Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/21**

Paper 2 Multiple Choice (Extended) **October/November 2018**

45 minutes

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

* 0 5 2 4 9 1 5 9 8 8 *

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.

1 Which is a characteristic of all living things?

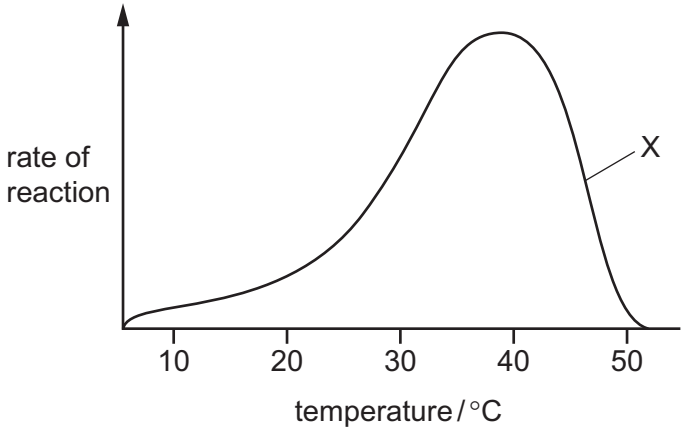
A a heart

B breathing

C excretion

D sexual reproduction

2 The graph shows the rate of reaction of salivary amylase at different temperatures.



What does the graph show at point X?

A The enzyme has stopped working.

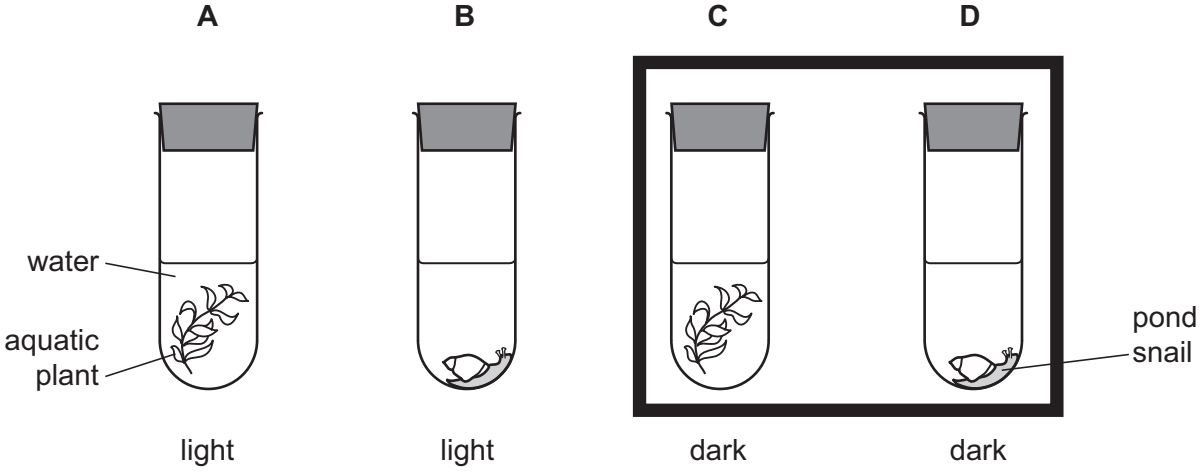
B The reaction is nearly completed.

C The reaction rate is controlled by pH.

D The temperature is higher than the optimum.

3 Four test-tubes were set up as shown in the diagram.

Which test-tube will contain the most dissolved oxygen after 24 hours?



4 Water is taken in through the roots and lost from the leaves of tall trees.

What enables this to happen?

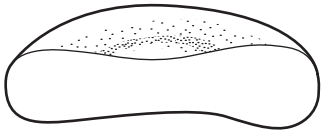
A active transport by the xylem vessels

B pressure from the roots

C translocation in the phloem

D transpiration loss from the leaves

5 The diagram shows a section through a red blood cell.



How is the structure of the cell related to its function?

A The cell has no nucleus to use up oxygen.

B The cell membrane has a small surface area in relation to volume.

C The cytoplasm contains haemoglobin.

D The flat structure makes it easier to be carried through arteries.

6 Which word equation for anaerobic respiration in yeast is correct?

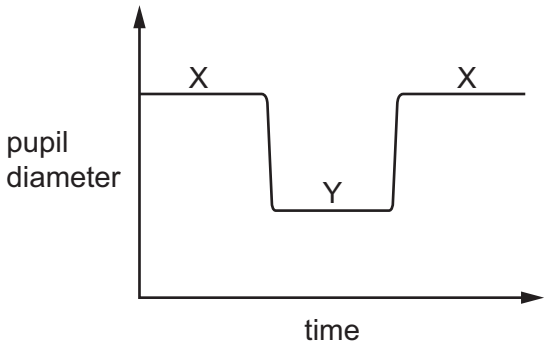
A glucose → carbon dioxide + alcohol

B glucose → carbon dioxide + water

C glucose → lactic acid + alcohol

D glucose → lactic acid + water

7 The graph shows the diameter of the pupil in an eye at different times.



What is the eye doing at times X and Y?

	time X	time Y
A	focusing on a distant object	focusing on a nearby object
B	focusing on a nearby object	focusing on a distant object
C	looking at a bright light	looking at a dim light
D	looking at a dim light	looking at a bright light

8 To which environmental stimulus is a plant root responding when it grows downwards?

A a decrease in soil water content

B light falling on the leaves of the plant

C rising temperature

D the force of gravity

9 What is an advantage of asexual reproduction compared with sexual reproduction?

A A specific disease is less likely to spread throughout the whole population.

B It increases variation in the offspring.

C It produces offspring more rapidly.

D It requires two parents.

10 Kangaroos have 16 chromosomes in their skin cells.

How many chromosomes are there in a kangaroo sperm cell?

A 4 **B** 8 **C** 16 **D** 32

11 What contains **only** the information to produce a specific protein?

A chromosome

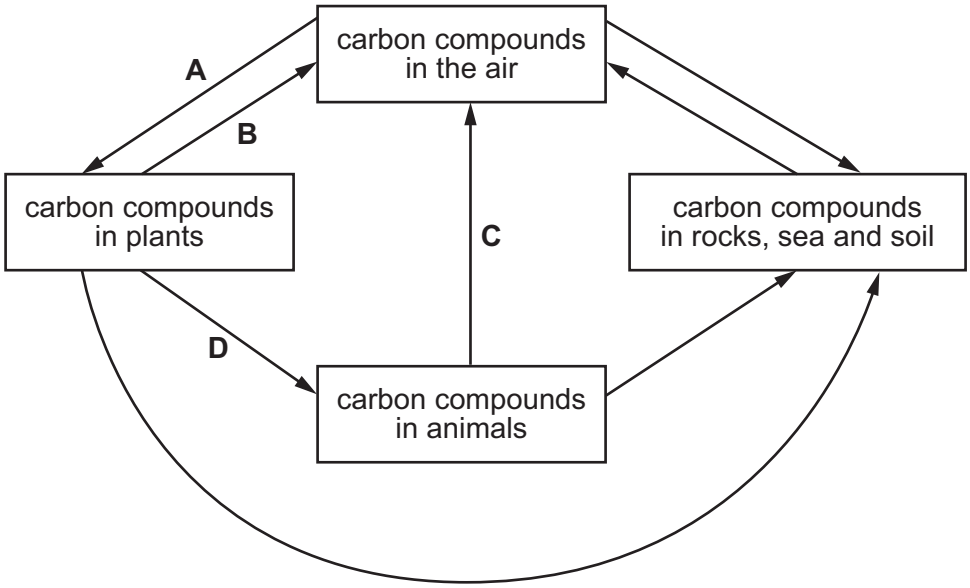
B cytoplasm

C gene

D nucleus

12 The diagram shows part of the carbon cycle.

Which arrow represents plant respiration?



13 The flow diagram shows the consequence of the overuse of fertilisers on farm land.

leaching fertiliser → fast growth of algae → death of algae → fast growth of **X** → death of fish

Which group of organisms is represented by **X**?

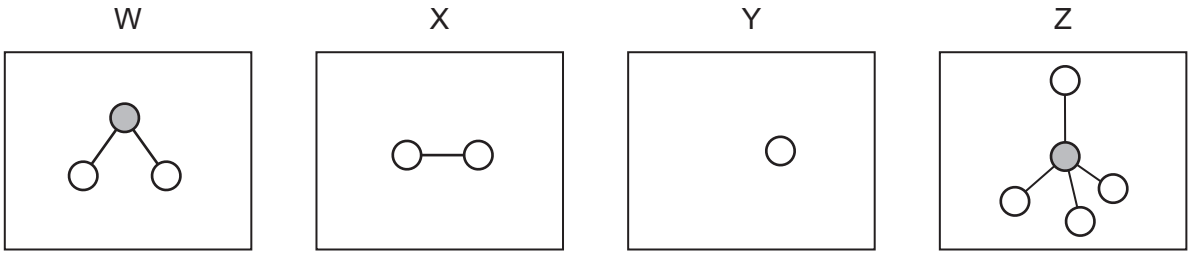
A bacteria

B fish

C invertebrates

D plants

14 W, X, Y and Z are diagrams representing atoms and molecules.



Which statement is correct?

A W and Z are molecules and X and Y are atoms.

B W, X and Z are molecules and Y is an atom.

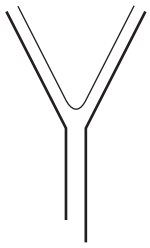
C W, Y and Z are molecules and X is an atom.

D X, Y and Z are molecules and W is an atom.

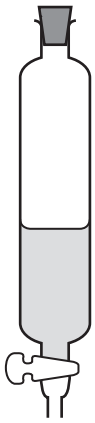
15 Hexane and octane are liquid hydrocarbons that mix together.

Which apparatus is used to separate a mixture of these two liquids?

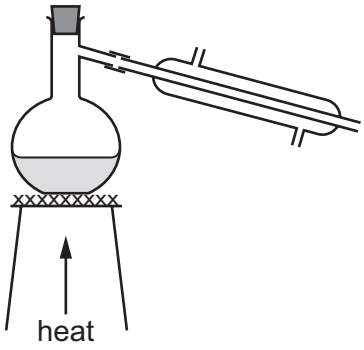
A



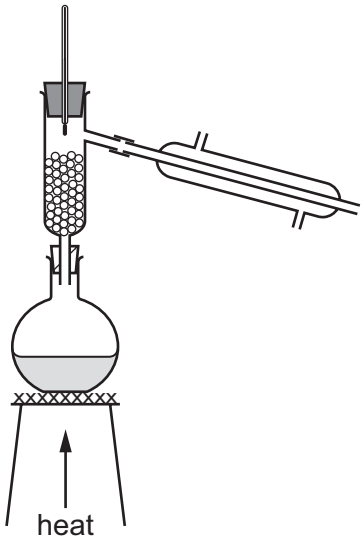
B



C

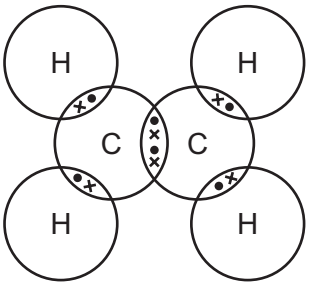


D



16 Which dot-and-cross diagram represents the bonding of electrons in a molecule of ethene?

A



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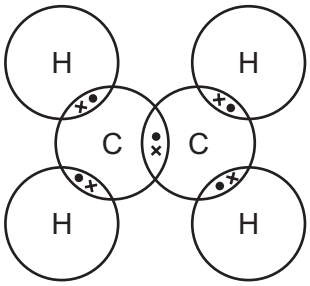

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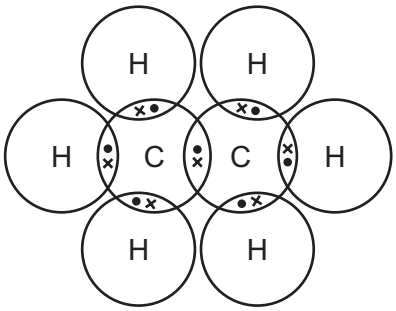

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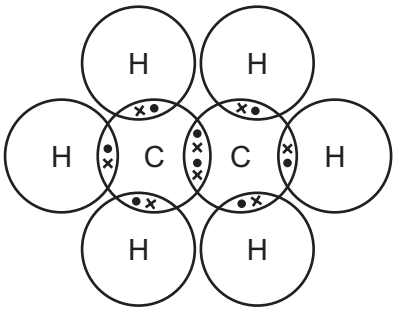


17 Hydrogen chloride is a gas. It dissolves in water to form an acidic solution.

Three different samples of hydrogen chloride are listed.

1 73.0 g of hydrogen chloride gas

2 7.30 dm^3 of hydrogen chloride gas

3 730 cm^3 of 1.00 mol / dm^3 solution of hydrogen chloride

Which row shows the relative number of moles of hydrogen chloride in these samples?

	fewest ⟶		most
A	1	2	3
B	1	3	2
C	2	3	1
D	3	2	1

18 Which statement describes what happens during electrolysis?

A Covalent compounds produce more complex substances.

B Covalent compounds produce simpler substances.

C Ionic compounds produce more complex substances.

D Ionic compounds produce simpler substances.

19 Methane is used as a fuel.

Which row describes the temperature change and the type of reaction when methane burns?

	temperature change	type of reaction
A	decrease	endothermic
B	decrease	exothermic
C	increase	endothermic
D	increase	exothermic

20 Which word equation represents a redox reaction?

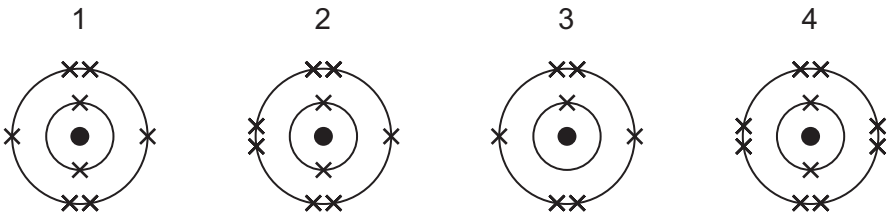
A calcium carbonate → calcium oxide + carbon dioxide

B calcium oxide + hydrochloric acid → calcium chloride + water

C copper oxide + carbon → copper + carbon dioxide

D sodium oxide + water → sodium hydroxide

21 The electronic structures of four particles are shown.



Which diagrams represent the electronic structures of a Group VI atom and its ion?

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

22 Part of the reactivity series is shown.

most reactive → least reactive						
K	Na	Ca	Zn	Fe	(H)	Cu

Which method is used to extract potassium from its ore?

A electrolysis of the molten ore

B electrolysis of the ore dissolved in water

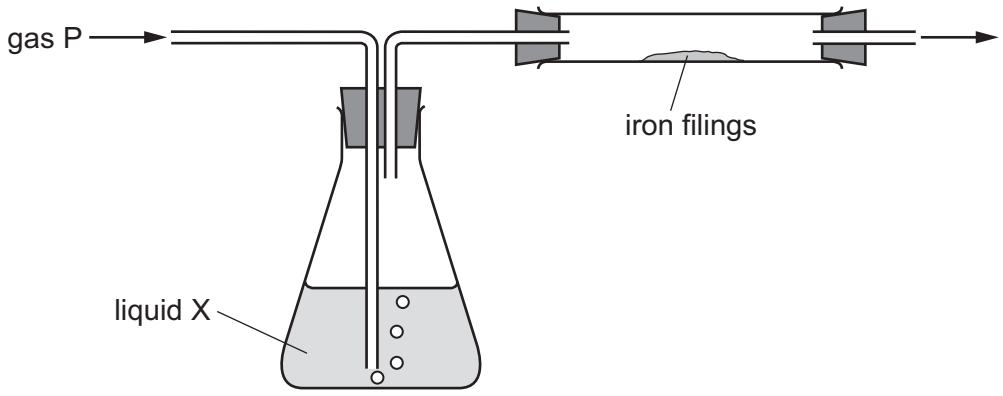
C heating the ore with hydrogen

D heating the ore with carbon

23 Which row describes the source of hydrogen and of nitrogen used to manufacture ammonia in the Haber process?

	hydrogen	nitrogen
A	air	air
B	air	petroleum
C	petroleum	air
D	petroleum	petroleum

24 The diagram shows gas P being passed through liquid X and over iron filings.



Which gas and liquid cause the iron to rust?

	gas P	liquid X
A	nitrogen	concentrated sulfuric acid (a drying agent)
B	nitrogen	water
C	oxygen	concentrated sulfuric acid (a drying agent)
D	oxygen	water

25 Sulfuric acid is manufactured by the Contact process.

Which conditions are used in this process?

A 2 atmospheres pressure and a vanadium pentoxide catalyst

B 2 atmospheres pressure and an iron catalyst

C 200 atmospheres pressure and a vanadium pentoxide catalyst

D 200 atmospheres pressure and an iron catalyst

26 Which formula represents but-1-ene?

A $CH_3CH{=}CH_3$

B $CH_3CH_2CH_2CH_3$

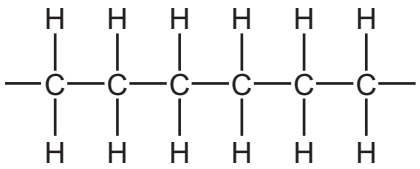
C $CH_3CH_2CH{=}CH_2$

D $CH_3CH{=}CHCH_3$

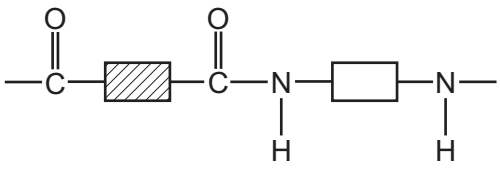
27 Nylon is a condensation polymer.

Which diagram represents the structure of nylon?

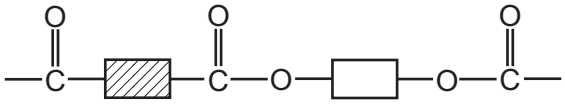
A



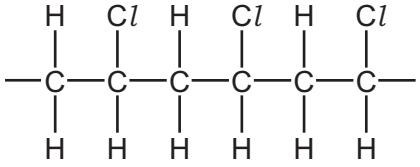
B



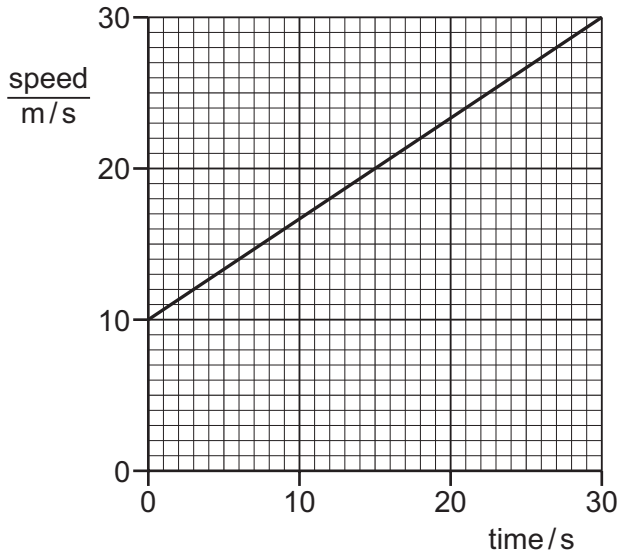
C



D



28 The diagram shows the speed-time graph for a car.



How far does the car travel in 30 seconds?

A 300 m **B** 450 m **C** 600 m **D** 900 m

29 A man is standing in a bus that is moving forwards. The bus stops suddenly, causing the man to fall over.

Which property of the man resists the change in his motion and in which direction does the man fall?

	property that resists the change in motion	direction of fall
A	mass	backwards
B	mass	forwards
C	weight	backwards
D	weight	forwards

30 A brick of mass 2.0 kg is at rest. It falls to the ground through a distance of 5.0 m.

The acceleration of free fall g is 10 m / s^2. Air resistance can be ignored.

At what speed does the brick hit the ground?

A 3.2 m / s **B** 7.1 m / s **C** 10 m / s **D** 50 m / s

31 Which source of energy is renewable?

A geothermal

B natural gas

C nuclear fission

D oil

32 Two substances X and Y are in different states.

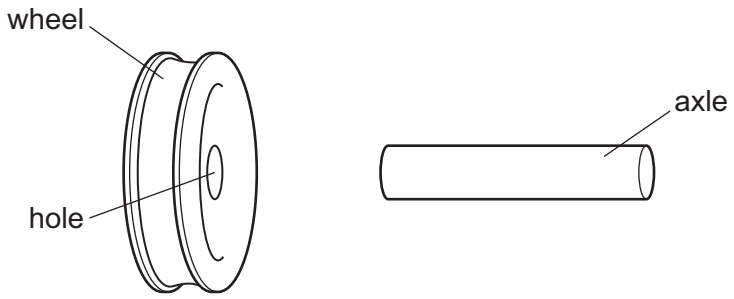
Substance X has a definite shape and has a definite volume.

Substance Y has no definite shape but has a definite volume.

Which row gives the state of each substance?

	substance X	substance Y
A	solid	liquid
B	solid	gas
C	liquid	solid
D	liquid	gas

33 An axle is slightly larger than the hole in a wheel made from the same metal.



How could an engineer fit the wheel onto the axle?

A cool the axle only

B cool the axle and cool the wheel by the same temperature change

C heat the axle only

D heat the axle and heat the wheel by the same temperature change

34 There is a vacuum between the double walls of a vacuum flask.

Which types of heat transfer are reduced by the vacuum?

A conduction, convection and radiation

B conduction and convection only

C conduction and radiation only

D convection and radiation only

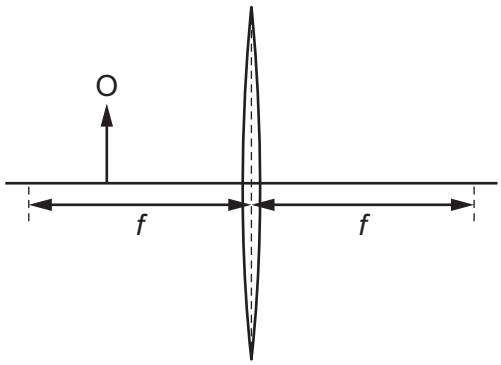
35 A radio transmitter emits radio waves with a frequency of 1.25×10^8 Hz. The most suitable aerial for this frequency is $\frac{1}{4}$ of a wavelength long.

The speed of radio waves is 3.0×10^8 m/s.

What is the length of the most suitable aerial?

A 0.10 m **B** 0.60 m **C** 2.4 m **D** 9.6 m

36 The diagram shows a converging lens and an object O. The focal length *f* is marked on each side of the lens.



Is the image real or virtual, and is it inverted or upright?

A real and inverted

B real and upright

C virtual and inverted

D virtual and upright

37 A wave in air consists of a series of regions called compressions and rarefactions.

In which region is the pressure higher, and which type of wave is this?

	higher pressure	type of wave
A	in a compression	longitudinal
B	in a compression	transverse
C	in a rarefaction	longitudinal
D	in a rarefaction	transverse

38 A circuit contains a lamp and a fuse.

There is a current of 2.0 A in the lamp and it operates normally.

A fault develops in the lamp. The current in the circuit increases, and the fuse now blows.

The diagrams show two circuits.

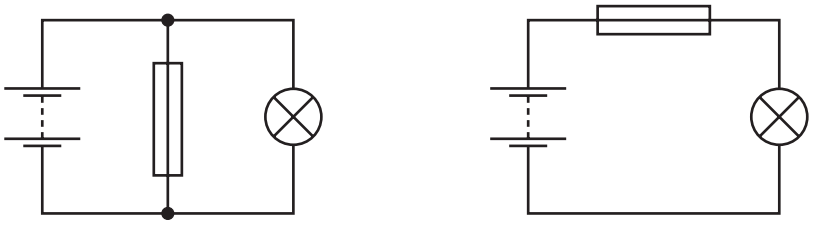
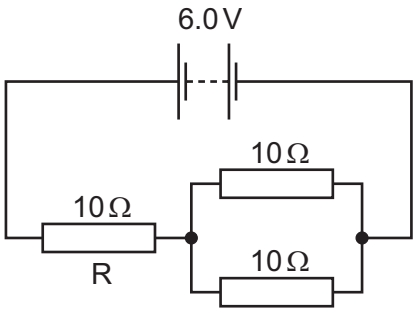


diagram 1 diagram 2

Which is the circuit used and what is the effect of the fuse when it blows?

	circuit	effect of fuse
A	diagram 1	reduces current to 0
B	diagram 1	reduces current to 2.0 A
C	diagram 2	reduces current to 0
D	diagram 2	reduces current to 2.0 A

39 A 6.0 V battery is connected to three 10 Ω resistors, as shown. One resistor is labelled R.

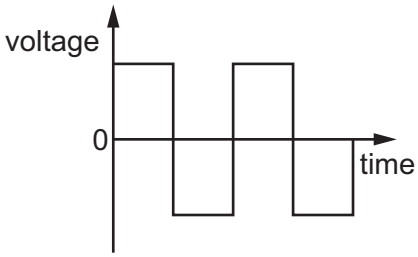


What is the current in resistor R?

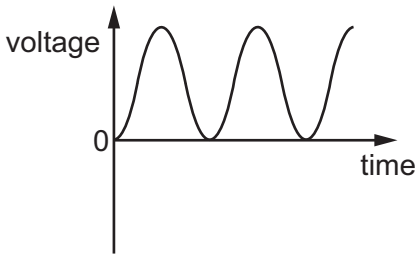
A 0.20 A **B** 0.40 A **C** 0.60 A **D** 1.8 A

40 Which diagram shows the voltage output of a rotating-coil generator with slip rings?

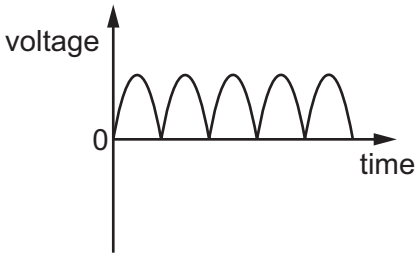
A



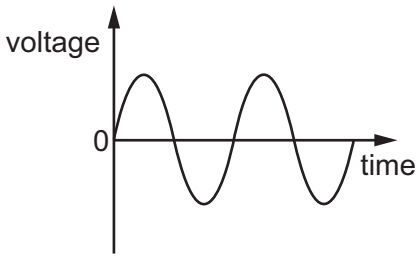
B



C



D



The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
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 –		

Key

atomic number
atomic symbol
name
relative atomic mass

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 dm^3 at room temperature and pressure (r.t.p.).