

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4472/01

ADDITIONAL SCIENCE/CHEMISTRY

**CHEMISTRY 2
FOUNDATION TIER**

A.M. TUESDAY, 14 January 2014

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	6	
3.	4	
4.	6	
5.	7	
6.	7	
7.	8	
8.	4	
9.	6	
10.	6	
Total	60	

ADDITIONAL MATERIALS

In addition to this paper you will need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

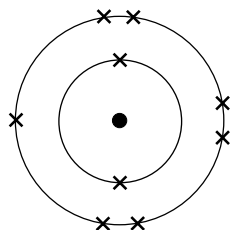
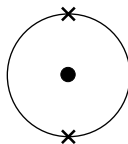
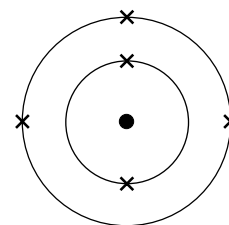
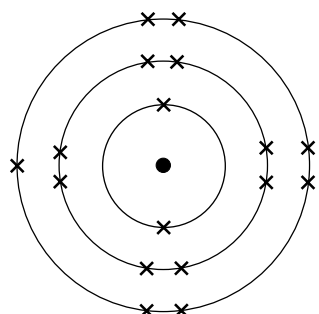
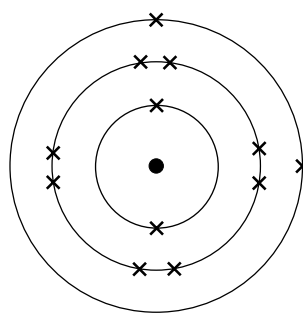
INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for good English and orderly presentation in your answers.
Assessment will take into account the quality of written communication (QWC) in your answer to question **10**.
The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

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Answer all questions.

1. (a) The following diagrams represent five different atoms, **A–E**.

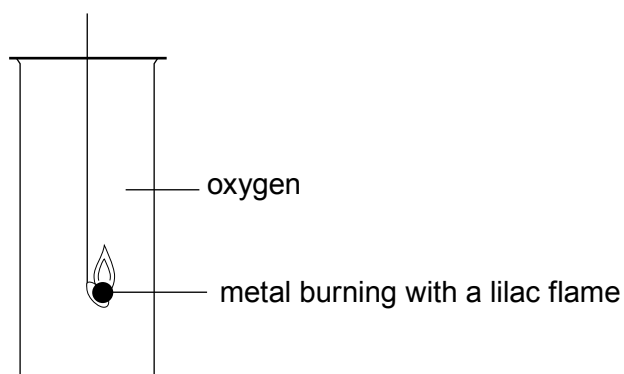
**A****B****C****D****E**

Use the diagrams to answer the following questions.

- (i) Give the electronic structure of element **D**. [1]
- (ii) Give the letters, **A–E**, of the elements that are found in Period 3. [1]
..... and
- (iii) Give the letters, **A–E**, of the elements that are found in Group 7. [1]
..... and
- (iv) Give the atomic number of element **C**. [1]
- (b) Complete the following table to show the relative masses and charges of the particles found in an atom. [2]

Particle	Relative mass	Relative charge
proton	1
neutron	0
electron	0	-1

2. A Group 1 metal is burned in a gas jar containing oxygen.



- (a) Use the information in the diagram above to name the Group 1 metal. [1]

.....

- (b) Write a **word** equation for the reaction taking place. [1]

..... + \longrightarrow

- (c) Give the name of a Group 1 metal that would react **less** vigorously than the metal named in (a) above. [1]

.....

- (d) A similar reaction can be carried out using chlorine instead of oxygen. The product obtained is a white solid.

- (i) Choose from the box below a solution that could be used to show that the white solid contains chloride ions. [1]

limewater	silver nitrate	sodium hydroxide	sulfuric acid
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Solution

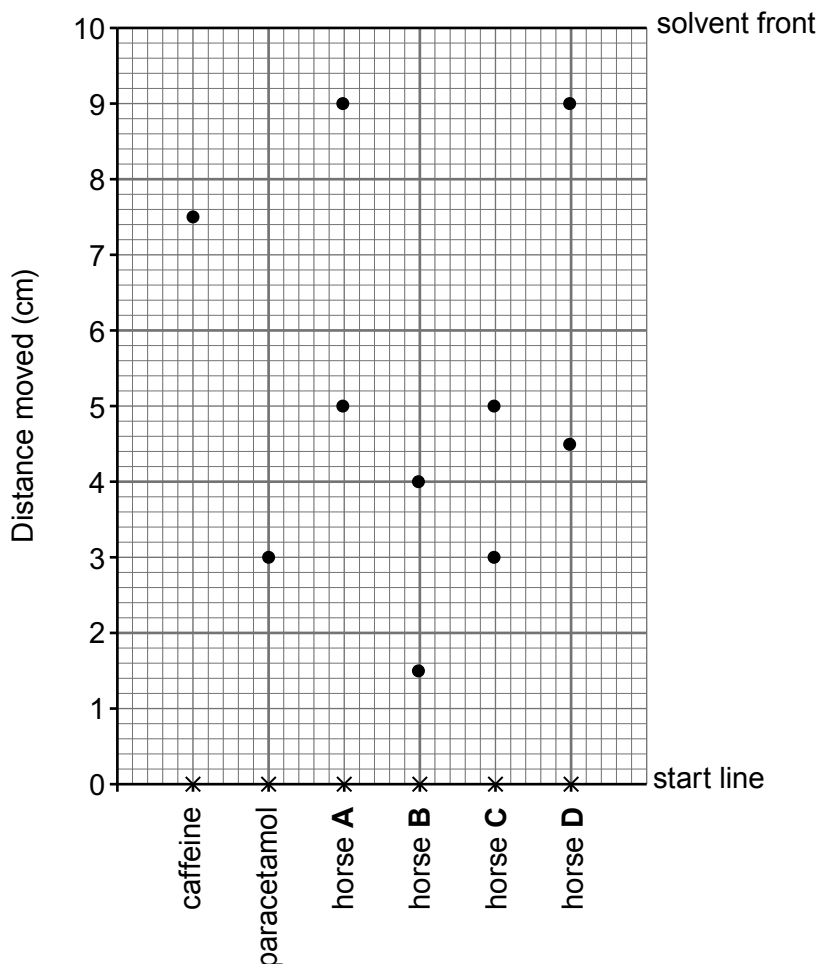
- (ii) State what must be done to the white solid in order to carry out the test. [1]

.....

- (iii) Give the colour of the precipitate formed. [1]

.....

3. Chromatography can be used to test if racehorses have been given illegal drugs. Urine samples from four horses, **A–D**, were tested to find out whether they contained caffeine or paracetamol. The following diagram shows the results obtained.



- (a) Give the letter of the horse, **A–D**, that had been given paracetamol. [1]

.....

- (b) State, giving a reason, if any of the four horses had been given caffeine. [1]

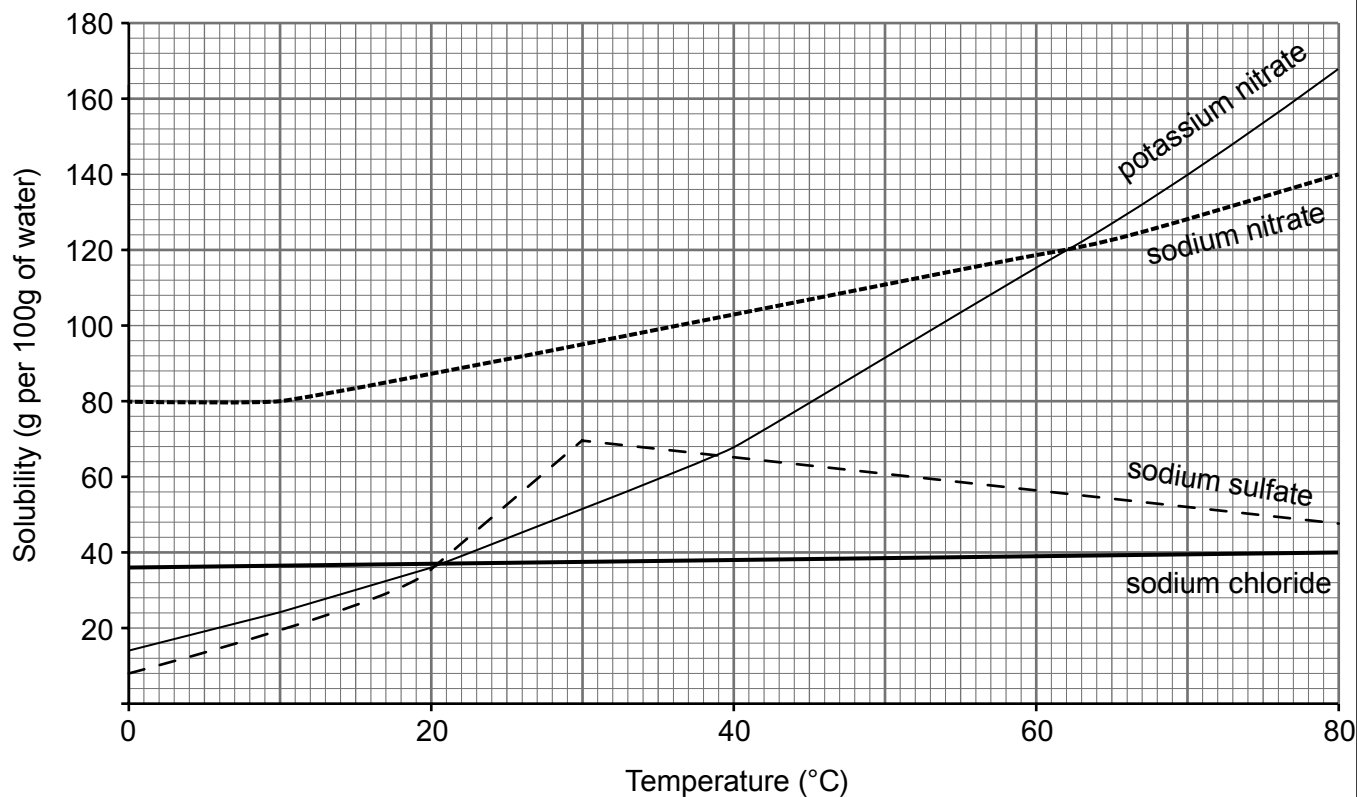
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- (c) The R_f value can be used to identify a substance. Use the following equation to calculate the R_f value of paracetamol. [2]

$$R_f \text{ value} = \frac{\text{distance moved by paracetamol}}{\text{distance moved by solvent}}$$

R_f value =

4. The following graph shows how the solubility of four different substances varies with temperature.



(a) Name the substance that shows the smallest change in solubility. [1]

.....

(b) Give the temperature at which the solubility of potassium nitrate and sodium nitrate is the same. [1]

..... °C

(c) If a saturated solution of sodium nitrate in 100g of water is cooled from 80°C to 10°C, calculate the mass of crystals that will be formed. [2]

Mass of crystals formed = g

(d) Describe, **using data from the graph**, how the solubility of sodium sulfate changes with temperature. [2]

.....

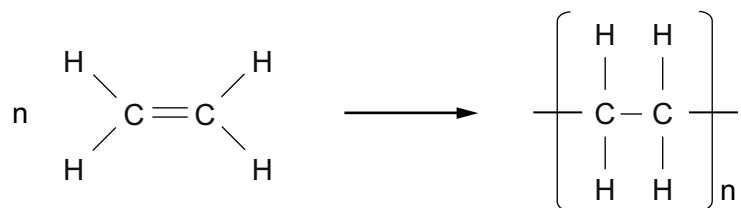
5. The following table shows some information about four organic compounds.

Name	Molecular formula	Structural formula	Family of hydrocarbons
methane		$\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$	
butane	C_4H_{10}		alkane
ethene	C_2H_4	$\begin{array}{c} \text{H} \quad \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C}=\text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \quad \text{H} \end{array}$	
	C_3H_6	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}=\text{C} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array}$	alkene

(a) Complete the table.

[4]

(b) Ethene undergoes polymerisation to form polythene. The following equation shows the reaction taking place.



Describe what happens during this process.

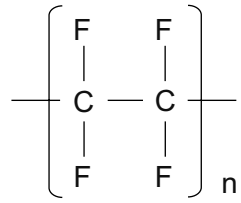
[2]

.....

.....

.....

- (c) Another polymer is PTFE. Its repeating unit is shown below.



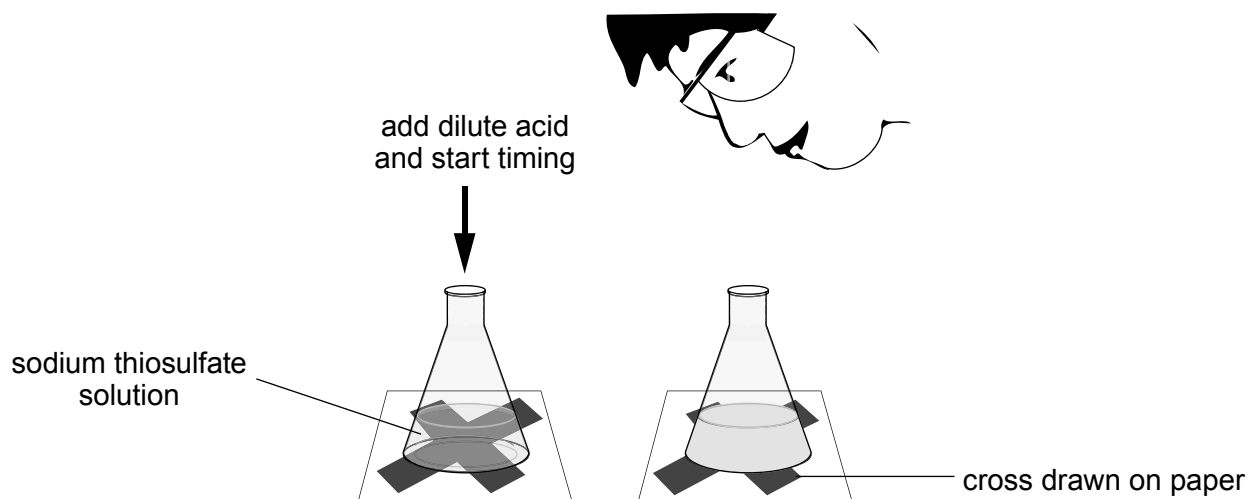
Draw the structure of the monomer used to produce PTFE.

[1]

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6. When sodium thiosulfate solution reacts with dilute acid, sulfur forms as a precipitate. The precipitate causes the solution to go cloudy. The rate of reaction can be measured by placing a cross beneath the flask and measuring the time taken for the cross to disappear.

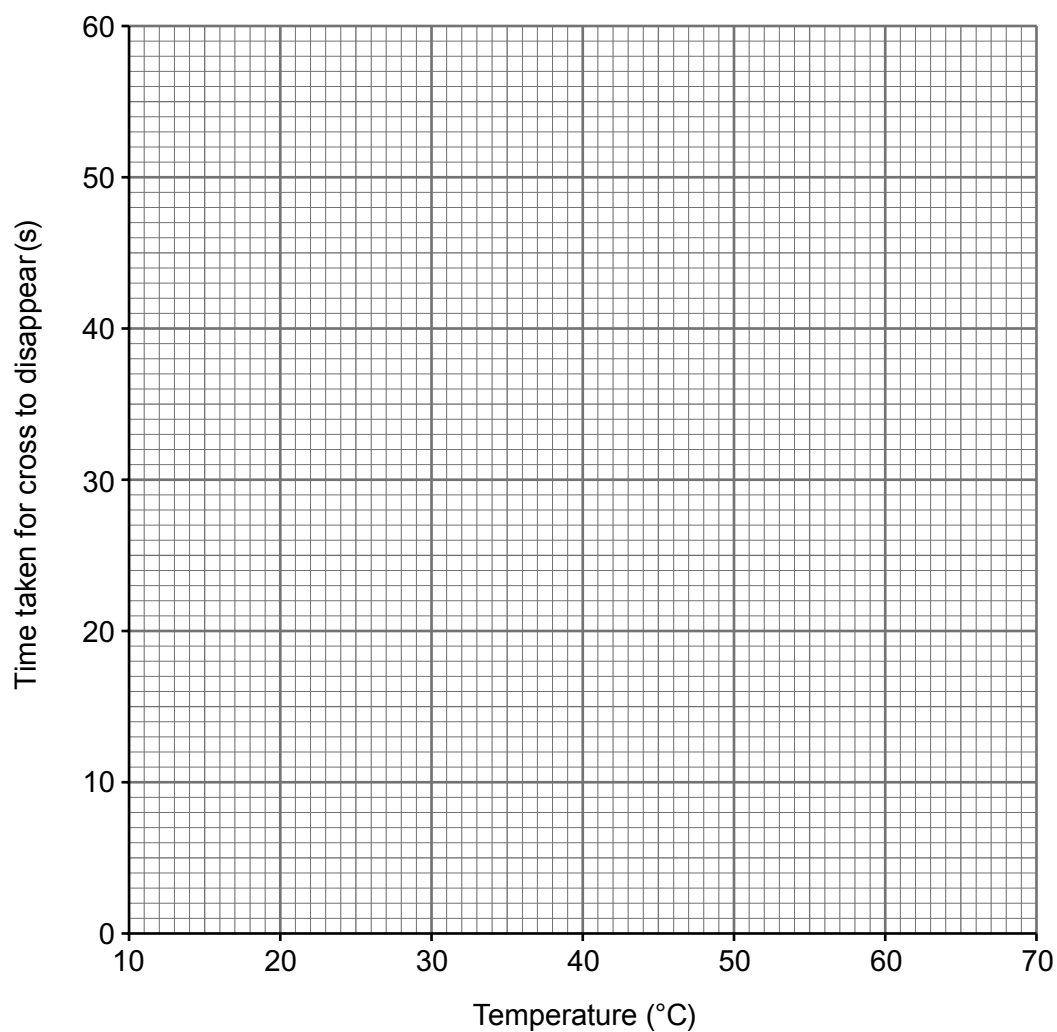


A pupil studied the effect of temperature on the reaction and obtained the following results.

Temperature (°C)	20	30	40	50	60
Time taken for cross to disappear (s)	50	32	25	20	17

- (a) (i) Plot the results on the grid below and draw a suitable line.

[3]



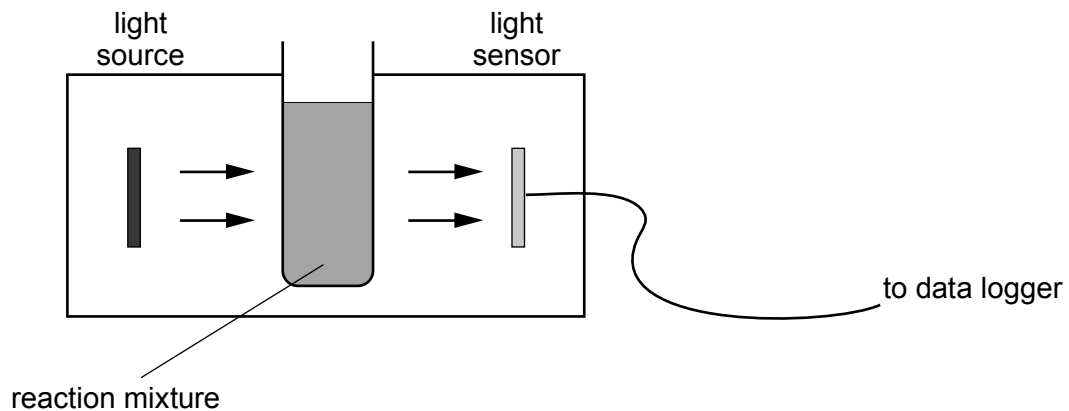
- (ii) Describe the trend in the results.

[1]

- (iii) A second student carried out the same experiment using a higher concentration of acid. Draw the line you would expect him to obtain on the same grid.

[1]

- (b) Another student suggested using a light sensor and data logger to study the reaction rate.



Describe how the light intensity detected by the sensor would change during the reaction and give **one** advantage of using a light sensor. [2]

.....

.....

.....

7. The following table shows information about some atoms, **A–E**.

A–E are not the chemical symbols for the elements.

Atom	A	B	C	D	E
atomic number	3	6		10	11
mass number		12	14	20	23
number of protons	3	6	6	10	11
number of neutrons	4	6	8	10	
number of electrons	3	6	6	10	11

- (a) **Complete** the table. [3]

- (b) (i) Give the electronic structure of element **D**. [1]

- (ii) Use this information to explain why this element is found in Period 2 and Group 0. [2]

.....

.....

.....

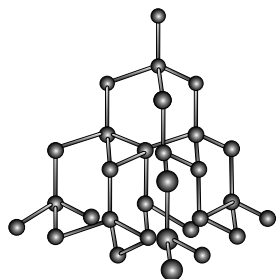
- (c) Choose the letters, **A–E**, of the atoms that represent isotopes and give a reason for your choice. [2]

Letters and

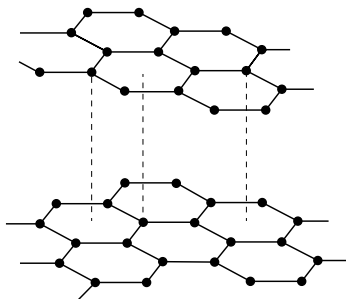
Reason

.....

8. The following diagrams show the structures of diamond, graphite and carbon nanotubes.



diamond



graphite



carbon nanotube

(a) Two of the structures shown above conduct electricity. Name both and give the reason why they are able to conduct electricity. [2]

Structures and

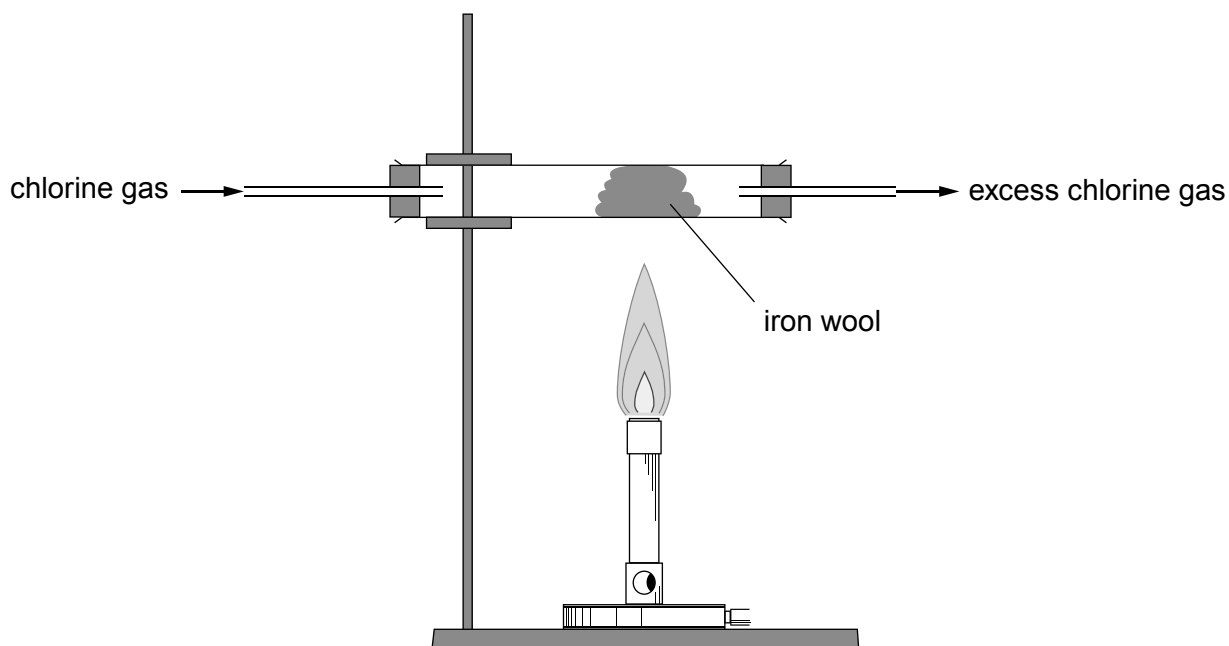
Reason

(b) Name the structure above that is used as a lubricant and give a reason why it is suitable for this use. [2]

.....
.....

4

9. The reaction of chlorine with iron can be demonstrated using the following apparatus.



- (a) State why the reaction should be carried out in a fume cupboard. [1]

.....

.....

- (b) The product of the reaction above is iron(III) chloride, FeCl_3 . Complete and balance the following symbol equation for the reaction. [2]



- (c) Calculate the percentage by mass of chlorine in iron(III) chloride, FeCl_3 . [3]

$$A_r(\text{Fe}) = 56 \qquad A_r(\text{Cl}) = 35.5$$

Percentage by mass of chlorine = %

6

FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al^{3+}	Bromide	Br^-
Ammonium	NH_4^+	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^-
Calcium	Ca^{2+}	Fluoride	F^-
Copper(II)	Cu^{2+}	Hydroxide	OH^-
Hydrogen	H^+	Iodide	I^-
Iron(II)	Fe^{2+}	Nitrate	NO_3^-
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^+	Sulfate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^+		
Silver	Ag^+		
Sodium	Na^+		
Zinc	Zn^{2+}		

PERIODIC TABLE OF ELEMENTS

1 2 3 4 5 6 7 0

Group

		${}^1_1\text{H}$ Hydrogen										${}^4_2\text{He}$ Helium					
${}^3_1\text{Li}$ Lithium	${}^4_2\text{Be}$ Beryllium			${}^9_4\text{B}$ Boron	${}^{12}_6\text{C}$ Carbon	${}^{14}_7\text{N}$ Nitrogen	${}^{16}_8\text{O}$ Oxygen	${}^{19}_9\text{F}$ Fluorine	${}^{20}_{10}\text{Ne}$ Neon								
${}^{11}_{13}\text{Na}$ Sodium	${}^{12}_{12}\text{Mg}$ Magnesium			${}^{27}_{13}\text{Al}$ Aluminium	${}^{28}_{14}\text{Si}$ Silicon	${}^{31}_{15}\text{P}$ Phosphorus	${}^{32}_{16}\text{S}$ Sulfur	${}^{35}_{17}\text{Cl}$ Chlorine	${}^{40}_{18}\text{Ar}$ Argon								
${}^{19}_{19}\text{K}$ Potassium	${}^{20}_{20}\text{Ca}$ Calcium	${}^{45}_{21}\text{Sc}$ Scandium	${}^{48}_{22}\text{Ti}$ Titanium	${}^{51}_{23}\text{V}$ Vanadium	${}^{52}_{24}\text{Cr}$ Chromium	${}^{55}_{25}\text{Mn}$ Manganese	${}^{56}_{26}\text{Fe}$ Iron	${}^{59}_{27}\text{Co}$ Cobalt	${}^{59}_{28}\text{Ni}$ Nickel	${}^{64}_{29}\text{Cu}$ Copper	${}^{65}_{30}\text{Zn}$ Zinc	${}^{70}_{31}\text{Ga}$ Gallium	${}^{73}_{32}\text{Ge}$ Germanium	${}^{75}_{33}\text{As}$ Arsenic	${}^{79}_{34}\text{Se}$ Selenium	${}^{80}_{35}\text{Br}$ Bromine	${}^{84}_{36}\text{Kr}$ Krypton
${}^{37}_{37}\text{Rb}$ Rubidium	${}^{38}_{38}\text{Sr}$ Strontium	${}^{89}_{39}\text{Y}$ Yttrium	${}^{91}_{40}\text{Zr}$ Zirconium	${}^{93}_{41}\text{Nb}$ Niobium	${}^{96}_{42}\text{Mo}$ Molybdenum	${}^{99}_{43}\text{Tc}$ Technetium	${}^{101}_{44}\text{Ru}$ Ruthenium	${}^{103}_{45}\text{Rh}$ Rhodium	${}^{106}_{46}\text{Pd}$ Palladium	${}^{108}_{47}\text{Ag}$ Silver	${}^{112}_{48}\text{Cd}$ Cadmium	${}^{115}_{49}\text{In}$ Indium	${}^{119}_{50}\text{Sn}$ Tin	${}^{122}_{51}\text{Sb}$ Antimony	${}^{128}_{52}\text{Te}$ Tellurium	${}^{127}_{53}\text{I}$ Iodine	${}^{131}_{54}\text{Xe}$ Xenon
${}^{55}_{55}\text{Cs}$ Caesium	${}^{56}_{56}\text{Ba}$ Barium	${}^{139}_{57}\text{La}$ Lanthanum	${}^{179}_{72}\text{Hf}$ Hafnium	${}^{181}_{73}\text{Ta}$ Tantalum	${}^{184}_{74}\text{W}$ Tungsten	${}^{186}_{75}\text{Re}$ Rhenium	${}^{190}_{76}\text{Os}$ Osmium	${}^{192}_{77}\text{Ir}$ Iridium	${}^{195}_{78}\text{Pt}$ Platinum	${}^{197}_{79}\text{Au}$ Gold	${}^{201}_{80}\text{Hg}$ Mercury	${}^{204}_{81}\text{Tl}$ Thallium	${}^{207}_{82}\text{Pb}$ Lead	${}^{209}_{83}\text{Bi}$ Bismuth	${}^{210}_{84}\text{Po}$ Polonium	${}^{210}_{85}\text{At}$ Astatine	${}^{222}_{86}\text{Rn}$ Radon
${}^{87}_{87}\text{Fr}$ Francium	${}^{88}_{88}\text{Ra}$ Radium	${}^{227}_{89}\text{Ac}$ Actinium															

Key:

