Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **May/June 2023**

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **20** pages. Any blank pages are indicated.

1 Which term is used to describe the removal of toxic materials from living organisms?

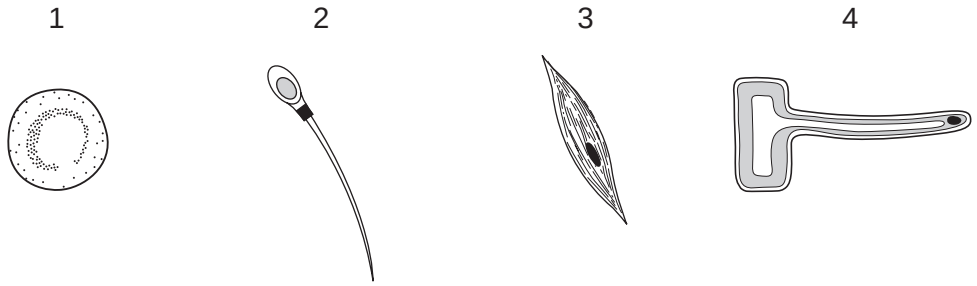
A excretion

B nutrition

C respiration

D secretion

2 The diagrams show four different cells found in living organisms.



Which cell types have a large surface area for diffusion?

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

3 Eggs contain fat, protein and water.

Which results are obtained from doing food tests on an egg?

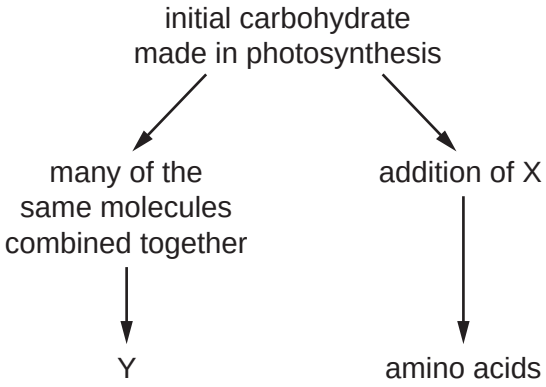
	Benedict's test	biuret test	ethanol emulsion test	iodine test
A	blue	purple	white emulsion	yellow
B	orange	purple	white emulsion	blue-black
C	orange	blue	colourless	yellow
D	blue	blue	colourless	blue-black

4 During an enzyme-controlled reaction, the temperature is gradually lowered from the enzyme's optimum temperature of 20 °C to 5 °C.

Which changes occur as the temperature is lowered?

	formation of product	shape of active site of enzyme
A	decreases	no change
B	decreases	changes
C	increases	no change
D	increases	changes

5 The diagram shows some of the uses in a plant of the initial carbohydrate made by photosynthesis.



Which statement is correct?

A X is a magnesium ion.

B X is iron.

C Y is starch.

D Y is an oil molecule.

6 A person is unwell with the following symptoms.

- swollen abdomen (belly)
- red patches on their skin
- loss of muscle mass

What is the likely condition that this person has?

A iron deficiency

B kwashiorkor

C marasmus

D scurvy

7 Which cells lose water by evaporation from their surfaces during transpiration?

A epidermis cells

B guard cells

C mesophyll cells

D root hair cells

8 Endothermic reactions use up more energy than they release while exothermic reactions release energy overall.

Which row describes the type of reaction that occurs in the process of photosynthesis and in the process of respiration?

	respiration	photosynthesis
A	endothermic	endothermic
B	endothermic	exothermic
C	exothermic	endothermic
D	exothermic	exothermic

9 Which type of chemical is adrenaline?

A enzyme

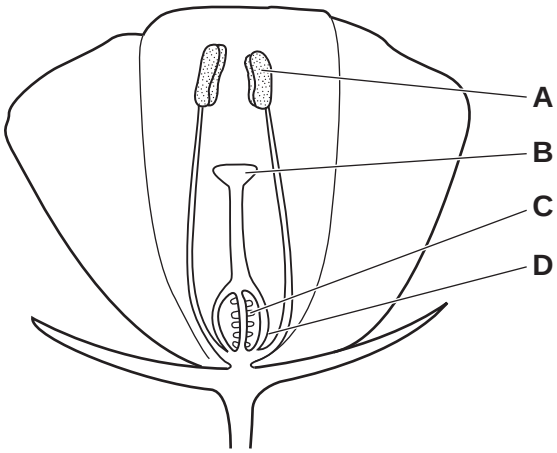
B hormone

C mineral salt

D vitamin

10 The diagram shows a section through an insect-pollinated flower.

When pollination occurs, where must the pollen grains reach?



11 A student writes down the statement shown.

> 'Selective breeding by natural selection is carried out over many generations to improve crop plants and domesticated animals.'

The statement is **not** correct.

Which change makes the statement correct?

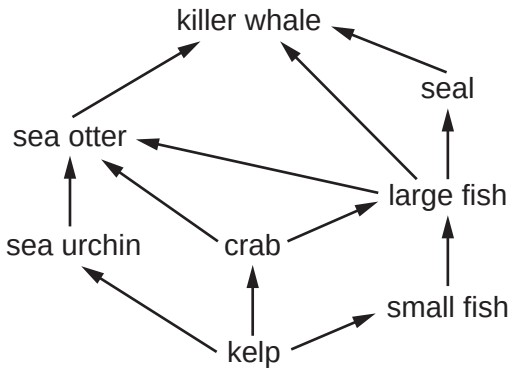
A Change crop plants to flowering plants.

B Change domesticated to wild.

C Change generations to offspring.

D Change natural to artificial.

12 The diagram shows a marine food web around a kelp (seaweed) forest.



Which organisms are secondary consumers and which organisms are tertiary consumers?

	secondary consumers	tertiary consumers
A	seal	killer whale
B	sea otter, large fish	killer whale, seal, large fish
C	sea otter, large fish	sea otter, killer whale, seal
D	sea urchin, small fish, crab	sea otter, large fish

13 What decreases as a result of eutrophication?

A aerobic respiration by decomposers

B decomposition of dead producers

C dissolved oxygen in the water

D growth of producers

14 A mixture of solid sulfur and solid sodium chloride is added to water and stirred.

Sulfur is insoluble in water.

Sodium chloride is soluble in water.

Which processes are used to obtain pure sodium chloride from the mixture?

A distillation then chromatography

B distillation then crystallisation

C filtration then chromatography

D filtration then crystallisation

15 An atom of indium has the atomic number 49 and the nucleon number 115.

Which row shows the numbers of protons, neutrons and electrons in this atom?

	number of protons	number of neutrons	number of electrons
A	49	66	49
B	49	115	49
C	66	49	49
D	49	66	66

16 Pentane, C_5H_{12}, burns in a limited air supply to produce some carbon dioxide and some carbon monoxide.

What is a balanced equation for this reaction?

A $C_5H_{12} + 7O_2 \rightarrow 3CO_2 + 2CO + 6H_2O$

B $C_5H_{12} + 9O_2 \rightarrow CO_2 + 4CO + 12H_2O$

C $C_5H_{12} + 14O \rightarrow 3CO_2 + 2CO + 6H_2O$

D $C_5H_{12} + 18O \rightarrow CO_2 + 4CO + 12H_2O$

17 Copper is refined by electrolysis.

Which statements about this process are correct?

1 Aqueous copper(II) sulfate is the electrolyte.

2 Inert anodes are used.

3 Cu^{2+} ions are reduced at the cathode.

4 Pure copper is deposited at the anode.

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

18 Which statement about chemical reactions is correct?

A Endothermic reactions result in a temperature decrease.

B Endothermic reactions result in a temperature increase.

C Exothermic reactions always produce a large temperature rise.

D Exothermic reactions always produce a small temperature rise.

19 Which row describes the effect of increasing temperature on the collisions between particles in a chemical reaction?

	frequency of collisions	energy of collisions
A	decreases	increases
B	decreases	decreases
C	increases	decreases
D	increases	increases

20 Crystals of copper(II) sulfate, a soluble salt, are made by reacting excess copper(II) oxide with dilute sulfuric acid.

After filtering off the unreacted copper(II) oxide, the solution is heated until it is saturated. It is then left to cool.

Which statements about this preparation are correct?

1 Excess copper(II) oxide is used in order to ensure a high yield is obtained.

2 After filtering, the solution is heated to evaporate some of the water.

3 When the saturated solution cools, crystals of copper(II) sulfate begin to appear.

4 After cooling, the water is rapidly removed by evaporation.

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

21 The first row of the transition elements is shown.

Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn

Which statement about transition elements is **not** correct?

A They are often used as catalysts.

B They always form colourless compounds.

C They have high densities.

D They have high melting points.

22 Which equation represents a reaction that takes place in the catalytic converter of a car?

A $N_2 + 2O_2 \rightarrow 2NO_2$

B $2NO \rightarrow N_2 + O_2$

C $N_2 + 3H_2 \rightarrow 2NH_3$

D $2SO_2 + O_2 \rightarrow 2SO_3$

23 The Haber process is used to make ammonia.

Which statement about the Haber process is **not** correct?

A A vanadium(V) oxide catalyst is used.

B The nitrogen used is obtained from the air.

C The pressure used is 200 atmospheres.

D The temperature used is 450 °C.

24 Four different reactions occur in the manufacture of sulfuric acid by the Contact process.

Which substance is a reactant in one of these reactions and a product in another?

A H_2O **B** O_2 **C** S **D** SO_3

25 When limestone is heated, it decomposes.

Which row about limestone and the decomposition is correct?

	chemical name for limestone	decomposition products
A	calcium carbonate	calcium oxide only
B	calcium carbonate	calcium oxide and carbon dioxide
C	calcium oxide	calcium carbonate only
D	calcium oxide	calcium carbonate and carbon dioxide

26 Which fraction obtained from petroleum is used as a feedstock for making chemicals?

A bitumen

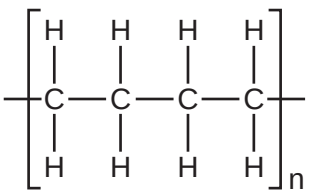
B gasoline

C naphtha

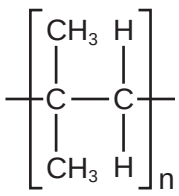
D refinery gas

27 What is the structure of the addition polymer formed from but-2-ene?

A



B



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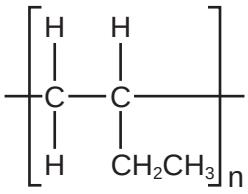

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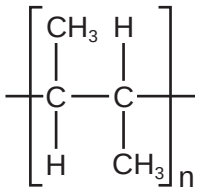
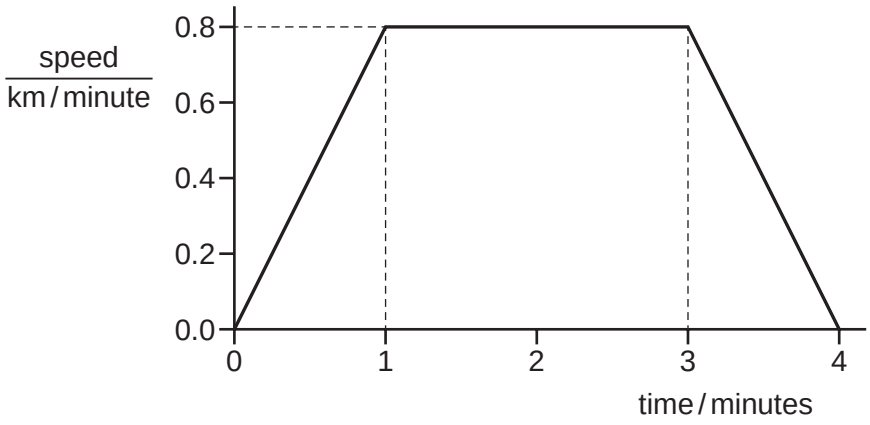


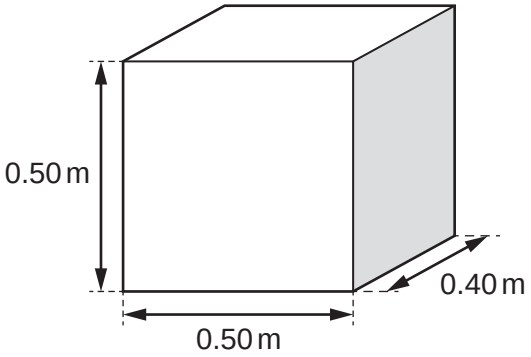
28 The speed–time graph represents the journey of a bicycle.



What is the total distance travelled by the bicycle?

A 1.6 km **B** 2.0 km **C** 2.4 km **D** 3.2 km

29 The diagram shows a cuboid box resting on the ground. The dimensions of the box are shown.



The pressure on the ground due to the weight of the box is 50 Pa.

What is the weight of the box?

A 5.0 N **B** 10 N **C** 250 N **D** 500 N

30 Electricity can be generated in different types of power station.

Which statement about geothermal power and nuclear power is correct?

A Geothermal power and nuclear power are both renewable.

B Geothermal power and nuclear power are both non-renewable.

C Geothermal power is renewable but nuclear power is not.

D Nuclear power is renewable but geothermal power is not.

31 What is the definition of efficiency?

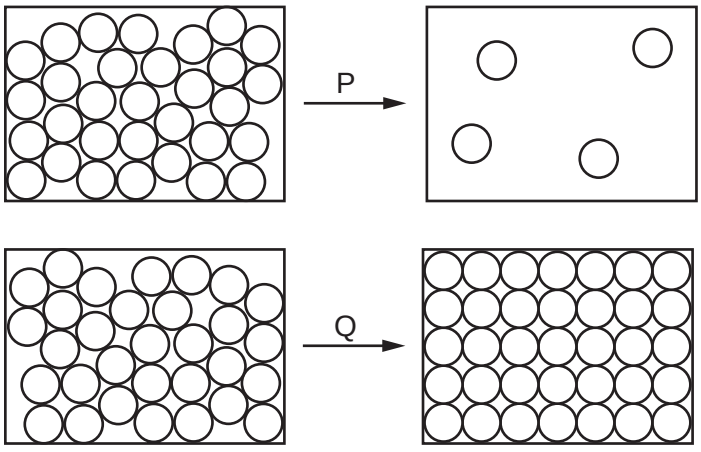
A $\frac{\text{energy input}}{\text{useful energy output}} \times 100\%$

B $\frac{\text{energy input}}{\text{wasted energy}} \times 100\%$

C $\frac{\text{useful energy output}}{\text{energy input}} \times 100\%$

D $\frac{\text{wasted energy}}{\text{energy input}} \times 100\%$

32 The diagrams represent the arrangement of molecules in three states of matter. Arrows P and Q represent two changes of state.



Which row identifies the changes of state?

	P	Q
A	evaporation	condensation
B	evaporation	solidification
C	melting	condensation
D	melting	solidification

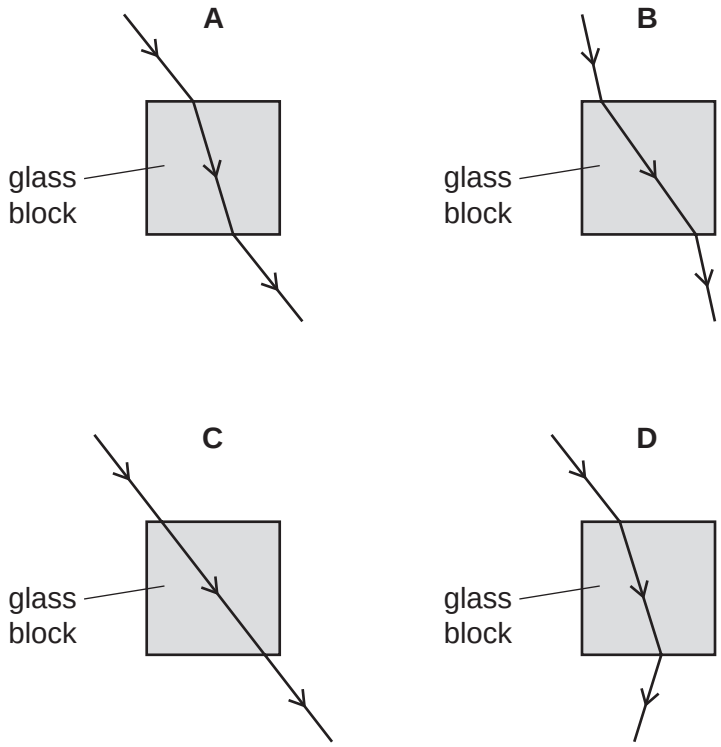
33 A sound wave has a frequency of 16 kHz. The speed of sound is 320 m / s.

What is the wavelength of the wave?

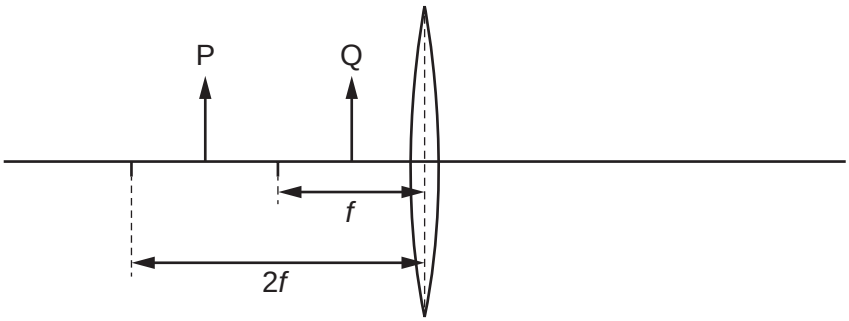
A 0.020 m **B** 0.050 m **C** 20 m **D** 50 m

34 Light passes from air through a solid glass block and back into the air.

Which diagram shows the path of the light?



35 The diagram shows an object at position P in front of a thin converging lens of focal length *f*. The lens produces a real image of the object.



The object is moved to position Q. The image produced is now virtual.

What happens to the image?

A It changes from a diminished image to an enlarged image.

B It changes from an enlarged image to a diminished image.

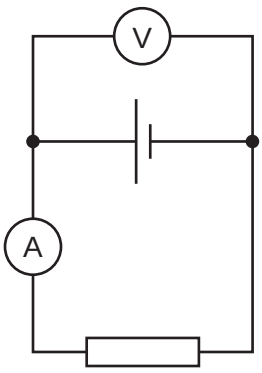
C It remains a diminished image.

D It remains an enlarged image.

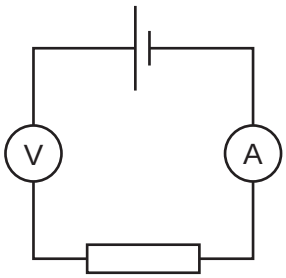
36 A student measures the current in a resistor and the potential difference (p.d.) across it.

Which circuit shows an ammeter and a voltmeter both connected correctly?

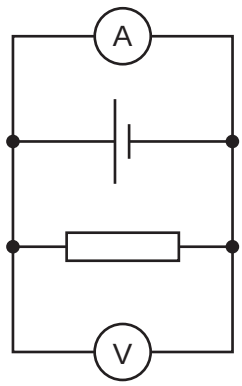
A



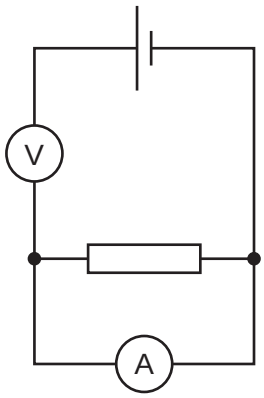
B



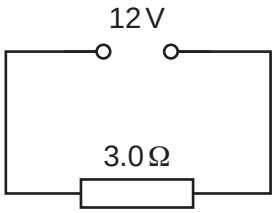
C



D



37 A 3.0 Ω resistor is connected to a 12 V power supply.



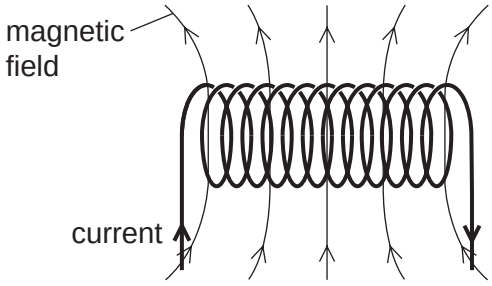
How much electrical energy does the resistor transfer in 10 s?

A 3.6 J **B** 4.8 J **C** 360 J **D** 480 J

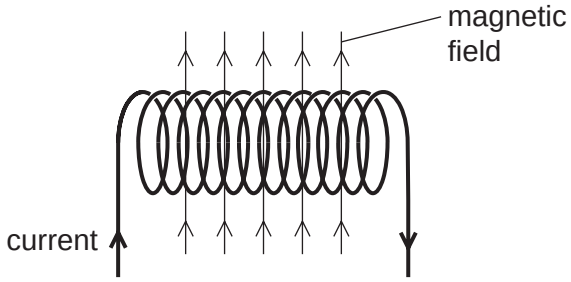
38 A solenoid carrying a current produces a magnetic field.

Which diagram shows the magnetic field pattern?

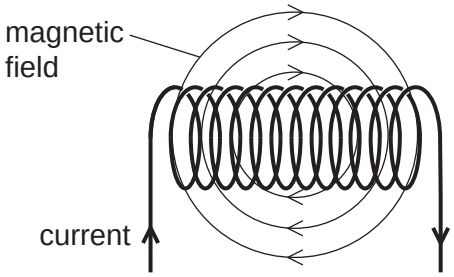
A



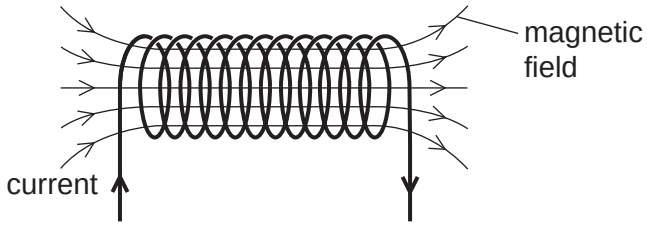
B



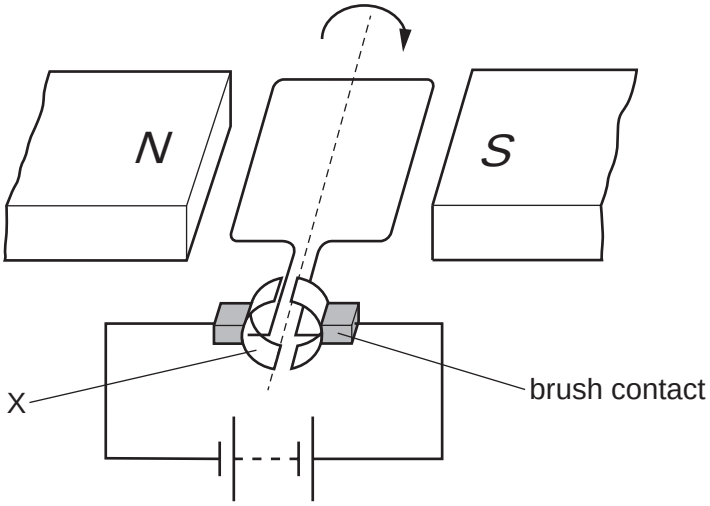
C



D



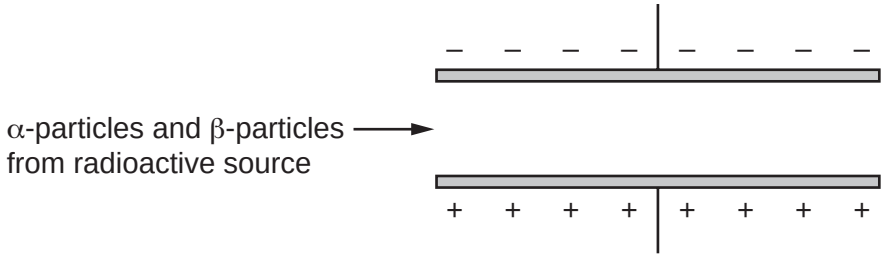
39 The diagram shows a motor. One part of the motor is labelled X.



What is the name of part X and how does it help the motor to work?

	name of part X	how X helps the motor to work
A	split-ring commutator	reduces the current so the coil does not overheat
B	split-ring commutator	reverses the current in the coil every half turn
C	step-down transformer	reduces the current so the coil does not overheat
D	step-down transformer	reverses the current in the coil every half turn

40 A radioactive source emits α-particles and β-particles that pass into the space between two charged plates.



In which directions are the particles deflected as they pass between the plates and which particles are deflected more?

	direction of deflection	amount of deflection
A	α towards lower plate, β towards upper plate	α-particles deflected more
B	α towards lower plate, β towards upper plate	β-particles deflected more
C	α towards upper plate, β towards lower plate	α-particles deflected more
D	α towards upper plate, β towards lower plate	β-particles deflected more

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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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).