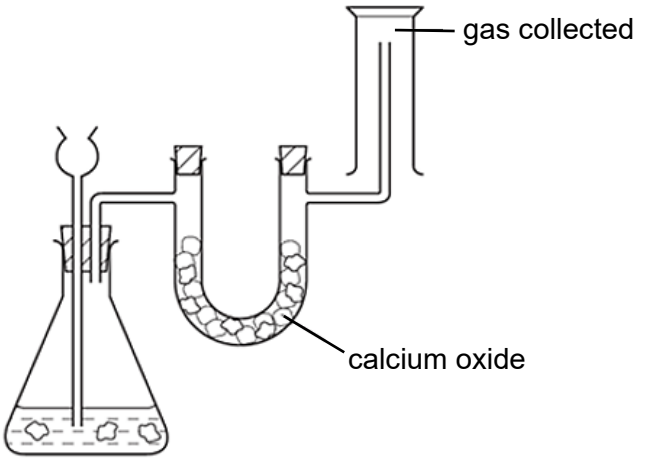
1 The diagram shows the setup for a chemical reaction which produces a gas. The gas is then dried and collected.



What could the gas be?

A carbon dioxide
B hydrogen
C oxygen
D sulfur dioxide

2 The melting and boiling points of the gases in a sample of air are shown.

gas	melting point / °C	boiling point / °C
oxygen	-219	-183
argon	-189	-186
nitrogen	-210	-196

At which temperature will the sample of air contain oxygen as the only liquid?

A -174°C
B -187°C
C -215°C
D -222°C

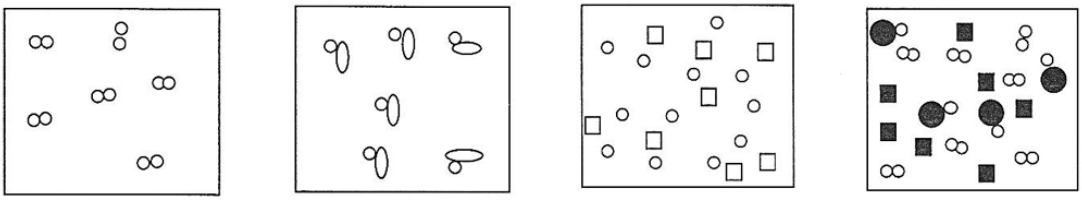
3 Which of the following pairs of substances can be separated by heating?

A ammonium chloride and iodine
B ammonium chloride and potassium iodide
C copper (II) nitrate and potassium iodide
D copper (II) nitrate and sodium chloride

Downloaded from SingaKids.com

4 The following diagrams can be used to illustrate the following.

1 a mixture of elements and compounds
2 a mixture of elements
3 molecules of an element
4 molecules of a compound



W X Y Z

What is the correct order of the diagrams?

	1	2	3	4
A	Y	Z	X	W
B	Z	Y	X	W
C	Z	Y	W	X
D	Z	X	W	Y

5 A student wrote the following statements in her test script:

statement 1: "Hydrogen chloride has a lower boiling point than calcium chloride as covalent bonds are weaker than electrostatic forces of attraction."

statement 2: "In a gaseous sample of methane, the intermolecular forces of attraction between the CH_4 molecules are weak."

statement 3: "In silicon dioxide, all valence electrons of silicon are used in the making of covalent bonds."

Which of the above statements are correct?

A statement 1 and statement 2
B statement 1 and statement 3
C statement 2 and statement 3
D statement 1, 2 and 3

Downloaded from SingaKids.com

6 The table shows the proton number and nucleon number of elements M and N.

element	proton number	nucleon number
M	13	27
N	8	16

When M and N react to form a compound, what will be the mass of one mole of the compound?

A 43
B 70
C 102
D 113

7 The relative masses and relative charges of particles V to Z are shown in Fig. 1 and Fig. 2 respectively.

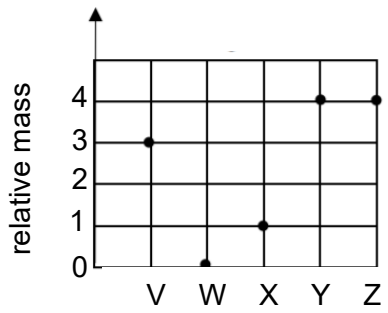


Fig. 1

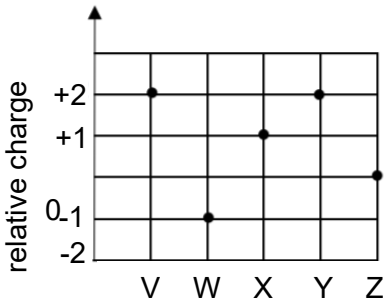


Fig. 2

Which of the following statements are correct?

1 W represents an electron.
2 X represents a hydrogen ion.
3 Z represents the nucleus of a helium atom.
4 V and Y represent the nuclei of isotopes.

A 1 and 2 only
B 2 and 3 only
C 1, 2 and 4 only
D 2, 3 and 4 only

8 Which statement best explains why brass, made of copper and zinc, is suitable to make music instruments compared to pure copper?

A The zinc atoms form strong metallic bonds with copper atoms in brass.
B The zinc atoms have more valence electrons than copper atoms.
C The zinc atoms prevent layers of copper atoms from sliding over each other.
D The zinc atoms prevent the ‘sea of electrons’ from moving freely.

Downloaded from SingaKids.com

9 A 286 g sample of hydrated copper(II) sulfate contains 126 g of water of crystallisation.

What is the correct formula of this compound?

A $CuSO_4 \bullet 3H_2O$
B $CuSO_4 \bullet 5H_2O$
C $CuSO_4 \bullet 7H_2O$
D $CuSO_4 \bullet 9H_2O$

10 Aqueous sodium hydroxide reacts with a certain metal chloride, MCl_n solution according to the equation given.

$$MCl_n + nNaOH \rightarrow M(OH)_n + nNaCl$$

10.0 cm^3 of 3.00 mol/dm^3 NaOH solution were found to react with 10.0 cm^3 of 1.50 mol/dm^3 MCl_n solution.

What is the formula of the metal chloride?

A MCl
B MCl_2
C MCl_3
D MCl_4

11 Sulfur dioxide can react with oxygen to form sulfur trioxide as shown.

$$2SO_2\,(g) + O_2\,(g) \rightarrow 2SO_3\,(g)$$

If 200 cm^3 of sulfur dioxide is reacted with 200 cm^3 of oxygen, what is the volume of gases remaining after the reaction?

A 100 cm^3
B 200 cm^3
C 300 cm^3
D 400 cm^3

12 An aqueous solution has a pH of 14.

What does this imply about the concentration of ions present in the solution?

	concentration of OH^- ions	concentration of H^+ ions
A	high	low
B	high	none
C	low	high
D	low	none

Downloaded from SingaKids.com

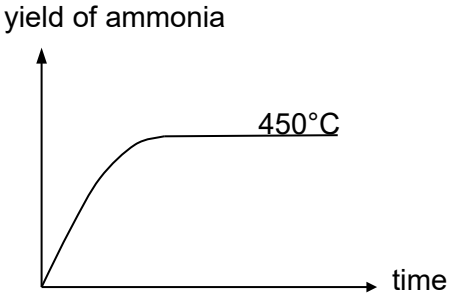
13 Which of the following equations suggests that the underlined oxide has amphoteric properties?

A $\underline{Ga_2O_3}$ + 2NaOH → $2NaGaO_2$ + H_2O
B $\underline{Li_2O}$ + H_2O → 2LiOH
C $\underline{CuO}$ + 2HC*l* → $CuCl_2$ + H_2O
D $\underline{Cl_2O}$ + 2NaOH → 2NaC*l*O + H_2O

14 Which of the following salts can be prepared using the same method?

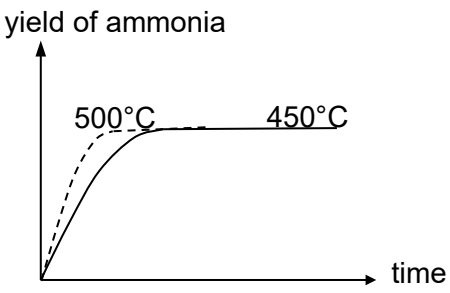
A calcium sulfate, zinc chloride,
B copper(II) sulfate, silver nitrate
C potassium nitrate, magnesium nitrate
D potassium iodide, silver iodide

15 The graph shows the optimal yield of ammonia at 450°C and 250 atm.

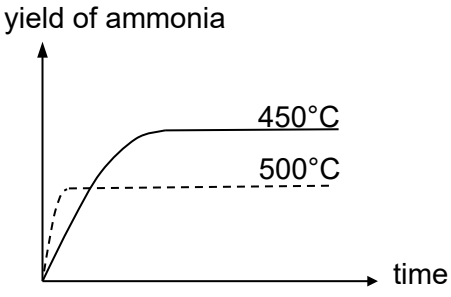


Which of the following graphs shows a correct comparison of the yield of ammonia produced at temperature of 500°C and 250 atm?

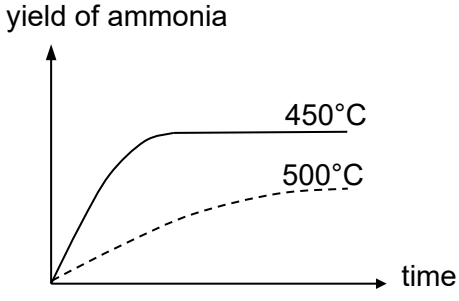
A



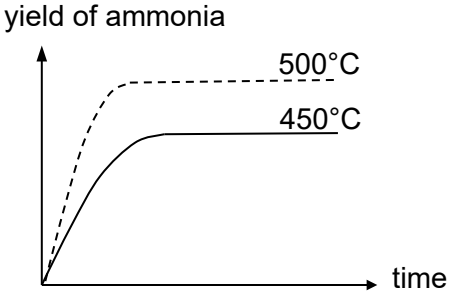
B



C



D



Downloaded from SingaKids.com

16 Several tests are performed on an unlabelled bottle containing an aqueous sample.

Which of the following results is likely to correspond to iron(II) chloride?

	test 1: add dilute nitric acid, then aqueous silver nitrate	test 2: add dilute nitric acid, then aqueous barium nitrate	test 3: add aqueous sodium hydroxide dropwise, then add in excess
A	no visible reaction	white precipitate formed	green precipitate formed, does not dissolve in excess sodium hydroxide
B	no visible reaction	white precipitate formed	reddish-brown precipitate formed, does not dissolve in excess sodium hydroxide
C	white precipitate formed	no visible reaction	green precipitate formed, does not dissolve in excess sodium hydroxide
D	white precipitate formed	no visible reaction	reddish-brown precipitate formed, does not dissolve in excess sodium hydroxide

17 Disproportionation is a reaction in which the same element is both oxidised and reduced.

Which reaction is **not** an example of disproportionation?

A $Cl_2 + 2NaOH \rightarrow NaCl + NaOCl + H_2O$
B $2CuCl \rightarrow CuCl_2 + Cu$
C $2H_2O_2 \rightarrow 2H_2O + O_2$
D $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2$

18 In an electrolysis experiment, the same amount of charge deposited 19.2 g of copper and 9 g of scandium. The charge on the copper ion is +2.
[A_r: Sc, 45; Cu, 64]

What was the charge on the scandium ion?

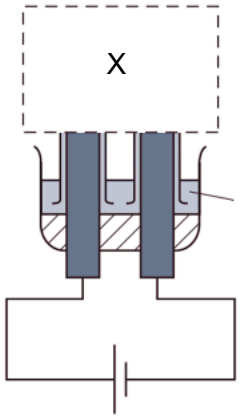
A +1
B +2
C +3
D +4

Downloaded from SingaKids.com

19 Which property is **not** typical of transition metals?

A They exhibit variable oxidation states.
B They form coloured compounds.
C They have high melting points
D They have low densities.

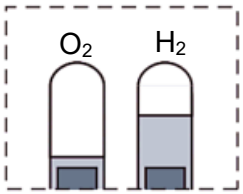
20 The electrolysis set-up shown is incomplete.



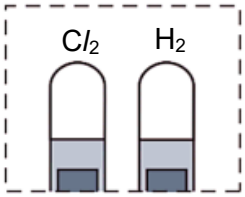
concentrated hydrochloric acid

What should be shown at X when the solution has been electrolysed for some time?

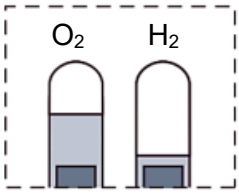
A



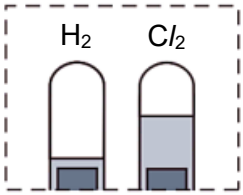
B



C



D



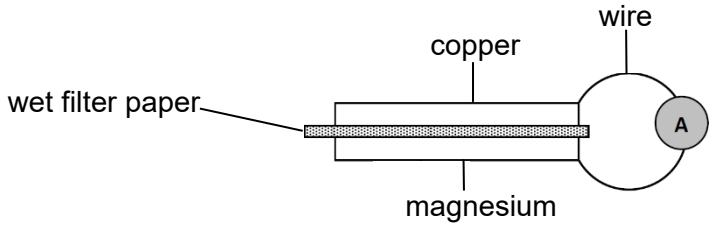
21 Lithium and rubidium are both in Group 1 of the Periodic Table.

Which statement is correct?

A Lithium atoms and rubidium atoms have the same number of electrons in their outer shell.
B Lithium atoms and rubidium ions have the same number of electrons in their outer shell.
C Lithium atoms are larger than rubidium atoms.
D Rubidium ions are larger than rubidium atoms.

Downloaded from SingaKids.com

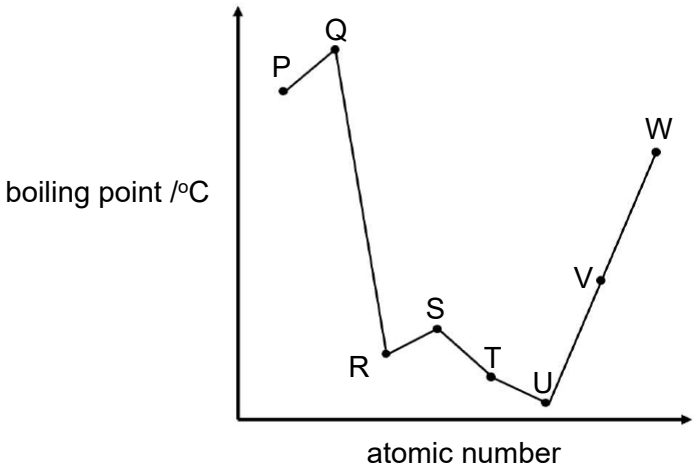
22 In the following setup, magnesium and copper strips are pressed against a piece of wet filter paper soaked in dilute sulfuric acid and current can be detected by an ammeter.



Which of the following statement is correct?

A Copper strip decreases in size.
B Electrons flow from copper to magnesium through the external wire.
C Magnesium strip is coated with a pink substance.
D Oxidation occurs on the magnesium strip.

23 The graph shows the variation in boiling points for eight consecutive elements in Periods 3 and 4 of the Periodic Table with atomic numbers less than or equal to 20.



What can be deduced from the above?

A Element P is a Group 1 element.
B Element S has a metallic lattice structure.
C Element U exists as diatomic molecules.
D Element V is a strong reducing agent.

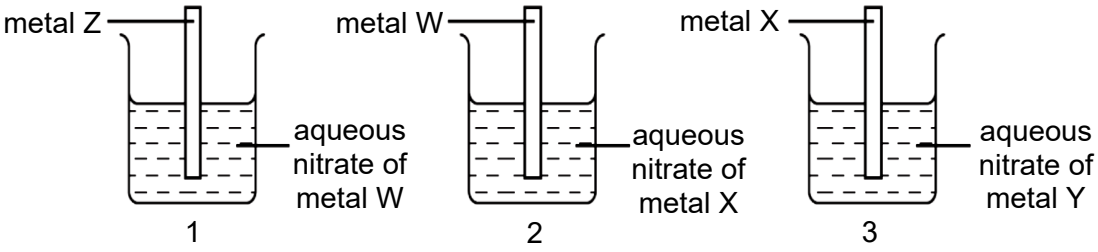
24 Magnesium blocks are attached to iron pipes to prevent them from rusting.

Which statement best explains how magnesium stop the iron from rusting?

A Magnesium forms a compound with iron.
B Magnesium reacts in preference to iron.
C Magnesium reacts to form a protective coating of magnesium oxide to the iron.
D Magnesium stops oxygen in the water from getting to the iron.

Downloaded from SingaKids.com

25 Three different reactions were set up as shown.



In beaker 1 metal W is displaced from solution.

In beaker 2 metal X is displaced from solution.

In beaker 3 metal Y is displaced from solution.

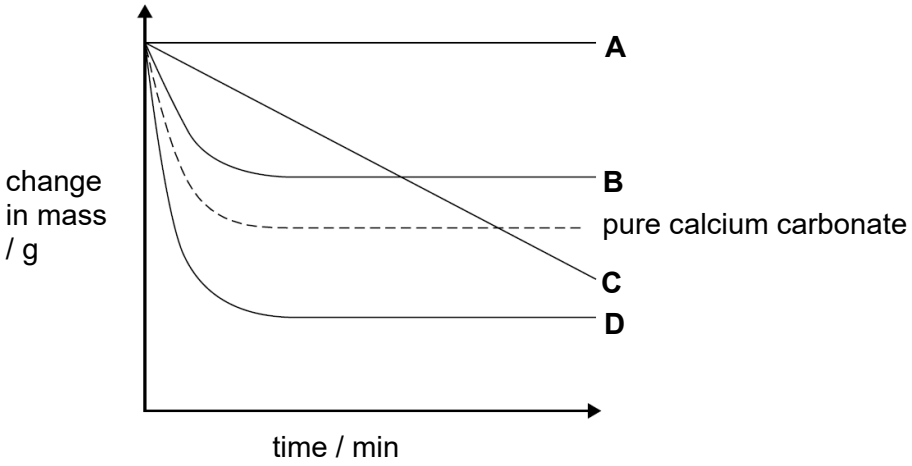
What is the order of reactivity of these four metals?

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

26 Limestone usually contains impurities.

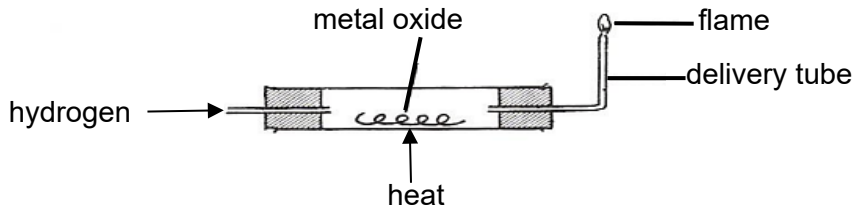
The diagram shows the change in mass when pure calcium carbonate is heated.

Which graph, **A**, **B**, **C** or **D**, shows a sample of limestone, of the same mass, containing impurities that are thermally stable to decomposition?



Downloaded from SingaKids.com

27 The reaction of a metal oxide with hydrogen is shown.



Which of the following is correct?

	metal oxide	mass of metal oxide after heating
A	copper(II) oxide	increases
B	lead(II) oxide	decreases
C	magnesium oxide	increases
D	zinc oxide	decreases

28 Hydrogen and chlorine react together to form hydrogen chloride

$$H_2\,(g) + Cl_2\,(g) \rightarrow 2HCl\,(g) \qquad \Delta H = -92\ kJ/mol$$

The average bond energies of two of the bonds involved are shown in the table.

bond	H–H	Cl–Cl
bond energy / kJ/mol	436	244

What is the bond energy of a H-Cl bond?

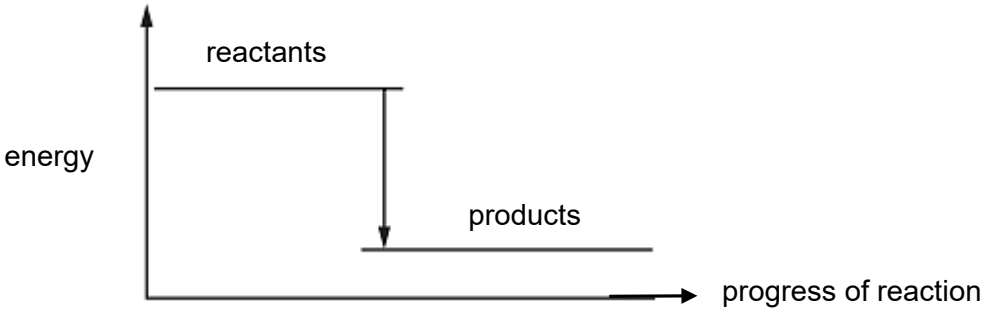
A 294 kJ/mol
B 386 kJ/mol
C 588 kJ/mol
D 772 kJ/mol

29 Which change will increase the speed of the reaction between 1 mol of two reacting gases?

A a decrease in temperature
B a decrease in the volume of the reaction flask
C a decrease in surface area of the catalyst
D an increase in the volume of the reaction flask

Downloaded from SingaKids.com

30 A diagram for the energy change during a chemical reaction is shown.



For which reaction(s) would this be an appropriate diagram?

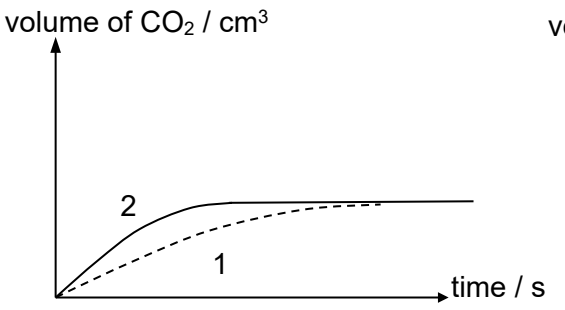
1 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
2 $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
3 $2C + O_2 \rightarrow 2CO$

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

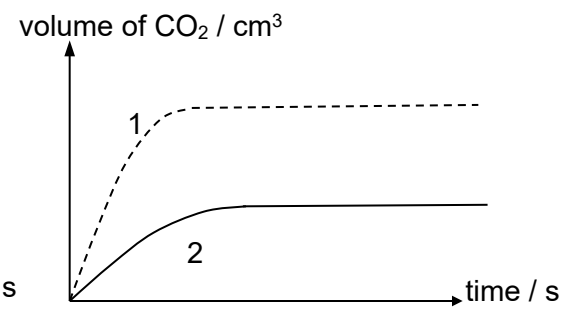
31 In two separate experiments, the reaction of calcium carbonate with an excess of dilute hydrochloric acid was investigated. The calcium carbonate used in Experiment 1 was more finely divided than that used in Experiment 2.

Assuming all other conditions were identical in both experiments, which of the following graphs best illustrates the results?

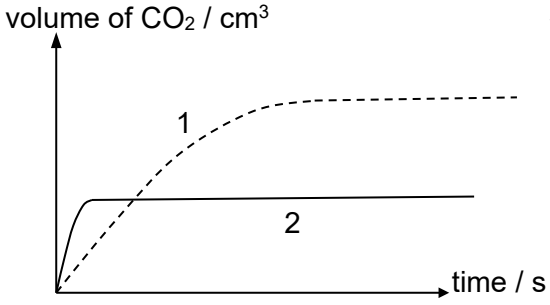
A



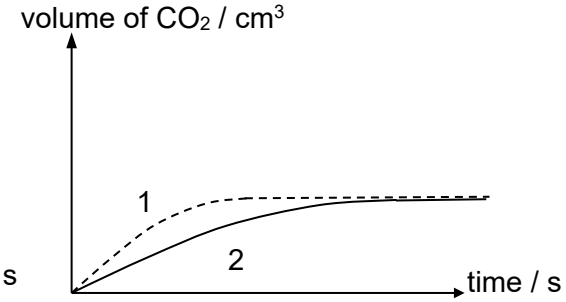
B



C

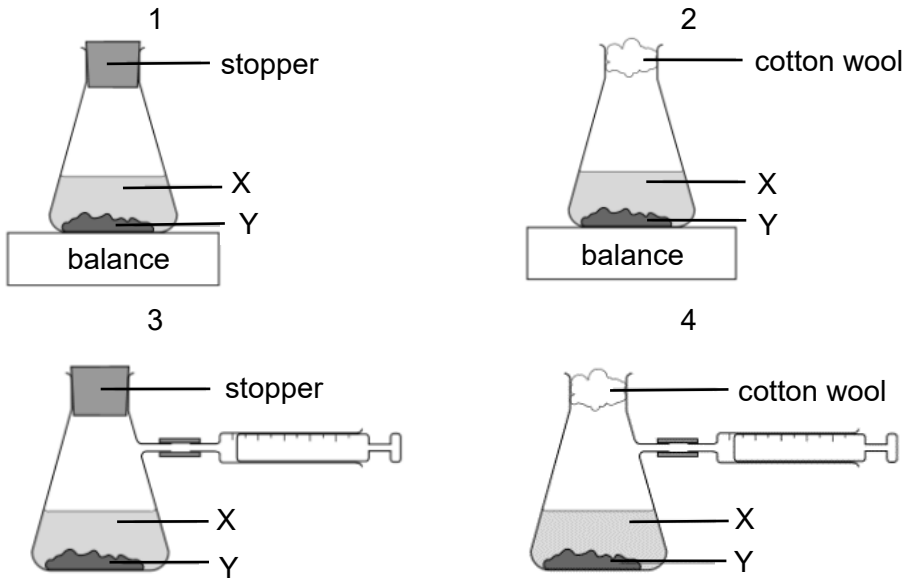


D



Downloaded from SingaKids.com

32 Solution X reacts with solid Y to form a gas.



Which two diagrams show suitable methods for investigating the speed of reaction?

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

33 The table shows the boiling points of four fractions, P, Q, R and S, obtained when crude oil is distilled.

fraction	P	Q	R	S
boiling range / °C	35-75	80-145	150-250	greater than 250

How is fraction P different from S?

A Fraction P is collected at the bottom while fraction S is collected at the top.
B Fraction P is larger in molecular masses than fraction S.
C Fraction P is more flammable than fraction S.
D Fraction P is more viscous than fraction S.

34 What will propanol, C_3H_7OH, form on complete oxidation?

A CH_3CO_2H
B $C_2H_5CO_2H$
C $C_3H_7CO_2H$
D $C_4H_9CO_2H$

Downloaded from SingaKids.com

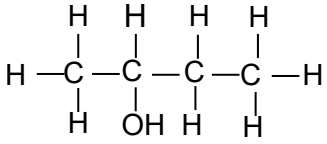
35 The compound, C_6H_{12} undergoes the following process.

$$C_6H_{12} \xrightarrow{\text{process X}} \text{ethene + compound Y}$$

Which row in the table correctly identifies process X and compound Y?

	process X	compound Y
A	cracking	butane
B	cracking	butene
C	distillation	butane
D	distillation	butene

36 How many isomers are there for butan-2-ol?



A 1
B 2
C 3
D 4

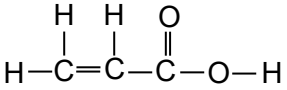
37 An ester with molecular formula $C_6H_{12}O_2$ undergoes hydrolysis to form an alcohol G and an acid H. Alcohol G can be oxidised to acid H by warming with acidified potassium manganate(VII).

Which of the following is the formula of the ester?

A $CH_3COOC_4H_9$
B $C_2H_5COOC_3H_7$
C $C_3H_7COOC_2H_5$
D $HCOOC_5H_{11}$

Downloaded from SingaKids.com

38 A compound has the following structure.

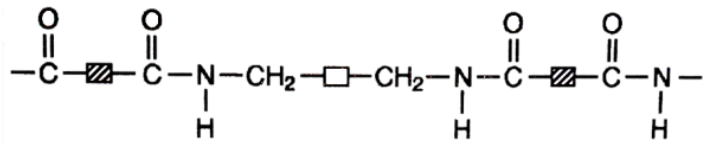


Which reaction(s) will occur with this compound?

1 It will react with aqueous bromine under room temperature.
2 It will react with an alcohol to form an ester.
3 It will react with sodium metal.

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

39 The diagram shows part of the molecule of polymer Q.



Which row correctly describes the monomer of Q and how the polymer is formed?

	functional groups present in the monomer	polymer formed by
A	alkene and amine	addition polymerisation
B	alkene and amine	condensation polymerisation
C	carboxylic acid and amine	addition polymerisation
D	carboxylic acid and amine	condensation polymerisation

40 Which row in the table shows the correct atmospheric pollutant and its possible effects?

	pollutant	effect
A	CFCs	layer forms photochemical smog
B	CO_2	is poisonous to humans
C	CO	cause depletion of the ozone
D	NO_2	forms acid rain

Downloaded from SingaKids.com

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											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 x 10^{23} mol^{-1}

Downloaded from SingaKids.com