Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **May/June 2024**

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 What do both animals and plants need to meet their nutritional requirements?

A carbon dioxide

B ions

C light

D organic compounds

2 Oxygen produced in palisade mesophyll cells by photosynthesis diffuses into the air spaces in the leaf.

What causes this movement?

A osmosis between the leaf cells

B evaporation of water from mesophyll cells

C difference in oxygen concentration inside and outside the cells

D wind blowing over the leaves

3 A student tests a sample of food to identify its composition.

The results are shown.

test	final colour of test
Benedict's test	brick-red precipitate
biuret test	blue
iodine solution	blue-black

Which substances are shown to be present in the food sample?

A protein, reducing sugar and starch

B protein and starch only

C reducing sugar and starch only

D reducing sugar and protein only

4 The diagram shows a functional human enzyme at 37 °C.

Which row shows the likely shape of this enzyme at 5 °C and 80 °C?

	at 5 °C	at 80 °C
A		
B		
C		
D		

5 What is the manufacture of carbohydrates from raw materials using light energy called?

A growth

B photosynthesis

C respiration

D reproduction

6 Which row about secretions in the alimentary canal is correct?

	substance secreted	action	area of alimentary canal
A	amylase	breaks down fats into fatty acids and glycerol	small intestine
B	bile	breaks down fats into fatty acids and glycerol	small intestine
C	hydrochloric acid	breaks down proteins into amino acids	stomach
D	protease	breaks down proteins into amino acids	stomach

7 Which vessels carry blood towards the heart?

	aorta	pulmonary artery	pulmonary vein	vena cava
A	✓	✓	✗	✗
B	✓	✗	✓	✗
C	✗	✓	✗	✓
D	✗	✗	✓	✓

key
✓ = yes
✗ = no

8 Which process releases the most energy?

A carbon dioxide + water → glucose + oxygen

B glucose + oxygen → carbon dioxide + water

C glucose → alcohol + carbon dioxide

D glucose → lactic acid

9 The arterioles that supply blood to the skin's surface capillaries undergo vasodilation.

Which row describes the effect of this on the core body temperature and the volume of blood passing through these capillaries?

	core body temperature	volume of blood
A	decreases	decreases
B	increases	decreases
C	decreases	increases
D	increases	increases

10 Which statements about human egg and sperm cells are correct?

1 The egg cell's membrane changes to prevent other sperm from entering it after fertilisation.

2 The egg and sperm cells have a diploid nucleus.

3 The sperm's enzymes allow it to penetrate the egg to fertilise it.

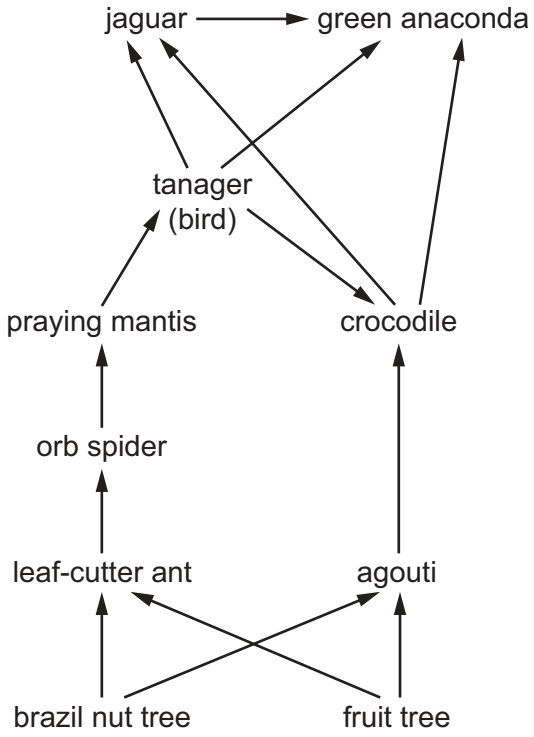
4 The process of fertilisation occurs in the ovary.

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

11 Which row shows the sex chromosomes in humans?

	female	male
A	XX	XY
B	XY	XX
C	YY	XX
D	XX	YY

12 The diagram shows part of a food web in a rainforest.



Which animals are feeding as quaternary consumers?

A crocodile and green anaconda

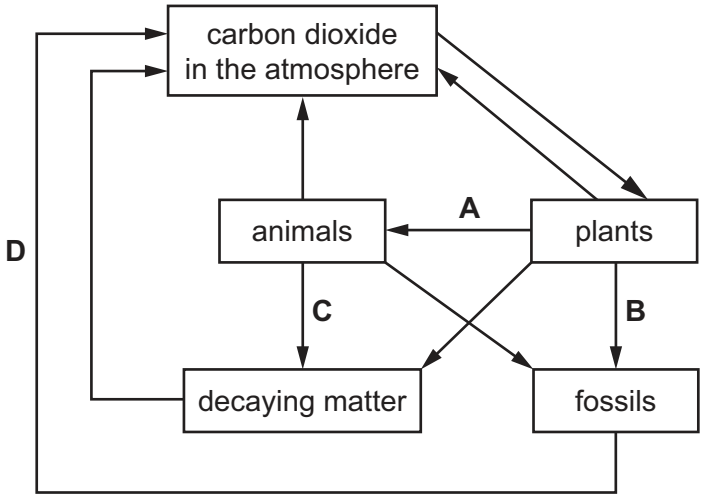
B crocodile and jaguar

C green anaconda and tanager

D jaguar and tanager

13 The diagram shows part of the carbon cycle.

Which process, due to human activities, has increased the concentration of carbon dioxide in the atmosphere?



14 Which process is used to obtain water from a salt solution?

A chromatography

B crystallisation

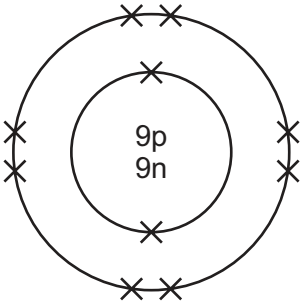
C distillation

D filtration

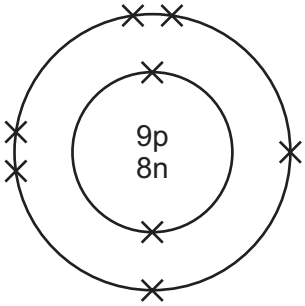
15 One isotope of oxygen is represented by $^{16}_{8}O$.

Which diagram represents a different isotope of oxygen?

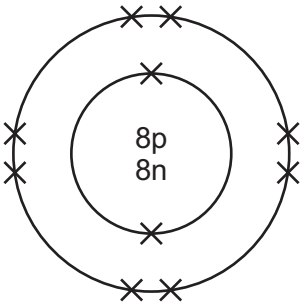
A



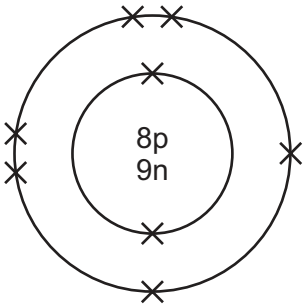
B



C



D



16 Which row shows the ionic half-equation for the reaction at the cathode during the electrolysis of the named electrolyte?

	electrolyte	equation
A	molten aluminium oxide	$Al^{3+} + 3e^- \rightarrow Al$
B	molten aluminium oxide	$2O^{2-} \rightarrow O_2 + 4e^-$
C	concentrated aqueous sodium chloride	$H_2 \rightarrow 2H^+ + 2e^-$
D	concentrated aqueous sodium chloride	$Na^+ + e^- \rightarrow Na$

[Turn over

17 When dilute hydrochloric acid reacts with calcium carbonate, carbon dioxide is produced.

Which pieces of apparatus are used to investigate the effect of temperature on the rate of this reaction?

1

2

3

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

18 Solid zinc reacts with aqueous copper(II) sulfate. The ionic equation for the reaction is shown.

$$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$$

Which row identifies the substance being oxidised and the reducing agent?

	substance being oxidised	reducing agent
A	Cu^{2+}	Cu^{2+}
B	Cu^{2+}	Zn
C	Zn	Cu^{2+}
D	Zn	Zn

19 Chromium(III) oxide reacts with dilute hydrochloric acid and with aqueous sodium hydroxide.

Which word describes chromium(III) oxide?

A acidic

B amphoteric

C basic

D neutral

20 Gas X turns limewater milky.

What is X?

A carbon dioxide

B chlorine

C hydrogen

D oxygen

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

1 Bromine is lighter in colour than chlorine.

2 Chlorine is more reactive than bromine.

3 Chlorine displaces iodide ions from aqueous solution.

4 Iodine displaces bromide ions from aqueous solution.

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

22 Neon is in Group VIII of the Periodic Table.

Which row about neon is correct?

	unreactive	diatomic	full inner electron shell	incomplete outer electron shell
A	✓	✗	✓	✓
B	✗	✓	✗	✗
C	✓	✗	✓	✗
D	✗	✓	✗	✓

key

✓ = true

✗ = false

23 Which row identifies an ore of aluminium and the method of extraction of aluminium from its ore?

	ore	method of extraction
A	bauxite	electrolysis
B	bauxite	reduction using carbon
C	hematite	electrolysis
D	hematite	reduction using carbon

24 Copper(II) sulfate and cobalt(II) chloride are used to test for water.

Which rows show the colour changes for these two substances?

	substance	initial colour	final colour
1	cobalt(II) chloride	blue	pink
2	cobalt(II) chloride	pink	blue
3	copper(II) sulfate	blue	white
4	copper(II) sulfate	white	blue

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

25 Sulfuric acid is manufactured by the Contact process.

Which reaction in this process uses a catalyst?

A $S + O_2 \rightarrow SO_2$

B $2SO_2 + O_2 \rightarrow 2SO_3$

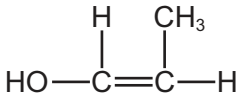
C $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

D $H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

26 What is the main constituent of clean air and of natural gas?

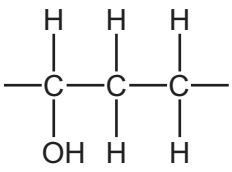
	clean air	natural gas
A	nitrogen	ethane
B	nitrogen	methane
C	oxygen	ethane
D	oxygen	methane

27 The structure of a monomer is shown.

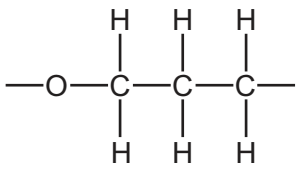


Which structure represents a section of the addition polymer that is formed from this monomer?

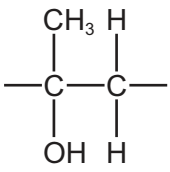
A



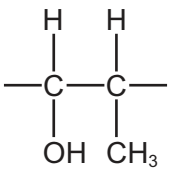
B



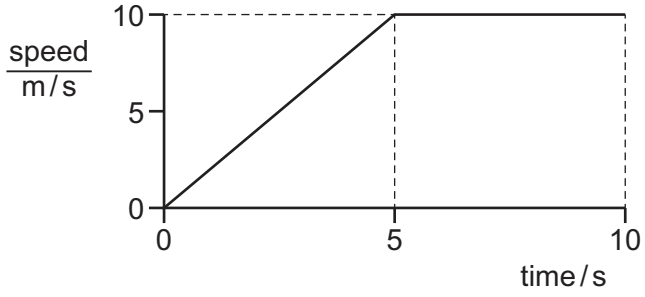
C



D



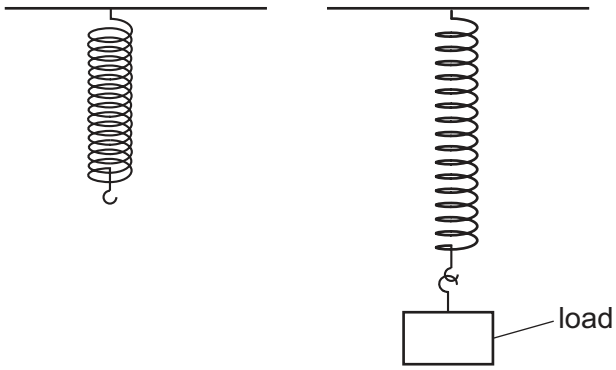
28 The speed–time graph represents the motion of a vehicle during the first 10 s of a journey.



How far does the vehicle travel during the 10 s?

A 25 m **B** 50 m **C** 75 m **D** 100 m

29 The diagram shows a spring without a load and then with a load of mass 500 g suspended from the same spring. The spring obeys Hooke's law.



The length of the unloaded spring is 30 cm.

When the 500 g load is suspended from the spring, the spring extends to a new length of 35 cm.

The gravitational field strength g is 10 N / kg.

Which calculation gives the spring constant of the spring?

A $\dfrac{0.5 \times 10}{35 - 30}$ N / cm

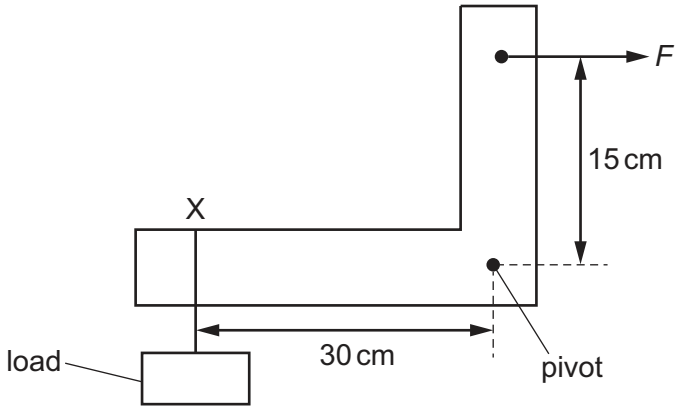
B $\dfrac{0.5}{10 \times (35 - 30)}$ N / cm

C $\dfrac{10 \times (35 - 30)}{0.5}$ N / cm

D $0.5 \times 10 \times (35 - 30)$ N / cm

30 A weightless L-shaped beam is pivoted as shown.

A load of mass 2.4 kg is suspended from the beam at point X. The beam is held in equilibrium by a horizontal force *F* acting at the point shown.



The gravitational field strength *g* is 10 N / kg.

What is *F*?

A 4.8 N **B** 48 N **C** 72 N **D** 720 N

31 Four different kettles contain different masses of water.

They are used to heat the water from room temperature to boiling point.

The kettles take different times to do this.

Which kettle has the lowest useful power output?

	mass of water / g	time to heat water to boiling point / minute
A	1000	3.0
B	1000	5.0
C	2500	3.0
D	2500	5.0

32 A gas in a balloon is heated at constant pressure.

What happens to the gas?

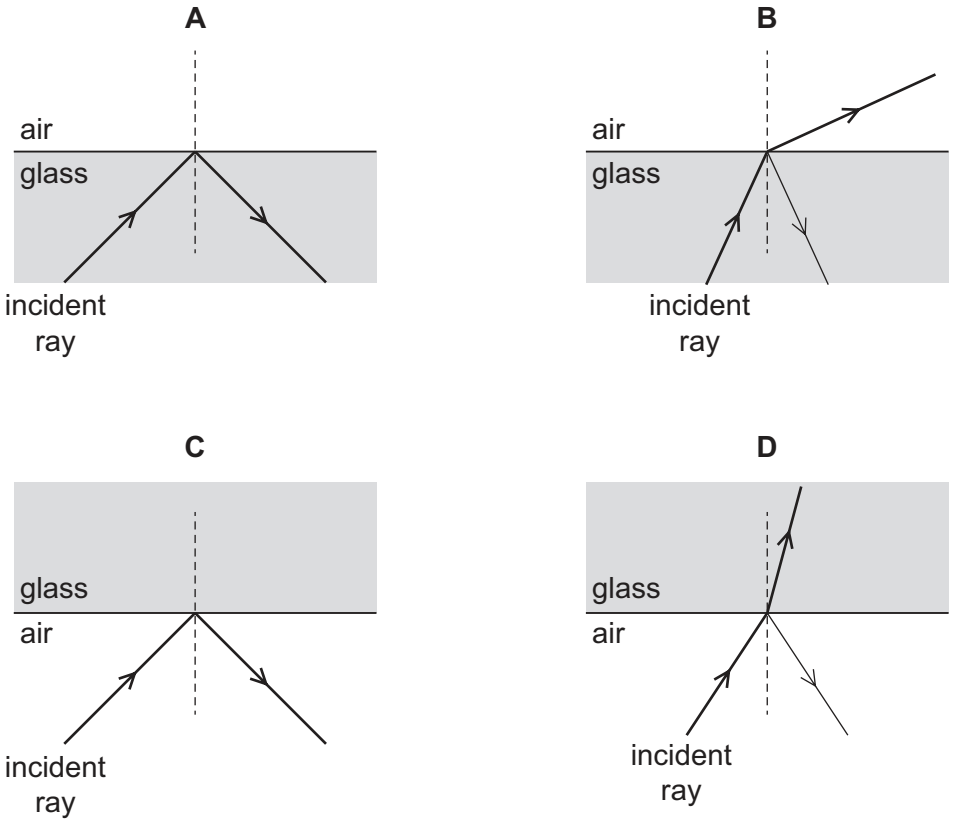
A Its density decreases.

B Its mass decreases.

C Its temperature decreases.

D Its volume decreases.

33 Which diagram shows a ray of light undergoing total internal reflection?



34 Which two types of wave **cannot** travel at the same speed as each other in a vacuum?

A infrared and gamma

B ultraviolet and X-rays

C light and microwaves

D radio waves and sound

35 The electromotive force (e.m.f.) of a battery is 2.0 V.

Which statement is correct?

A The battery supplies 0.50 J of energy for every 1.0 C of charge driven around a circuit.

B The battery supplies 0.50 J of energy for every 2.0 C of charge driven around a circuit.

C The battery supplies 2.0 J of energy for every 1.0 C of charge driven around a circuit.

D The battery supplies 2.0 J of energy for every 2.0 C of charge driven around a circuit.

36 The potential difference (p.d.) across a 60 Ω resistor is 12 V.

How much time does it take for a charge of 100 C to pass through the resistor?

A 0.0020 s **B** 0.050 s **C** 20 s **D** 500 s

37 A heater circuit is protected by a 10 A fuse.

How does the fuse protect the circuit?

A It cuts off the current when the current in the heater is greater than 10 A.

B It decreases the current in the heater to 10 A when the current is more than 10 A.

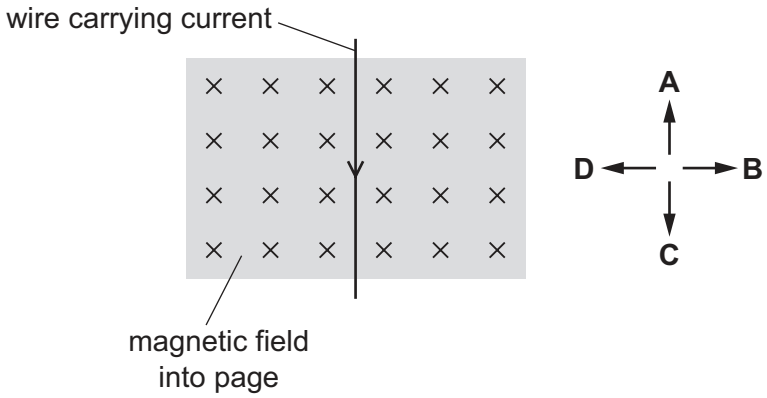
C It increases the current in the heater to 10 A when the current is less than 10 A.

D It maintains a constant temperature in the heater.

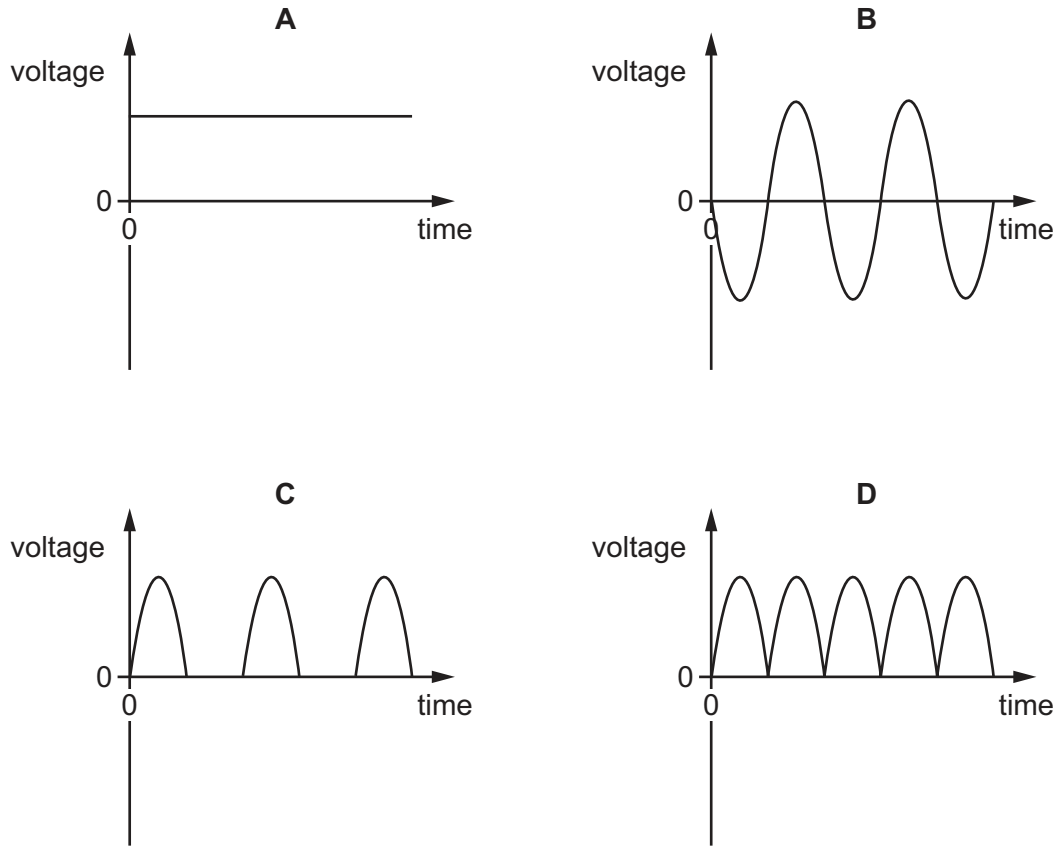
38 The diagram shows a wire carrying an electric current in the direction shown (towards the bottom of the page). The wire is at right angles to a magnetic field that is directed into the page.

A force acts on the wire because of the current and the magnetic field.

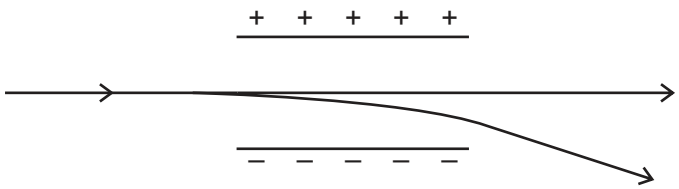
In which labelled direction does this force act?



39 Which voltage–time graph shows the output voltage of a simple a.c. generator?



40 A beam of different types of ionising radiation passes through an electric field between two metal plates. The diagram shows the direction of each type of radiation as it passes through the field.



What does the beam contain?

A alpha (α)-particles, beta (β)-particles and gamma (γ)-rays

B alpha (α)-particles and beta (β)-particles only

C alpha (α)-particles and gamma (γ)-rays only

D beta (β)-particles and gamma (γ)-rays only

BLANK PAGE

BLANK PAGE

BLANK PAGE

The Periodic Table of Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 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.).