UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/12**

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)

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.

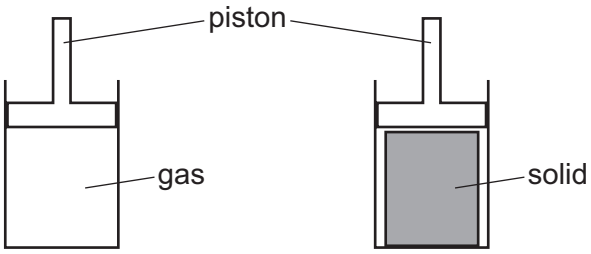
Read the instructions on the Answer Sheet very carefully.

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 **18** printed pages and **2** blank pages.

UNIVERSITY of CAMBRIDGE International Examinations

1 An attempt was made to compress a gas and a solid using the apparatus shown.



Which substance would be compressed and what is the reason for this?

	substance	reason
A	gas	the gas particles are close together
B	gas	the gas particles are far apart
C	solid	the solid particles are close together
D	solid	the solid particles are far apart

2 A student measures the rate of two reactions.

In one reaction, there is a change in mass of the reactants during the reaction.

In the second reaction, there is a change in temperature during the reaction.

Which piece of apparatus would be essential in **both** experiments?

A balance

B clock

C pipette

D thermometer

3 Diagram 1 shows the paper chromatogram of substance X.

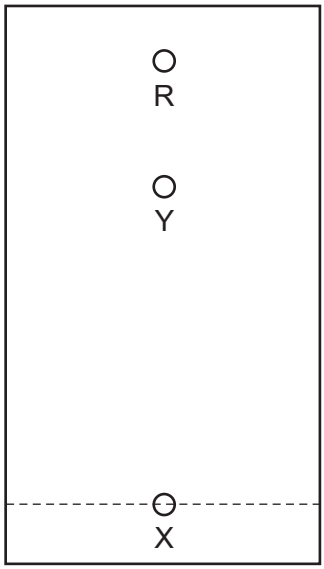


diagram 1

Diagram 2 shows the cooling curve for substance Y.

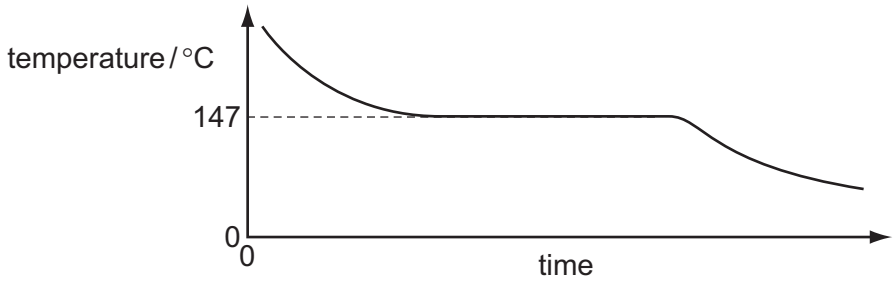


diagram 2

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 Which statements about a sodium atom, $^{23}_{11}Na$, are correct?

1 The number of protons and neutrons is the same.

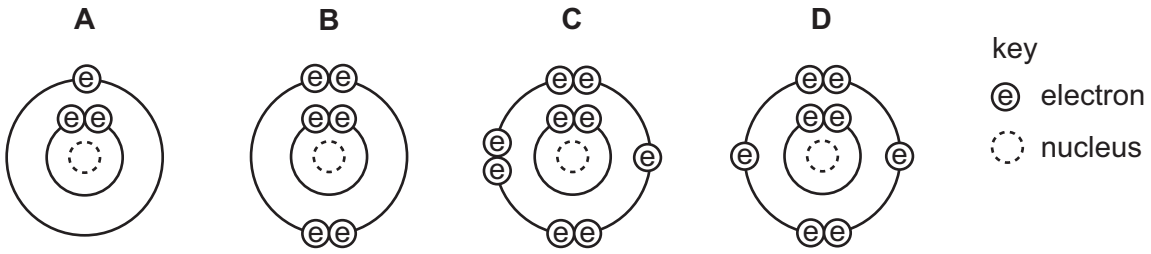
2 The number of protons and electrons is the same.

3 The number of outer electrons is one.

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

5 The diagrams show the electron arrangements in the atoms of four elements.

Which element does **not** form a covalent bond?



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

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

7 Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

A Y has more electron shells than X.

B Y has more electrons in its outer shell than X.

C Y is in a different group of the Periodic Table from X.

D Y is in the same period of the Periodic Table as X

8 The formulae of compounds W, X and Y are shown.

W $CuSO_4.5H_2O$

X $MgSO_4.7H_2O$

Y $Cu(NO_3)_2.6H_2O$

Which statement is correct?

A W contains twice as many hydrogen atoms as oxygen atoms.

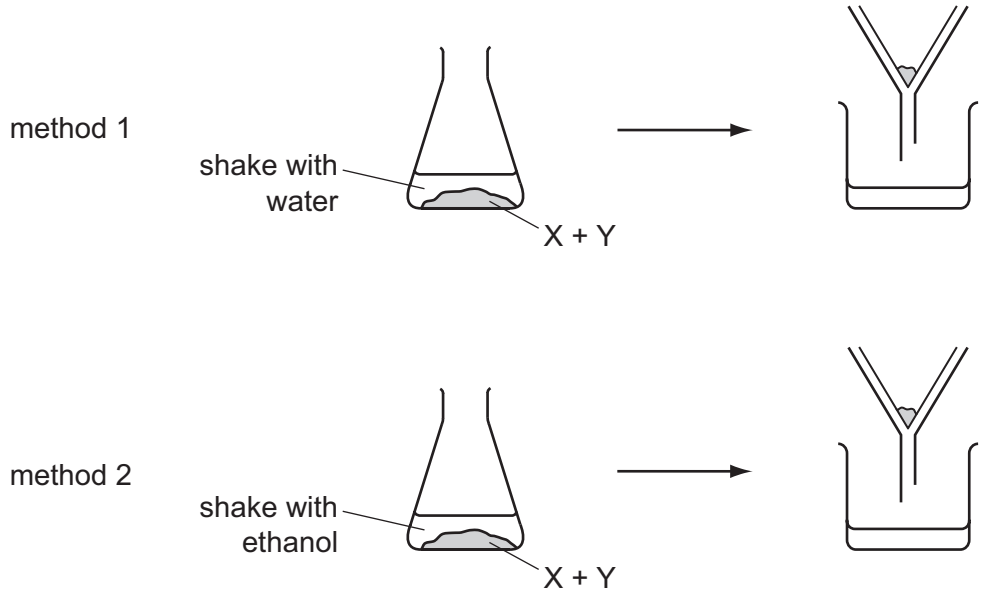
B X contains the most oxygen atoms.

C Y contains the most hydrogen atoms.

D Y contains the same number of hydrogen and oxygen atoms.

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

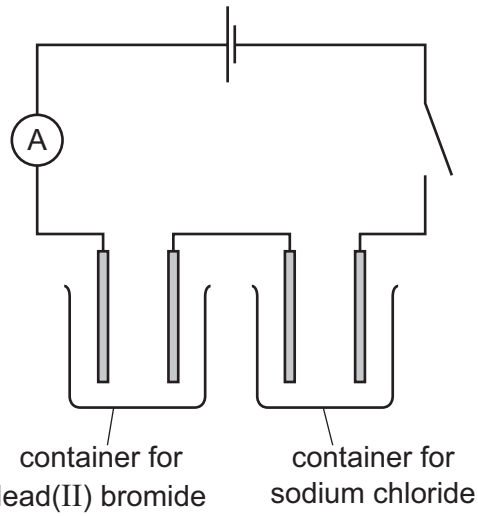
Two students suggest methods of separating the mixture as shown.



Which methods of separation are likely to work?

	1	2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

10 The diagram shows the circuit for electrolysing lead(II) bromide and sodium chloride to obtain the metal.



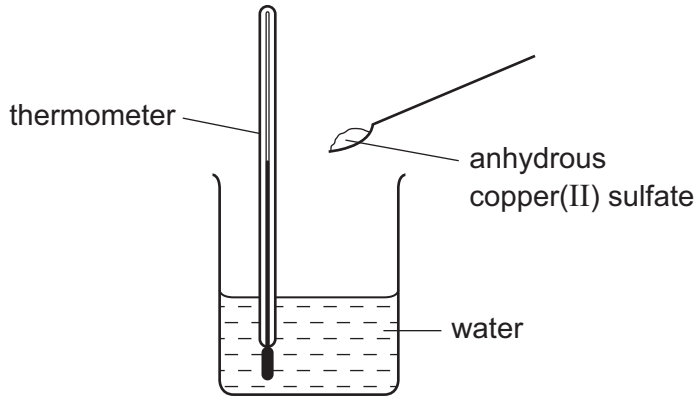
In what form are these salts electrolysed for liberating the metal?

	lead(II) bromide	sodium chloride
A	concentrated solution	concentrated solution
B	concentrated solution	molten
C	molten	concentrated solution
D	molten	molten

11 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

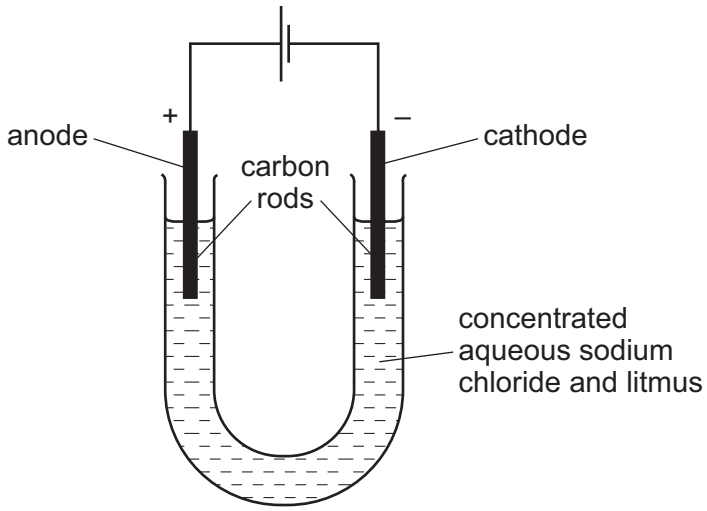
12 When anhydrous copper(II) sulfate is added to water a solution is formed and heat is



Which row correctly shows the temperature change and the type of reaction taking place?

	temperature change	type of reaction
A	decreases	endothermic
B	decreases	exothermic
C	increases	endothermic
D	increases	exothermic

13 The diagram shows the electrolysis of concentrated aqueous sodium chloride.



What is the colour of the litmus at each electrode after five minutes?

	colour at anode	colour at cathode
A	blue	red
B	red	blue
C	red	colourless
D	colourless	blue

14 Anhydrous copper(II) sulfate can be made by heating hydrated copper(II) sulfate.

$$CuSO_4.5H_2O \rightarrow CuSO_4 + 5H_2O$$

What can be added to anhydrous copper(II) sulfate to turn it into hydrated copper(II) sulfate?

A concentrated sulfuric acid

B sodium hydroxide powder

C sulfur dioxide

D water

15 Which fuel does **not** produce carbon dioxide when it burns?

A coal

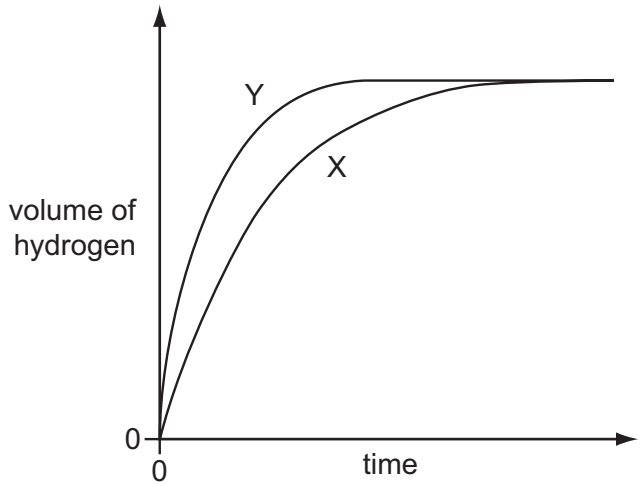
B hydrogen

C methane

D petrol

16 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.

17 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	✗	✗

18 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

19 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

20 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.

21 Compound X is tested and the results are shown in the table.

test	result
aqueous sodium hydroxide is added, then heated gently	gas given off which turns damp red litmus paper blue
dilute hydrochloric acid is added	effervescence, gas given off which turns limewater milky

Which ions are present in compound X?

A ammonium ions and carbonate ions

B ammonium ions and chloride ions

C calcium ions and carbonate ions

D calcium ions and chloride ions

22 Some properties of four elements W, X, Y and Z are listed.

1 W melts at 1410 °C and forms an acidic oxide.

2 X has a high density and is easily drawn into wires.

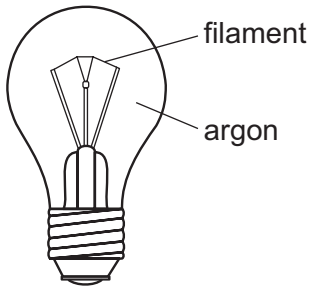
3 Y acts as a catalyst and its oxide reacts with acids.

4 Z is a red-brown solid used to make alloys.

Which of the elements are metals?

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

23 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.

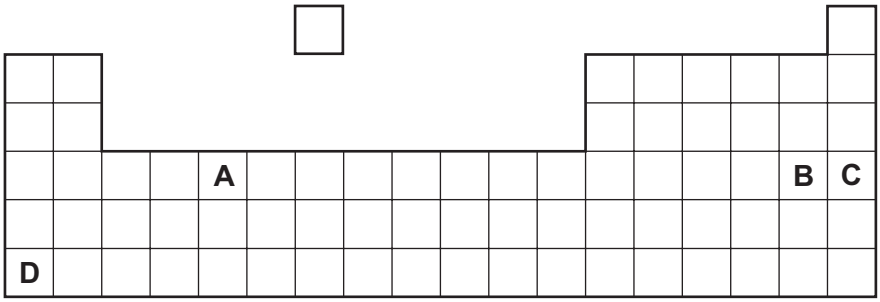
B Argon is more reactive than air.

C The filament glows more brightly.

D The filament does not react with the argon.

24 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?



25 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.

26 Equations P and Q represent two reactions which occur inside a blast furnace.

P $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Q $CaCO_3 \rightarrow CaO + CO_2$

Which type of reactions are P and Q?

	P	Q
A	redox	redox
B	redox	thermal decomposition
C	thermal decomposition	redox
D	thermal decomposition	thermal decomposition

27 Farmers add calcium oxide (lime) and ammonium salts to their fields.

The compounds are not added at the same time because they react with each other.

Which gas is produced in this reaction?

A ammonia

B carbon dioxide

C hydrogen

D nitrogen

28 Which row describes the uses of mild steel and stainless steel?

	mild steel	stainless steel
A	car bodies, cutlery	chemical plant, machinery
B	car bodies, machinery	chemical plant, cutlery
C	chemical plant, cutlery	car bodies, machinery
D	chemical plant, machinery	car bodies, cutlery

29 Reactions of three metals and their oxides are listed in the table.

metal	reacts with cold water	metal oxide reacts with carbon
W	no	no
X	no	yes
Y	yes	no

What is the order of reactivity of the metals?

	least reactive	⟶	most reactive
A	W	X	Y
B	X	W	Y
C	X	Y	W
D	Y	W	X

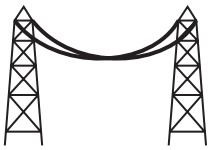
30 The diagrams show four uses of iron.

In which of these uses is the iron most likely to rust?

A

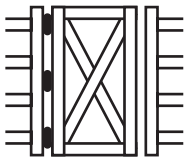
iron bucket electroplated with zinc

B



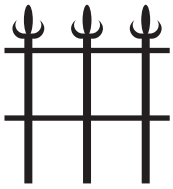
iron cored aluminium electricity cables

C



iron hinges on a gate

D



painted iron fence

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

A burning of natural gas

B fermentation

C heating lime

D respiration

32 M is a shiny silver metal. It has a melting point of 1455 °C. Many of its compounds are

What is metal M?

A aluminium

B copper

C mercury

D nickel

33 In many countries river water is used for the washing of clothes.

The same water is not considered to be safe for drinking.

Why is it **not** safe for drinking?

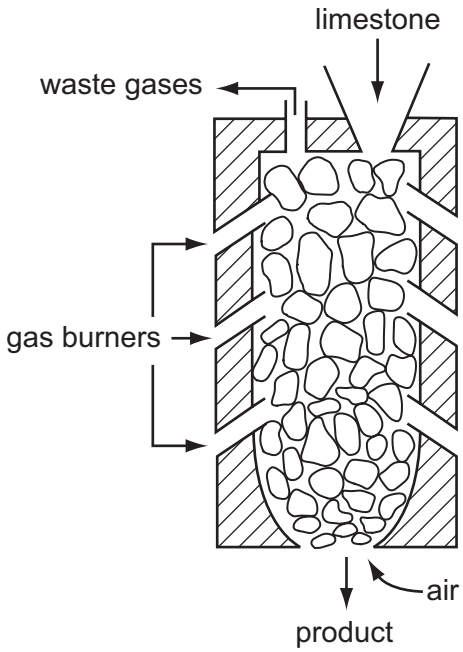
A because river water contains dissolved salts

B because river water may contain harmful bacteria

C because river water may contain small particles of sand

D because river water may contain soap from washing clothes

34 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

35 Which air pollutant is **not** made when coal burns in a power station?

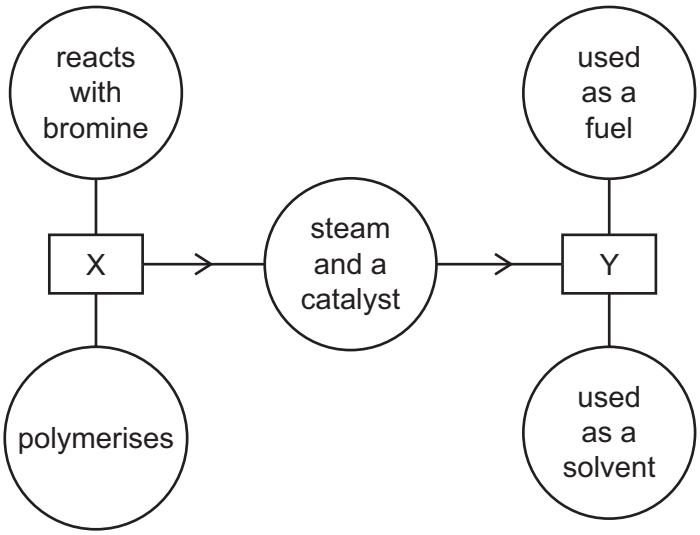
A carbon monoxide

B lead compounds

C nitrogen oxides

D sulfur dioxide

36 The diagram shows some properties of two organic compounds X and Y.



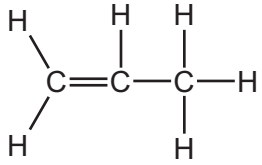
What are X and Y?

	X	Y
A	ethane	ethanoic acid
B	ethane	ethanol
C	ethene	ethanoic acid
D	ethene	ethanol

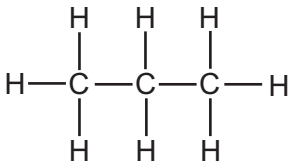
37 Three types of organic compound are alkanes, alkenes and alcohols.

Which structure does **not** belong to any of these three types of compound?

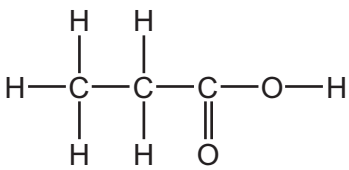
A



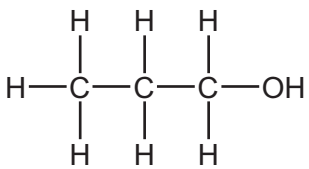
B



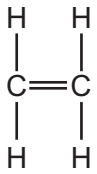
C



D

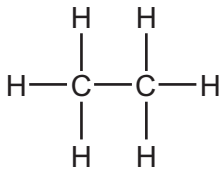


38 The diagram represents ethene.

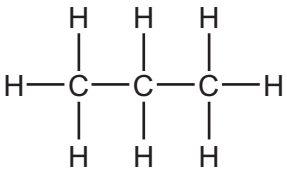


Which compound has chemical properties similar to those of ethene?

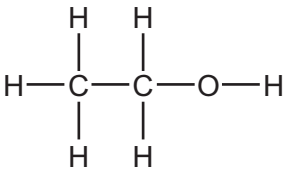
A



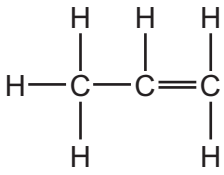
B



C



D



39 Petroleum is a mixture of hydrocarbons which can be separated into fractions using fractional distillation.

Which fraction is used as fuel in jet engines?

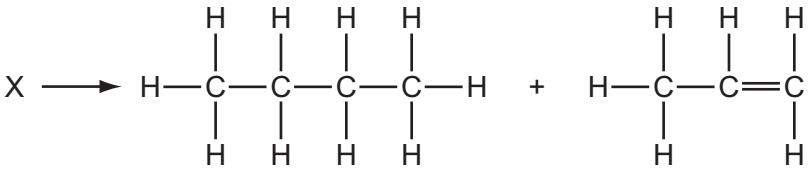
A bitumen

B gasoline

C kerosene

D naphtha

40 A chemist carried out a cracking reaction on a hydrocarbon, X, and obtained two products, Y and Z.



Y Z

The chemist then wrote the following statements in his notebook.

1 A molecule of X has 7 carbon atoms.

2 Y is unsaturated.

3 Z will decolourise bromine water.

Which statements are correct?

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

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DATA SHEET
The Periodic Table of the Elements

	Group																	
	I	II									III	IV	V	VI	VII	0
																4 He Helium 2
						1 H Hydrogen 1										
	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 = 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.).