



Cambridge IGCSE™

CO-ORDINATED SCIENCES

0654/12

Paper 1 Multiple Choice (Core)

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 **16** pages.



1 Which is **not** a characteristic of all living organisms?

- A excretion
- B growth
- C photosynthesis
- D sensitivity

2 Which statement about the structures found in animal and plant cells is correct?

- A Both have cell walls.
- B Only plant cells have a cell membrane.
- C Both have cytoplasm.
- D Only animal cells have a nucleus.

3 Which row shows the elements and the small molecules that are used to make the larger molecules?

	elements	small molecule	larger molecule
A	carbon, hydrogen and oxygen	glucose	fats
B	carbon, hydrogen, oxygen and nitrogen	amino acids	fats
C	carbon, hydrogen and oxygen	glucose	proteins
D	carbon, hydrogen, oxygen and nitrogen	amino acids	proteins

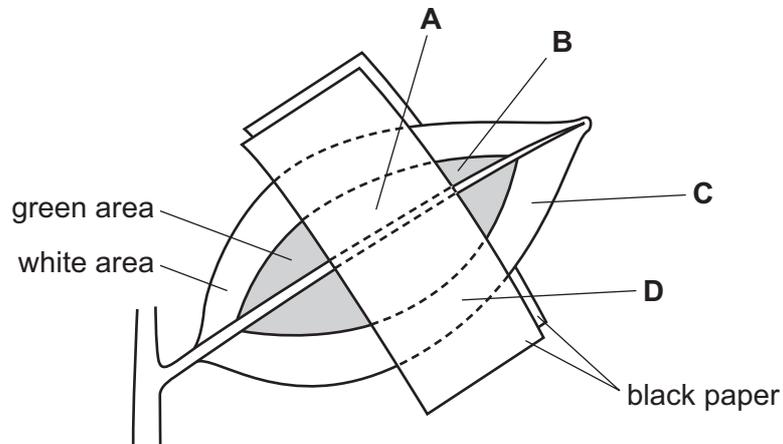
4 Which type of molecules speed up chemical digestion?

- A carbohydrates
- B enzymes
- C hormones
- D fatty acids

- 5 The diagram shows a leaf, still attached to a plant, with both green and white areas that have been partly covered with black paper.

The leaf is left in bright light for six hours and then tested for starch.

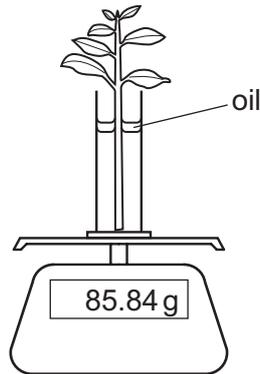
Which area of the leaf turns blue-black after the starch test?



- 6 Which nutrient is needed to make strong bones and teeth?

- A calcium
- B fat
- C starch
- D fibre

- 7 The diagram shows a shoot at the start of an experiment investigating transpiration. The mass of the shoot, measuring cylinder, water and oil is measured.



The apparatus is left for three days and then the mass recorded for a second time.

Under which conditions would there be the most loss of mass from the apparatus?

	temperature	humidity
A	high	high
B	high	low
C	low	high
D	low	low

- 8 During cold weather, warm blooded animals, such as mammals and birds, require more food.

Which statement explains the reason for this?

	energy required to maintain constant body temperature	rate of respiration
A	high	high
B	high	low
C	low	high
D	low	low

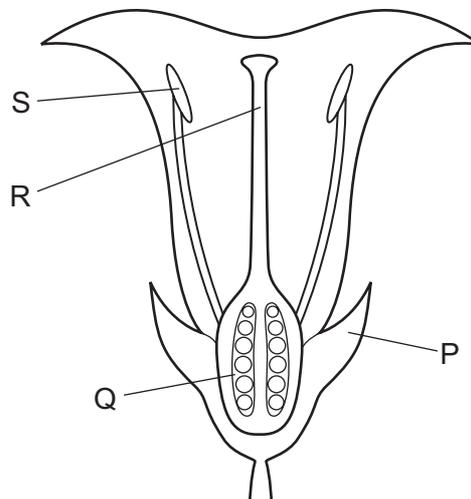
- 9 A person leaves an air conditioned building.

The temperature of the air conditioned building is 16 °C.

The outside temperature is 39 °C.

Which statement describes one response to the change in temperature?

- A** The blood detects the change in temperature and the person starts to shiver.
B The blood detects the change in temperature and the person starts to sweat.
C The brain detects the change in temperature and the person starts to shiver.
D The brain detects the change in temperature and the person starts to sweat.
- 10 The diagram shows a section through a flower.



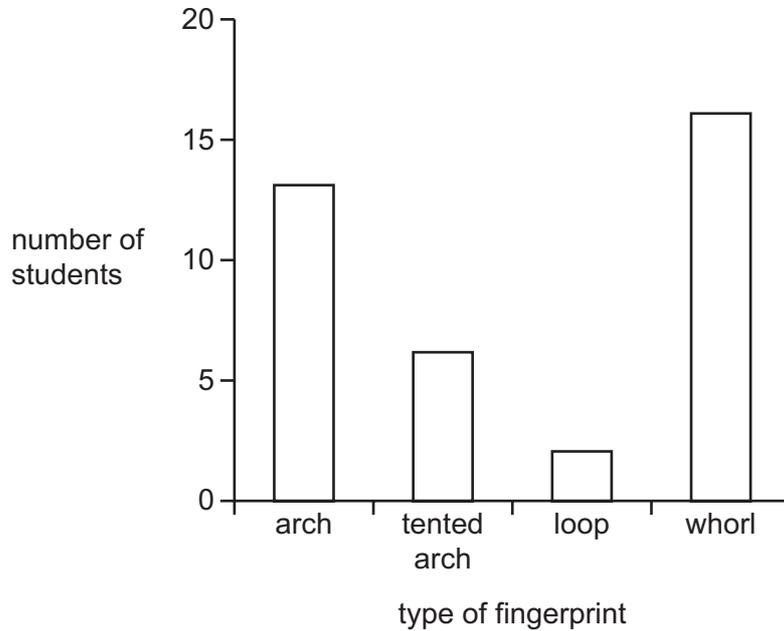
Which labelled structures are the anther and the ovary?

	anther	ovary
A	R	P
B	R	Q
C	S	P
D	S	Q

11 Fingerprints are classified by their shape.

A class of students identified the type of fingerprint they have on the thumb of their left hand.

The chart shows the results.

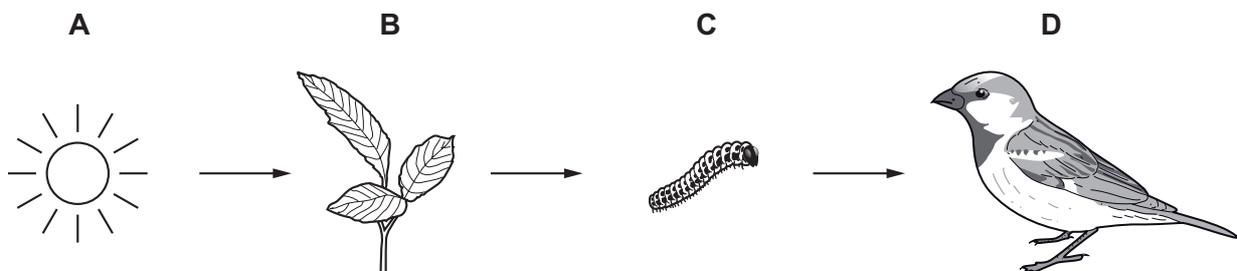


Which statement about the data in the chart is correct?

- A Fingerprints are an example of continuous variation because the data shows a range of phenotypes.
- B Fingerprints are an example of continuous variation because the data shows no intermediates.
- C Fingerprints are an example of discontinuous variation because the data shows a range of phenotypes.
- D Fingerprints are an example of discontinuous variation because the data shows no intermediates.

12 The diagram shows a food chain.

Which is the producer?

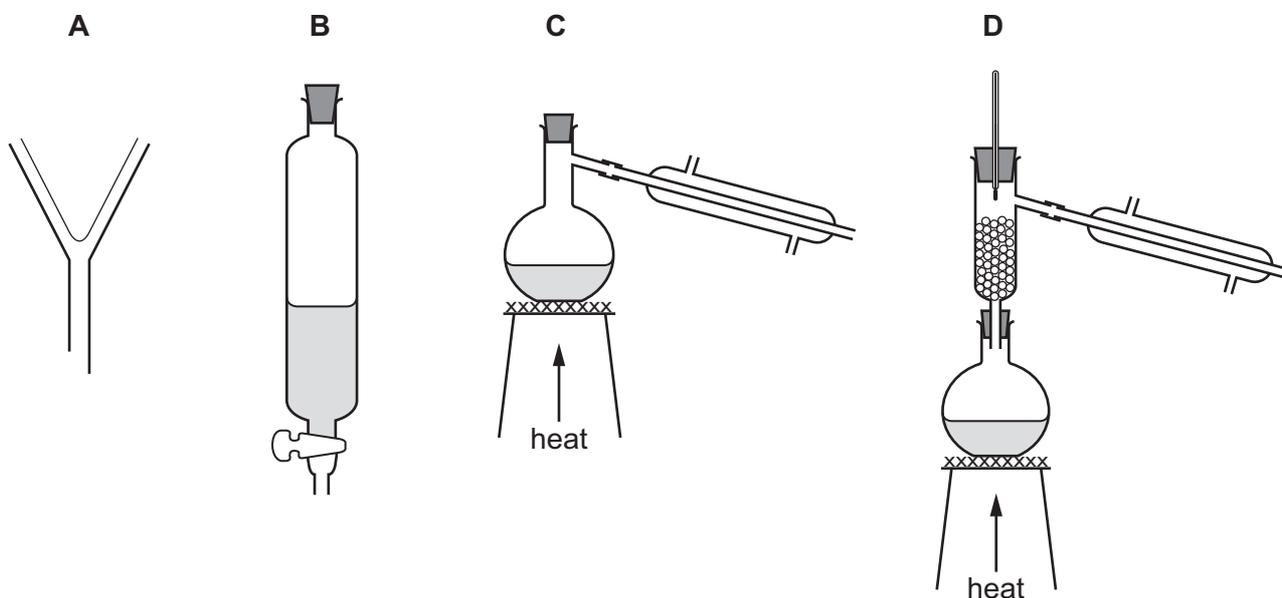


13 Which row about the effects of deforestation is correct?

	risk of flooding	amount of carbon dioxide in atmosphere
A	decreased	decreased
B	decreased	increased
C	increased	decreased
D	increased	increased

14 Hexane and octane are liquid hydrocarbons that mix together.

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



15 When solid zinc carbonate is heated, a different solid and a gas are formed.

Which type of change occurs?

- A** chemical
- B** exothermic
- C** physical
- D** separation

16 An atom of osmium is represented by $^{190}_{76}\text{Os}$.

How many neutrons are in this atom?

- A** 76
- B** 114
- C** 190
- D** 266

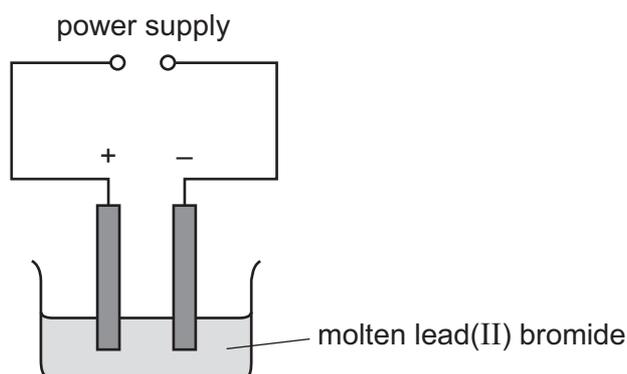
17 The structures of some compounds are shown.

	structure	formula
1	<pre> H H H — C — C — O — H H H </pre>	C_2H_6O
2	$C=O$	CO_2
3	<pre> O H — O — N — O </pre>	HNO_3
4	$O=S=O$	SO_4

In which rows does the formula match the structure?

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

18 Molten lead(II) bromide is electrolysed using inert electrodes as shown.



An element is produced at the negative electrode.

What is the name of the element and of the negative electrode?

	element	negative electrode
A	bromine	anode
B	bromine	cathode
C	lead	anode
D	lead	cathode

19 Potassium chloride is added to water.

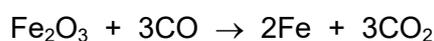
The temperature of the solution decreases as the potassium chloride dissolves.

Which type of reaction occurs?

- A endothermic
- B exothermic
- C oxidation
- D reduction

20 Iron is extracted from its ore in the blast furnace.

One of the reactions involved is shown.



Which statement is correct?

- A Iron(III) oxide and carbon monoxide are both oxidised.
- B Iron(III) oxide and carbon monoxide are both reduced.
- C Iron(III) oxide is oxidised and carbon monoxide is reduced.
- D Iron(III) oxide is reduced and carbon monoxide is oxidised.

21 Potassium oxide and sulfur dioxide are both soluble in water.

Which row describes properties of these oxides?

	oxide	pH in aqueous solution	effect on damp red litmus
A	potassium oxide	14	turns blue
B	potassium oxide	2	stays red
C	sulfur dioxide	14	stays red
D	sulfur dioxide	2	turns blue

22 The box lists four substances.

Br ₂	CO	Cu	Na
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Which substance is an element that forms a basic oxide and coloured compounds?

- A** Br₂
- B** CO
- C** Cu
- D** Na

23 Which statement about the treatment of the water supply is correct?

- A Water from reservoirs and rivers is filtered to remove dissolved impurities.
- B Chlorine is added to the water to kill bacteria.
- C Sodium chloride is added to the water to make it pleasant to drink.
- D Chlorine is added to make the water pure.

24 Which element is used in the manufacture of sulfuric acid?

- A carbon
- B hydrogen
- C nitrogen
- D sulfur

25 Which statements about limestone are correct?

- 1 It contains calcium oxide.
- 2 It is used to manufacture lime.
- 3 It neutralises acidic industrial waste products.
- 4 It neutralises alkaline soil.

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

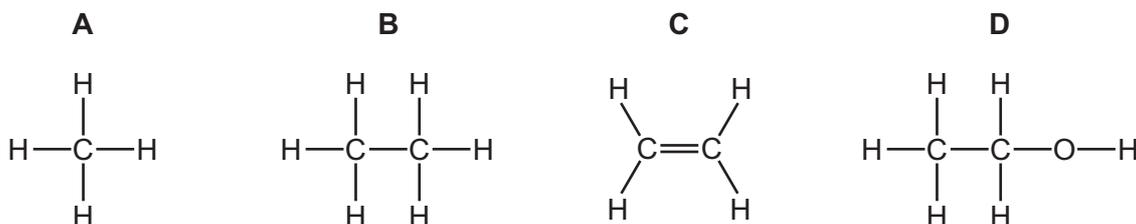
26 Naphtha is obtained by the fractional distillation of petroleum.

Which statements about naphtha are correct?

- 1 It burns to form carbon dioxide and water.
- 2 It is a mixture of hydrocarbons.
- 3 It is present in bottled gas.
- 4 The main component of naphtha is methane.

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

27 Which diagram represents a molecule that is formed by fermentation?



28 Two children X and Y pull on a rope in opposite directions.

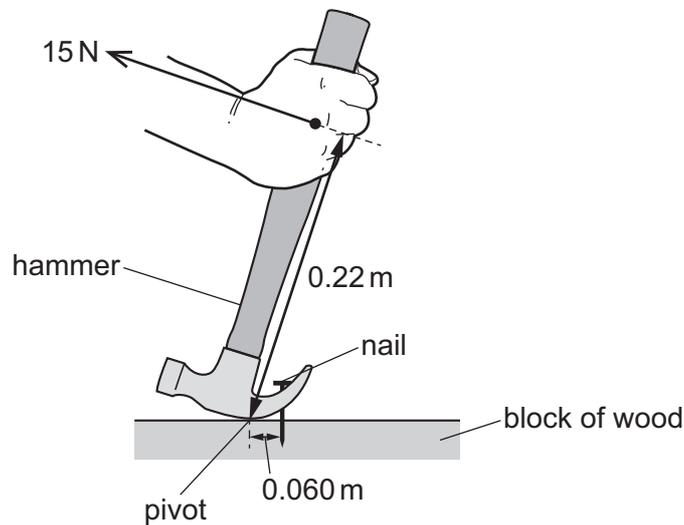
The diagram shows the size of each force and its direction.



What is the resultant force on the rope?

- A 50 N towards X
- B 50 N towards Y
- C 950 N towards X
- D 950 N towards Y

29 A boy pulls a nail from a block of wood using a hammer, as shown.



The boy pulls the hammer with a force of 15 N in the position shown.

What is the moment produced about the pivot by the boy pulling on the hammer?

- A 0.90 N m
- B 2.4 N m
- C 3.3 N m
- D 4.2 N m

30 Electricity is generated using different sources of energy.

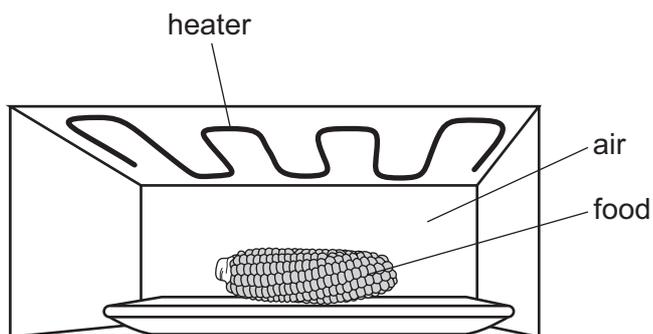
Which energy source is non-renewable?

- A coal
- B hydroelectric
- C solar
- D wind

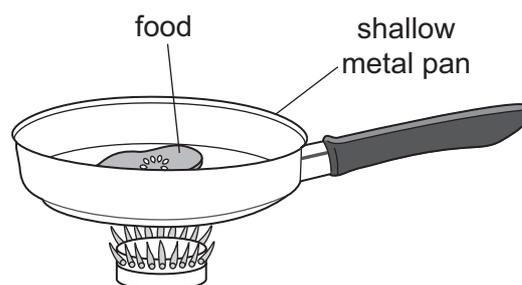
31 Which statement about gas particles is **not** correct?

- A Increasing the temperature of a gas makes the gas particles move more slowly.
- B The gas particles are in constant random motion.
- C The pressure of a gas is caused by the collision of gas particles with the container.
- D Very small particles suspended in a gas are in constant random motion.

32 Two methods of cooking are grilling under a red-hot heater and frying in a shallow metal pan.



method 1: grilling



method 2: frying

How does thermal energy pass through the air to reach the food in method 1 and how does thermal energy pass through the bottom of the metal pan in method 2?

	method 1	method 2
A	convection	conduction
B	convection	radiation
C	radiation	conduction
D	radiation	radiation

33 What is the name of the distance between two consecutive crests of a water wave?

- A amplitude
- B frequency
- C speed
- D wavelength

34 An object is placed in front of a plane mirror on a wall.

What are the characteristics of the image formed?

- A** same size as object and inverted top to bottom
- B** same size as object and laterally inverted (left to right)
- C** smaller than object and inverted top to bottom
- D** smaller than object and laterally inverted (left to right)

35 A plastic rod is rubbed with a cloth and the rod becomes positively charged.

What happens during this process?

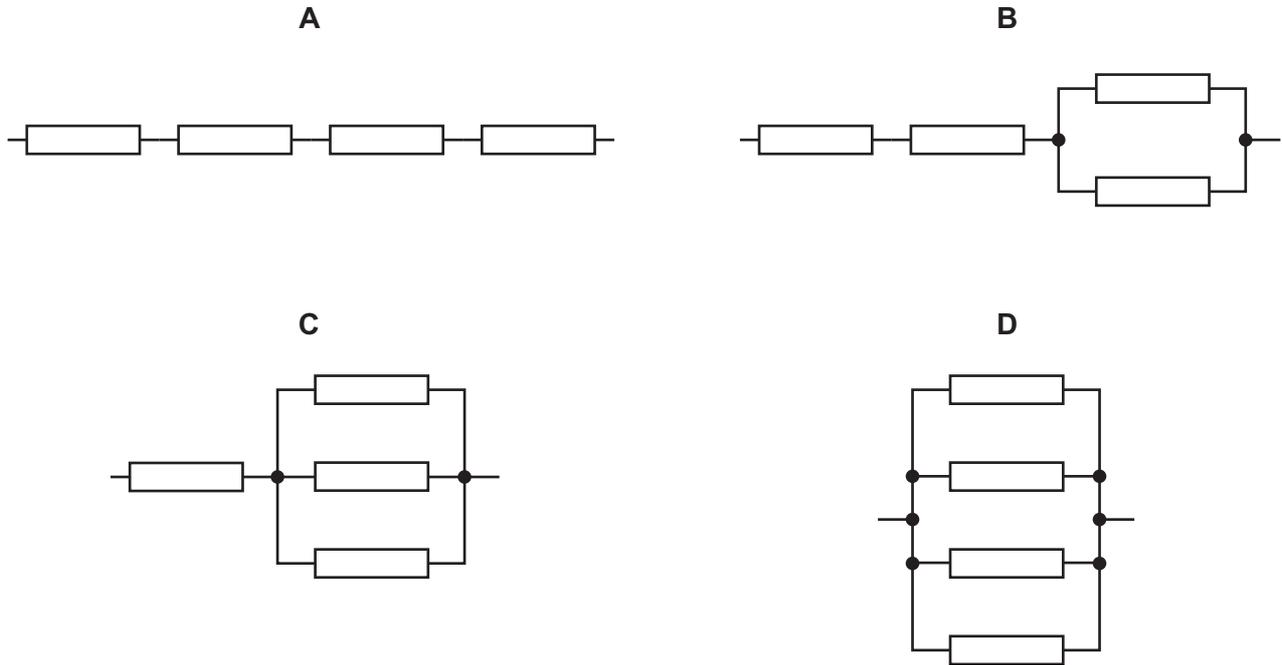
- A** Negative charges move from the cloth to the rod.
- B** Negative charges move from the rod to the cloth.
- C** Positive charges move from the cloth to the rod.
- D** Positive charges move from the rod to the cloth.

36 Which material is used for the core of an electromagnet?

- A** aluminium
- B** copper
- C** iron
- D** steel

37 The diagrams show four identical resistors connected together in different arrangements.

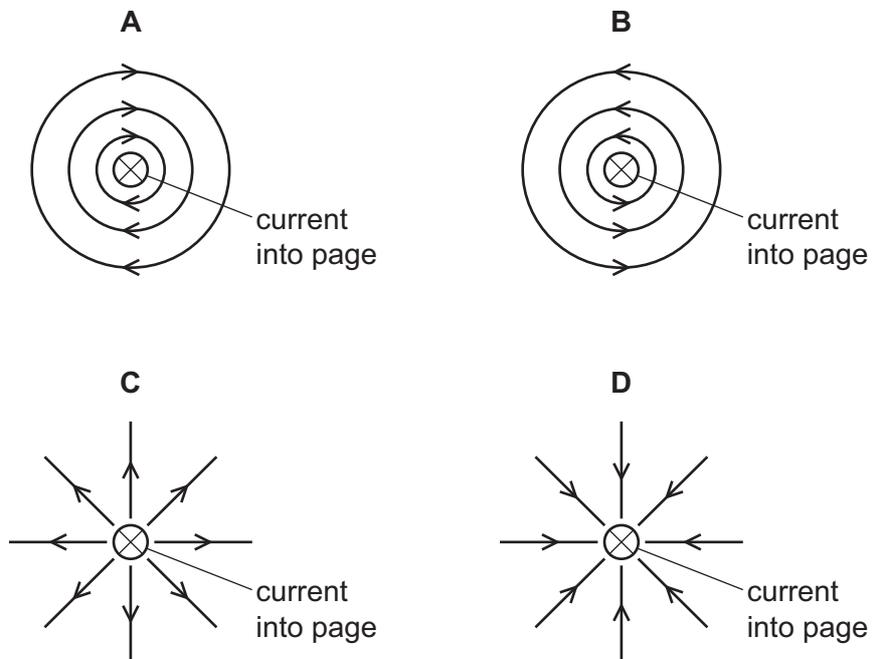
Which arrangement has the smallest combined resistance?



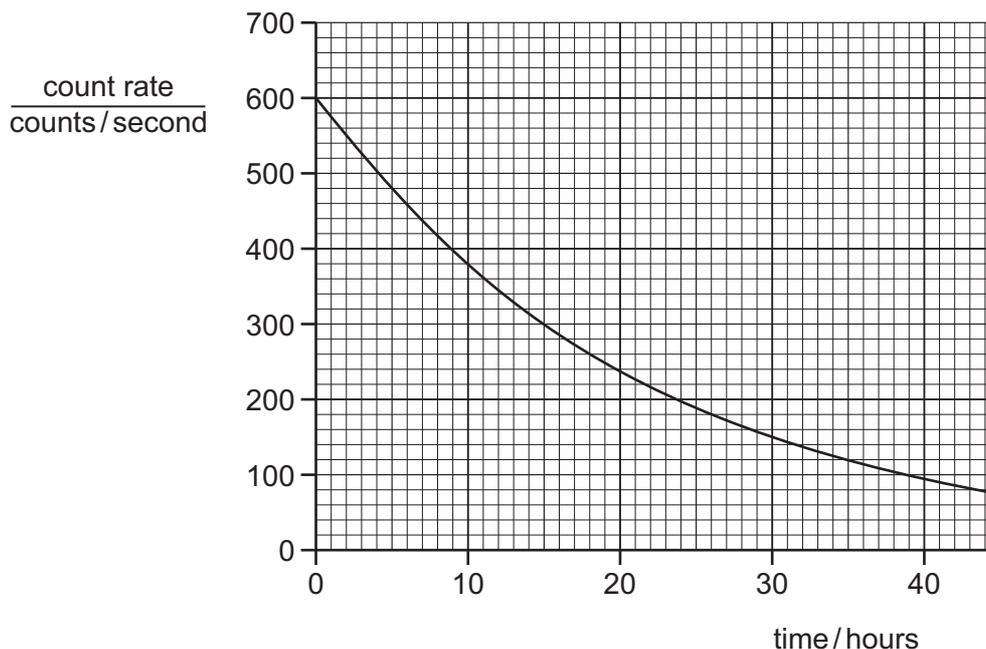
38 There is a current-carrying wire perpendicular to the page.

The direction of the current is into the page.

Which diagram shows the pattern and direction of the magnetic field around the wire?



39 The diagram shows how the count rate for a radioactive isotope varies with time.

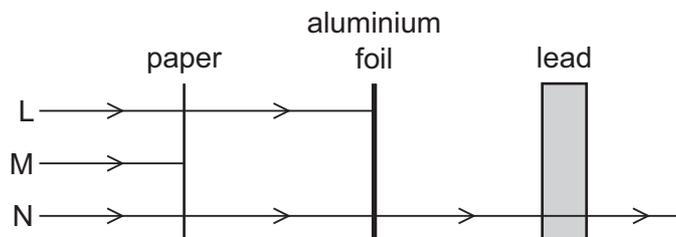


How many half-lives of the isotope elapse in 45 hours?

- A** 1 **B** 3 **C** 45 **D** 75

40 The diagram represents three types of ionising radiation L, M and N directed towards a sheet of paper, a sheet of aluminium foil and a block of lead.

The diagram shows whether each type of radiation penetrates each of the materials.



Which row identifies the radiations L, M and N?

	L	M	N
A	α	β	γ
B	α	γ	β
C	β	α	γ
D	β	γ	α

The Periodic Table of Elements

		Group															
I	II	III	IV	V	VI	VII	VIII										
3 Li lithium 7	4 Be beryllium 9	11 Na sodium 23	12 Mg magnesium 24	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Key atomic number atomic symbol name relative atomic mass </div>													
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 —

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.).