# IGCSE CHEMISTRY EXAM

# Q118

Oxygen and fluorine are gaseous elements next to each other in the Periodic Table.

Under the same conditions of temperature and pressure, oxygen diffuses .....1..... than fluorine because its .....2..... is less than that of fluorine.

Which words correctly complete gaps 1 and 2?

| | 1 | 2 |
|---|---|---|
| **A** | faster | molecular mass |
| **B** | faster | reactivity |
| **C** | slower | molecular mass |
| **D** | slower | reactivity |

# Q418

Two naturally occurring isotopes of oxygen are $^{16}O$ and $^{17}O$.

Which statement is correct?

**A** Both isotopes react with iron to form rust.

**B** Neither isotope reacts with iron to form rust.

**C** Only $^{16}O$ reacts with iron to form rust.

**D** Only $^{17}O$ reacts with iron to form rust.

# Q818

The equation for the reaction between calcium carbonate and dilute nitric acid is shown.

$$CaCO_3(s) + 2HNO_3(aq) \rightarrow Ca(NO_3)_2(aq) + CO_2(g) + H_2O(l)$$

25 g of calcium carbonate is reacted with an excess of dilute nitric acid.

Which mass of calcium nitrate and which volume of carbon dioxide is produced at room temperature and pressure?

| | mass of calcium nitrate / g | volume of carbon dioxide / $dm^3$ |
|---|---|---|
| **A** | 29 | 6 |
| **B** | 29 | 12 |
| **C** | 41 | 6 |
| **D** | 41 | 12 |

# Q918

The formulae of some ions are shown.

| positive ion | negative ion |
|---|---|
| $Ti^{4+}$ | $PO_4^{3-}$ |
| $Al^{3+}$ | $SO_4^{2-}$ |
| $Mg^{2+}$ | $NO_3^-$ |
| $K^+$ | $Cl^-$ |

Which formula is **not** correct?

**A** $Al_3(SO_4)_2$ **B** $K_3PO_4$ **C** $Mg(NO_3)_2$ **D** $TiCl_4$

# Q1218

Hydrogen peroxide, H–O–O–H, decomposes to form water and oxygen.

$$2H_2O_2(g) \rightarrow 2H_2O(g) + O_2(g)$$

The bond energies are shown in the table. The reaction is exothermic.

| bond | bond energy in kJ / mol |
|---|---|
| O–H | +460 |
| O–O | +150 |
| O=O | +496 |

What is the energy change for the reaction?

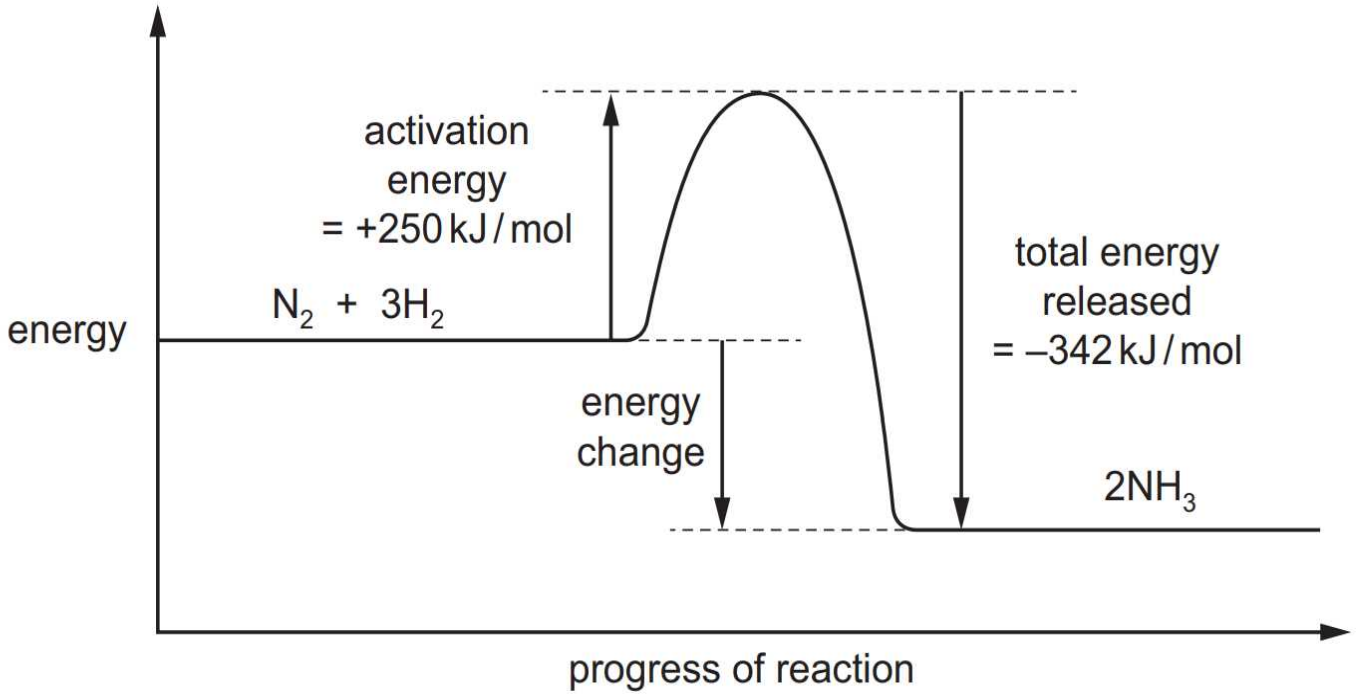
**A** –346 kJ / mol **B** –196 kJ / mol **C** +196 kJ / mol **D** +346 kJ / mol

Q1318

The equation for the formation of ammonia is shown.

$$N_2 + 3H_2 \rightarrow 2NH_3$$

The energy level diagram for the reaction is shown.




What is the energy change for the reaction?

**A** –592 kJ / mol

**B** –92 kJ / mol

**C** +92 kJ / mol

**D** +592 kJ / mol

# Q1618

The thermite reaction can be used to produce iron from iron(III) oxide.

The equation for the reaction is shown.

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

Which statements about this reaction are correct?

1 Aluminium is the oxidising agent.

2 Aluminium is less reactive than iron.

3 Electrons are transferred from aluminium to iron.

4 The iron in the iron(III) oxide is reduced.

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

# Q2118

Elements in Group I of the Periodic Table react with water.

Which row describes the products made in the reaction and the trend in reactivity of the elements?

| | products | trend in reactivity |
|---|---|---|
| **A** | metal hydroxide and hydrogen | less reactive down the group |
| **B** | metal hydroxide and hydrogen | more reactive down the group |
| **C** | metal oxide and hydrogen | less reactive down the group |
| **D** | metal oxide and hydrogen | more reactive down the group |

# Q3718

Ethanol can be formed by:

1 fermentation

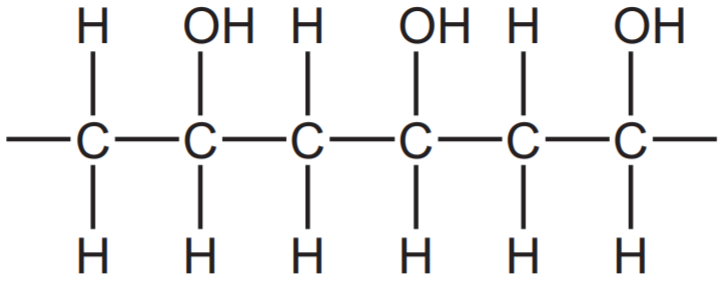
2 reaction between steam and ethene.

Which of these processes use a catalyst?

| | 1 | 2 |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

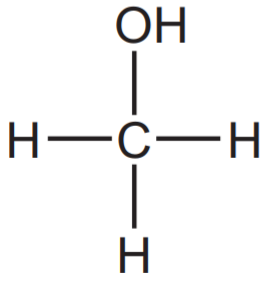
# Q4018

The structure of an addition polymer is shown.

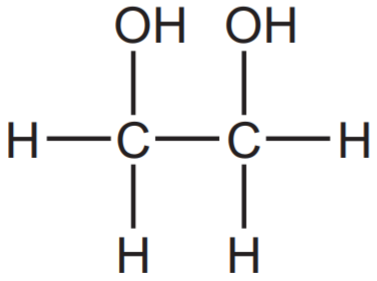


Which monomer is used to make this polymer?

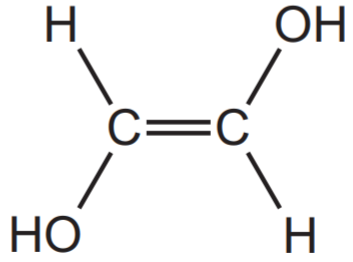
**A**



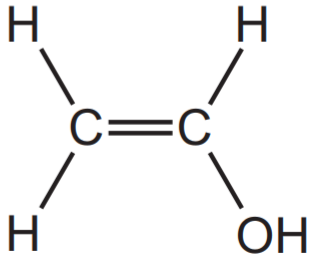
**B**



**C**



**D**



# Q219

A student is asked to measure the time taken for 0.4 g of magnesium carbonate to react completely with 25.0 $cm^3$ of dilute hydrochloric acid.

Which pieces of apparatus does the student need?

**A** balance, stop-clock, pipette

**B** balance, stop-clock, thermometer

**C** balance, pipette, thermometer

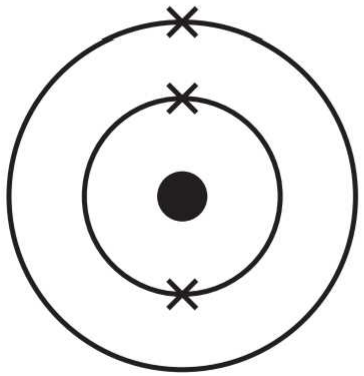
**D** stop-clock, pipette, thermometer

# Q619

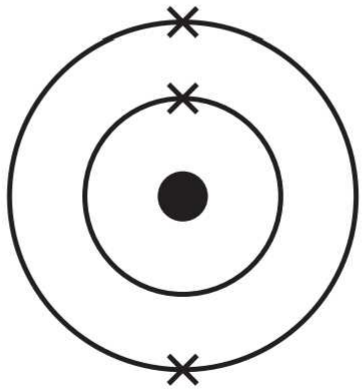
An isotope of lithium has the symbol $^{7}_{3}\mathrm{Li}$ .

What is the arrangement of electrons in one atom of this isotope of lithium?

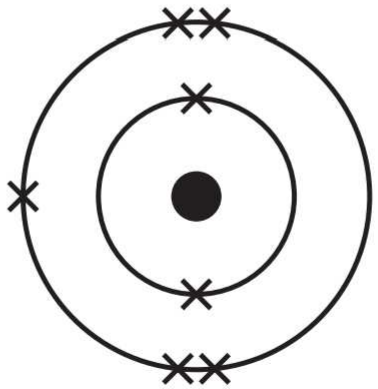
**A**



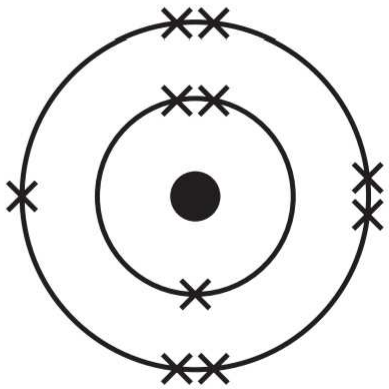
**B**



**C**

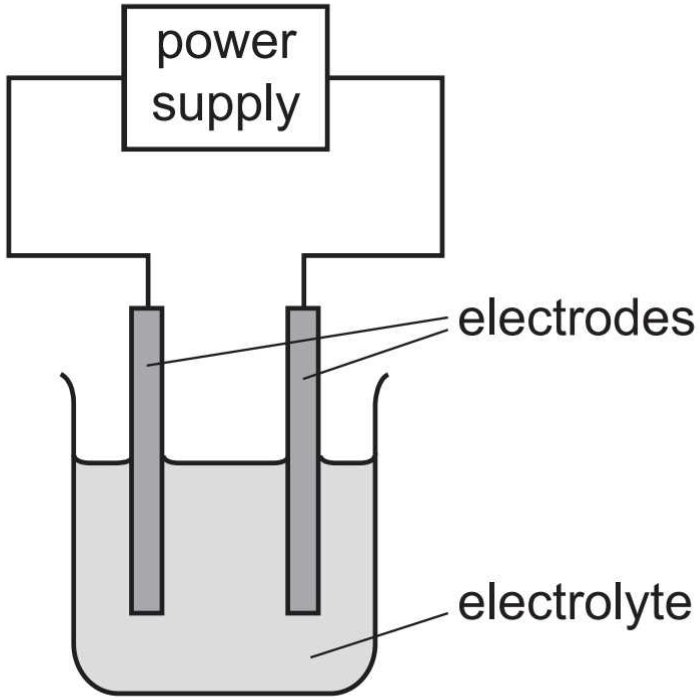


**D**



Q1019

The apparatus used for electrolysis is shown.




Which statement is correct?

**A** Copper forms at the anode in some electrolysis reactions.

**B** Hydrogen forms at the cathode in some electrolysis reactions.

**C** Oxygen forms at the cathode in some electrolysis reactions.

**D** The negative electrode is called the anode.

# Q1719

A sample of X is heated with aqueous sodium hydroxide and small pieces of aluminium.

A gas is produced which turns red litmus paper blue.

Aqueous sodium hydroxide solution is added to a second sample of X. A pale green precipitate is observed.

What is X?

**A** ammonium nitrate

**B** chromium(II) chloride

**C** iron(II) nitrate

**D** iron(II) sulfate

# Q2019

Which statements describe changes that occur from left to right across a period of the Periodic Table?

1 The atomic number of the elements increases.

2 The metallic character of the elements decreases.

3 The physical state of the elements changes from gas to solid.

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

# Q2719

Which row describes the uses of aluminium, copper and mild steel?

| | aluminium | copper | mild steel |
|---|---|---|---|
| **A** | aircraft bodies | electrical wiring | car bodies |
| **B** | car bodies | cooking utensils | electrical wiring |
| **C** | electrical wiring | aircraft bodies | food containers |
| **D** | food containers | aircraft bodies | cooking utensils |

# Q2919

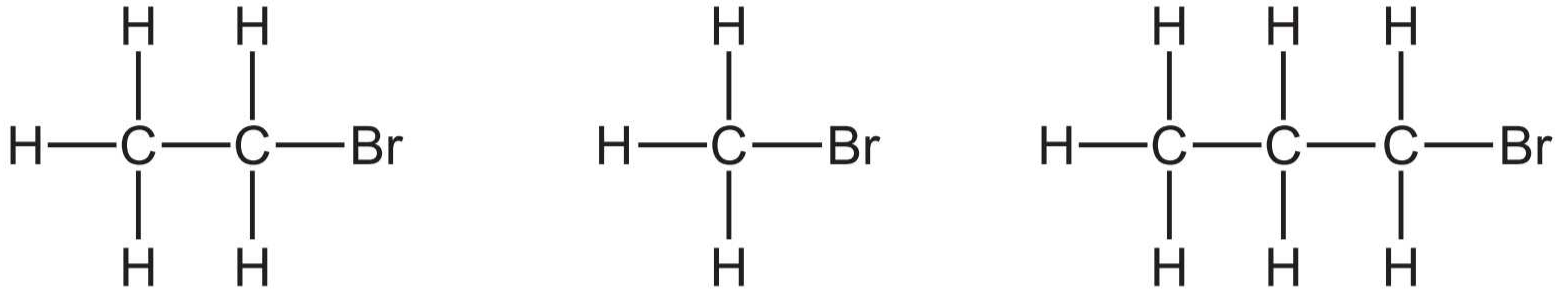
Clean, dry air contains nitrogen, oxygen and small amounts of other gases. The noble gases have been left out of the table.

Which row shows the composition of clean, dry air?

| | nitrogen / % | oxygen / % | other gases |
|---|---|---|---|
| **A** | 21 | 78 | small amount of carbon dioxide |
| **B** | 21 | 78 | small amount of carbon monoxide |
| **C** | 78 | 21 | small amount of carbon dioxide |
| **D** | 78 | 21 | small amount of carbon monoxide |

# Q3619

The structures of three compounds are shown.



Which statement explains why these three compounds have similar chemical properties?

**A** They all contain bromine, carbon and hydrogen.

**B** They all contain the same functional group.

**C** They are all carbon-based molecules.

**D** They are all saturated molecules.

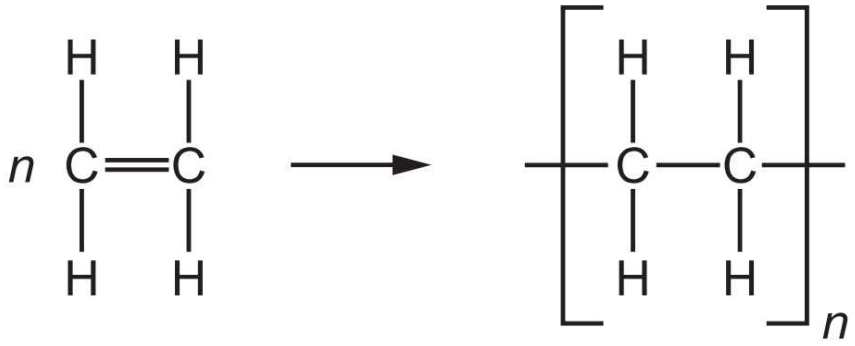
# Q3819

Which products are obtained by the cracking of an alkane?

| | alkene | hydrogen | water |
|---|---|---|---|
| **A** | ✓ | ✓ | ✓ |
| **B** | ✓ | ✓ | ✗ |
| **C** | ✓ | ✗ | ✓ |
| **D** | ✗ | ✓ | ✓ |

# Q4019

The diagram shows the structure of a monomer and of the polymer made from it.




What are the monomer and polymer?

| | monomer | polymer |
|---|---|---|
| **A** | ethane | poly(ethane) |
| **B** | ethane | poly(ethene) |
| **C** | ethene | poly(ethane) |
| **D** | ethene | poly(ethene) |

# Q120

‘The movement of a substance **very slowly** from an area of high concentration to an area of low concentration.’

Which process is being described?

**A** a liquid being frozen

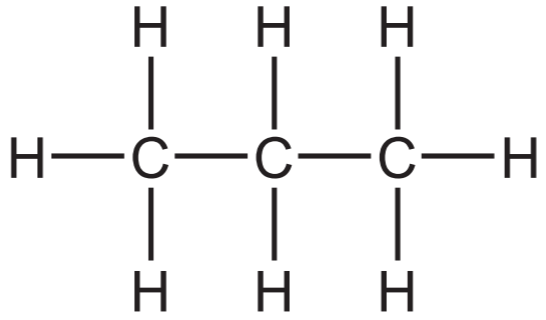
**B** a solid melting

**C** a substance diffusing through a liquid

**D** a substance diffusing through the air

# Q820

The structure of propane, $C_3H_8$, is shown.




How many electrons are involved in the bonding of propane?

**A** 8 **B** 10 **C** 16 **D** 20

# Q1920

During the manufacture of sulfuric acid, sulfur dioxide is converted to sulfur trioxide.

$$2SO_2 + O_2 \rightarrow 2SO_3$$

Which type of reaction is this?

**A** displacement

**B** neutralisation

**C** oxidation

**D** thermal decomposition

# Q2520

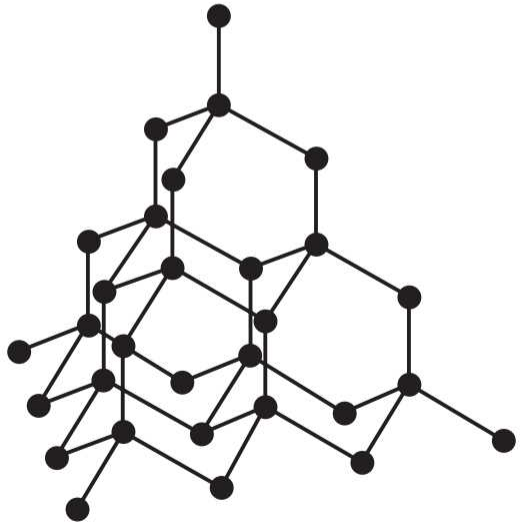
Which row about elements in the Periodic Table is correct?

| | statement 1 | statement 2 |
|---|---|---|
| **A** | two elements in the same group have similar chemical properties | metals are on the left of the table |
| **B** | two elements in the same group have similar chemical properties | metals are on the right of the table |
| **C** | two elements in the same period have similar chemical properties | metals are on the left of the table |
| **D** | two elements in the same period have similar chemical properties | metals are on the right of the table |

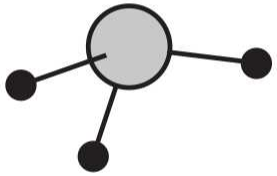
# Q2920

Which diagram best represents the structure of a substance that is a good conductor of electricity at 25 °C?

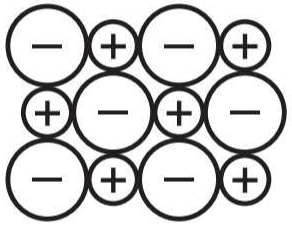
**A**



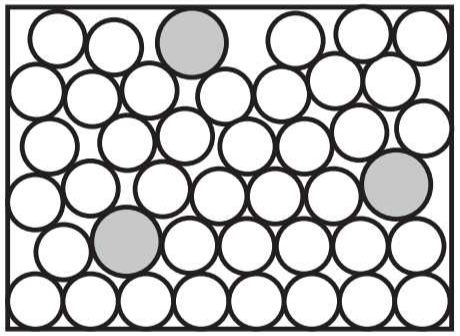
**B**



**C**

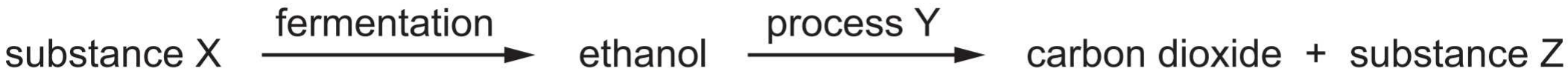



**D**



# Q3820

The flow chart shows the preparation of ethanol and some important chemistry of ethanol.




What are X, Y and Z?

| | X | Y | Z |
|---|---|---|---|
| **A** | yeast | combustion | oxygen |
| **B** | glucose | combustion | steam |
| **C** | glucose | polymerisation | water |
| **D** | yeast | fermentation | glucose |

# Q221

A student put exactly 25.00 $cm^3$ of dilute hydrochloric acid into a conical flask.

The student added 2.5 g of solid sodium carbonate and measured the change in temperature of the mixture.

Which apparatus does the student need to use?

**A** balance, measuring cylinder, thermometer

**B** balance, pipette, stopwatch

**C** balance, pipette, thermometer

**D** burette, pipette, thermometer

# Q621

Rubidium is in Group I and iodine is in Group VII of the Periodic Table.

Which row describes what happens when rubidium and iodine react together to form rubidium iodide?

| | rubidium | iodine |
|---|---|---|
| **A** | each atom gains one electron | each atom loses one electron |
| **B** | each atom loses one electron | each atom gains one electron |
| **C** | each atom loses more than one electron | each atom gains more than one electron |
| **D** | each atom neither gains nor loses an electron | each atom neither gains nor loses an electron |

# Q1021

Iron can be electroplated with zinc to make it resistant to corrosion.

Which row about electroplating iron with zinc is correct?

| | positive electrode (anode) | negative electrode (cathode) | electrolyte |
|---|---|---|---|
| **A** | iron | zinc | iron nitrate |
| **B** | iron | zinc | zinc nitrate |
| **C** | zinc | iron | iron nitrate |
| **D** | zinc | iron | zinc nitrate |

# Q1321

Solid copper(II) carbonate reacts with dilute sulfuric acid.

$$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + CO_2 + H_2O$$

The rate of the reaction can be changed by varying the conditions.

Which changes always increase the rate of this chemical reaction?

1 increasing the concentration of sulfuric acid

2 increasing the size of the pieces of copper(II) carbonate

3 increasing the temperature

4 increasing the volume of sulfuric acid

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

# Q1821

Oxide 1 is a solid that reacts with dilute hydrochloric acid.

Oxide 2 is a gas that reacts with sodium hydroxide solution.

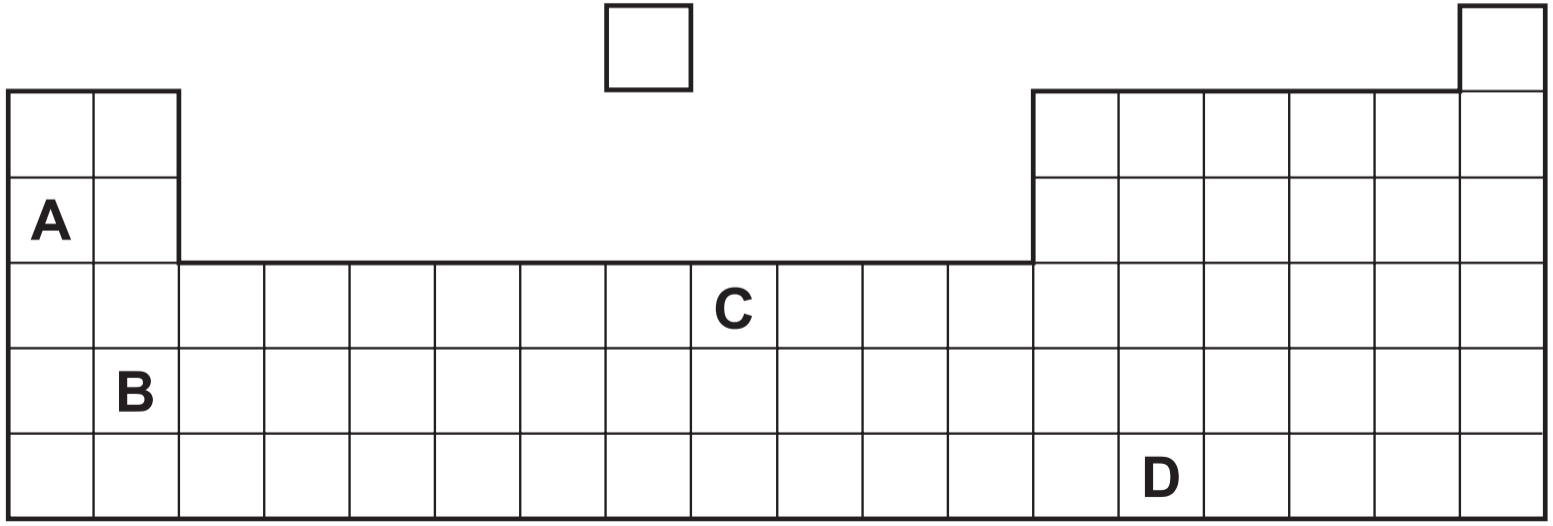
What are the formulae of the oxides?

| | oxide 1 | oxide 2 |
|---|---|---|
| **A** | CaO | MgO |
| **B** | MgO | $NO_2$ |
| **C** | $NO_2$ | $SO_2$ |
| **D** | $SO_2$ | CaO |

# Q2321

Part of the Periodic Table is shown.

Which element is a transition element?



# Q3321

A chemical equation for the complete combustion of methane is shown.

$$2CH_4 + zO_2 \rightarrow 2CO_2 + 4H_2O$$

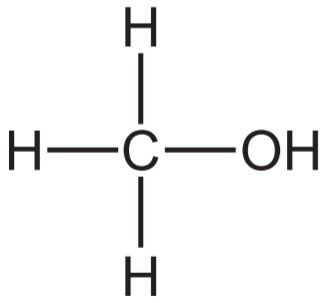
What is the value of *z*?

**A** 2 **B** 3 **C** 4 **D** 6

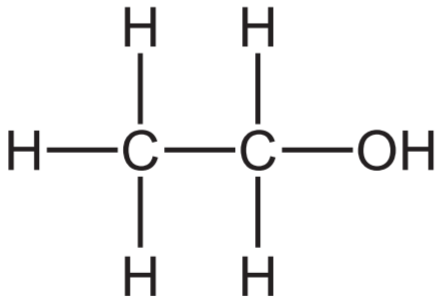
# Q3621

Which compound belongs to a different homologous series to the others?

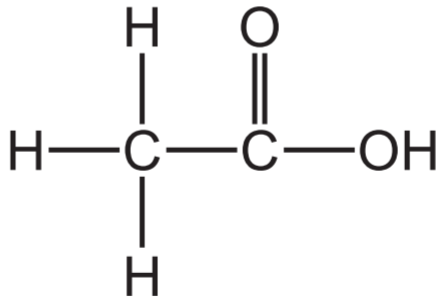
**A**



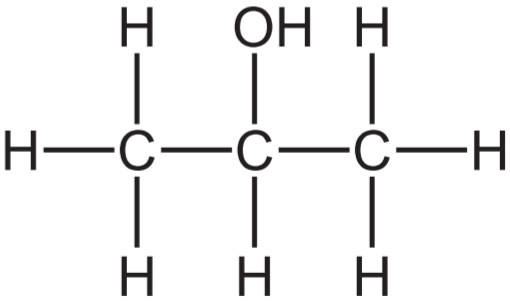
**B**



**C**



**D**



# Q4021

Which statements are correct?

1 Polymers are large molecules built up from monomers.

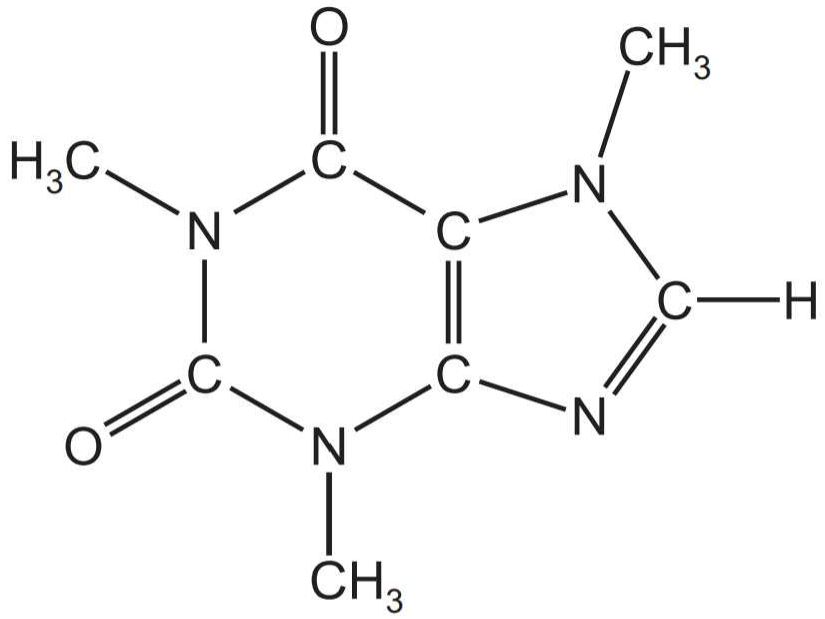
2 Proteins are natural polymers.

3 Proteins and carbohydrates are constituents of food.

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

# Q822

Caffeine is a stimulant found in coffee.




caffeine

Which formula represents caffeine?

**A** $C_7H_{10}N_4O_2$ **B** $C_8H_{10}N_3O_2$ **C** $C_8H_{10}N_4O_2$ **D** $C_8H_{11}N_4O_2$

# Q1222

Some properties of four fuels are shown.

Which fuel is a gas at room temperature and makes two products when it burns in a plentiful supply of air?

| | fuel | formula | melting point / °C | boiling point / °C |
|---|---|---|---|---|
| **A** | hydrogen | $H_2$ | –259 | –253 |
| **B** | methane | $CH_4$ | –182 | –164 |
| **C** | octane | $C_8H_{18}$ | –57 | 126 |
| **D** | wax | $C_{31}H_{64}$ | 60 | 400 |

# Q2722

Some properties and uses of different metals are shown.

| | metal | property | use |
|---|---|---|---|
| 1 | aluminium | low density | aircraft |
| 2 | copper | good conductor of electricity | electrical wiring |
| 3 | copper | poor conductor of heat | cooking utensils |
| 4 | stainless steel | corrodes easily | cutlery |

Which rows link a use of the metal to its stated property?

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

# Q3922

Which statement about unsaturated hydrocarbons is correct?

**A** $CH_3CH_2CH=CHCH_3$ is an unsaturated hydrocarbon.

**B** Ethene has more hydrogen atoms per molecule than ethane.

**C** Unsaturated hydrocarbons have double bonds between carbon and hydrogen atoms.

**D** Unsaturated hydrocarbons turn aqueous bromine from colourless to brown.

# Q123

The melting points and boiling points of four elements are shown.

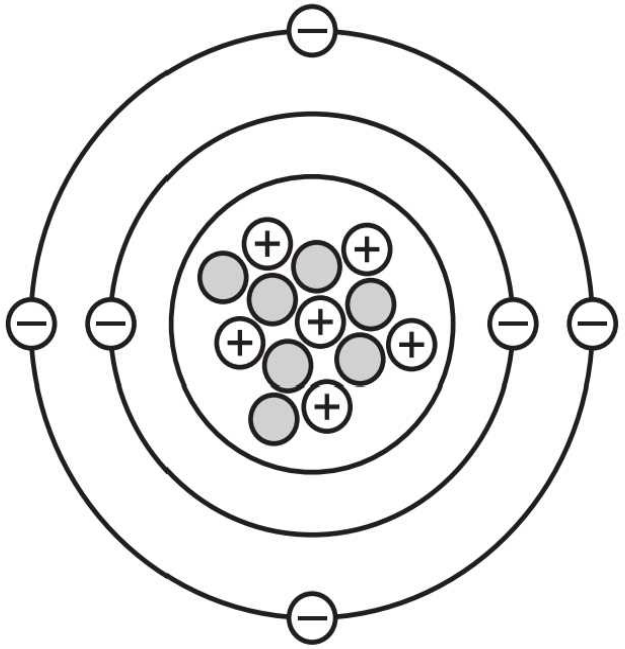
| element | melting point / °C | boiling point / °C |
|---|---|---|
| W | –7 | 60 |
| X | –101 | –34 |
| Y | 114 | 184 |
| Z | 39 | 688 |

In which elements do the particles vibrate about fixed positions at 0 °C?

**A** W and X **B** W and Z **C** X and Y **D** Y and Z

# Q323

A representation of an atom is shown.

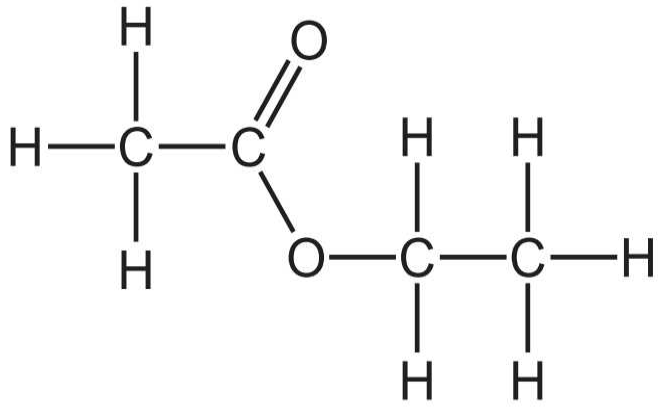


What is the nucleon number of this atom?

**A** 6 **B** 7 **C** 12 **D** 13

# Q823

The diagram shows the structure of a molecule of ethyl ethanoate.



What is the molecular formula of a molecule of ethyl ethanoate?

**A** $CHO$ **B** $C_4H_8O_2$ **C** $C_4(H_2)_2(O_2)$ **D** $C_2H_4O$

# Q1023

Limestone is used to reduce sulfur dioxide emissions from coal-fired power stations.

The equation for the reaction is shown.

$$CaCO_3 + SO_2 \rightarrow CaSO_3 + CO_2$$

What is the smallest mass of $CaCO_3$ required to remove 1 tonne of $SO_2$?

**A** 1 tonne

**B** 2 tonnes

**C** 64 tonnes

**D** 100 tonnes

# Q2123

Some properties of element R are shown.

| | |
|---|---|
| melting point in °C | 98 |
| boiling point in °C | 883 |
| reaction with cold water | gives off $H_2$ gas |
| reaction when heated with oxygen | burns to give a white solid |

In which part of the Periodic Table is R found?

**A** Group I

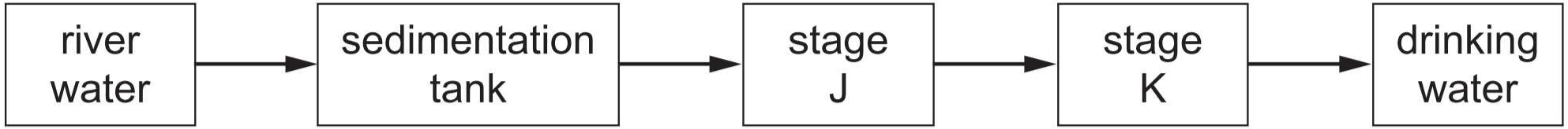
**B** Group VII

**C** Group VIII

**D** transition elements

# Q3123

The flow chart shows stages in the treatment of river water to produce drinking water.



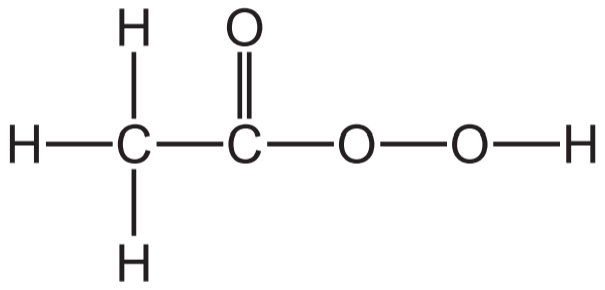

What occurs at stages J and K?

| | J | K |
|---|---|---|
| **A** | distillation | chlorination |
| **B** | distillation | filtration |
| **C** | filtration | chlorination |
| **D** | filtration | distillation |

# Q3423

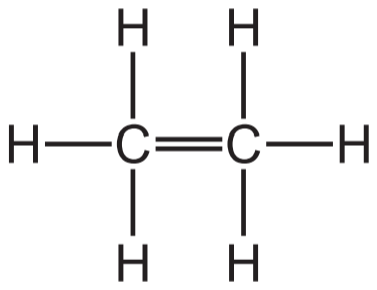
Which diagram shows the displayed formula for the named organic compound?

**A**



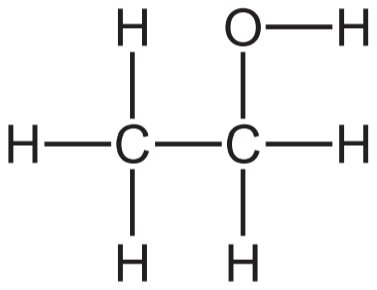
ethanoic acid

**B**



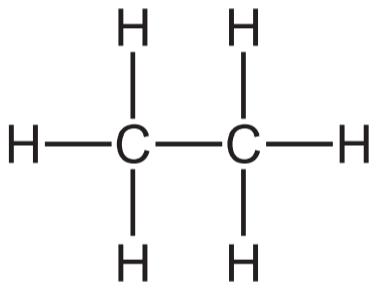
ethene

**C**



ethanol

**D**



methane

# Q3423

The results of tests on three gases, X, Y and Z, are shown.

| test | X | Y | Z |
|---|---|---|---|
| aqueous potassium manganate(VII) | purple to colourless | no change | no change |
| damp red litmus paper | no change | turns blue | no change |
| lighted splint | no change | no change | pops |

What are X, Y and Z?

| | X | Y | Z |
|---|---|---|---|
| **A** | chlorine | sulfur dioxide | hydrogen |
| **B** | chlorine | sulfur dioxide | oxygen |
| **C** | sulfur dioxide | ammonia | oxygen |
| **D** | sulfur dioxide | ammonia | hydrogen |