



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.

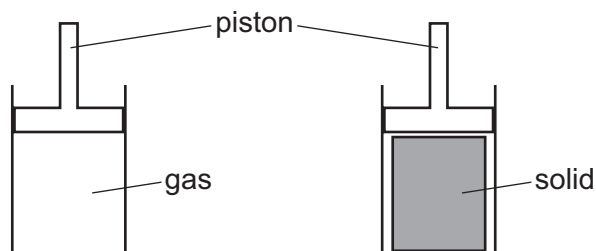
A copy of the Periodic Table is printed on page 20.

Electronic calculators may be used.

This document consists of **18** printed pages and **2** blank pages.



- 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.

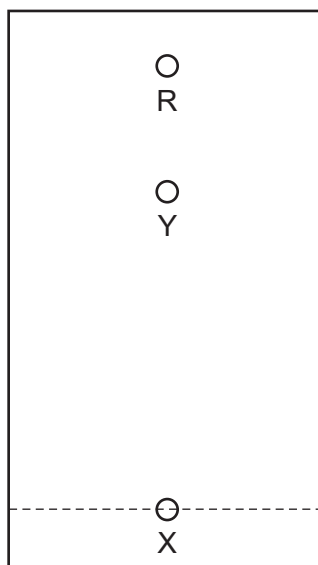


diagram 1

Diagram 2 shows the cooling curve for substance Y.

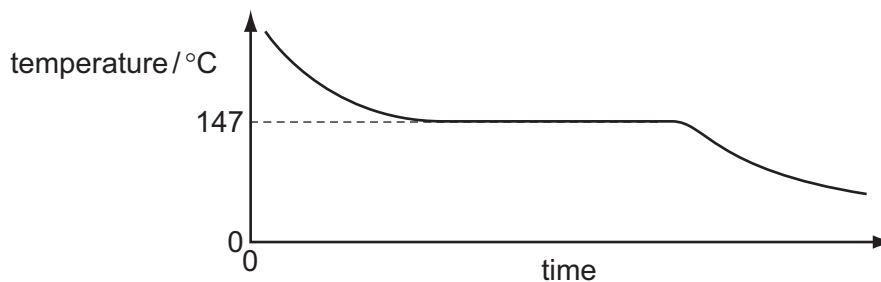


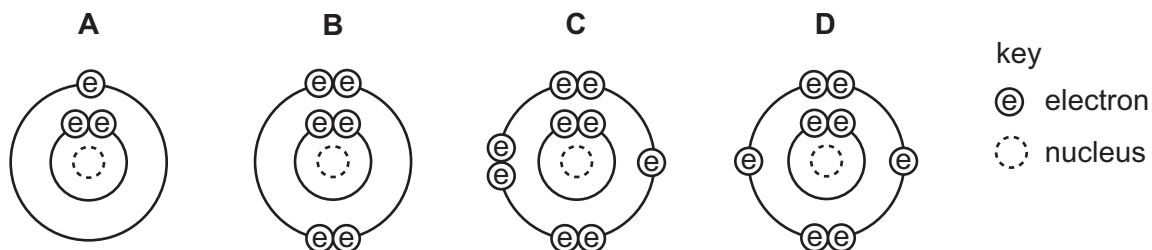
diagram 2

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, ${}_{11}^{23}\text{Na}$, 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.

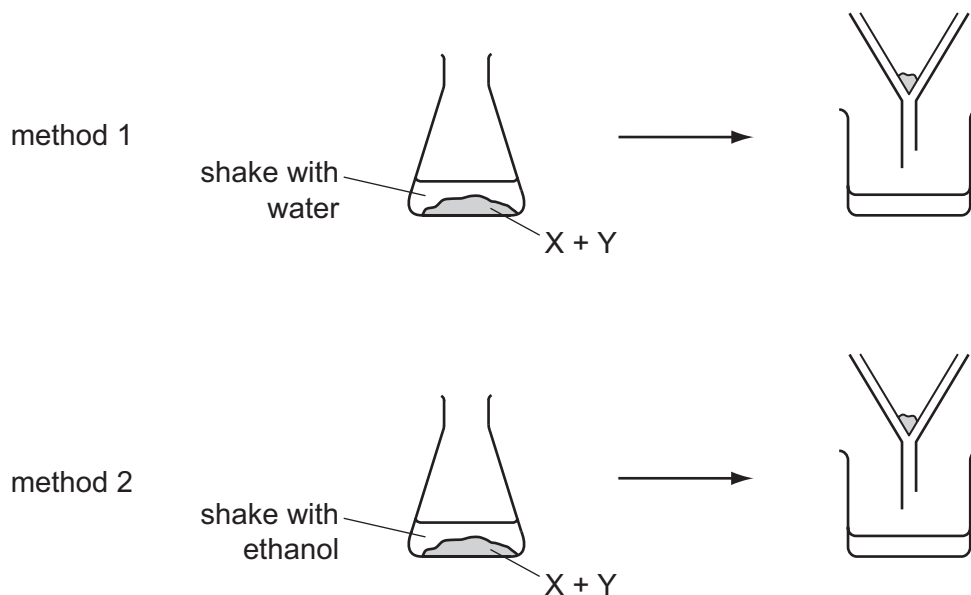


Which statement is correct?

- 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.

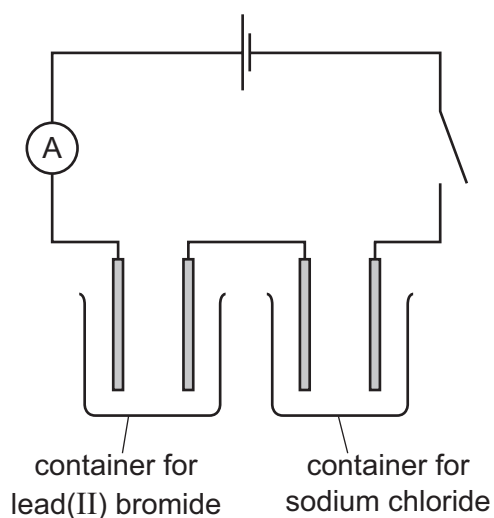
Two students suggest methods of separating the mixture as shown.



Which methods of separation are likely to work?

| | 1 | 2 |
|----------|---|---|
| A | ✓ | ✓ |
| B | ✓ | x |
| C | x | ✓ |
| D | x | x |

- 10 The diagram shows the circuit for electrolysis of lead(II) bromide and sodium chloride to liberate the metal.



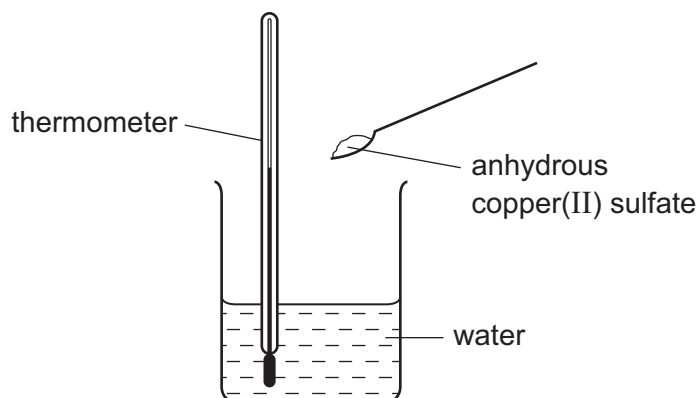
In what form are these salts electrolysed for liberating the metal?

| | 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 |

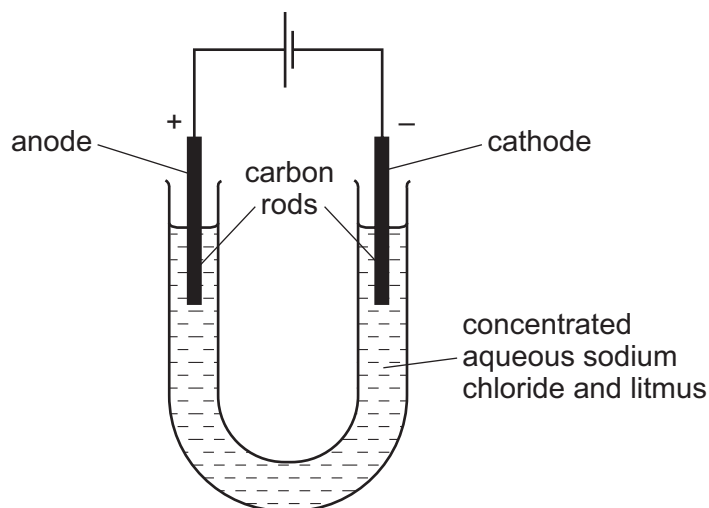
12 When anhydrous copper(II) sulfate is added to water a solution is formed and heat is given out.



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 |

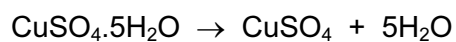
13 The diagram shows the electrolysis of concentrated aqueous sodium chloride.



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 |

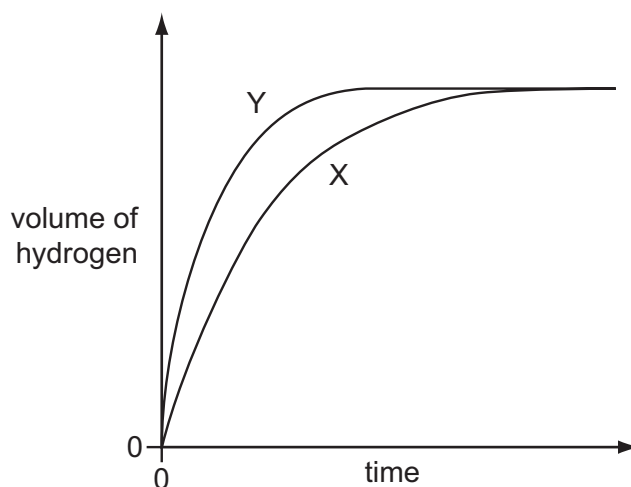
- 14 Anhydrous copper(II) sulfate can be made by heating hydrated copper(II) sulfate.



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?

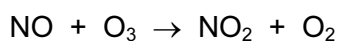
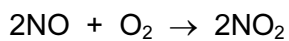
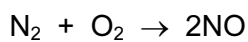
- 1 reacts with ammonium sulfate to form ammonia
- 2 turns red litmus blue

| | 1 | 2 |
|----------|---|---|
| A | ✓ | ✓ |
| B | ✓ | x |
| C | x | ✓ |
| D | x | x |

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.



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?

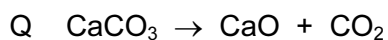
- A ammonium ions and carbonate ions
 - B ammonium ions and chloride ions
 - C calcium ions and carbonate ions
 - D calcium ions and chloride ions
- 22 Some properties of four elements W, X, Y and Z are listed.

- 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

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



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



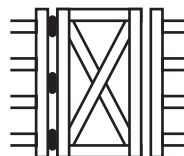
iron bucket
electroplated
with zinc

B



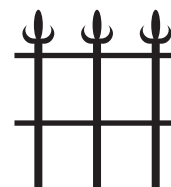
iron cored
aluminium
electricity cables

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 green.

What is metal M?

- A aluminium
- B copper
- C mercury
- D nickel

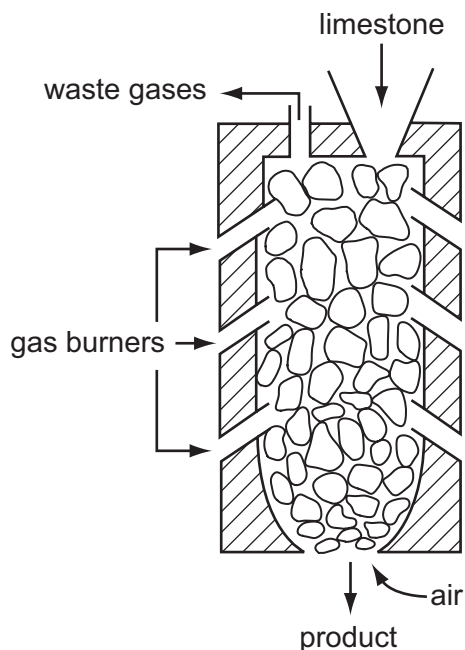
33 In many countries river water is used for the washing of clothes.

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.



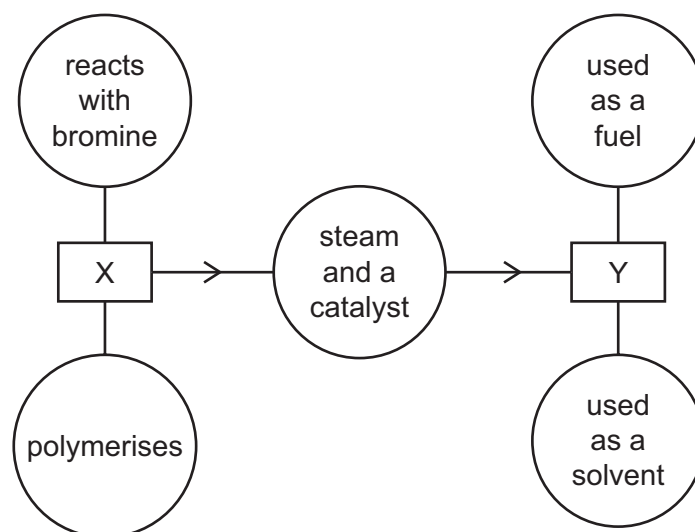
What is the product and what waste gas is formed?

| | 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.



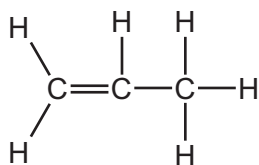
What are X and Y?

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

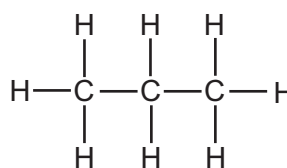
37 Three types of organic compound are alkanes, alkenes and alcohols.

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

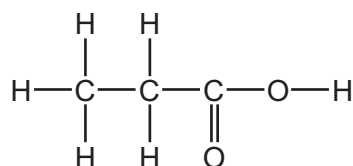
A



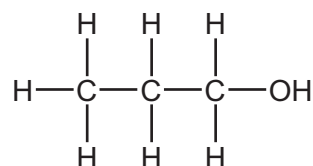
B



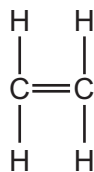
C



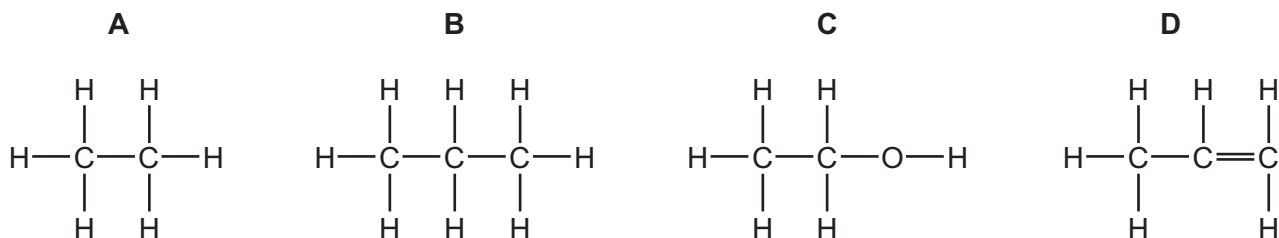
D



38 The diagram represents ethene.



Which compound has chemical properties similar to those of ethene?

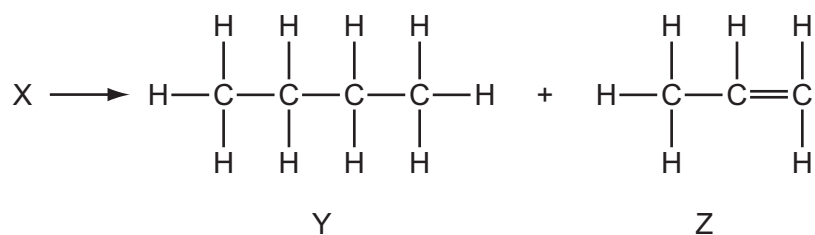


39 Petroleum is a mixture of hydrocarbons which can be separated into fractions using fractional distillation.

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.



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

DATA SHEET
The Periodic Table of the Elements

| | | Group | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| I | II | III | IV | V | VI | VII | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | 1 H Hydrogen 1 | 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 | 101 Ru Ruthenium 44 | 106 Pd Palladium 46 | 112 Cd Cadmium 48 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 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 | 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 | 210 Po Polonium 84 | 210 At Astatine 85 | 210 Rn Radon 86 | 226 Ra Radium 88 | 227 Ac Actinium 89 | † |
| | | | | | | | | | | | | 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | 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 | 238 U Uranium 92 | 238 Np Neptunium 93 | 238 Pu Plutonium 94 | 238 Am Americium 95 | 238 Cm Curium 96 | 238 Bk Berkelium 97 | 238 Cf Californium 98 | 238 Es Einsteinium 99 | 238 Fm Fermium 100 | 238 Md Mendelevium 101 | 238 No Nobelium 102 | 238 Lr Lawrencium 103 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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

| | |
|---|----------|
| a | X |
| b | |

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

Key

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

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