MINISTRY OF EDUCATION, SINGAPORE
in collaboration with
CAMBRIDGE ASSESSMENT INTERNATIONAL EDUCATION
General Certificate of Education Ordinary Level

SCIENCE (PHYSICS, CHEMISTRY) 5086/01

Paper 1 Multiple Choice **For examination from 2024**

SPECIMEN PAPER

1 hour

Additional Materials: Multiple Choice Answer Sheet

0123456789

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and index number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE ON ANY BARCODES.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.

A copy of the Data Sheet is printed on page 17.
A copy of the Periodic Table is printed on page 18.

The use of an approved scientific calculator is expected, where appropriate.

Singapore Examinations and Assessment Board

Cambridge Assessment International Education

[Turn over

1 A student uses a stopwatch to time a runner running around a circular track. The runner runs two laps (twice around the track).

The diagrams show the readings on the stopwatch when the runner starts running, at the end of the first lap, and at the end of the second lap.

reading when runner starts

reading at end of first lap

reading at end of second lap

What is the time taken for the runner to run the second lap?

A 0 min 50 s **B** 1 min 10 s **C** 1 min 13 s **D** 2 min 03 s

2 A student measures the velocity of a trolley travelling in a straight line. At one instant, the velocity of the trolley is 1.0 m/s and 2.0 s later the velocity is 4.0 m/s.

What is the acceleration of the trolley?

A 1.5 m/s^2 **B** 2.0 m/s^2 **C** 2.5 m/s^2 **D** 5.0 m/s^2

3 A passenger is sitting in an aeroplane which takes off and climbs to 10 000 m in a certain time.

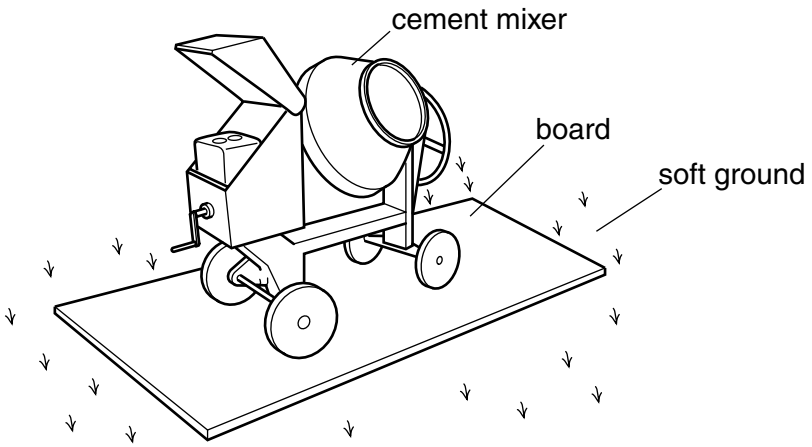
During this time what happens to the mass and to the weight of the passenger?

	mass	weight
A	decreases	decreases
B	increases	increases
C	unchanged	decreases
D	unchanged	increases

4 What are the conditions for equilibrium?

	resultant force acting	resultant turning effect acting
A	no	no
B	no	yes
C	yes	no
D	yes	yes

5 To prevent a cement mixer sinking into soft ground, the mixer is placed on a large flat board.



Why does this prevent the mixer sinking?

A The large area decreases the pressure on the ground.

B The large area increases the pressure on the ground.

C The large area decreases the weight on the ground.

D The large area increases the weight on the ground.

6 A bungee jumper has jumped from a bridge and falls with increasing speed before the cord begins to extend.

What is the principal energy transfer taking place during this period?

A kinetic store to gravitational potential store

B kinetic store to internal store

C gravitational potential store to kinetic store

D gravitational potential store to internal store

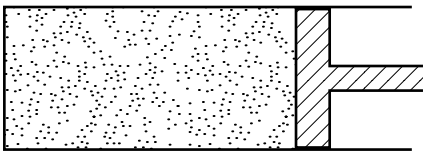
7 A man weighs 600 N. He runs up a staircase of total height 4.0 m in 3.0 s.

How much power is needed to do this?

A 450 W **B** 800 W **C** 2400 W **D** 7200 W

8 A quantity of gas is trapped in a container by a frictionless piston.

The temperature of the gas is raised.



Which statement is correct?

A The gas expands.

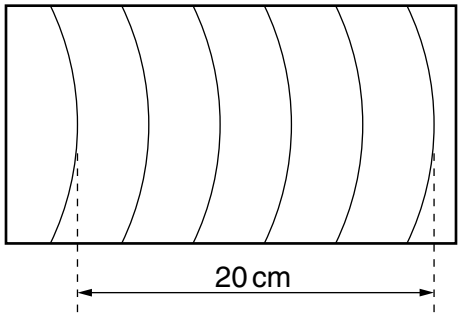
B The molecules get larger.

C The piston remains in the same place.

D The speed of the molecules decreases.

9 The dipper in a ripple tank vibrates at a frequency of 4.0 Hz and the resulting wave pattern is photographed.

The distance between the two crests shown is 20 cm.



What is the speed of the wave?

A 4.0 cm / s **B** 5.0 cm / s **C** 16 cm / s **D** 20 cm / s

10 Which group contains only transverse waves?

A infrared waves, light waves, sound waves

B infrared waves, light waves, ultraviolet waves

C infrared waves, ultraviolet waves, sound waves

D light waves, sound waves, ultraviolet waves

11 A radio wave has a wavelength of 1500 m and travels with a speed of 3.0×10^8 m/s.

What is the radio wave's frequency?

A 5.0×10^2 Hz

B 4.5×10^3 Hz

C 2.0×10^5 Hz

D 2.0×10^6 Hz

12 A hospital needs to sterilise medical equipment.

Which electromagnetic waves could be used?

A infrared

B microwaves

C radio waves

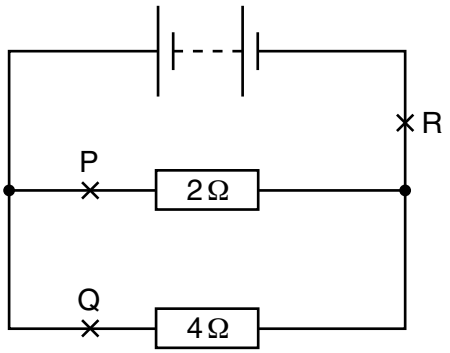
D ultraviolet

13 The current in an electric heater is 10 A. It is switched on for 5 minutes.

How much charge flows through the heater?

A 0.5 C **B** 2 C **C** 50 C **D** 3000 C

14 A circuit contains two resistors connected in parallel with a battery.



Which of the following statements about the currents at P, Q and R is correct?

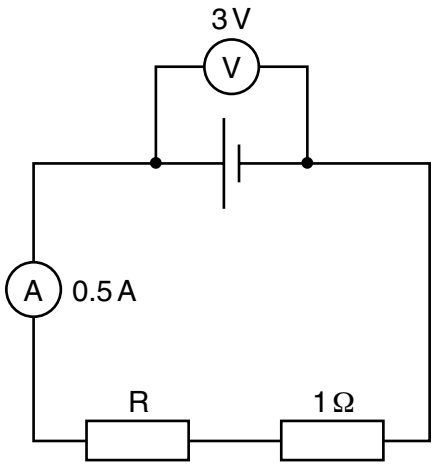
A The current at P is the greatest.

B The current at Q is the greatest.

C The current at R is the greatest.

D The current is the same at points P, Q and R.

15 The diagram shows a circuit.



The ammeter has negligible resistance.

What is the resistance of the resistor R?

A 0.5 Ω **B** 1.5 Ω **C** 5 Ω **D** 6 Ω

16 An electric heater is rated at 3 kW. The consumer is charged 20 cents per kW h of energy transferred electrically from the mains supply.

What is the cost of using the heater for 5 hours?

A 12 cents **B** 60 cents **C** 100 cents **D** 300 cents

17 Many electrical appliances have metal cases.

To prevent the case from becoming 'live', with the possibility of an electric shock, the earth wire of the electric cable is attached to the case.

How does the earth wire prevent an electric shock?

A It allows a current to flow to earth, so that the appliance continues working.

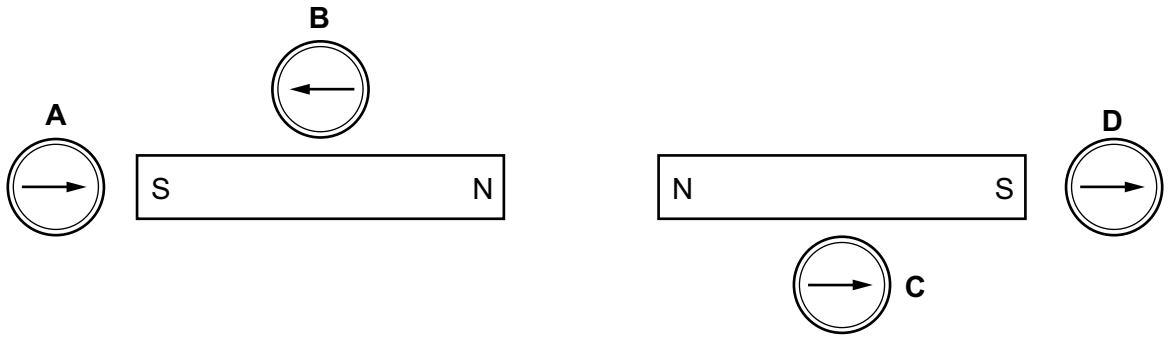
B It allows a large current to flow to earth, blowing the fuse.

C It prevents the fuse from blowing.

D It reduces the current to a safe level.

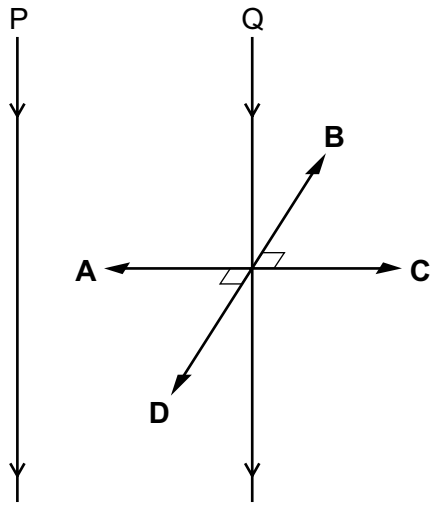
18 Four plotting compasses are placed in the magnetic field of two identical bar magnets as shown in the diagram.

Which compass is shown pointing in the **wrong** direction?



19 Two parallel vertical wires P and Q are a small distance apart in air. There is a downwards electric current in both wires. A force acts on Q owing to the current in P. This force is perpendicular to the wire Q.

What is the direction of the force on Q?



20 The half-life of the nuclide radium-225 is 15 days.
A pure sample of this nuclide has a mass of 16 g.
How long will it be before the mass of radium-225 in the sample is 2.0 g?

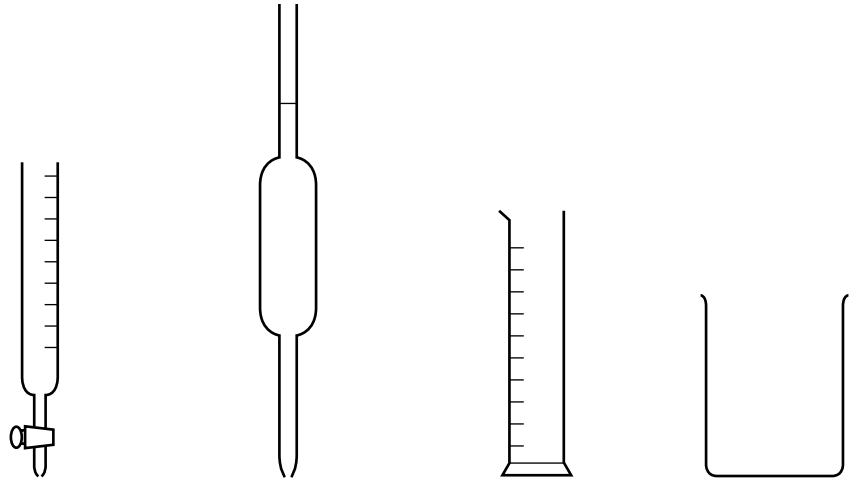
A 45 days

B 60 days

C 105 days

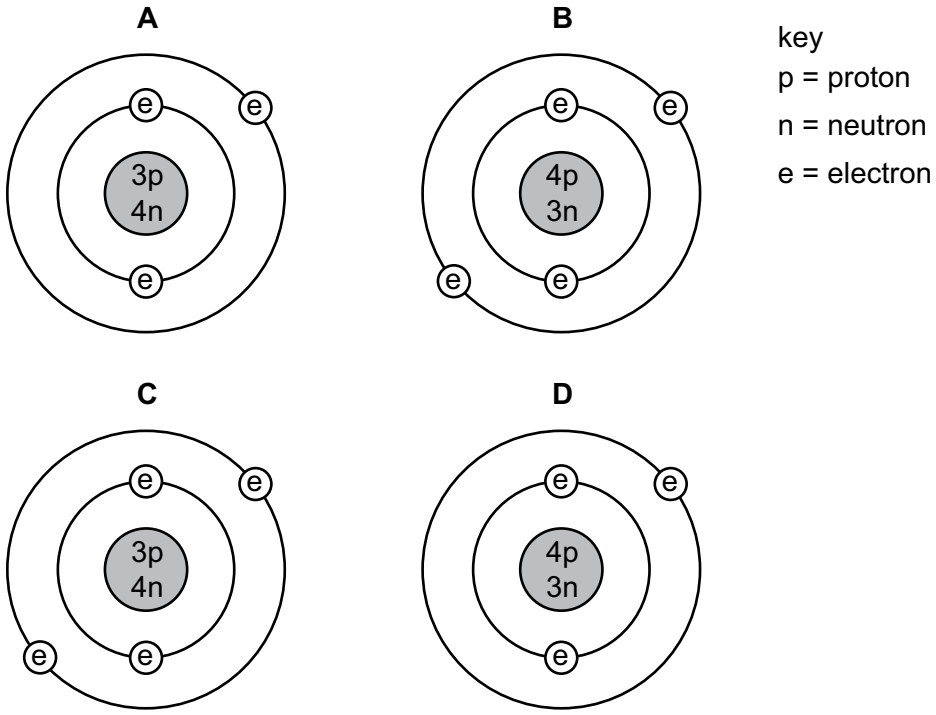
D 120 days

21 Which apparatus would be most suitable to measure accurately the volume of acid needed to neutralise 25.0 cm^3 of an alkali? The apparatus are not drawn to scale.



A **B** **C** **D**

22 Which diagram shows the structure of a $^{7}_{3}Li$ atom?

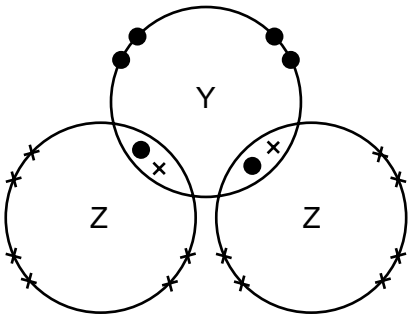


23 The elements X and Y form the compound X_2Y.

What is the electronic configuration of the atoms X and Y?

	electronic configuration	
	atom of X	atom of Y
A	2,1	2,7
B	2,2	2,7
C	2,1	2,6
D	2,2	2,6

24 The diagram shows the arrangement of electrons in a molecule of compound YZ_2.



key

● outer electron of a Y atom

× outer electron of a Z atom

What are elements Y and Z?

	Y	Z
A	calcium	chlorine
B	carbon	oxygen
C	oxygen	hydrogen
D	sulfur	chlorine

25 Brass is an alloy of copper and zinc.

Which statement is correct?

A Brass can be represented by a chemical formula.

B Brass is formed by a chemical reaction between copper and zinc.

C Brass will react completely with dilute hydrochloric acid.

D The zinc in brass will react with dilute hydrochloric acid.

26 The equation represents the reaction between dilute nitric acid and copper.

$$x\,Cu + y\,HNO_3 \rightarrow x\,Cu(NO_3)_2 + 4H_2O + 2NO$$

What are the values of x and y?

A $x = 1$, $y = 4$

B $x = 1$, $y = 8$

C $x = 3$, $y = 4$

D $x = 3$, $y = 8$

27 Calcium reacts with dilute hydrochloric acid.

$$Ca + 2HCl \rightarrow CaCl_2 + H_2$$

What volume of $1.0\,mol/dm^3$ hydrochloric acid is required to react completely with 5 g of calcium?

A $0.125\,dm^3$ **B** $0.250\,dm^3$ **C** $0.5\,dm^3$ **D** $10\,dm^3$

28 An aqueous solution of the organic compound methylamine has a pH greater than 7.

Which statement about methylamine is correct?

A It neutralises an aqueous solution of sodium hydroxide.

B It reacts with copper(II) carbonate to give carbon dioxide.

C It reacts with hydrochloric acid to form a salt.

D It turns Universal Indicator red.

29 Which pair of substances reacts to form a salt and water only?

A aqueous sodium chloride and silver nitrate solution

B aqueous sodium hydroxide and dilute hydrochloric acid

C aqueous sodium carbonate and dilute sulfuric acid

D zinc and dilute hydrochloric acid

30 A student adds aqueous sodium hydroxide and aqueous ammonia separately to solutions of four different metal compounds.

Which solution contains Zn^{2+} ions?

solution	add a few drops of NaOH(aq)	add excess NaOH(aq)	add a few drops of NH_3(aq)	add excess NH_3(aq)
A	ppt	ppt dissolves	ppt	ppt dissolves
B	ppt	ppt dissolves	ppt	ppt remains
C	ppt	ppt remains	no ppt	no ppt
D	no ppt	no ppt	no ppt	no ppt

31 Which reaction is **not** a redox reaction?

A $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$

B $Cu^{2+}(aq) + Zn(s) \rightarrow Cu(s) + Zn^{2+}(aq)$

C $CuO(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + H_2O(l)$

D $Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

32 Many properties of an element and its compounds can be predicted from the position of the element in the Periodic Table.

What property could **not** be predicted in this way?

A the acidic or basic nature of its oxide

B the formula of its oxide

C the number of isotopes it has

D its metallic or non-metallic properties

33 Elements X and Y are in Group 17 of the Periodic Table.

X is a liquid at room temperature. Y is a solid at room temperature.

1 Atoms of Y have more protons than atoms of X.

2 Molecules of Y have more atoms than molecules of X.

3 Y displaces X from aqueous solutions of X^- ions.

Which statements are correct?

A 1 only

B 2 only

C 3 only

D 1, 2 and 3

34 Metal M is extracted from its oxide by heating the oxide with carbon.

Iron reacts slowly with steam, and metal M reacts very slowly with steam. Sodium reacts vigorously with cold water.

What is the order of reactivity of the above metals and copper?

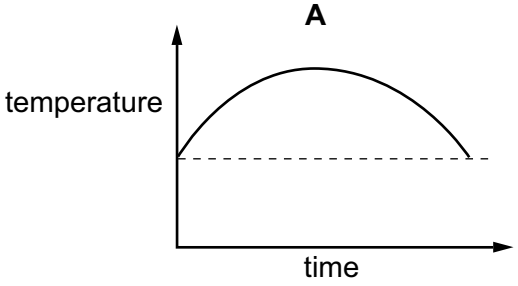
	least reactive ⟶ most reactive			
A	sodium	metal M	iron	copper
B	sodium	iron	metal M	copper
C	copper	iron	metal M	sodium
D	copper	metal M	iron	sodium

35 Ammonium nitrate dissolving in water is endothermic.

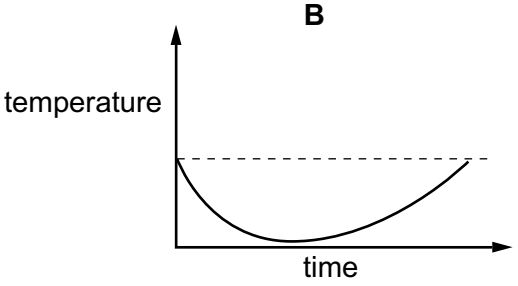
When ammonium nitrate is added to water and the solution formed is allowed to stand for several minutes, the temperature changes.

Which graph shows how the temperature changes?

A

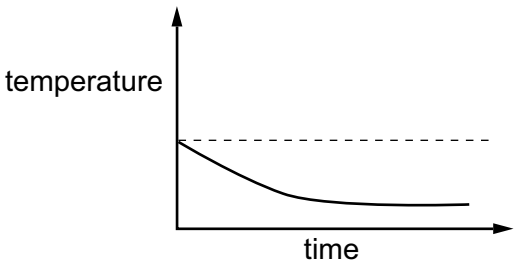


B

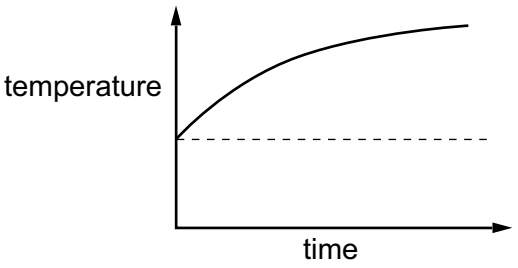


key
--- room temperature

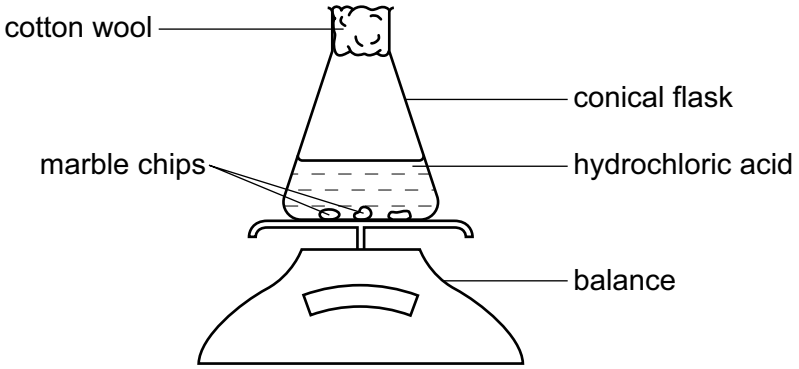
C



D



36 Two experiments are carried out using the apparatus shown.

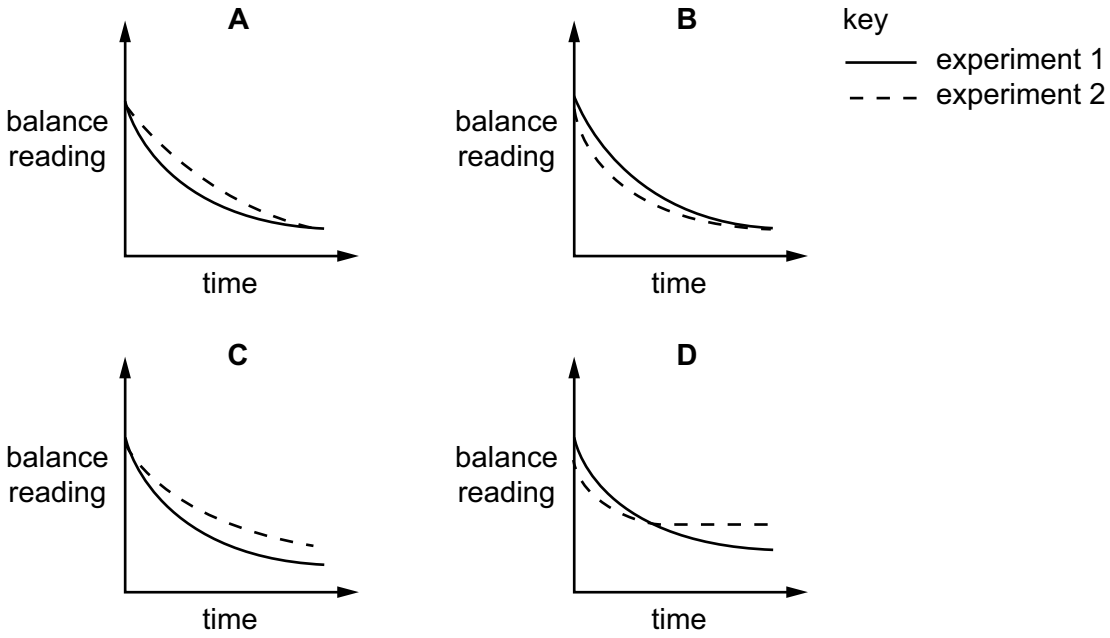


In experiment 1, dilute hydrochloric acid is used.

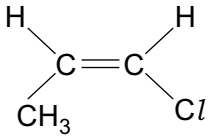
In experiment 2, concentrated hydrochloric acid is used.

In both experiments, all the marble chips react completely and all the other conditions are kept the same.

Which diagram shows the results obtained?

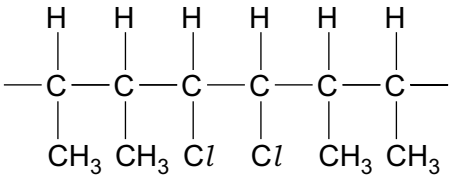


37 The structure shows a monomer.

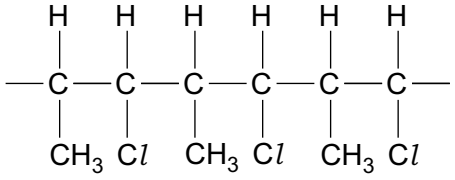


Which structure shows a part of the polymer chain formed from **three** molecules of the monomer?

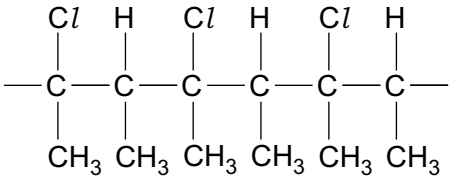
A



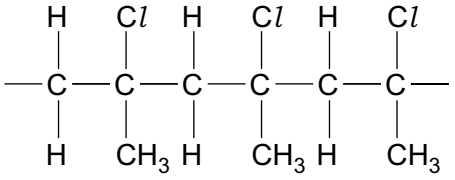
B



C



D



38 When ethanol is left standing in the air for some time, it becomes acidic.

Which equation represents this change?

A $CH_3CH_2OH + CO \rightarrow CH_3CH_2CO_2H$

B $CH_3CH_2OH + O_2 \rightarrow CH_3CO_2H + H_2O$

C $CH_3CH_2OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

D $2CH_3CH_2OH + O_2 \rightarrow 2CH_3CO_2H + 2H_2$

39 Which statements about alkanes are correct?

1 They undergo addition reactions with chlorine.

2 The viscosity increases as the relative molecular mass increases.

3 They form carbon monoxide when they burn in a limited supply of oxygen.

4 They are unsaturated hydrocarbons.

A 1 and 3

B 1 and 4

C 2 and 3

D 2 and 4

40 Which statements about air pollutants are correct?

1 Carbon monoxide is responsible for the production of ‘acid rain’.

2 Oxides of nitrogen are present in car exhausts.

3 Nitrogen dioxide forms acid rain which can corrode buildings.

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

Data Sheet

Colours of Some Common Metal Hydroxides

aluminium hydroxide	white
calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
zinc hydroxide	white

The Periodic Table of Elements

Group																	
1	2											13	14	15	16	17	18
							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	3	4	5	6	7	8	9	10	11	12	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

proton (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.).
The Avogadro constant, $L = 6.02 \times 10^{23}\ mol^{-1}$.