UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice **October/November 2013**

45 Minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

* 5 4 5 0 4 2 8 1 8 8 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN 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 Periodic Table is printed on page 20.
Electronic calculators may be used.

This document consists of **19** printed pages and **1** blank page.

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1 A gas jar of bromine vapour and a gas jar of air are set up as shown in diagram 1.

The glass slide is removed. Diagram 2 shows the appearance of the gas jars after one hour.

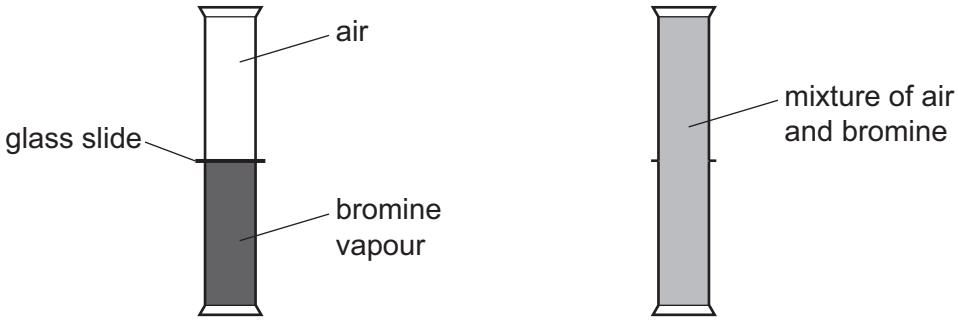


diagram 1 diagram 2

Which statement explains why the bromine and air mix together?

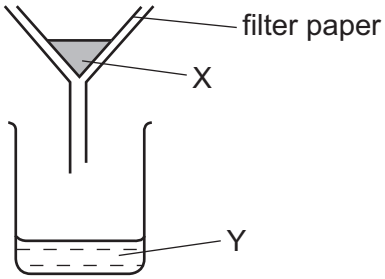
A Bromine is denser than air.

B Bromine is lighter than air.

C Bromine molecules moved upwards and molecules in air moved downwards.

D Molecules in bromine and air moved randomly.

2 The diagram shows a method for separating a substance that contains X and Y.



Which types of substance can be separated as shown?

A compounds

B elements

C mixtures

D molecules

3 Diagram 1 shows the paper chromatogram of substance X.

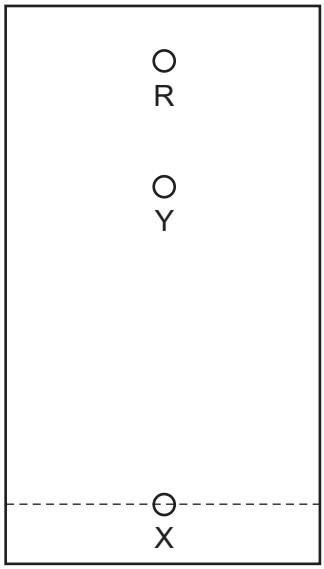


diagram 1

Diagram 2 shows the cooling curve for substance Y.

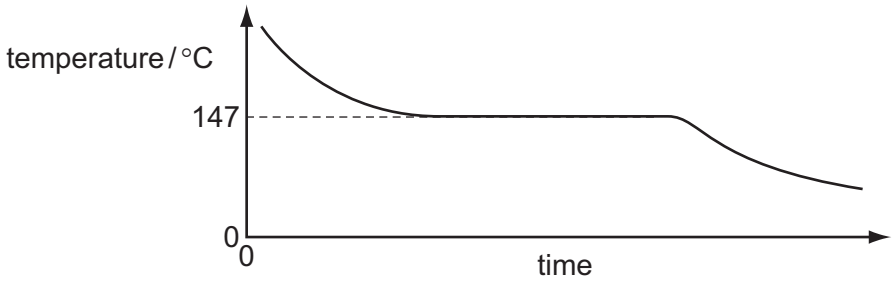


diagram 2

Which statement about X and Y is correct?

A X is a mixture and Y is a pure substance.

B X is a pure substance and Y is a mixture.

C X and Y are mixtures.

D X and Y are pure substances.

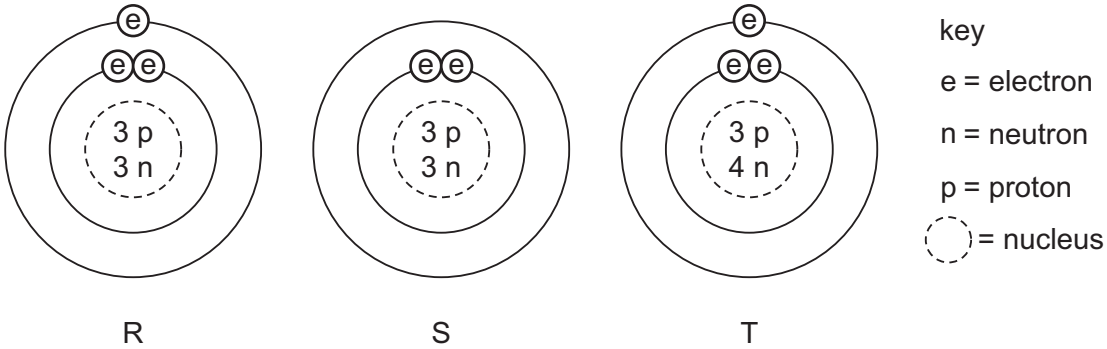
4 The atomic structures of four atoms are shown.

atom	number of neutrons	number of protons	number of electrons
W	6	6	6
X	7	7	7
Y	8	6	6
Z	8	8	8

Which pair of atoms are isotopes?

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

5 The diagram shows the structure of three particles, R, S and T.



Which row describes these particles?

	ions	isotopes
A	R	S and T
B	R and S	T
C	S	R and T
D	T	R and S

6 Which statement about the bonding in a molecule of water is **not** correct?

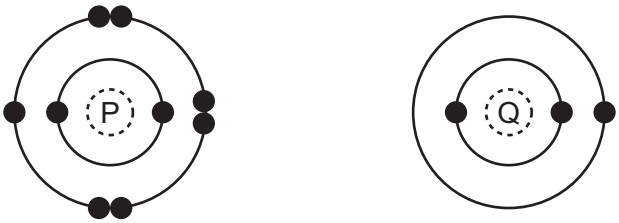
A Both hydrogen and oxygen have a noble gas configuration of electrons.

B Each hydrogen shares its one electron with oxygen.

C Oxygen shares one of its own electrons with each hydrogen.

D Oxygen shares two of its own electrons with each hydrogen.

7 The electronic structures of atoms P and Q are shown.



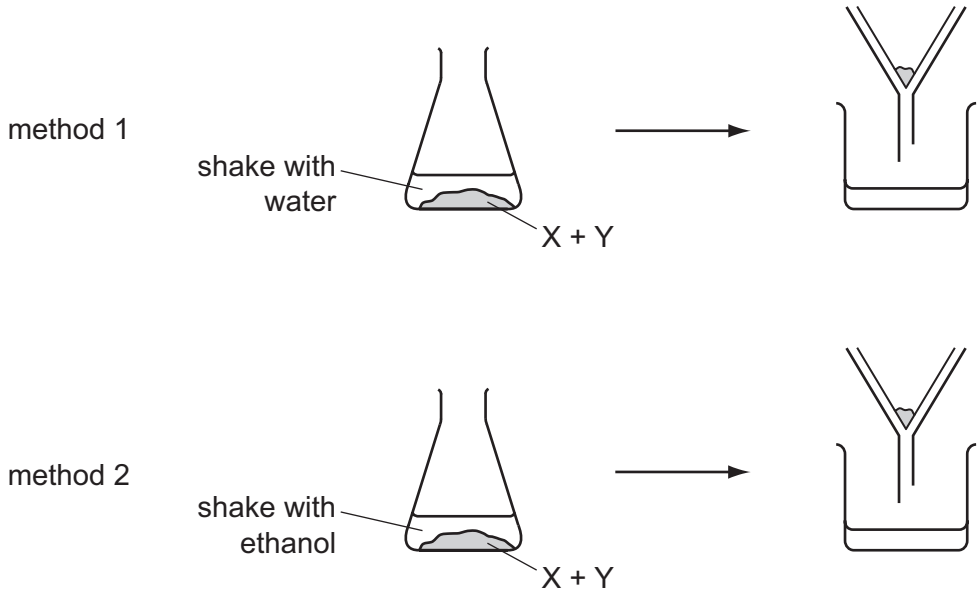
P and Q react to form an ionic compound.

What is the formula of the compound?

A Q_7P **B** QP **C** QP_3 **D** QP_7

8 A solid mixture contains an ionic salt, X, and a covalent organic compound, Y.

Two students suggest methods of separating the mixture as shown.



Which methods of separation are likely to work?

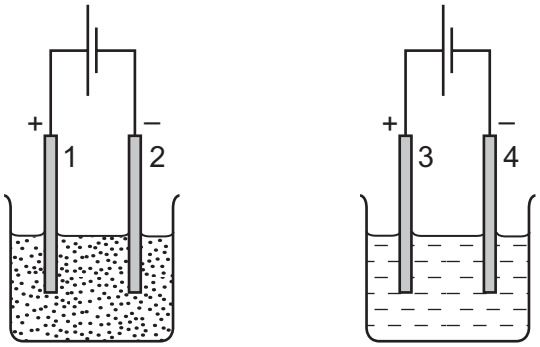
	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

9 Which relative molecular mass, M_r, is **not** correct for the molecule given?

	molecule	M_r
A	ammonia, NH_3	17
B	carbon dioxide, CO_2	44
C	methane, CH_4	16
D	oxygen, O_2	16

10 Two electrolysis experiments were carried out as shown in the diagram below.

The graphite electrodes are labelled 1-4.



molten sodium chloride

concentrated aqueous sodium chloride

Which row describes the products at the electrodes in these experiments?

	electrode 1	electrode 2	electrode 3	electrode 4
A	chlorine	hydrogen	chlorine	hydrogen
B	chlorine	sodium	chlorine	hydrogen
C	chlorine	sodium	hydrogen	chlorine
D	sodium	chlorine	sodium	chlorine

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11 One molten compound and two aqueous solutions were electrolysed.

The table gives the compounds electrolysed and the electrodes used.

	substance electrolysed	electrodes
1	concentrated hydrochloric acid	carbon
2	concentrated sodium chloride	platinum
3	molten lead bromide	platinum

In which experiments is a gas evolved at the cathode?

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

12 When ammonium nitrate is added to water the temperature of the water decreases.

The ammonium nitrate can be recovered by evaporating the water added.

Which explains these observations?

A The ammonium nitrate dissolves in the water and the process is endothermic.

B The ammonium nitrate reacts with the water and the process is endothermic.

C The ammonium nitrate dissolves in the water and the process is exothermic.

D The ammonium nitrate reacts with the water and the process is exothermic.

13 Which substance could **not** be used as a fuel to heat water in a boiler?

A ethanol

B hydrogen

C methane

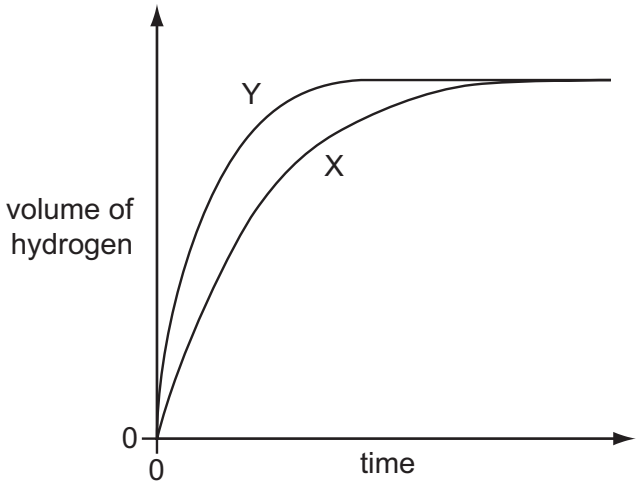
D oxygen

14 Which substance is not a fossil fuel?

A coal **B** kerosene **C** gasoline **D** wood

15 A student investigates the rate of reaction between zinc and an excess of sulfuric acid.

The graph shows the results of two experiments, X and Y.



Which change explains the difference between X and Y?

A A catalyst is added in Y.

B A lower temperature is used in Y.

C Larger pieces of zinc are used in Y.

D Less concentrated acid is used in Y.

16 When green iron(II) sulfate is heated, it turns white and a colourless liquid is produced. When the liquid is put back into the white solid it changes back to green.

What type of reaction takes place and what is the name of the liquid?

	type of reaction	name of liquid
A	redox	sulfuric acid
B	redox	water
C	reversible	sulfuric acid
D	reversible	water

17 The reactions shown may occur in the air during a thunder storm.

$N_2 + O_2 \rightarrow 2NO$

$2NO + O_2 \rightarrow 2NO_2$

$NO + O_3 \rightarrow NO_2 + O_2$

Which row shows what happens to the reactant molecules in each of these reactions?

	N_2	NO	O_3
A	oxidised	oxidised	oxidised
B	oxidised	oxidised	reduced
C	reduced	reduced	oxidised
D	reduced	reduced	reduced

18 Which are properties of an acid?

1 reacts with ammonium sulfate to form ammonia

2 turns red litmus blue

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

19 Which of the following are properties of the oxides of non-metals?

	property 1	property 2
A	acidic	covalent
B	acidic	ionic
C	basic	covalent
D	basic	ionic

20 The cations shown are identified by the colour of the precipitates formed when an excess of an aqueous solution of X is added.

cations present	effect of adding an excess of aqueous X
iron(II) (Fe^{2+})	green precipitate
copper(II) (Cu^{2+})	light blue precipitate
iron(III) (Fe^{3+})	red-brown precipitate

What is X?

A ammonia

B limewater

C silver nitrate

D sodium hydroxide

21 Calcium, on the left of Period 4 of the Periodic Table, is more metallic than bromine on the right of this period.

Why is this?

Calcium has

A fewer electrons.

B fewer protons.

C fewer full shells of electrons.

D fewer outer shell electrons.

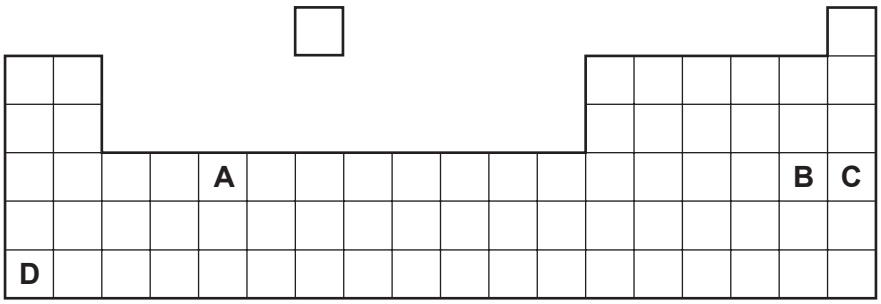
22 The diagrams show the labels of four bottles.

Which label is **not** correct?

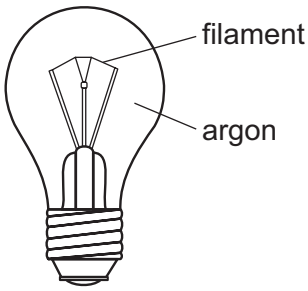
A	**B**	**C**	**D**
Bromine Br_2 Harmful liquid. Do not spill.	Iodine I_2 Danger Avoid breathing vapour from the solid.	Potassium K Danger Store under water.	Sodium Na Danger Store under oil.

23 An element has a melting point of 1084 °C and a density of 8.93 g / cm^3. It's oxide can be used as a catalyst.

In which position in the Periodic Table is the element found?



24 The diagram shows a light bulb.



Why is argon used instead of air in the light bulb?

A Argon is a good conductor of electricity.

B Argon is more reactive than air.

C The filament glows more brightly.

D The filament does not react with the argon.

25 Duralumin is an alloy. It contains aluminium, copper and magnesium.

It has many uses including the manufacture of cooking utensils and ships.

Which statement about duralumin and its properties is correct?

A It is a good conductor of electricity.

B It is brittle.

C It is soluble in water.

D The aluminium, copper and magnesium are chemically combined.

26 The list gives the order of some metals (and hydrogen) in the reactivity series.

Metal X is also included:

Most reactive	K
	Mg
	Zn
	(H)
	X
Least reactive	Cu

Which row correctly shows the properties of metal X?

	reacts with dilute acids	oxide reduced by carbon
A	no	no
B	no	yes
C	yes	no
D	yes	yes

27 A new bicycle is being developed.
Two different materials are used in its construction, both of which must be corrosion resistant.

Which two metals could be used?

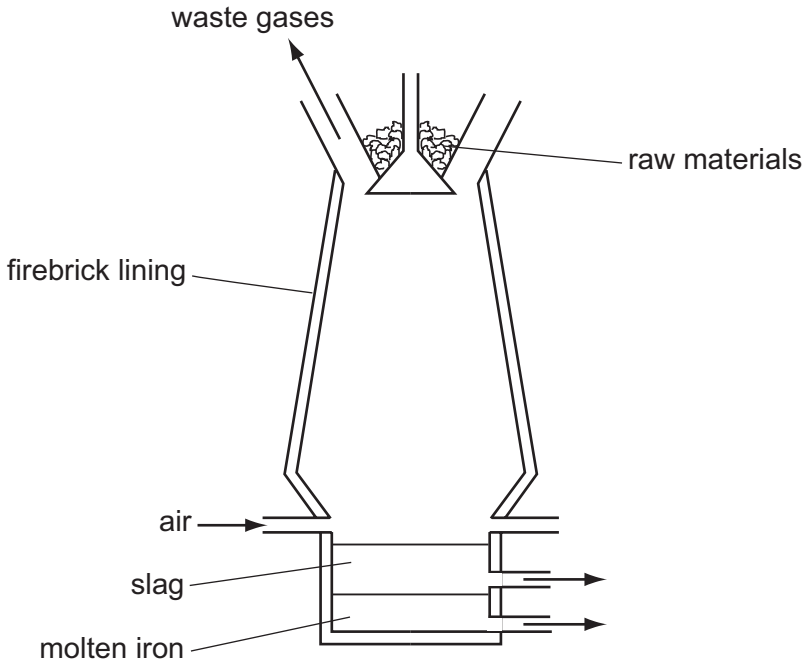
A aluminium and mild steel

B aluminium and stainless steel

C mild steel and pure iron

D pure iron and stainless steel

28 Iron is extracted from hematite in the Blast Furnace.



The hematite contains silica as an impurity.

What reacts with this impurity to remove it?

A calcium oxide

B carbon

C carbon dioxide

D oxygen

29 In which process is carbon dioxide **not** formed?

A burning of natural gas

B fermentation

C heating lime

D respiration

30 Carbon dioxide is produced when

X reacts with ethanol.

Y reacts with sodium carbonate.

What are X and Y?

	X	Y
A	H_2	HCl
B	H_2	NaOH
C	O_2	HCl
D	O_2	NaOH

31 A sample of fertiliser is tested by warming it with aqueous sodium hydroxide.

A colourless gas is produced which turns red litmus paper blue.

Which element, essential for plant growth, must be present?

A nitrogen

B phosphorus

C potassium

D sulfur

32 Iron rusts. This process involves the ……1…… of iron. Rusting can be prevented by covering the iron with grease or paint which stops ……2…… from reaching the surface of the iron.

Which words correctly complete gaps 1 and 2?

	1	2
A	oxidation	nitrogen
B	oxidation	oxygen
C	reduction	nitrogen
D	reduction	oxygen

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33 Oxides of nitrogen are given out from car exhausts.

Which row best shows why oxides of nitrogen are unwanted?

	acidic	toxic
A	no	no
B	no	yes
C	yes	no
D	yes	yes

34 Water is treated at a water works to make it fit to drink.

What is present in the water when it leaves the waterworks?

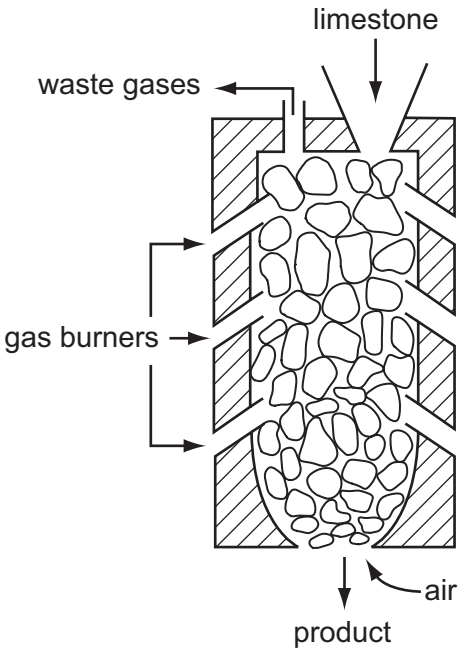
A bacteria only

B bacteria and insoluble substances

C chlorine only

D chlorine and soluble substances

35 The diagram shows a kiln used to heat limestone.



What is the product and what waste gas is formed?

	product	waste gas
A	lime, CaO	carbon monoxide
B	lime, CaO	carbon dioxide
C	slaked lime, $Ca(OH)_2$	carbon monoxide
D	slaked lime, $Ca(OH)_2$	carbon dioxide

36 Molecule X is both an alkene and a carboxylic acid.

Which row describes X?

	saturated	–COOH present
A	no	no
B	no	yes
C	yes	no
D	yes	yes

37 Which hydrocarbon reacts with steam to produce ethanol?

A C_2H_4 **B** C_2H_6 **C** C_3H_6 **D** C_3H_8

38 Petroleum is a mixture of different hydrocarbons.

Which process is used to separate the petroleum into groups of similar hydrocarbons?

A combustion

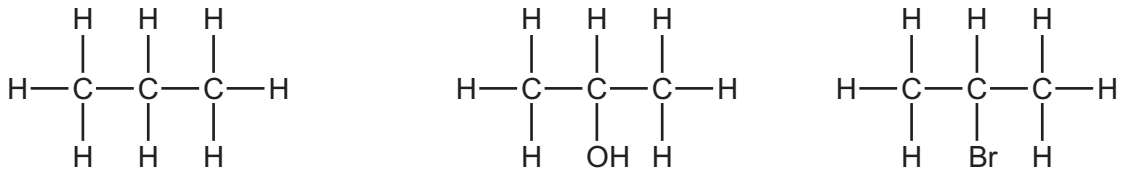
B cracking

C fractional distillation

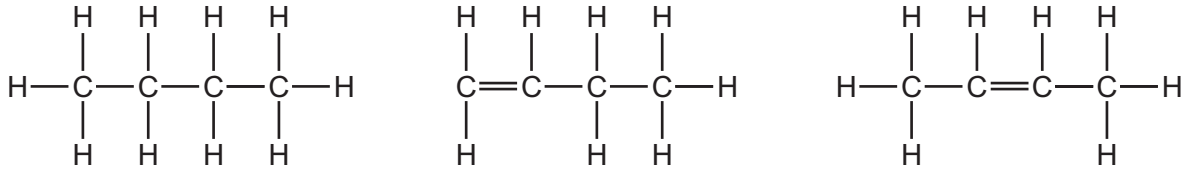
D reduction

39 Which row represents compounds in the same homologous series?

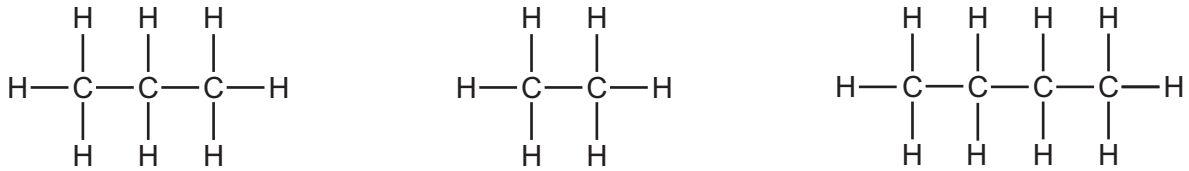
A



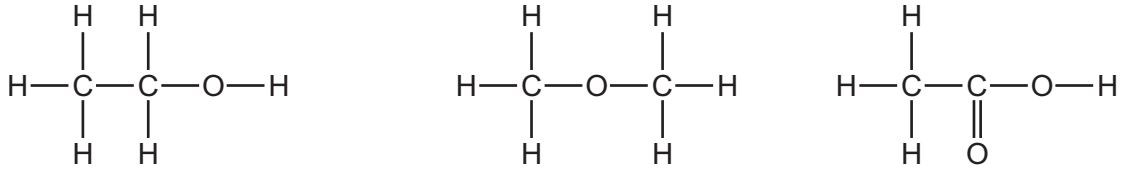
B



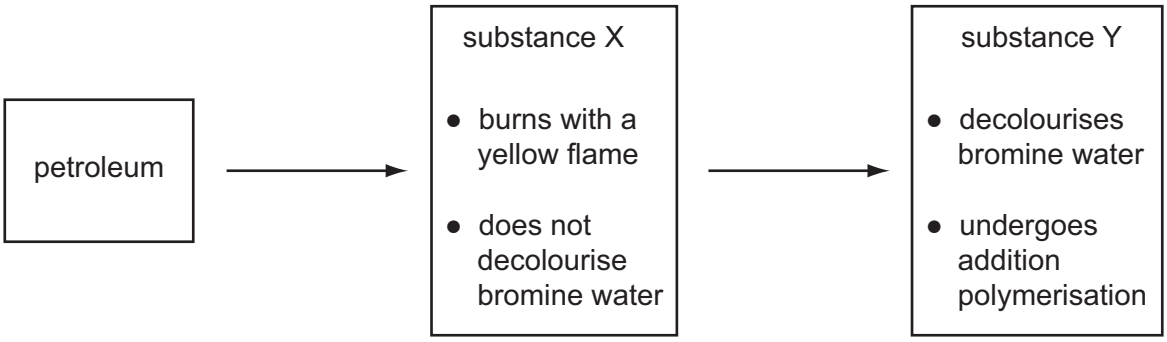
C



D



40 The diagram shows a flow diagram.



Which type of organic compounds are X and Y?

	substance X	substance Y
A	alcohol	alkane
B	alkane	alkene
C	alkene	alkane
D	alkane	alcohol

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DATA SHEET
The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 **H** Hydrogen 1										4 **He** Helium 2
7 **Li** Lithium 3	9 **Be** Beryllium 4											11 **B** Boron 5	12 **C** Carbon 6	14 **N** Nitrogen 7	16 **O** Oxygen 8	19 **F** Fluorine 9	20 **Ne** Neon 10
23 **Na** Sodium 11	24 **Mg** Magnesium 12											27 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulfur 16	35.5 **Cl** Chlorine 17	40 **Ar** Argon 18
39 **K** Potassium 19	40 **Ca** Calcium 20	45 **Sc** Scandium 21	48 **Ti** Titanium 22	51 **V** Vanadium 23	52 **Cr** Chromium 24	55 **Mn** Manganese 25	56 **Fe** Iron 26	59 **Co** Cobalt 27	59 **Ni** Nickel 28	64 **Cu** Copper 29	65 **Zn** Zinc 30	70 **Ga** Gallium 31	73 **Ge** Germanium 32	75 **As** Arsenic 33	79 **Se** Selenium 34	80 **Br** Bromine 35	84 **Kr** Krypton 36
85 **Rb** Rubidium 37	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	**Tc** Technetium 43	101 **Ru** Ruthenium 44	103 **Rh** Rhodium 45	106 **Pd** Palladium 46	108 **Ag** Silver 47	112 **Cd** Cadmium 48	115 **In** Indium 49	119 **Sn** Tin 50	122 **Sb** Antimony 51	128 **Te** Tellurium 52	127 **I** Iodine 53	131 **Xe** Xenon 54
133 **Cs** Caesium 55	137 **Ba** Barium 56	139 **La** Lanthanum 57 *	178 **Hf** Hafnium 72	181 **Ta** Tantalum 73	184 **W** Tungsten 74	186 **Re** Rhenium 75	190 **Os** Osmium 76	192 **Ir** Iridium 77	195 **Pt** Platinum 78	197 **Au** Gold 79	201 **Hg** Mercury 80	204 **Tl** Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	**Po** Polonium 84	**At** Astatine 85	**Rn** Radon 86
Fr Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †															

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	**Pm** Promethium 61	150 **Sm** Samarium 62	152 **Eu** Europium 63	157 **Gd** Gadolinium 64	159 **Tb** Terbium 65	162 **Dy** Dysprosium 66	165 **Ho** Holmium 67	167 **Er** Erbium 68	169 **Tm** Thulium 69	173 **Yb** Ytterbium 70	175 **Lu** Lutetium 71
232 **Th** Thorium 90	**Pa** Protactinium 91	238 **U** Uranium 92	**Np** Neptunium 93	**Pu** Plutonium 94	**Am** Americium 95	**Cm** Curium 96	**Bk** Berkelium 97	**Cf** Californium 98	**Es** Einsteinium 99	**Fm** Fermium 100	**Md** Mendelevium 101	**No** Nobelium 102	**Lr** Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a
X
b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

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