



# Cambridge IGCSE™

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## COMBINED SCIENCE

0653/22

Paper 2 Multiple Choice (Extended)

February/March 2022

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)

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## 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.

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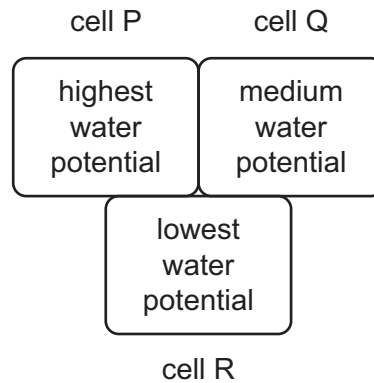
This document has **16** pages.



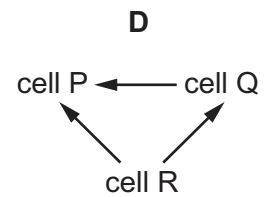
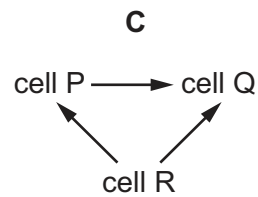
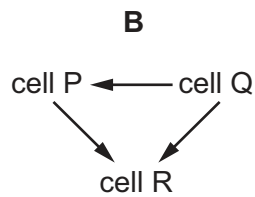
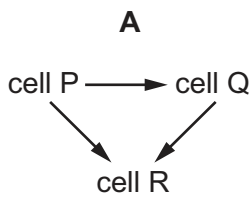
1 What is the function of the cell membrane?

- A to control which substances move in and out of the cell
- B to hold the DNA of the cell
- C to hold the chlorophyll of the cell
- D to store nutrients or waste products

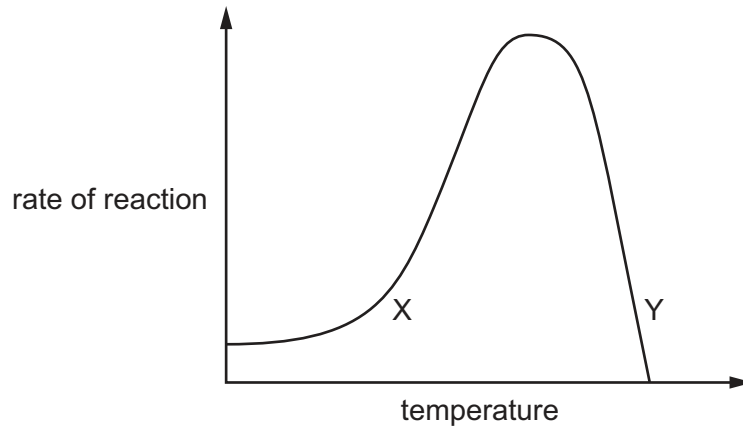
2 The diagram shows three plant cells, P, Q and R.



What is the correct net movement of water by osmosis?



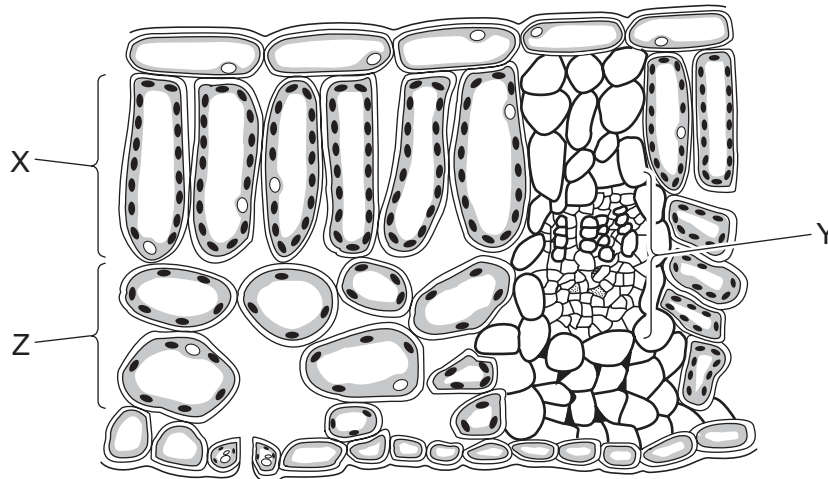
- 3 The graph shows the rate of an enzyme-controlled reaction at different temperatures.



Which row is correct at point X?

	kinetic energy of substrate	enzyme denatured
<b>A</b>	higher than at Y	no
<b>B</b>	higher than at Y	yes
<b>C</b>	lower than at Y	no
<b>D</b>	lower than at Y	yes

- 4 The diagram shows a section through a leaf.



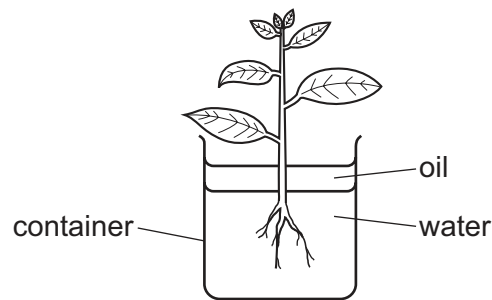
Which row correctly identifies the labelled parts of the leaf section?

	X	Y	Z
<b>A</b>	cuticle	vascular bundle	palisade mesophyll
<b>B</b>	palisade mesophyll	vascular bundle	spongy mesophyll
<b>C</b>	palisade mesophyll	cuticle	spongy mesophyll
<b>D</b>	spongy mesophyll	cuticle	vascular bundle

5 Which row is correct for chemical digestion?

	food	enzyme	substances produced
<b>A</b>	fat	protease	fatty acids and glycerol
<b>B</b>	fat	lipase	amino acids
<b>C</b>	protein	lipase	fatty acids and glycerol
<b>D</b>	protein	protease	amino acids

6 The diagram shows a plant in a container of water. The layer of oil stops the water in the container from evaporating.



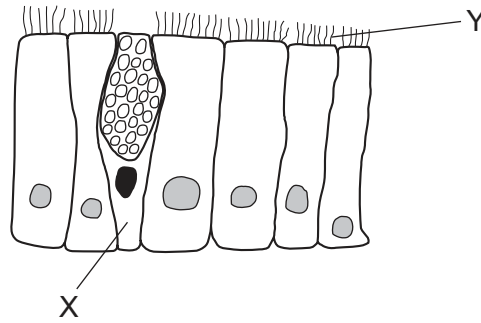
The initial mass of the container and its contents is 296 g.

After two hours, the mass of the container and its contents is 292 g.

What is the rate of transpiration in this time?

- A** 148 g of water per hour
- B** 146 g of water per hour
- C** 4 g of water per hour
- D** 2 g of water per hour

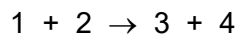
- 7 The diagram shows two different types of cell which line the trachea in the gas exchange system.



Which row describes the roles of X and Y?

	X	Y
<b>A</b>	produces mucus	traps pathogens
<b>B</b>	produces mucus	moves pathogens towards the mouth
<b>C</b>	moves pathogens towards the mouth	traps pathogens
<b>D</b>	moves pathogens towards the mouth	moves pathogens towards the mouth

- 8 In the equation for respiration shown, the components have been represented by numbers.



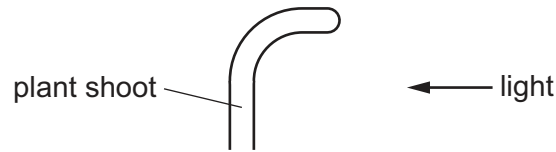
Each component has been given a letter, as shown.

W = carbon dioxide, X = glucose, Y = oxygen, Z = water

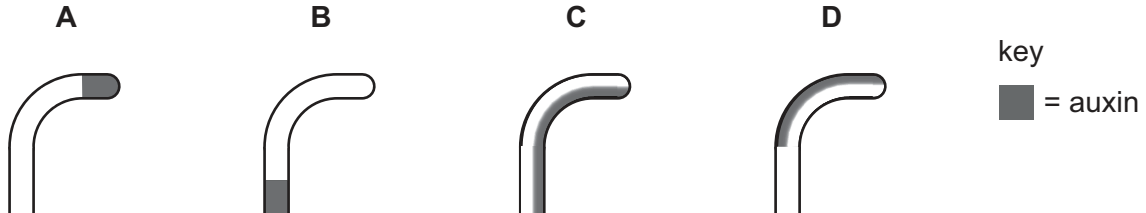
Which letter should be inserted into each position in the equation?

	1	2	3	4
<b>A</b>	W	Y	X	Z
<b>B</b>	W	Z	X	Y
<b>C</b>	X	Y	W	Z
<b>D</b>	X	Z	W	Y

- 9 The shoot of a plant grows towards the light.



Which diagram shows the correct distribution of auxin in this shoot?



- 10 Which features are correct for a wind-pollinated flower?

	nectar	petals
<b>A</b>	absent	small
<b>B</b>	absent	large
<b>C</b>	present	small
<b>D</b>	present	large

- 11 During pregnancy, what protects the embryo against toxins?

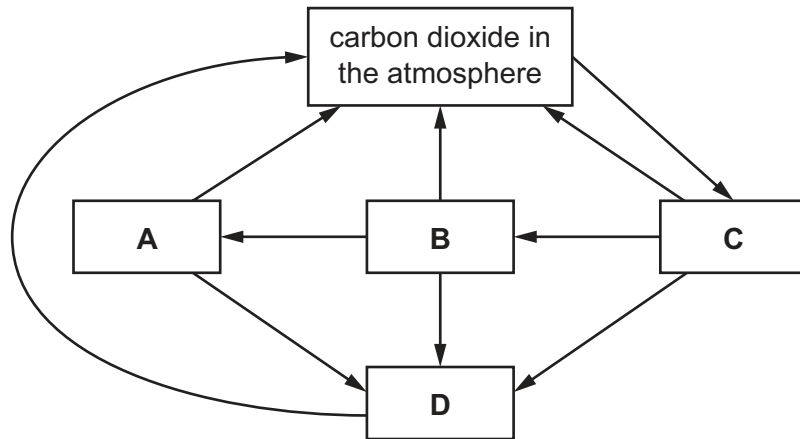
- A** amniotic fluid
- B** amniotic sac
- C** placenta
- D** umbilical cord

- 12 A human eats vegetables.

Which row describes the position of the human in the food chain?

	consumer	trophic level
<b>A</b>	primary	first
<b>B</b>	primary	second
<b>C</b>	secondary	first
<b>D</b>	secondary	second

13 Which labelled box represents plants in the carbon cycle?

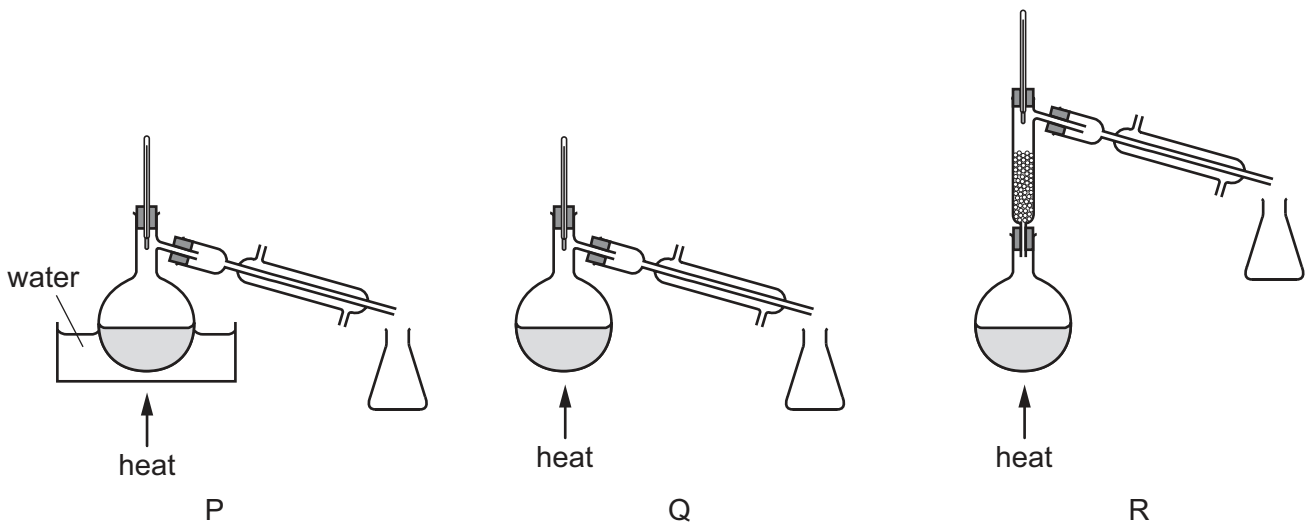


14 A mixture contains two liquids.

One liquid has a boiling point of 120 °C.

The other liquid has a boiling point of 160 °C.

They are separated by fractional distillation.



Which apparatus is used to separate the two liquids?

- A** P and Q      **B** P only      **C** Q only      **D** R only

15 Iodine is a non-metal.

It is a solid at room temperature.

What is a property of iodine?

- A It can be stretched into a wire.
- B It is brittle.
- C It is a good conductor of electricity.
- D It is a good conductor of heat.

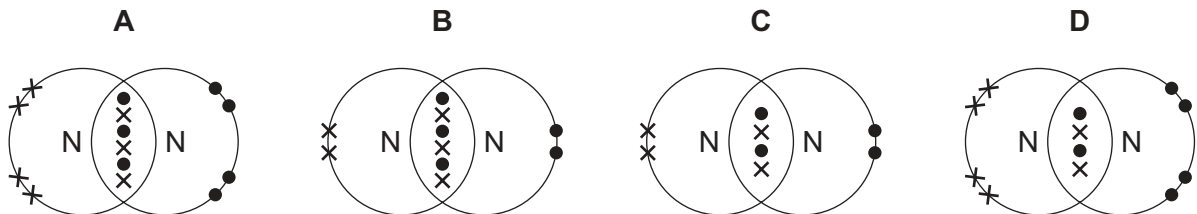
16 The atomic number of argon is 18.

The mass number of argon is 40.

How many protons, neutrons and electrons are in an argon atom?

	protons	neutrons	electrons
A	18	22	18
B	18	22	22
C	22	18	18
D	22	18	22

17 Which dot-and-cross diagram represents the bonding in nitrogen?



18 What happens at the anode during the electrolysis of molten aluminium oxide?

- A Aluminium ions gain electrons to form aluminium atoms.
- B Aluminium ions lose electrons to form aluminium atoms.
- C Oxide ions gain electrons to form oxygen molecules.
- D Oxide ions lose electrons to form oxygen molecules.



19 Steam condenses to form liquid water.

Which row shows the type of reaction and the energy level diagram for this change?

	type of reaction	energy level diagram
<b>A</b>	endothermic	
<b>B</b>	endothermic	
<b>C</b>	exothermic	
<b>D</b>	exothermic	

20 In which reaction is carbon dioxide **not** formed?

- A** adding hydrochloric acid to calcium
- B** adding hydrochloric acid to calcium carbonate
- C** burning coal in air
- D** burning methane in air

21 Which statements about elements in Group I of the Periodic Table are correct?

- 1 They become less reactive going down the group.
- 2 Sodium forms positive ions more easily than lithium.
- 3 Their melting points increase going down the group.
- 4 Rubidium is more dense than sodium.

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

22 Which statement about noble gases is correct?

- A** Argon is used in lamps because it gives out a bright light when it is heated.
- B** Helium is used to fill balloons because it is more dense than air.
- C** Krypton forms diatomic molecules because it is an unreactive gas.
- D** Neon is unreactive because it has a full outer shell of electrons.

23 X, Y and Z are three metals.

When Z is heated with the oxide of X, the metal X is formed.

When X is added to a solution of  $Y^{2+}$  ions, no reaction takes place.

What is the order of reactivity of the metals?

	least reactive	→	most reactive
<b>A</b>	X	Y	Z
<b>B</b>	Y	X	Z
<b>C</b>	Y	Z	X
<b>D</b>	Z	Y	X

24 Which statement describes the correct order in which two reactions in a blast furnace occur?

- A** Carbon dioxide is reduced, then carbon monoxide is oxidised.
- B** Carbon monoxide is oxidised, then carbon dioxide is reduced.
- C** Carbon monoxide is reduced, then carbon is oxidised.
- D** Iron oxide is reduced, then carbon is oxidised.

25 Which statement about carbon dioxide is correct?

- A Carbon dioxide is the only greenhouse gas.
- B Carbon dioxide makes up approximately 4% of clean air.
- C Increased concentrations of carbon dioxide enhance the greenhouse effect.
- D The only source of carbon dioxide in the air is from motor vehicles.

26 Refinery gas contains methane.

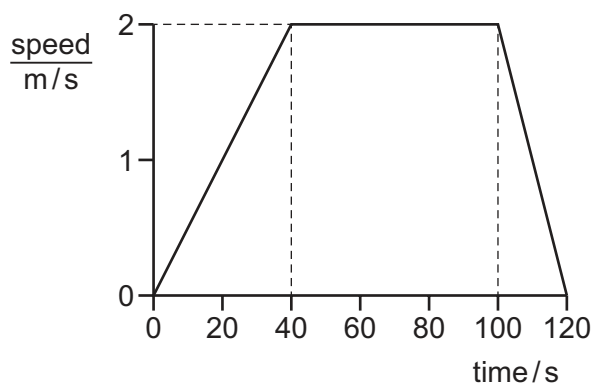
Which statement about methane is correct?

- A Its boiling point is high because it has strong forces of attraction between molecules.
- B Its boiling point is high because it has weak forces of attraction between molecules.
- C Its boiling point is low because it has strong forces of attraction between molecules.
- D Its boiling point is low because it has weak forces of attraction between molecules.

27 Which description identifies the monomer that is used to form poly(ethene) by addition polymerisation?

- A saturated alkane
- B saturated alkene
- C unsaturated alkane
- D unsaturated alkene

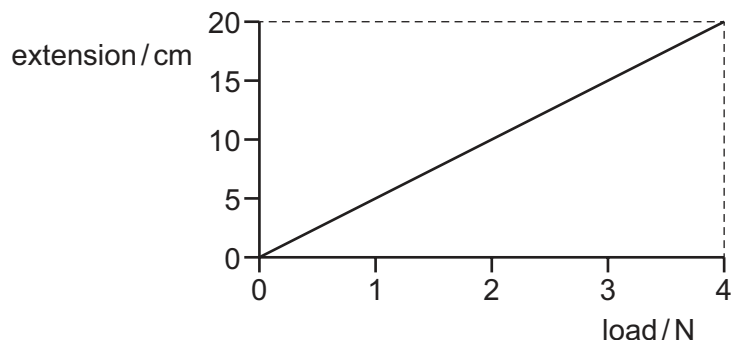
28 A boy walks for 120 s. The graph shows how the speed of the boy varies with time.



What is the distance travelled by the boy while his speed is increasing?

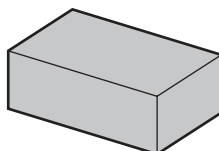
- A 20 m
- B 40 m
- C 80 m
- D 120 m

- 29 The diagram shows an extension–load graph for a spring.



What is the spring constant  $k$  of the spring?

- A** 0.20 N/cm    **B** 5.0 N/cm    **C** 40 N/cm    **D** 80 N/cm
- 30 A brick of mass  $m$  has an area  $A$  in contact with the ground.



The gravitational force on unit mass is  $g$ .

Which expression gives the pressure on the ground due to the brick?

- A**  $mgA$     **B**  $\frac{m}{Ag}$     **C**  $\frac{Ag}{m}$     **D**  $\frac{mg}{A}$
- 31 An object of mass  $m$  is travelling at speed  $v$  at a constant height  $h$  above the ground.
- Which expressions give the kinetic energy and the gravitational potential energy of the object?

	kinetic energy	gravitational potential energy
<b>A</b>	$\frac{1}{2}mv^2$	$\frac{mg}{h}$
<b>B</b>	$\frac{1}{2}mv^2$	$mgh$
<b>C</b>	$\frac{1}{2}(mv)^2$	$\frac{mg}{h}$
<b>D</b>	$\frac{1}{2}(mv)^2$	$mgh$

- 32 A motor is used to lift a load of 3000 N through a vertical distance of 40 m in 2.0 minutes.

How much useful power does the motor produce?

- A** 1000 W    **B** 9000 W    **C** 60 000 W    **D** 240 000 W

- 33 Electricity is generated in different power stations that use coal, hydroelectric dams, nuclear fission or geothermal resources.

How is a hydroelectric power station different from the other three types of power station?

- A It is the only power station that uses steam as part of the process.
- B It is the only power station that does not use steam as part of the process.
- C It is the only power station that uses a renewable form of energy.
- D It is the only power station that does not use a renewable form of energy.

- 34 A gas is trapped in a container.

Which properties of the molecules of the gas determine its temperature and its pressure?

	temperature determined by	pressure determined by
A	the separation of the molecules	how often the molecules collide with the container
B	the separation of the molecules	the forces between the molecules
C	the speed of the molecules	how often the molecules collide with the container
D	the speed of the molecules	the forces between the molecules

- 35 A wave travels through a substance from point X to point Y. The arrows show the direction in which particles of the substance vibrate.



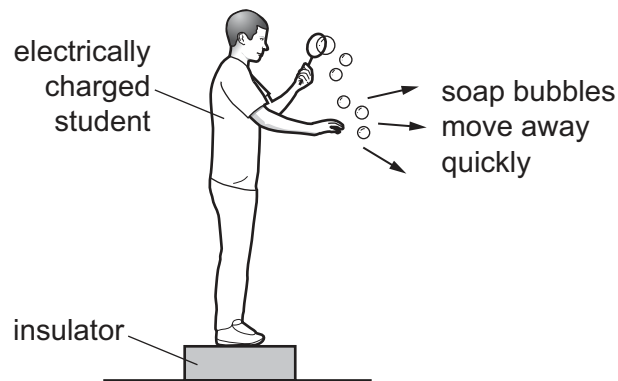
Which row states the type of wave involved and gives an example of this type of wave?

	type of wave	example
A	longitudinal	radio
B	longitudinal	sound
C	transverse	radio
D	transverse	sound

- 36 What is **not** part of the electromagnetic spectrum?

- A gamma-radiation
- B microwaves
- C sound waves
- D X-rays

- 37 An electrically charged student produces soap bubbles. When he holds his hand near the bubbles, they move away quickly from his hand.

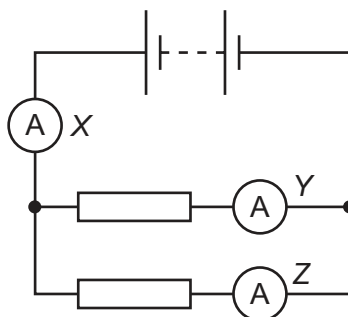


For this movement of the bubbles to happen, which statement is correct?

- A The bubbles must be negatively charged.
  - B The bubbles must be positively charged.
  - C The bubbles must have the opposite charge to the charge on the student.
  - D The bubbles must have the same charge as the charge on the student.
- 38 Which two changes together must cause the resistance of a wire to increase?

	change in length of wire	change in cross-sectional area of wire
<b>A</b>	decrease	decrease
<b>B</b>	decrease	increase
<b>C</b>	increase	decrease
<b>D</b>	increase	increase

- 39 The diagram shows a circuit with three ammeters. The readings on the ammeters are X, Y and Z.



Which set of readings on the ammeters is possible?

	X/A	Y/A	Z/A
<b>A</b>	2	3	5
<b>B</b>	3	2	5
<b>C</b>	3	3	3
<b>D</b>	5	2	3

- 40 A worker uses an electric drill continuously for 1.0 hour.

The current in the drill is 5.0 A when connected to the 250 V mains.

How much electrical energy is transferred by the drill?

- A** 1.25 kJ      **B** 180 kJ      **C** 4500 kJ      **D** 5400 kJ

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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: 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.).