 | 37 Rb Rubidium 37 | 36 Sr Strontium 38 | 37 Y Yttrium 39 | 62 Sm Samarium 62 | | | | | | 92 U Uranium 92 | |
| | | 35 Br Bromine 35 | 35 Br Bromine 35 | 34 Se Selenium 34 | 35 Br Bromine 35 | 62 Sm Samarium 62 | | | | | | 91 Pa Protactinium 91 | |
| | | 33 As Arsenic 33 | 33 As Arsenic 33 | 32 S Sulphur 16 | 33 As Arsenic 33 | 62 Sm Samarium 62 | | | | | | 90 Th Thorium 90 | |
| | | 31 P Phosphorus 15 | 31 P Phosphorus 15 | 30 Zn Zinc 30 | 31 P Phosphorus 15 | 62 Sm Samarium 62 | | | | | | 89 Fr Francium 87 | |
| | | 29 Cu Copper 29 | 29 Cu Copper 29 | 28 Ni Nickel 28 | 29 Cu Copper 29 | 62 Sm Samarium 62 | | | | | | 88 Ra Radium 88 | |
| | | 27 Al Aluminium 13 | 27 Al Aluminium 13 | 26 Fe Iron 26 | 27 Al Aluminium 13 | 62 Sm Samarium 62 | | | | | | 87 Fr Francium 87 | |
| | | 25 Mn Manganese 25 | 25 Mn Manganese 25 | 24 Cr Chromium 24 | 25 Mn Manganese 25 | 62 Sm Samarium 62 | | | | | | 86 Rn Radon 86 | |
| | | 23 Na Sodium 11 | 23 Na Sodium 11 | 22 Ti Titanium 22 | 23 Na Sodium 11 | 62 Sm Samarium 62 | | | | | | 85 At Astatine 85 | |
| | | 21 Sc Scandium 21 | 21 Sc Scandium 21 | 20 Ca Calcium 20 | 21 Sc Scandium 21 | 62 Sm Samarium 62 | | | | | | 84 Po Polonium 84 | |
| | | 19 K Potassium 19 | 19 K Potassium 19 | 18 Ar Argon 18 | 19 K Potassium 19 | 62 Sm Samarium 62 | | | | | | 83 Bi Bismuth 83 | |
| | | 17 Cl Chlorine 17 | 17 Cl Chlorine 17 | 16 S Sulphur 16 | 17 Cl Chlorine 17 | 62 Sm Samarium 62 | | | | | | 82 Pb Lead 82 | |
| | | 15 P Phosphorus 15 | 15 P Phosphorus 15 | 14 C Carbon 6 | 15 P Phosphorus 15 | 62 Sm Samarium 62 | | | | | | 81 Tl Thallium 81 | |
| | | 13 Al Aluminium 13 | 13 Al Aluminium 13 | 12 C Carbon 6 | 13 Al Aluminium 13 | 62 Sm Samarium 62 | | | | | | 80 Hg Mercury 80 | |
| | | 11 B Boron 5 | 11 B Boron 5 | 10 Ne Neon 10 | 11 B Boron 5 | 62 Sm Samarium 62 | | | | | | 79 Au Gold 79 | |
| | | 9 F Fluorine 9 | 9 F Fluorine 9 | 8 O Oxygen 8 | 9 F Fluorine 9 | 62 Sm Samarium 62 | | | | | | 78 Pt Platinum 78 | |
| | | 7 N Nitrogen 7 | 7 N Nitrogen 7 | 6 C Carbon 6 | 7 N Nitrogen 7 | 62 Sm Samarium 62 | | | | | | 77 Ir Iridium 77 | |
| | | 5 B Boron 5 | 5 B Boron 5 | 4 Be Beryllium 4 | 5 B Boron 5 | 62 Sm Samarium 62 | | | | | | 76 Os Osmium 76 | |
| | | 3 Li Lithium 3 | 3 Li Lithium 3 | 2 He Helium 2 | 3 Li Lithium 3 | 62 Sm Samarium 62 | | | | | | 75 Re Rhenium 75 | |
| | | 2 He Helium 2 | 2 He Helium 2 | 1 H Hydrogen 1 | 2 He Helium 2 | 62 Sm Samarium 62 | | | | | | 74 W Tungsten 74 | |

*58-71 Lanthanoid series
†90-103 Actinoid series

| | | | |
|-----|--------------------------|-------------------|----------------------------|
| | a | X | b |
| Key | a = relative atomic mass | X = atomic symbol | b = proton (atomic) number |

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).