Cambridge Assessment International Education

Cambridge IGCSE™

PHYSICAL SCIENCE **0652/21**

Paper 2 Multiple Choice (Extended) **October/November 2025**

45 minutes

You must answer on the multiple choice answer sheet.

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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 statement explains why oxygen, O_2, diffuses faster than ozone, O_3?

A Oxygen has a lower molecular mass than ozone.

B Oxygen has a higher molecular mass than ozone.

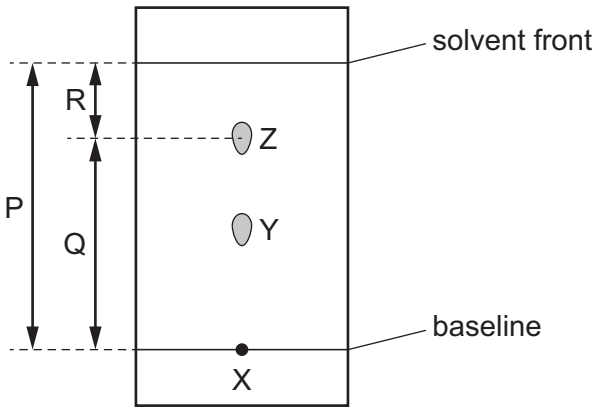
C The atoms in oxygen have a higher mass than the atoms in ozone.

D The atoms in oxygen have a lower mass than the atoms in ozone.

2 Mixture X contains two different substances, Y and Z.

Mixture X is separated by paper chromatography.

The resulting chromatogram is shown.



Which formula shows how the R_f value of Z is calculated?

A $\frac{P}{Q}$ **B** $\frac{Q}{P}$ **C** $\frac{Q}{R}$ **D** $\frac{R}{Q}$

3 Which method is used to separate two liquids that have different boiling points?

A crystallisation

B filtration

C fractional distillation

D paper chromatography

4 When sodium reacts with water, hydrogen gas is released and aqueous sodium hydroxide is formed.

The aqueous sodium hydroxide is a .....1..... .

The sodium hydroxide is the .....2..... and water is the .....3..... .

Which words complete gaps 1, 2 and 3?

	1	2	3
A	solute	solution	solvent
B	solute	solvent	solution
C	solution	solute	solvent
D	solution	solvent	solute

5 Which row describes the properties of an ionic compound?

	volatility	solubility in water	electrical conductivity when molten
A	non-volatile	insoluble	poor
B	non-volatile	soluble	good
C	volatile	insoluble	good
D	volatile	soluble	poor

6 Alum is a compound that contains the ions K^+, SO_4^{2-} and Al^{3+} only.

What is the formula of alum?

A $KAlSO_4$ **B** $KAl(SO_4)_2$ **C** $K_2Al(SO_4)_2$ **D** K_2AlSO_4

7 What is the concentration of 2 g of sodium hydroxide, NaOH, dissolved in 100 cm^3 water?

A 0.005 mol / dm^3

B 0.05 mol / dm^3

C 0.5 mol / dm^3

D 2 mol / dm^3

8 Which row describes the movement of the cations and what happens to the cations at the electrode during the electrolysis of molten lead bromide?

	movement of cations	at the electrode
A	towards anode	cations gain electrons
B	towards anode	cations lose electrons
C	towards cathode	cations gain electrons
D	towards cathode	cations lose electrons

9 Four statements about the effect of activation energy and the effect of temperature on the rate of reaction are listed.

1 At higher temperatures, more reactant particles possess the activation energy.

2 A lower activation energy leads to a faster reaction.

3 If the temperature is low and the activation energy is high, the reactant particles collide more frequently.

4 The activation energy for the reaction decreases with an increase in temperature.

Which statements are correct?

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

10 Aluminium reacts with iron(III) oxide as shown.

$$2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$$

Which substance is reduced?

A Al **B** Fe_2O_3 **C** Al_2O_3 **D** Fe

11 Which statement about acids is correct?

A They are proton donors in aqueous solution.

B They have pH values greater than 7.

C They react with bases to produce a salt and hydrogen only.

D They react with carbonates to produce a salt and water only.

12 The results of tests on an aqueous solution, X, are shown.

reagent	result
aqueous sodium hydroxide	green precipitate insoluble in excess
aqueous silver nitrate acidified with dilute nitric acid	white precipitate

What is X?

A iron(II) chloride

B iron(II) sulfate

C iron(III) chloride

D iron(III) sulfate

13 Rubidium is below potassium and above caesium in Group I of the Periodic Table.

Which statement about these elements is correct?

A Rubidium is more reactive than caesium.

B Rubidium, potassium and caesium all form acidic oxides.

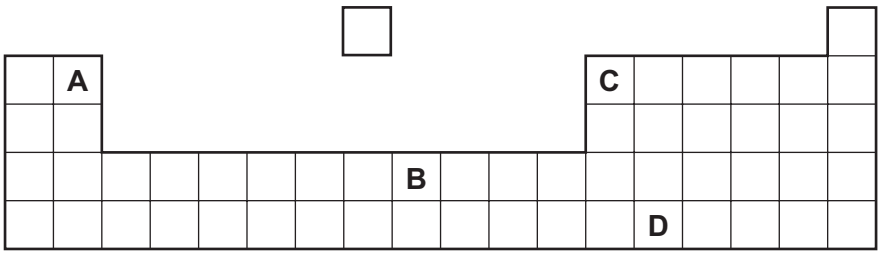
C Rubidium has a lower melting point than caesium.

D Rubidium has a greater density than potassium.

14 Part of the Periodic Table is shown.

The letters are not the symbols of the elements.

Which element forms coloured compounds that can act as catalysts?



15 Four different metals W, X, Y and Z are added to solutions of their metal nitrates.

The results are shown.

	solution of metal nitrate			
metal added	W nitrate	X nitrate	Y nitrate	Z nitrate
W		✓	✗	✗
X	✗		✗	✗
Y	✓	✓		✗
Z	✓	✓	✓	

key

✓ = reacts

✗ = no reaction

What is the order of reactivity?

	least reactive → most reactive			
A	X	W	Y	Z
B	X	Y	W	Z
C	Z	W	Y	X
D	Z	Y	W	X

16 Which statement about the extraction of iron in the blast furnace is correct?

A Bauxite is the ore of iron used.

B Carbon dioxide breaks down to form carbon and oxygen.

C Carbon dioxide reacts with iron oxide to form iron metal.

D Carbon reacts with carbon dioxide to produce the reducing agent.

17 Nitrogen oxides are produced in a car engine.

Which type of reaction catalytically removes nitrogen oxides from the exhaust fumes?

A combustion

B oxidation

C reduction

D thermal decomposition

18 Which reaction takes place when calcium oxide is formed from calcium carbonate?

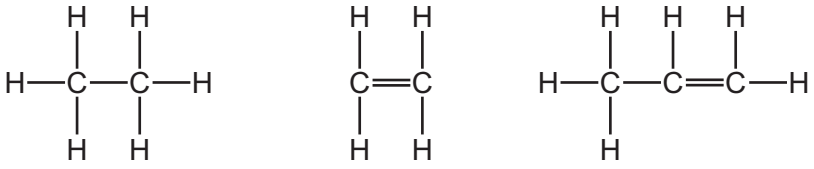
A addition

B combustion

C oxidation

D thermal decomposition

19 The structures of three hydrocarbons are shown.



1 2 3

Which hydrocarbons decolourise aqueous bromine?

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

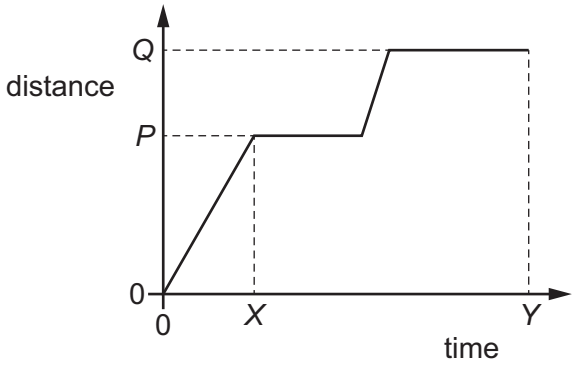
20 Which row describes the starting material and conditions used to make ethanol?

	starting material	conditions
A	ethene	high temperature, low pressure and a catalyst
B	ethene	yeast and low temperature
C	glucose	high temperature, low pressure and a catalyst
D	glucose	yeast and low temperature

21 A car moves in a straight line.

The graph shows how the distance moved by the car varies with time.

Two distances *P* and *Q*, and two times *X* and *Y* are labelled.



Which expression gives the average speed of the car for the complete journey?

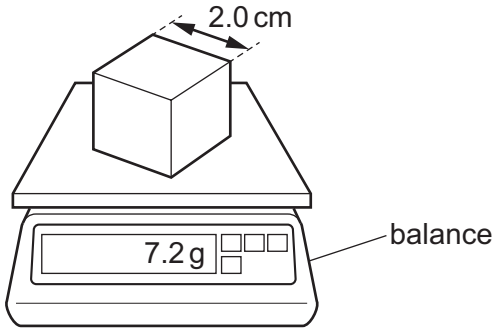
A distance *P* × time *X*

B $\frac{\text{distance } P}{\text{time } X}$

C distance *Q* × time *Y*

D $\frac{\text{distance } Q}{\text{time } Y}$

22 A plastic cube of side 2.0 cm is placed on a balance. The mass of the cube is shown on the balance.

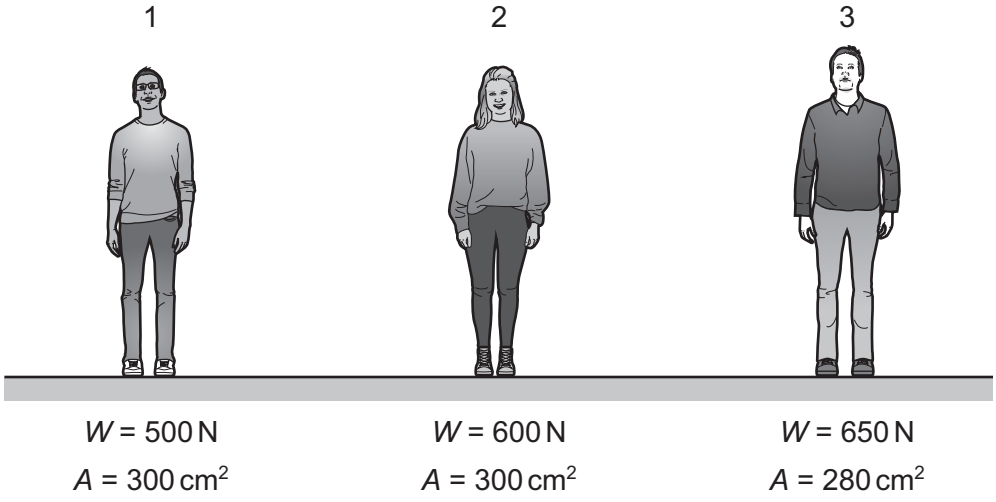


What is the density of the plastic?

A 0.90 g / cm^3 **B** 1.2 g / cm^3 **C** 1.8 g / cm^3 **D** 3.6 g / cm^3

23 The diagram shows three people standing on the ground.

The weight W of each person and the area A of contact with the ground for each person is shown.



Each person exerts a pressure on the ground.

What is the order of the pressures, from greatest pressure to smallest pressure?

A $1 \rightarrow 2 \rightarrow 3$ **B** $2 \rightarrow 1 \rightarrow 3$ **C** $3 \rightarrow 1 \rightarrow 2$ **D** $3 \rightarrow 2 \rightarrow 1$

24 A student uses a newton meter to pull a box along a rough horizontal floor with a constant force.

She uses the reading on the newton meter to calculate the work done.

Which other quantity does she need to measure?

A the distance moved by the box

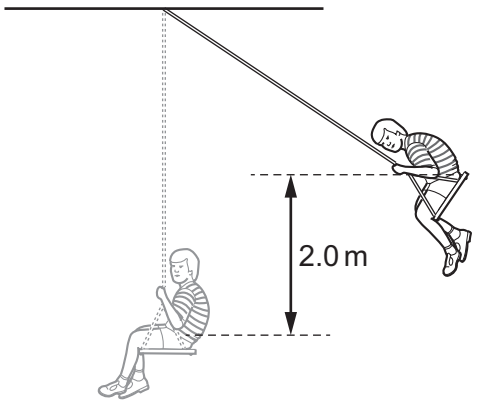
B the final speed of the box

C the mass of the box

D the time taken for the box to move

25 The diagram shows a child of mass 40 kg on a swing.

At his highest position he is 2.0 m above his lowest position.



In this highest position, the child has stopped moving upwards.

He starts to move downwards and his speed increases.

The gravitational field strength g is 10 N / kg. Air resistance is negligible.

What is the kinetic energy of the child when he reaches his lowest position?

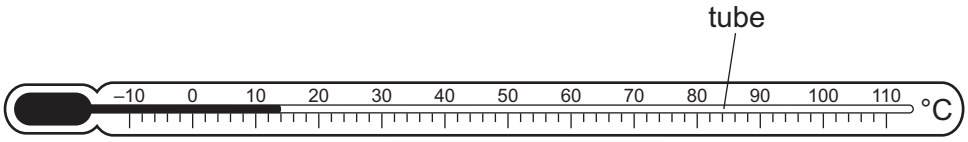
A 20 J **B** 80 J **C** 200 J **D** 800 J

26 A fixed mass of gas is cooled at constant pressure.

How do the average speed of the particles and the volume of the gas change?

	average speed of particles	volume of gas
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

27 The diagram shows a liquid-in-glass thermometer.



Which change to the tube makes the thermometer more sensitive?

A make the tube longer

B make the tube shorter

C make the tube thinner

D make the tube wider

28 A beaker of water in a laboratory is heated from 0 °C to 100 °C.

Which row states the temperatures at which evaporation and boiling of water occur?

	evaporation	boiling
A	at 100 °C only	at 100 °C only
B	at 100 °C only	between 0 °C and 100 °C
C	between 0 °C and 100 °C	at 100 °C only
D	between 0 °C and 100 °C	between 0 °C and 100 °C

29 The temperature of a small volume of air changes which causes this air to move downwards in a convection current.

Which statement explains one process that causes this air to move downwards?

A The air temperature decreases and the density of the air decreases.

B The air temperature decreases and the density of the air increases.

C The air temperature increases and the density of the air decreases.

D The air temperature increases and the density of the air increases.

30 A ship is at rest on the sea. A wave passes the ship, which causes the ship to move up and down.

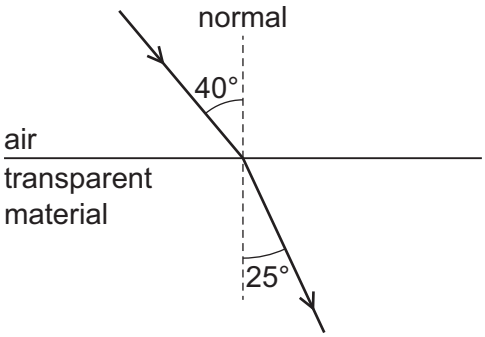
The ship moves from its lowest point to its highest point and then back to its lowest point three times in one minute. It takes 8.0 s for one wave crest to travel the length of the ship.

The ship has a length of 40 m.

What is the wavelength of the wave passing the ship?

A 13 m **B** 15 m **C** 100 m **D** 110 m

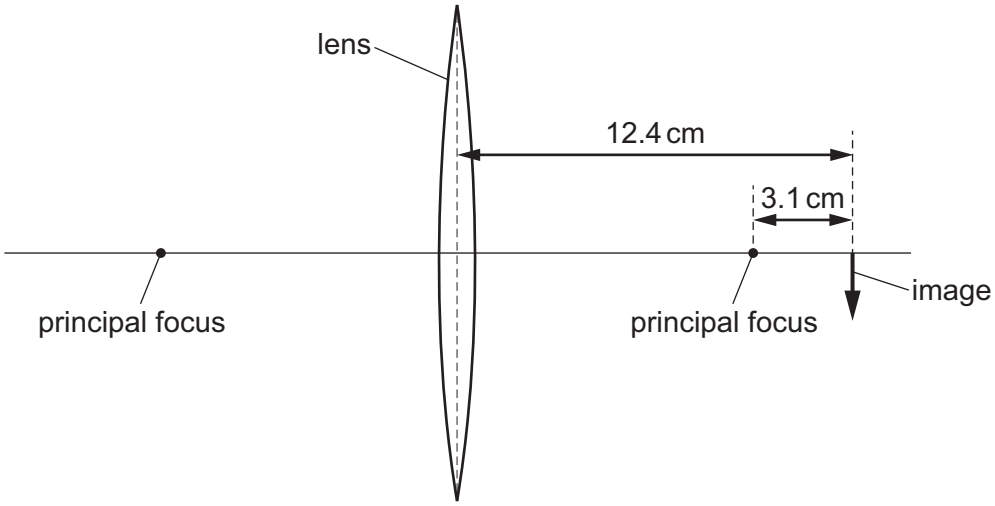
31 A ray of light passes from air into a transparent material, as shown.



What is the refractive index of the transparent material?

A 0.625 **B** 0.657 **C** 1.52 **D** 1.60

32 A thin converging lens forms a real image of an object. The image is 12.4 cm from the lens and 3.1 cm from the nearer principal focus, as shown.



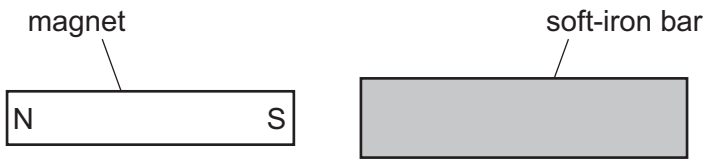
What is the focal length of the lens?

A 3.1 cm **B** 9.3 cm **C** 12.4 cm **D** 15.5 cm

33 In a vacuum, how do the speed of radio waves and the speed of X-rays compare with the speed of light *c*?

	speed of radio waves	speed of X-rays
A	equal to *c*	equal to *c*
B	equal to *c*	greater than *c*
C	greater than *c*	less than *c*
D	less than *c*	greater than *c*

34 An unmagnetised soft-iron bar is kept close to a strong permanent magnet. A temporary N pole is induced at the left-hand end of the soft-iron bar.



The soft-iron bar is continually tapped with a hammer.

What happens to the induced N pole at the left-hand end of the soft-iron bar?

A It gradually becomes a permanent N pole.

B It gradually becomes a permanent S pole.

C It gradually disappears.

D It stays as a temporary N pole.

35 Two resistors with resistances 4.0 Ω and 5.0 Ω are connected in parallel.

The combined resistance of the combination is *R*.

Which statement about *R* is correct?

A *R* is less than 4.0 Ω.

B *R* is equal to 4.5 Ω.

C *R* is equal to 9.0 Ω.

D *R* is greater than 9.0 Ω.

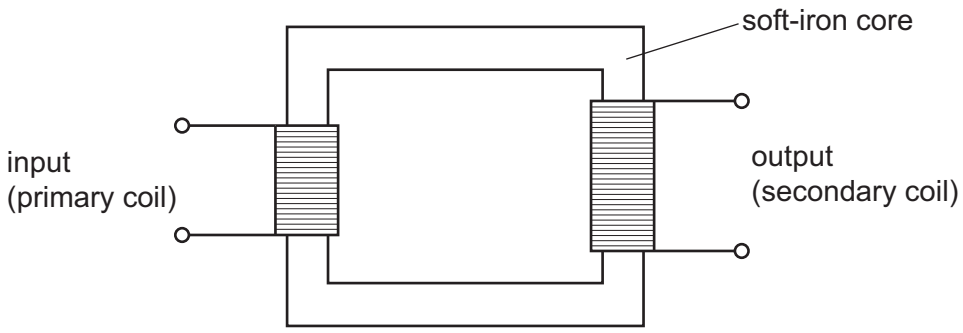
36 There is a current of 4.0 A in an electric heater.

The heater transfers 24 kJ of energy in a time of 6.0 min.

What is the potential difference (p.d.) across the heater?

A 1.0 V **B** 17 V **C** 36 V **D** 270 V

37 The diagram shows a transformer.



Why is there an induced electromotive force (e.m.f.) across the secondary coil?

A There is a changing magnetic field in the soft-iron core.

B There is an alternating current in the soft-iron core.

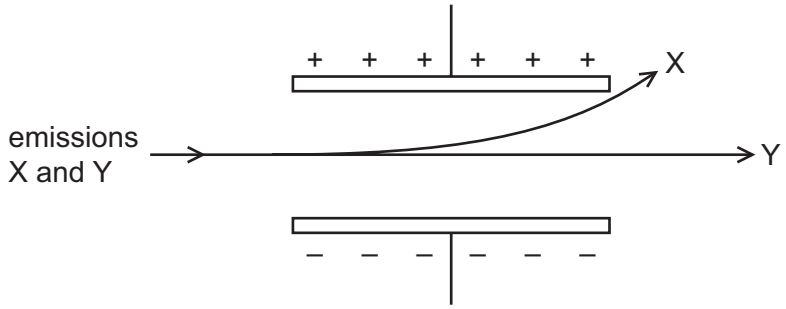
C There is a direct current in the primary coil.

D There is a steady magnetic field in the soft-iron core.

38 A beam contains two types of emission, X and Y, from a radioactive source.

The diagram shows the beam passing through the electric field between two charged plates.

Emission X is deflected and emission Y is not deflected.



What are the emissions X and Y?

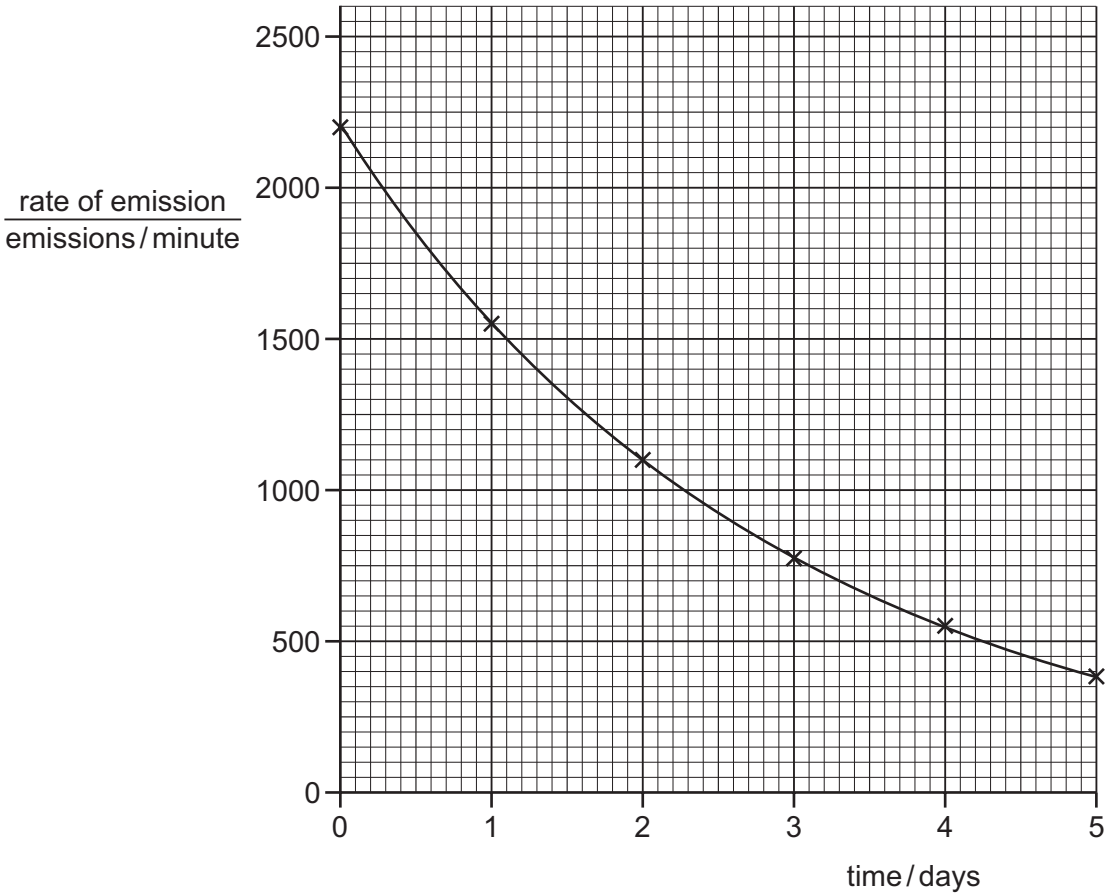
	X	Y
A	alpha-particles	gamma-rays
B	beta-particles	gamma-rays
C	gamma-rays	alpha-particles
D	gamma-rays	beta-particles

39 A radioactive nucleus emits a beta-particle.

What is the effect of this emission on the number of protons and the number of neutrons in the nucleus?

	number of protons	number of neutrons
A	decreases by 2	decreases by 2
B	decreases by 2	does not change
C	increases by 1	decreases by 1
D	increases by 1	does not change

40 The graph shows the decay curve for a radioactive isotope.



What is the half-life of this isotope?

A 1.0 day **B** 1.5 days **C** 2.0 days **D** 2.5 days

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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.).