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**CO-ORDINATED SCIENCES**

**0654/23**

Paper 2 Multiple Choice (Extended)

**October/November 2019**

**45 minutes**

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

\* 5 6 0 8 3 7 6 3 2 1 \*

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**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, 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.

**DO NOT WRITE IN ANY BARCODES.**

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.

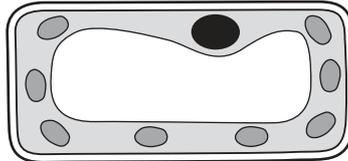
A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

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

- 1 What is a plant demonstrating when carbon dioxide is released from its cells?
- A assimilation
  - B egestion
  - C excretion
  - D nutrition
- 2 The diagram shows a section through a cell.



What shows that this is a plant cell?

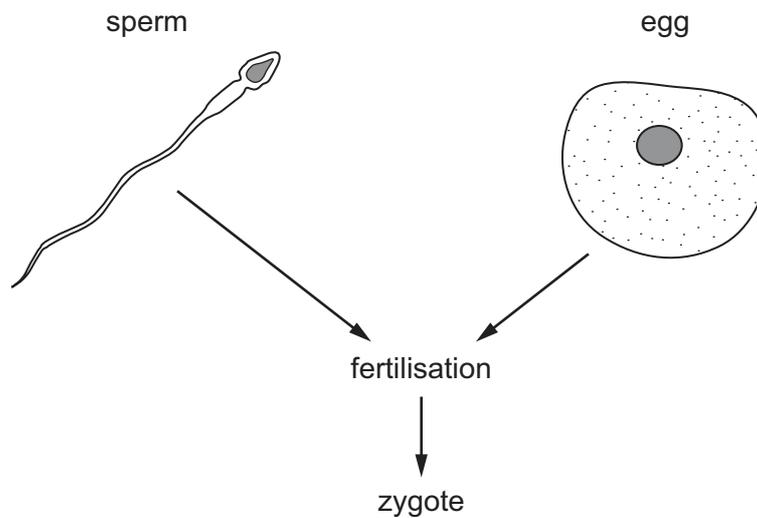
- A It has a cell membrane.
  - B It has a nucleus.
  - C It has a permanent vacuole.
  - D It has cytoplasm.
- 3 Which result with the biuret test shows that protein is present?
- A blue
  - B green
  - C orange
  - D purple
- 4 Four test-tubes were set up to investigate the effect of pH on the digestion of protein by the enzyme pepsin, the protease enzyme in the stomach.
- Each test-tube contained the same volumes of cloudy egg white suspension and pepsin solution.
- The temperature in each tube was the same but the pH differed as shown.
- In which test-tube would the suspension clear first?
- A pH 2
  - B pH 5
  - C pH 8
  - D pH 11



9 Which actions are voluntary and which are involuntary?

	a change in pupil size due to a change in light intensity	the lens in the eye changing shape during accommodation
<b>A</b>	involuntary	involuntary
<b>B</b>	involuntary	voluntary
<b>C</b>	voluntary	involuntary
<b>D</b>	voluntary	voluntary

10 The diagram shows a type of reproduction.



Which row is correct for this type of reproduction?

	type of reproduction	advantage
<b>A</b>	asexual	offspring are genetically identical
<b>B</b>	asexual	requires two parents
<b>C</b>	sexual	increases variation
<b>D</b>	sexual	offspring produced more quickly

11 A body cell taken from a male kangaroo contains 16 chromosomes in the nucleus.

How many chromosomes would be found in the nucleus of a sperm cell from the same kangaroo and what term describes this number?

	chromosome number	description of number
<b>A</b>	8	diploid
<b>B</b>	8	haploid
<b>C</b>	16	diploid
<b>D</b>	16	haploid

12 In the food chain shown, 10% of the energy is transferred between each trophic level.

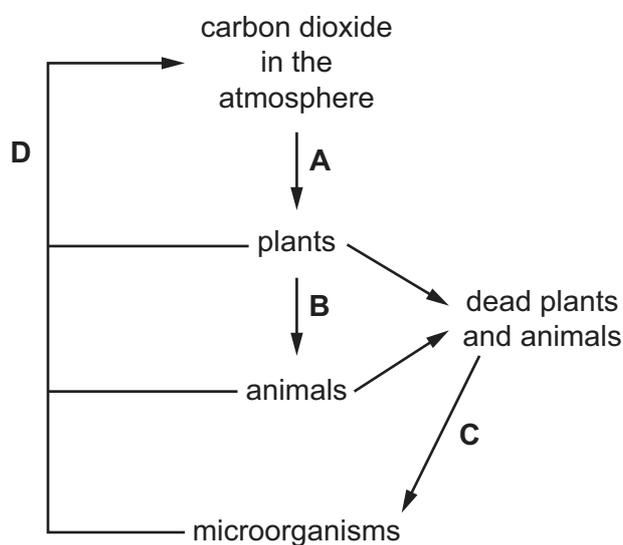
grass → grasshopper → frog → snake → buzzard

For every 100 kJ of energy in the herbivore, how much energy will be transferred to the tertiary consumer?

- A** 0.1 kJ      **B** 1 kJ      **C** 10 kJ      **D** 100 kJ

13 The diagram shows some of the processes in the carbon cycle.

Which process is respiration?



14 Which property of a substance is used to determine that it is pure?

- A** colour  
**B** melting point  
**C** pH  
**D** shape of the crystals

15 Which processes are chemical changes?

- 1 conversion of steam to liquid water
- 2 cracking of alkanes
- 3 fractional distillation of petroleum
- 4 thermal decomposition of calcium carbonate

A 1 and 3      B 1 and 4      C 2 and 3      D 2 and 4

16 Silicon(IV) oxide has a giant molecular structure.

Which row is correct?

	number of oxygen atoms bonded to each silicon atom	number of silicon atoms bonded to each oxygen atom
<b>A</b>	2	2
<b>B</b>	2	4
<b>C</b>	4	2
<b>D</b>	4	4

17 Which sample does **not** contain two moles of hydrogen atoms?

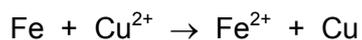
- A Avogadro's number of hydrogen molecules
- B 1 g of hydrogen molecules
- C 18 g of water molecules
- D 24 dm<sup>3</sup> hydrogen molecules at room temperature and pressure

18 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.

Which row describes how the number of sodium ions and of chloride ions changes during the electrolysis?

	number of sodium ions	number of chloride ions
<b>A</b>	decreases	decreases
<b>B</b>	decreases	no change
<b>C</b>	no change	decreases
<b>D</b>	no change	no change

19 A redox reaction is shown.

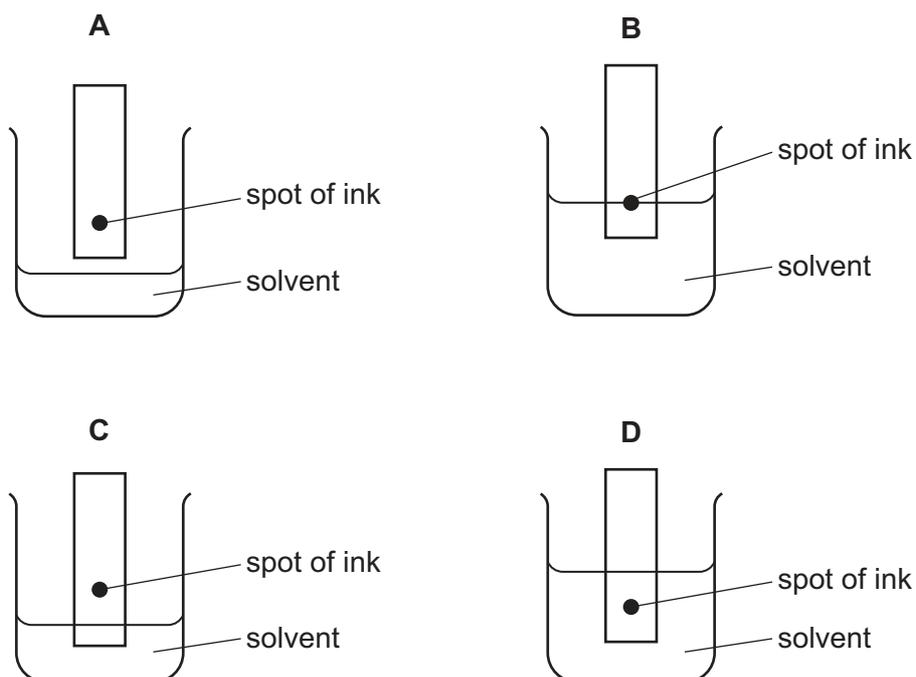


Which substance is the reducing agent?

- A** Cu                      **B**  $\text{Cu}^{2+}$                       **C** Fe                      **D**  $\text{Fe}^{2+}$

20 The colours in an ink can be separated by chromatography.

Which diagram shows the correct way to set up the apparatus?



21 Which statement about the Periodic Table is correct?

- A** Elements are listed in order of neutron number.  
**B** Elements are listed in order of nucleon number.  
**C** Elements are listed in order of proton number.  
**D** Elements are listed in order of relative atomic mass.

22 Which row describes a Group II element in period 3 of the Periodic Table?

	electrical conductivity	number of outer shell electrons
<b>A</b>	good	2
<b>B</b>	good	3
<b>C</b>	poor	2
<b>D</b>	poor	3

23 Which statement describes **all** metals?

- A They break when hit with a hammer.
- B They conduct electricity.
- C They dissolve in water.
- D They have high densities.

24 Which pair of substances do **not** react with each other?

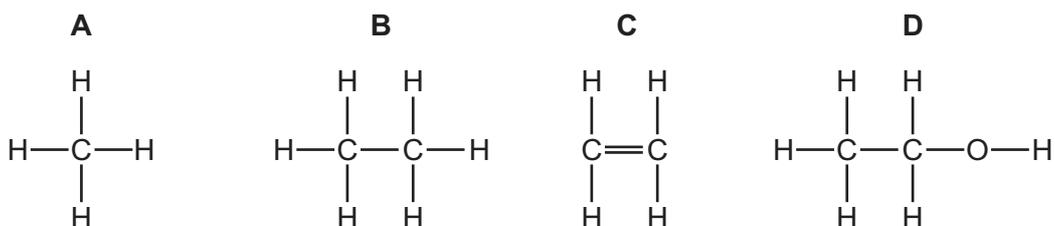
- A copper and aqueous magnesium sulfate
- B iron and aqueous copper(II) sulfate
- C magnesium and aqueous zinc sulfate
- D zinc and aqueous iron(II) sulfate

25 Which processes produce carbon dioxide?

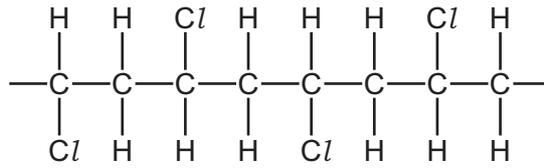
- 1 acid reacting with a metal
- 2 respiration
- 3 combustion of ethanol
- 4 acid reacting with a metal oxide

- A 1 and 2      B 1 and 4      C 2 and 3      D 3 and 4

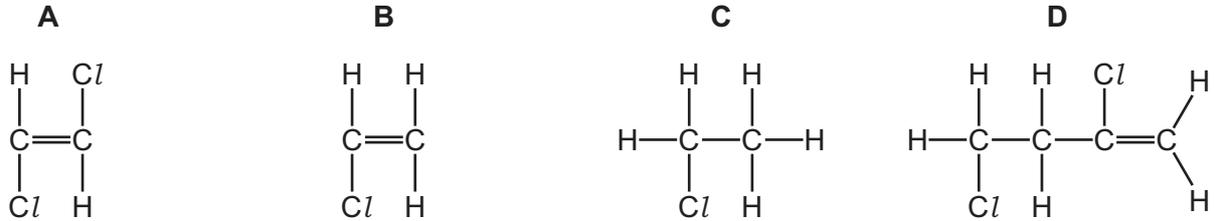
26 Which structure represents ethanol?



27 A section of a polymer chain is shown.



Which monomer is used to make this polymer?



28 There is no resultant force acting on a body.

Which statement is correct?

- A** The body is either at rest or moving at constant speed in a straight line.
- B** The body must be at rest.
- C** The body is gaining speed.
- D** The body is losing speed.

- 29 Diagram 1 shows a spring with its length indicated. Diagram 2 shows the same spring with a 20 N load hung from it, and the new length of the spring.

The spring obeys Hooke's Law.

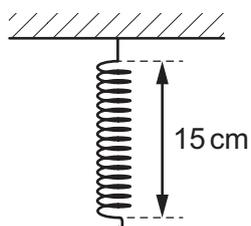


diagram 1

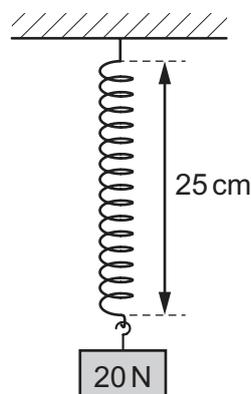
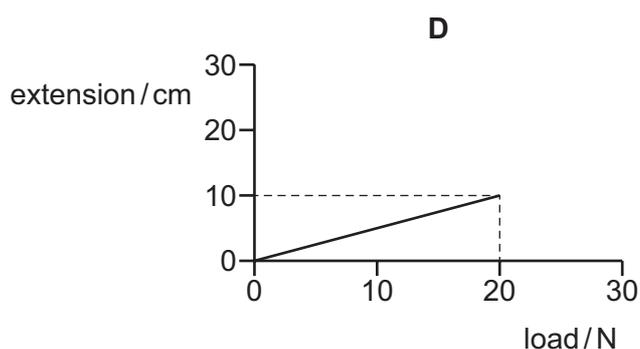
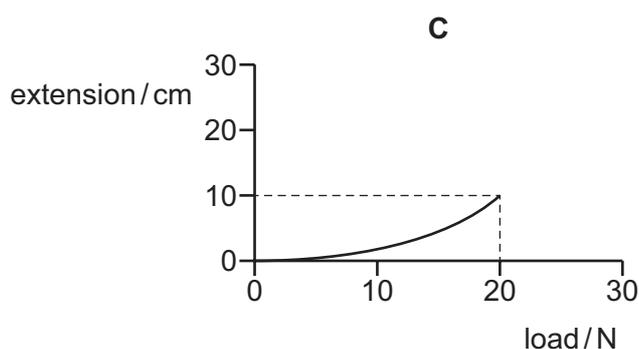
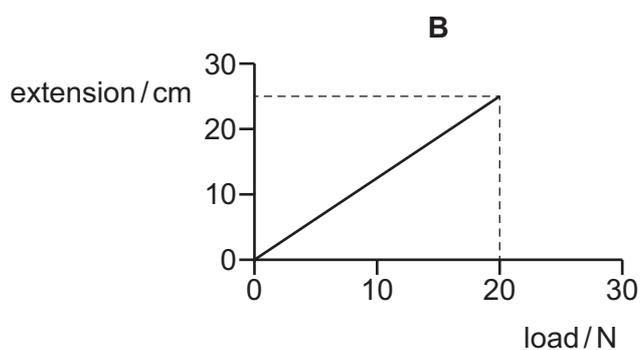
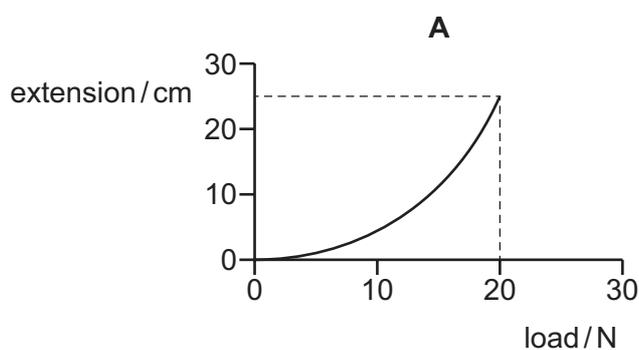


diagram 2

Which graph is the extension-load graph for the spring?



- 30 A body moving at speed  $v$  has kinetic energy  $E$ .

What is the speed of the body when its kinetic energy is  $4.0E$ ?

- A**  $0.25v$       **B**  $2.0v$       **C**  $4.0v$       **D**  $16v$

- 31 A student wishes to measure his average power when running up a flight of steps. The energy transferred is 7.0 kJ and the time taken is 14 seconds.

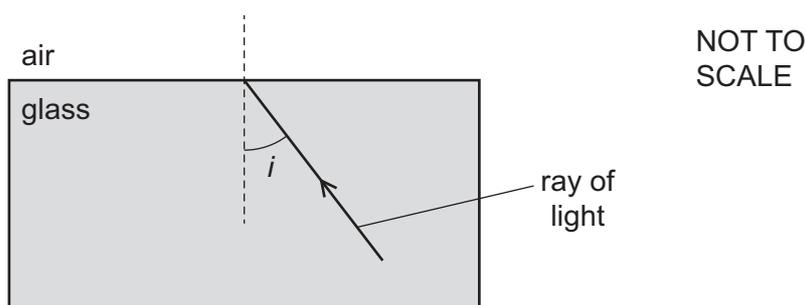
What is the student's average power?

- A 0.0020 W      B 98 W      C 500 W      D 98 000 W

- 32 A glass block is surrounded by air.

Light travelling in the glass block reaches the edge of the block.

The critical angle of the glass is  $42^\circ$ .



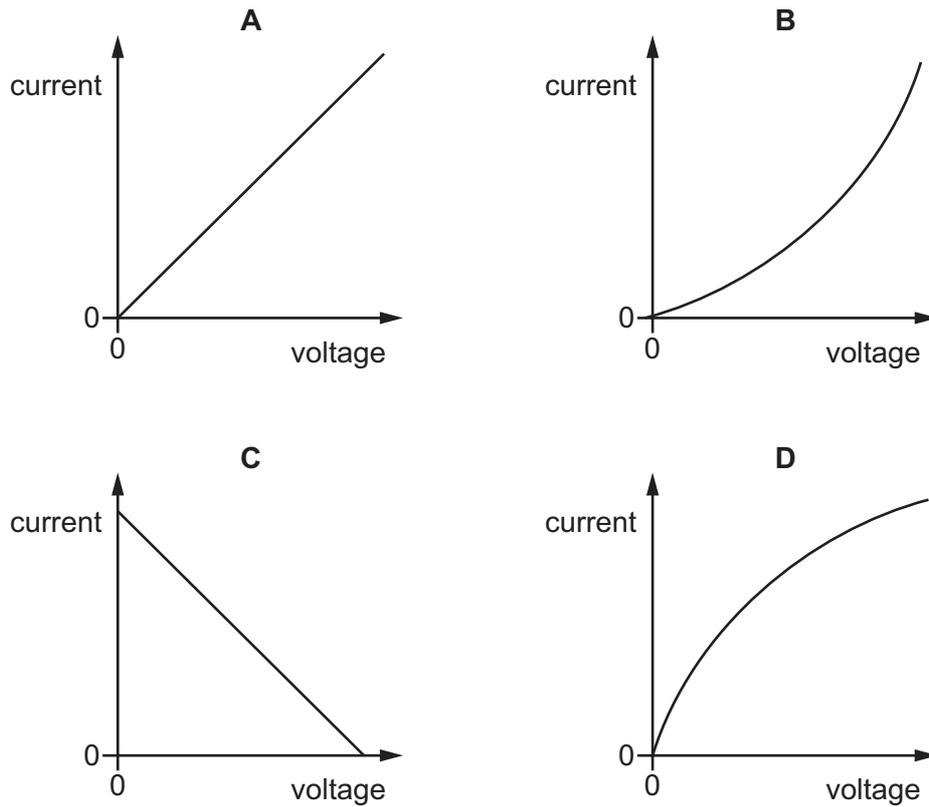
Which row shows an angle of incidence  $i$  of the light and what happens to the light when it reaches the edge of the glass block at this angle of incidence?

	$i$	what happens to the light
A	$30^\circ$	totally internally reflected
B	$45^\circ$	refracted
C	$60^\circ$	totally internally reflected
D	$75^\circ$	refracted

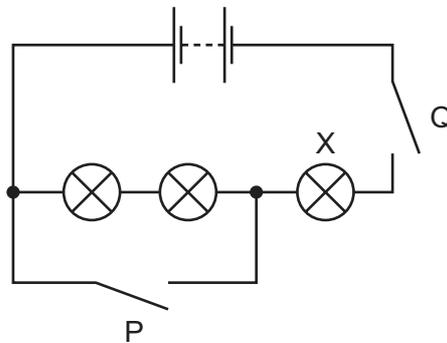
- 33 Which statement about real and virtual images formed by a thin converging lens is correct?

- A All real images are enlarged and inverted.  
 B All real images can be produced on a screen.  
 C All virtual images are diminished and upright.  
 D All virtual images can be produced on a screen.

34 Which graph is the current-voltage characteristic of a filament lamp?



35 The diagram shows a circuit containing two switches P and Q, and three lamps. One lamp is labelled X.



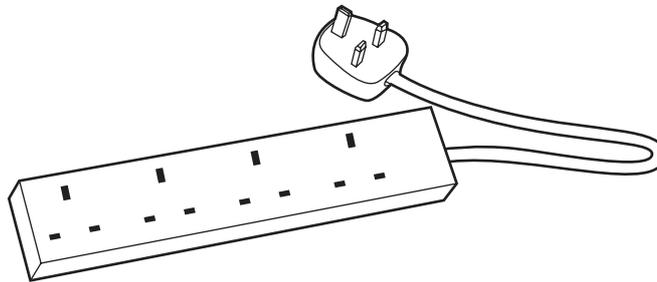
Which of the switches must be closed so that **only** lamp X is lit?

- A neither switch
- B switch P only
- C switch Q only
- D switch P and switch Q

- 36 Which row shows how lamps are connected in a lighting circuit in a house and gives an advantage of connecting them in this way?

	how lamps are connected	advantage of connecting them in this way
<b>A</b>	in parallel	they can be switched separately
<b>B</b>	in parallel	they share the voltage
<b>C</b>	in series	they can be switched separately
<b>D</b>	in series	they share the voltage

- 37 An electrical extension block has four sockets, a cable which can safely take a current of 6 A and a plug. It is protected by a fuse rated at 5 A.

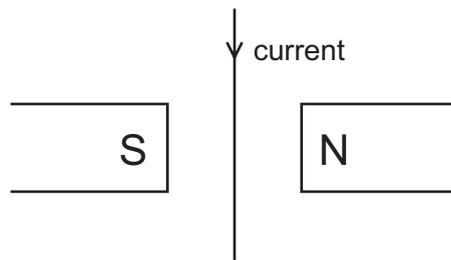


The extension block is used with four appliances and the 5 A fuse blows. The owner replaces the 5 A fuse with a 13 A fuse.

Why is the extension block now dangerous?

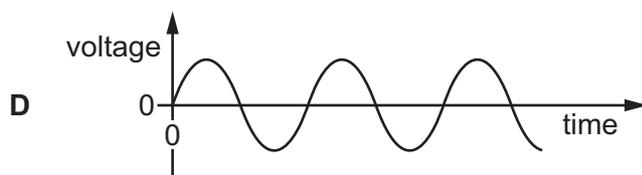
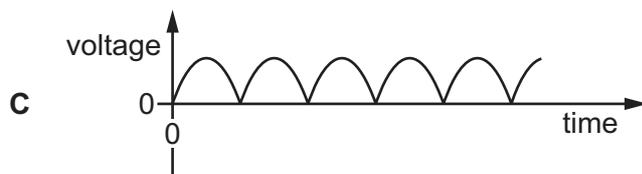
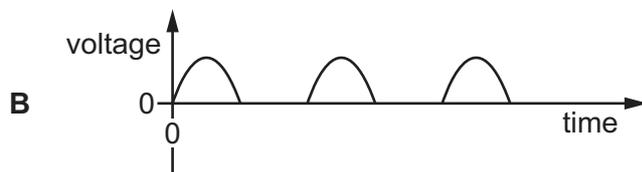
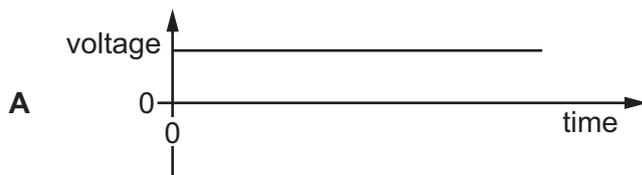
- A** The appliances may overheat before the fuse blows.
- B** The cable may overheat before the fuse blows.
- C** The sockets may burn out before the fuse blows.
- D** The 13 A fuse may blow too soon.

- 38 The diagram shows a current-carrying conductor between the poles of a magnet. The direction of the current is shown.



In which direction is the force that acts on the wire?

- A into the page
  - B out of the page
  - C to the left
  - D to the right
- 39 Which graph shows the output voltage from a simple a.c. generator?



40 Which type of radiation has the greatest ionising effect, and which is the most penetrating?

	greatest ionising effect	most penetrating
<b>A</b>	$\alpha$ -particles	$\alpha$ -particles
<b>B</b>	$\alpha$ -particles	$\gamma$ -rays
<b>C</b>	$\gamma$ -rays	$\alpha$ -particles
<b>D</b>	$\gamma$ -rays	$\gamma$ -rays

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The Periodic Table of Elements

		Group															
I	II	III	IV	V	VI	VII	VIII										
3 <b>Li</b> lithium 7	4 <b>Be</b> beryllium 9	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <b>Key</b>                      atomic number                      atomic symbol                      name                      relative atomic mass                 </div>										2 <b>He</b> helium 4					
11 <b>Na</b> sodium 23	12 <b>Mg</b> magnesium 24											5 <b>B</b> boron 11	6 <b>C</b> carbon 12	7 <b>N</b> nitrogen 14	8 <b>O</b> oxygen 16	9 <b>F</b> fluorine 19	10 <b>Ne</b> neon 20
19 <b>K</b> potassium 39	20 <b>Ca</b> calcium 40	21 <b>Sc</b> scandium 45	22 <b>Ti</b> titanium 48	23 <b>V</b> vanadium 51	24 <b>Cr</b> chromium 52	25 <b>Mn</b> manganese 55	26 <b>Fe</b> iron 56	27 <b>Co</b> cobalt 59	28 <b>Ni</b> nickel 59	29 <b>Cu</b> copper 64	30 <b>Zn</b> zinc 65	31 <b>Ga</b> gallium 70	32 <b>Ge</b> germanium 73	33 <b>As</b> arsenic 75	34 <b>Se</b> selenium 79	35 <b>Br</b> bromine 80	36 <b>Kr</b> krypton 84
37 <b>Rb</b> rubidium 85	38 <b>Sr</b> strontium 88	39 <b>Y</b> yttrium 89	40 <b>Zr</b> zirconium 91	41 <b>Nb</b> niobium 93	42 <b>Mo</b> molybdenum 96	43 <b>Tc</b> technetium —	44 <b>Ru</b> ruthenium 101	45 <b>Rh</b> rhodium 103	46 <b>Pd</b> palladium 106	47 <b>Ag</b> silver 108	48 <b>Cd</b> cadmium 112	49 <b>In</b> indium 115	50 <b>Sn</b> tin 119	51 <b>Sb</b> antimony 122	52 <b>Te</b> tellurium 128	53 <b>I</b> iodine 127	54 <b>Xe</b> xenon 131
55 <b>Cs</b> caesium 133	56 <b>Ba</b> barium 137	57–71 lanthanoids	72 <b>Hf</b> hafnium 178	73 <b>Ta</b> tantalum 181	74 <b>W</b> tungsten 184	75 <b>Re</b> rhenium 186	76 <b>Os</b> osmium 190	77 <b>Ir</b> iridium 192	78 <b>Pt</b> platinum 195	79 <b>Au</b> gold 197	80 <b>Hg</b> mercury 201	81 <b>Tl</b> thallium 204	82 <b>Pb</b> lead 207	83 <b>Bi</b> bismuth 209	84 <b>Po</b> polonium —	85 <b>At</b> astatine —	86 <b>Rn</b> radon —
87 <b>Fr</b> francium —	88 <b>Ra</b> radium —	89–103 actinoids	104 <b>Rf</b> rutherfordium —	105 <b>Db</b> dubnium —	106 <b>Sg</b> seaborgium —	107 <b>Bh</b> bohrium —	108 <b>Hs</b> hassium —	109 <b>Mt</b> meitnerium —	110 <b>Ds</b> darmstadtium —	111 <b>Rg</b> roentgenium —	112 <b>Cn</b> copernicium —	114 <b>Fl</b> flerovium —	116 <b>Lv</b> livermorium —	—	—	—	—

lanthanoids	57 <b>La</b> lanthanum 139	58 <b>Ce</b> cerium 140	59 <b>Pr</b> praseodymium 141	60 <b>Nd</b> neodymium 144	61 <b>Pm</b> promethium —	62 <b>Sm</b> samarium 150	63 <b>Eu</b> europium 152	64 <b>Gd</b> gadolinium 157	65 <b>Tb</b> terbium 159	66 <b>Dy</b> dysprosium 163	67 <b>Ho</b> holmium 165	68 <b>Er</b> erbium 167	69 <b>Tm</b> thulium 169	70 <b>Yb</b> ytterbium 173	71 <b>Lu</b> lutetium 175
actinoids	89 <b>Ac</b> actinium —	90 <b>Th</b> thorium 232	91 <b>Pa</b> protactinium 231	92 <b>U</b> uranium 238	93 <b>Np</b> neptunium —	94 <b>Pu</b> plutonium —	95 <b>Am</b> americium —	96 <b>Cm</b> curium —	97 <b>Bk</b> berkelium —	98 <b>Cf</b> californium —	99 <b>Es</b> einsteinium —	100 <b>Fm</b> fermium —	101 <b>Md</b> mendelevium —	102 <b>No</b> nobelium —	103 <b>Lr</b> lawrencium —

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).