



PHYSICAL SCIENCE

0652/02

Paper 2 Multiple Choice (Extended)

For Examination from 2017

SPECIMEN PAPER

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, 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.

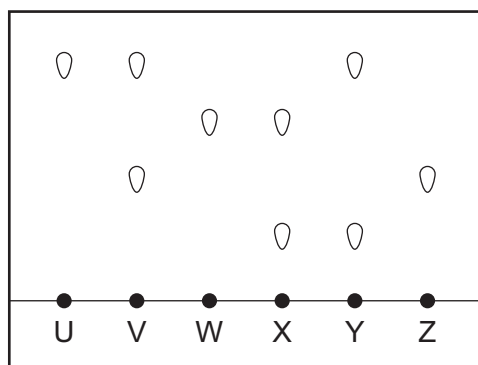
A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

This document consists of **20** printed pages.

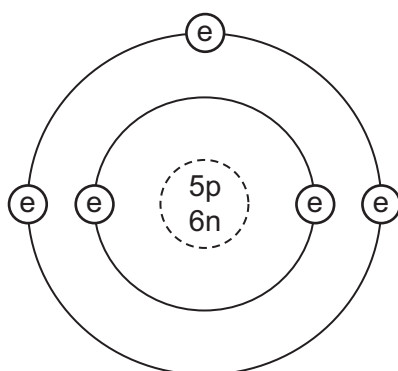


- 1 The diagram shows the results of a chromatography experiment.

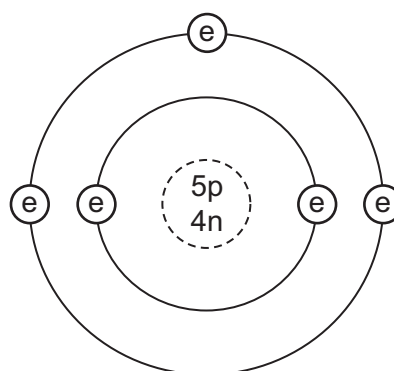


Which pair of substances are pure substances?

- A U and X
 - B U and Z
 - C V and W
 - D W and Y
- 2 The diagrams show two different atoms.



atom P



atom Q

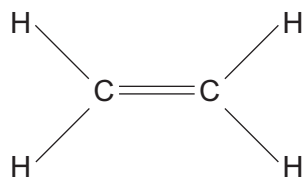
key

e = electron
n = neutron
p = proton

Which statement is **not** correct?

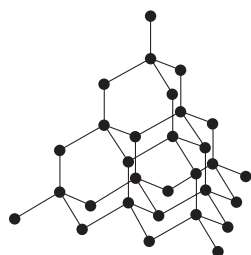
- A Atoms P and Q are isotopes of the same element.
- B Atom P has the electronic configuration 2,3.
- C Atom Q is boron.
- D The nucleon number of atom P is 9.

- 3 Ethene is an unsaturated hydrocarbon.

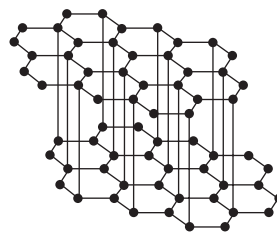


Which description of the bonding in ethene is correct?

- A** All of the atoms in the molecule share eight electrons.
- B** Each carbon atom shares two of its electrons with hydrogen atoms and two of its electrons with a carbon atom.
- C** Each carbon atom shares two of its electrons with hydrogen atoms and one of its electrons with a carbon atom.
- D** The two carbon atoms share a total of six electrons with other atoms.
- 4 The structures of two different forms of carbon are shown.



diamond



graphite

Which statement about diamond and graphite is correct?

- A** Diamond does not conduct electricity because its atoms are unable to move.
- B** Diamond has a high melting point because of strong ionic bonds between its atoms.
- C** Graphite conducts electricity because electrons are free to move.
- D** Graphite has a low melting point because of weak bonds between the layers.

- 5 Iron is a metal. The structure of iron is described as a lattice of positive ions in a 'sea of electrons'.

Which statements about iron are correct?

- 1 Iron conducts electricity because electrons are free to move.
- 2 Iron has a high melting point due to strong covalent bonds.
- 3 Iron is an alloy.
- 4 Iron is malleable because the layers of atoms can slide over each other.

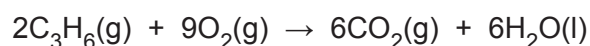
- A 1 only
B 1 and 3
C 1 and 4
D 2, 3 and 4

- 6 Which expression shows how the relative atomic mass (A_r) of an element is defined?

- A mass of one atom of an element \times mass of one atom of carbon-12
B mass of one atom of an element \times mass of one atom of carbon-12 \times 12
C $\frac{\text{mass of one atom of an element} \times 12}{\text{mass of one atom of carbon-12}}$
D $\frac{\text{mass of one atom of an element}}{\text{mass of one atom of carbon-12} \times 12}$

- 7 10 cm³ of propene, C₃H₆, are reacted with 60 cm³ of oxygen.

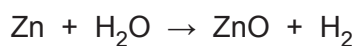
The equation for the reaction is



What is the total volume of gas remaining at the end of the reaction?
(All volumes are measured at room temperature and pressure.)

- A 30 cm³ B 45 cm³ C 60 cm³ D 70 cm³

- 8 What is the concentration of a solution containing 2.8g of potassium hydroxide in 500 cm³ of solution?
- A 0.025 mol/dm³
B 0.10 mol/dm³
C 0.25 mol/dm³
D 1.0 mol/dm³
- 9 In which reaction does light provide the energy for the reaction to occur?
- A explosion of flour in a flour mill
B fermentation of glucose to ethanol
C oxidation of iron to form rust
D reduction of silver ions to silver
- 10 Zinc reacts with steam to form zinc oxide and hydrogen.



During the reaction, which substance is oxidised?

- A hydrogen
B water
C zinc
D zinc oxide
- 11 Ammonia reacts with water to produce ammonium hydroxide solution.

Which row in the table describes the roles of ammonia and water in this reaction?

	ammonia	water
A	accepts a proton	donates a proton
B	accepts an electron	donates an electron
C	donates a proton	accepts a proton
D	donates an electron	accepts an electron

12 Reactions of four different oxides W, X, Y and Z are described.

W reacts with hydrochloric acid but not with sodium hydroxide.

X reacts with both hydrochloric acid and sodium hydroxide.

Y does not react with either hydrochloric acid or sodium hydroxide.

Z does not react with hydrochloric acid but does react with sodium hydroxide.

Which row shows the correct types of oxide?

	acidic	basic	amphoteric	neutral
A	W	Z	X	Y
B	X	W	Y	Z
C	Z	X	Y	W
D	Z	W	X	Y

13 When solid calcium hydroxide and solid ammonium chloride are heated together, a colourless gas is formed.

The gas turns damp red litmus paper blue.

What is the gas?

- A** ammonia
- B** chlorine
- C** hydrogen
- D** sulfur dioxide

14 An element, X, forms a covalent compound with hydrogen. The formula of the compound is XH_2 .

The diagram shows part of the Periodic Table.

What is X?

A																			
	C																		

15 Element Y is a transition metal.

Which row in the table describes element Y?

	forms coloured compounds	high density	low melting point
A	yes	yes	no
B	yes	no	no
C	no	yes	no
D	yes	yes	yes

16 Iron is extracted from hematite in the blast furnace.

The following reactions occur in the blast furnace.

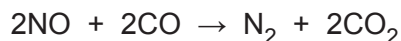
- 1 $\text{CO}_2 + \text{C} \rightarrow 2\text{CO}$
- 2 $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
- 3 $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- 4 $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$

Which reactions are redox reactions?

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

17 Nitrogen oxides and carbon monoxide are produced in a car engine when petrol is burned.

The exhaust gases from the engine are passed through a catalytic converter, and the following reaction takes place.



Which statement is **not** correct?

- A** Carbon monoxide is oxidised by the nitrogen oxides.
- B** Carbon monoxide is produced by the complete combustion of petrol.
- C** Nitrogen oxides are formed when nitrogen burns in oxygen.
- D** Nitrogen oxides are reduced in the catalytic converter.

18 Which row in the table shows the correct uses of the fractions obtained from petroleum?

	petrol	paraffin	lubricating fraction	bitumen
A	fuel for diesel engines	fuel for oil stoves	waxes and polishes	making roads
B	fuel for cars	fuel for oil stoves	waxes and polishes	making roads
C	fuel for cars	fuel for diesel engines	waxes and polishes	making roads
D	fuel for cars	fuel for oil stoves	fuel for diesel engines	waxes and polishes

19 The word equation shows a reaction of ethene.



What type of reaction occurs and what is X?

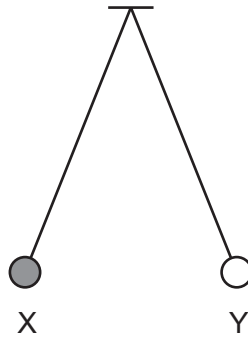
	type of reaction	X
A	addition	hydrogen
B	addition	steam
C	reduction	hydrogen
D	reduction	steam

20 Ethanol is produced by the fermentation of glucose.

Which statement about fermentation is **not** correct?

- A** Carbon dioxide is produced in the reaction.
- B** The reaction takes place between 50 °C and 60 °C.
- C** The reaction takes place in the absence of oxygen.
- D** Yeast provides the catalyst for the reaction.

- 21 A pendulum swings between point X and point Y.



A student wishes to measure the period of the pendulum.

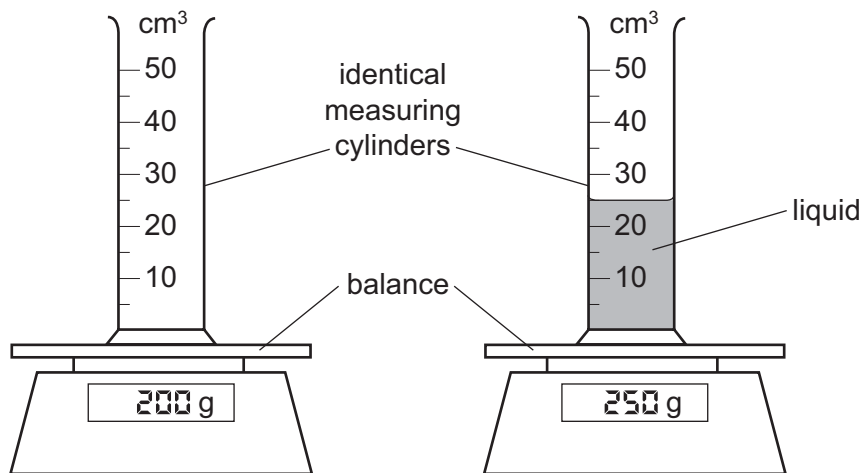
Which method produces the most accurate value for the period?

- A** measure the time for the pendulum to move from X to Y once
 - B** measure the time for the pendulum to move from X to Y ten times and divide this time by ten
 - C** measure the time for the pendulum to move from X to Y and back to X once
 - D** measure the time for the pendulum to move from X to Y and back to X ten times and divide this time by ten
- 22 An astronaut in an orbiting spacecraft experiences a force due to gravity. This force is less than when she is on the Earth's surface.

Compared with being on the Earth's surface, how do her mass and her weight change when she is in orbit?

	mass in orbit	weight in orbit
A	decreases	decreases
B	decreases	unchanged
C	unchanged	decreases
D	unchanged	unchanged

23 The diagram shows an experiment to find the density of a liquid.



What is the density of the liquid?

- A 0.5g/cm³
- B 2.0g/cm³
- C 8.0/cm³
- D 10.0g/cm³

24 An experiment is carried out to measure the extension of a rubber band for different loads.

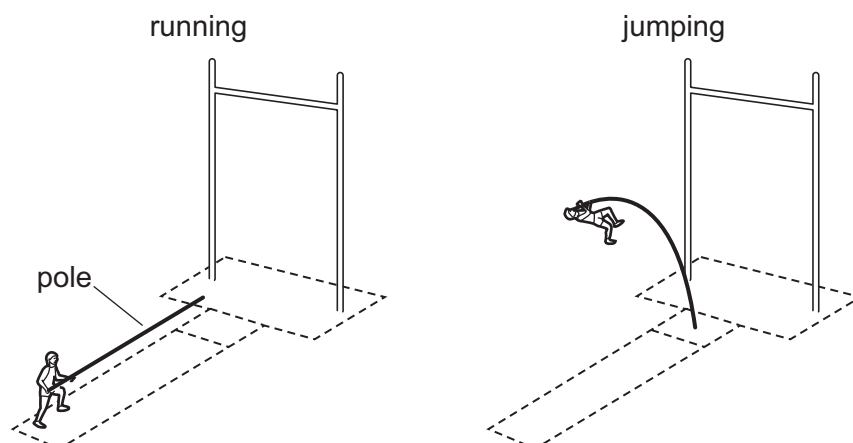
The results are shown below.

load/N	0	1.0	2.0	3.0
length/cm	15.2	16.2		18.6
extension/cm	0	1.0	2.1	3.4

Which figure is missing from the table?

- A 17.2
- B 17.3
- C 17.4
- D 18.3

- 25 A pole-vaulter runs up to a jump with his pole straight. He puts one end of the pole down on the ground and the pole bends as he jumps.



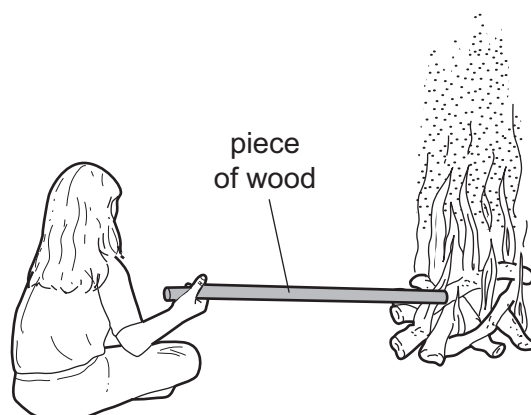
Which form of energy is stored in the pole because it is bent?

- A chemical
 - B gravitational
 - C motion
 - D strain
- 26 Two different temperatures are measured. One temperature is constant, and very high (approximately 600°C). The second temperature varies rapidly, but is approximately 60°C .

Which row in the table shows a thermometer suitable for measuring each temperature?

	constant and very high temperature (approximately 600°C)	rapidly varying temperature (approximately 60°C)
A	liquid-in-glass	liquid-in-glass
B	liquid-in-glass	thermocouple
C	thermocouple	liquid-in-glass
D	thermocouple	thermocouple

27 A girl sits by a camp fire. She holds a piece of wood with one end in the fire.



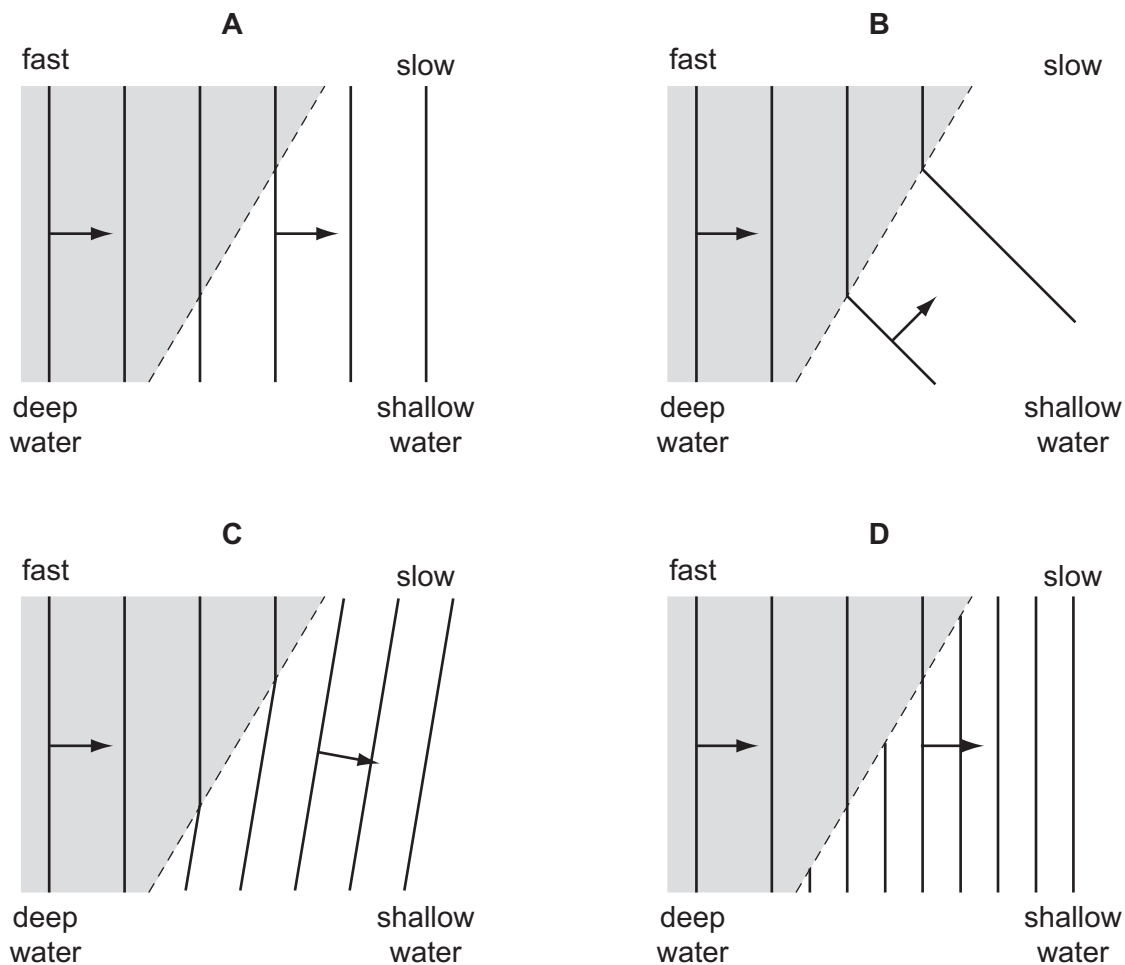
Heat from the fire reaches her hand.

How does heat from the fire reach her hand?

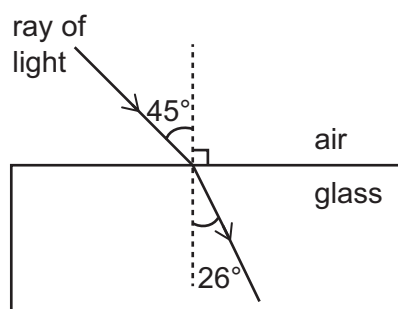
- A conduction, convection and radiation
- B conduction only
- C convection only
- D radiation only

28 The diagrams show water waves that move more slowly after passing into shallow water.

Which diagram shows what happens to the waves?



29 The diagram shows a ray of light passing from air into a glass block. The values of two angles are shown.

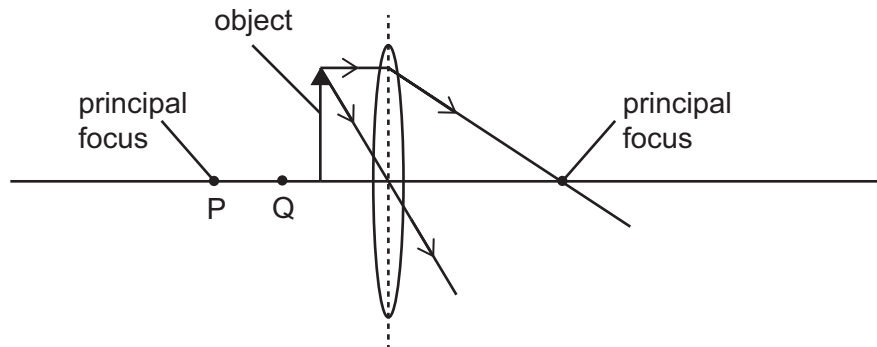


What is the refractive index n of the glass?

Use $n = \frac{\sin i}{\sin r}$

- A** 0.58 **B** 0.62 **C** 1.61 **D** 1.73

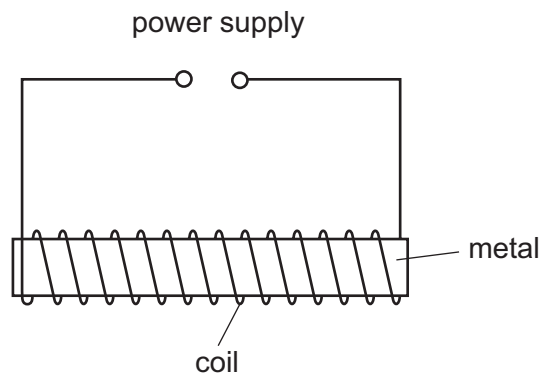
- 30 The diagram shows the paths of two rays of light from the top of an object. The rays pass through a converging lens. The principal foci of the lens are labelled.



At which point, P or Q, is an image formed, and is the image real or virtual?

	position of image	real or virtual image?
A	P	real
B	P	virtual
C	Q	real
D	Q	virtual

- 31 The diagram shows apparatus that is used to make a permanent magnet.



Which metal and which power supply is used to make a permanent magnet?

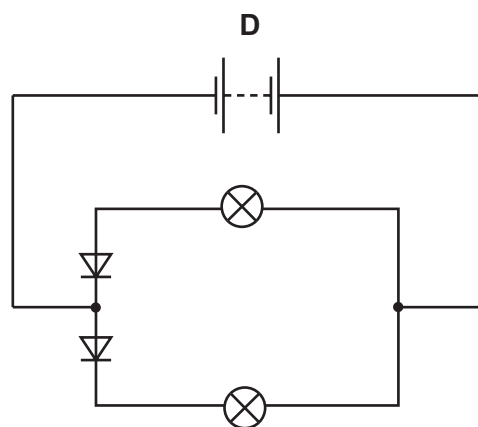
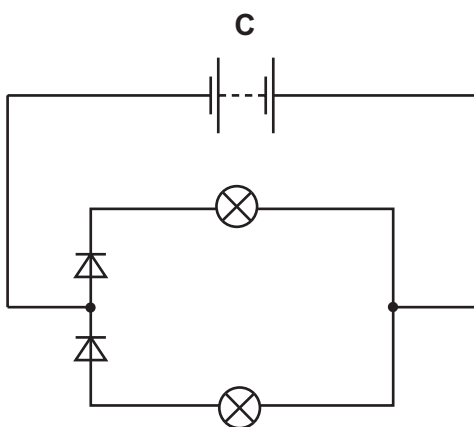
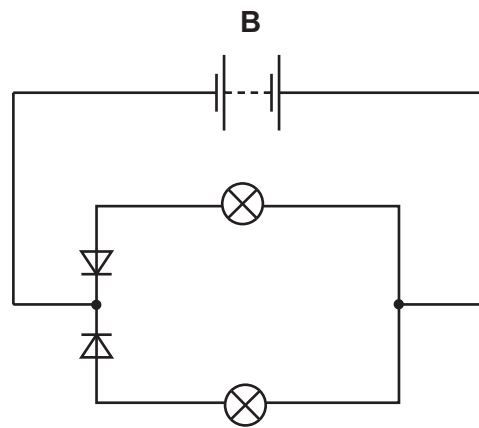
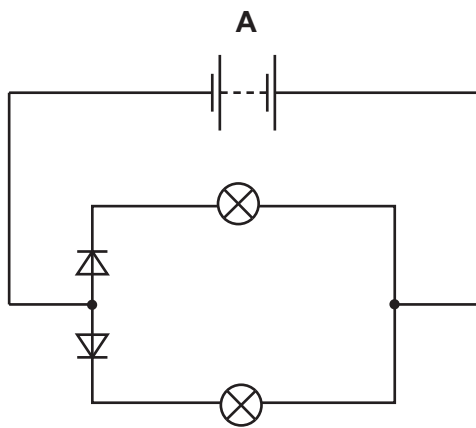
	metal	power supply
A	iron	a.c.
B	iron	d.c.
C	steel	a.c.
D	steel	d.c.

- 32 An electrical quantity is defined as the energy supplied by a source in driving a unit charge around a complete circuit.

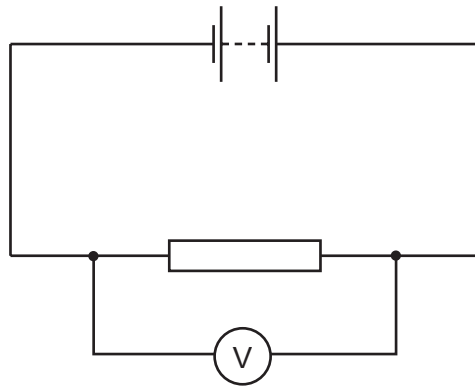
What is this electrical quantity?

- A current
 - B e.m.f.
 - C p.d.
 - D power
- 33 Two diodes are connected in each of four circuits.

In which circuit will both lamps light?

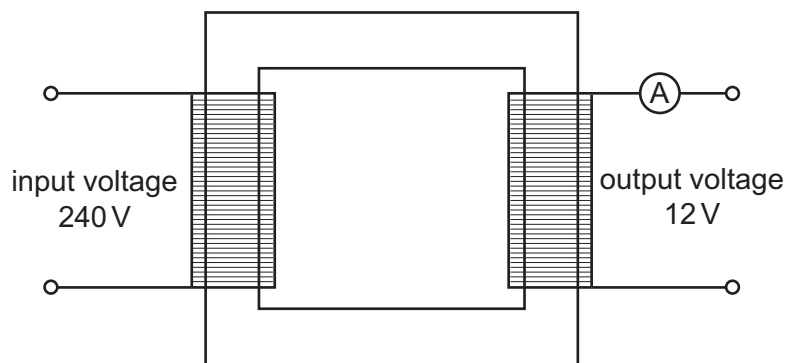


- 34 In the circuit shown, the current in the resistor is 4.0A and the voltmeter reads 6.0V .



How much energy is transferred by the resistor in 2.0 minutes?

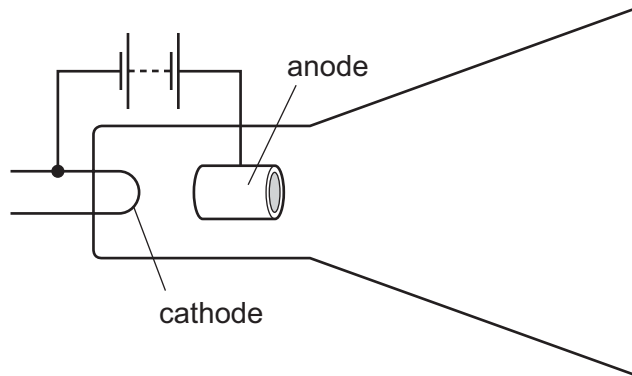
- A** 0.20J **B** 12J **C** 48J **D** 2880J
- 35 Which device uses slip rings?
- A** a d.c. motor
B an a.c. generator
C an oscilloscope
D a transformer
- 36 A transformer has an input voltage of 240V and an output voltage of 12V . The transformer is 100% efficient. An ammeter connected to the secondary coil shows a reading of 5.0A .



What is the current in the primary coil?

- A** 0.25A **B** 5.0A **C** 60A **D** 100A

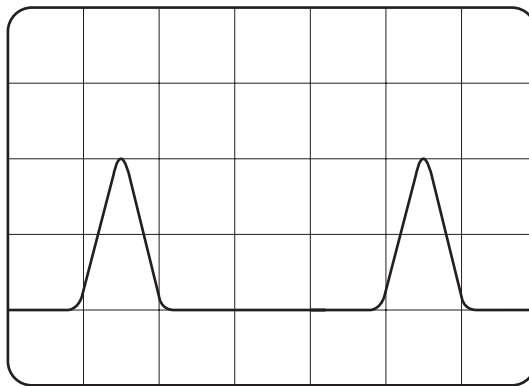
37 The diagram shows a cathode-ray tube.



In which direction is the conventional current, and in which direction do the electrons move between the electrodes?

	direction of conventional current	direction of electron movement
A	from anode to cathode	from anode to cathode
B	from anode to cathode	from cathode to anode
C	from cathode to anode	from anode to cathode
D	from cathode to anode	from cathode to anode

38 The diagram shows the display on an oscilloscope screen.

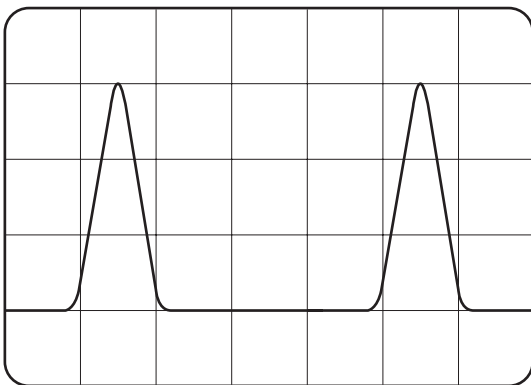


The time-base control of the oscilloscope is altered so that each division on the screen represents a smaller amount of time.

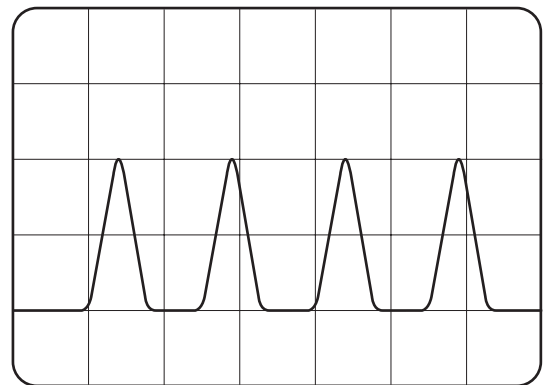
The signal into the oscilloscope does not change.

Which trace is produced?

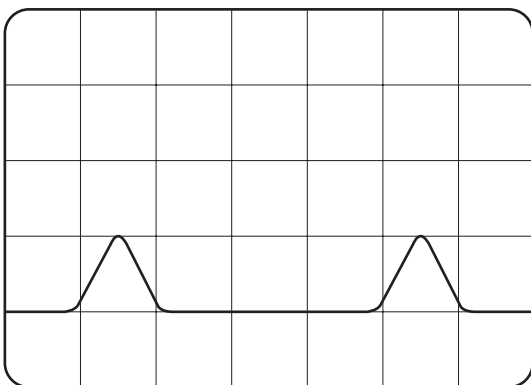
A



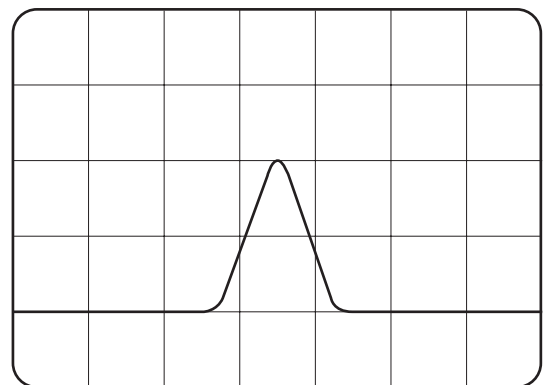
B



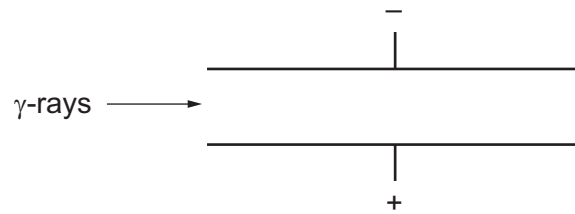
C



D



- 39 A beam of γ -rays passes between two charged metal plates as shown in the diagram.



How do the γ -rays pass between the two charged plates?

- A The rays are deflected in a direction perpendicular to the page.
 - B The rays are deflected towards the negative plate.
 - C The rays are deflected towards the positive plate.
 - D The rays continue in the same direction.
- 40 A powder contains 400 mg of a radioactive isotope.
- The half-life of the isotope is 5 days.
- What mass of this isotope remains after 10 days?
- A 0 mg B 40 mg C 100 mg D 200 mg

Group																																
I	II											III	IV	V	VI	VII	VIII															
<p style="text-align: center;">Key</p> <table border="1" style="margin: auto;"> <tr> <td>atomic number</td> </tr> <tr> <td>atomic symbol</td> </tr> <tr> <td>name</td> </tr> <tr> <td>relative atomic mass</td> </tr> </table>												atomic number	atomic symbol	name	relative atomic mass	1 H hydrogen 1																2 He helium 4
												atomic number																				
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3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20															
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40															
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84															
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131															
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –															
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –			114 Fl flerovium –			116 Lv livermorium –															
lanthanoids		57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175																
actinoids		89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –																

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

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