

CHEMISTRY

0620 P3

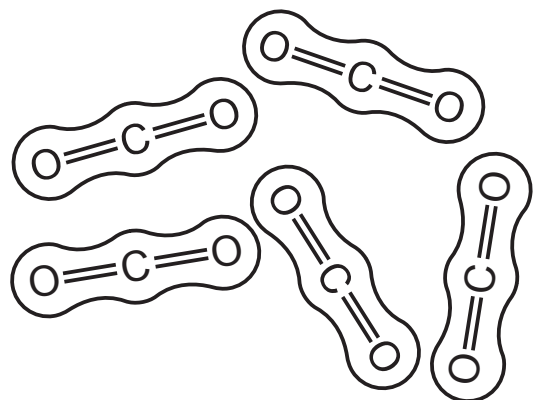
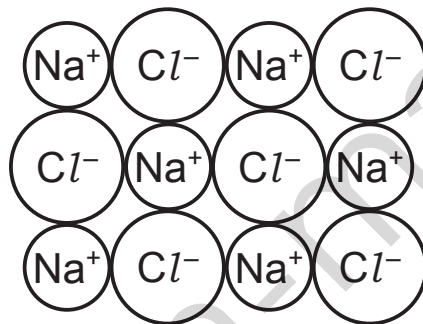
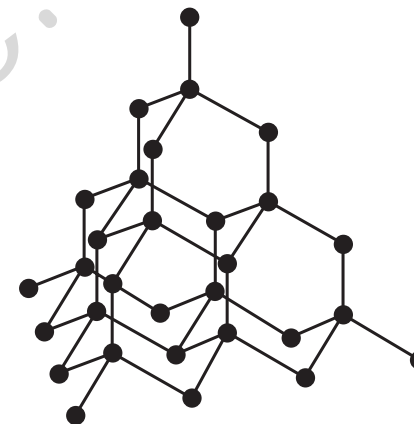
2017 — 2025

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1 - (0620/31_Summer_2017_Q3)

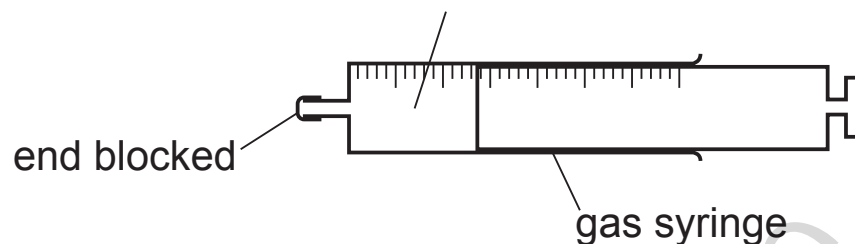
ANSWER

The diagram shows part of the structures of three substances, **X**, **Y** and **Z**, at room temperature and pressure.

**X****Y****Z**

(a) Describe substances **X**, **Y** and **Z** in terms of

- their bonding,
- the arrangement of their particles,
- the motion of their particles.



Describe what happens to the volume of substance **X** in the syringe when the pressure is increased. The temperature remains constant. Explain your answer in terms of particles.

.....

..... [2]

(c) Substance **Z** is diamond. Diamond is used in jewellery.

Give **one** other use of diamond.

..... [1]

(d) Substance **Y** undergoes physical and chemical changes.

Which **two** of the following are physical changes? Explain your answer.

- A** Substance **Y** dissolves easily in water.
- B** An aqueous solution of substance **Y** gives a white precipitate with acidified aqueous silver nitrate.
- C** Substance **Y** melts at $801\text{ }^{\circ}\text{C}$.
- D** Substance **Y** reacts with concentrated sulfuric acid.

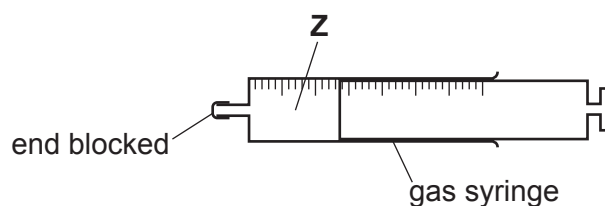
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.....

..... [3]

[Total: 11]

(b) A closed gas syringe contains substance **Z**.



Describe what happens to the volume of substance **Z** in the syringe when the temperature is increased. The pressure remains constant. Explain your answer in terms of particles.

.....
 [2]

(c) Describe the colour change when substance **Y** is added to anhydrous copper(II) sulfate.

..... [2]

(d) Give a reason why substance **Y** is a compound.

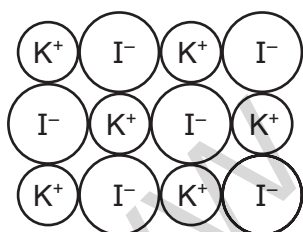
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[Total: 10]

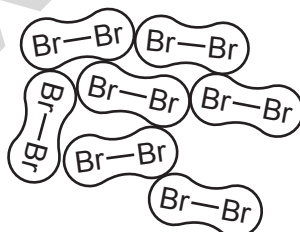
3 - (0620/33_Summer_2017_Q3)

ANSWER

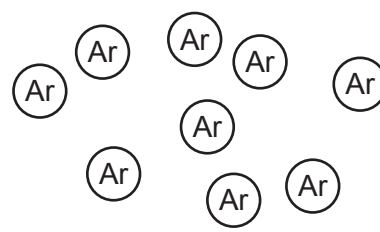
The diagram shows part of the structures of three substances, **P**, **Q** and **R**, at room temperature and pressure.



P



Q



R

(a) Describe substances **P**, **Q** and **R** in terms of

- their bonding,
- the arrangement of their particles,
- the motion of their particles.

.....

- (d) Graphite has a giant covalent structure containing layers of carbon atoms. Graphite is used to make inert electrodes for electrolysis.

State **one** other use of graphite and explain how this use is related to its structure.

.....

[2]

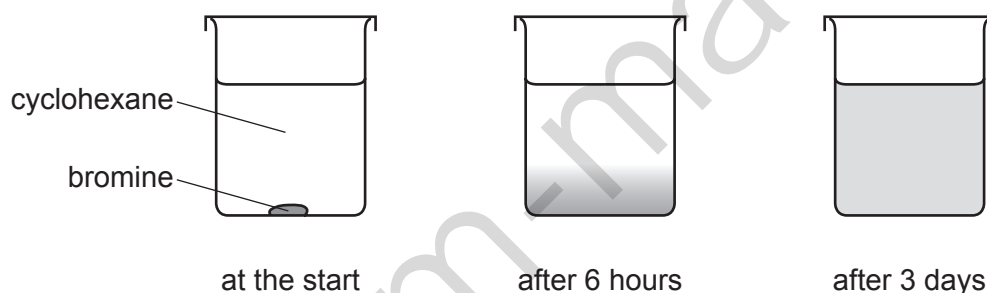
[Total: 12]

4 - (0620/31_Winter_2017_Q7)

ANSWER

Bromine is a red-brown liquid which is soluble in cyclohexane.

- (a) A few drops of liquid bromine were placed at the bottom of a beaker containing cyclohexane. After 3 days, a red-brown colour had spread throughout the beaker.

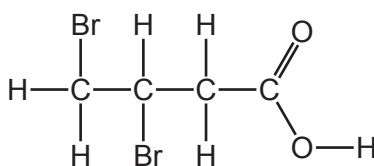


Explain these observations using the kinetic particle model.

.....

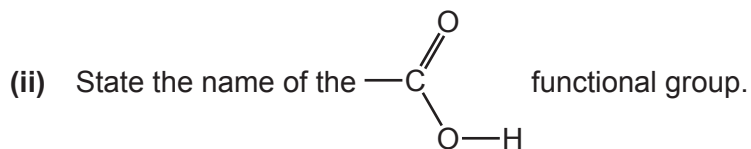
[3]

- (b) The structure of a compound containing bromine is shown.



- (i) Deduce the molecular formula of this compound showing the number of carbon, hydrogen, oxygen and bromine atoms.

..... [1]



..... [1]

(c) The relative atomic mass of bromine is 80.

Complete the definition of relative atomic mass using terms from the list.

6

12

an atom

an element

a molecule

average

carbon

hydrogen

total

Relative atomic mass is the mass of naturally occurring atoms
of on a scale where of the ^{12}C isotope has
a mass of exactly units. [4]

(d) Dilute hydrobromic acid reacts with magnesium ribbon.

(i) Suggest **three** ways of increasing the rate of this reaction.

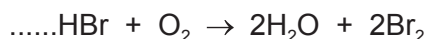
1

2

3 [3]

(ii) Hydrobromic acid reacts with oxygen. The products are water and bromine.

Balance the chemical equation for this reaction.



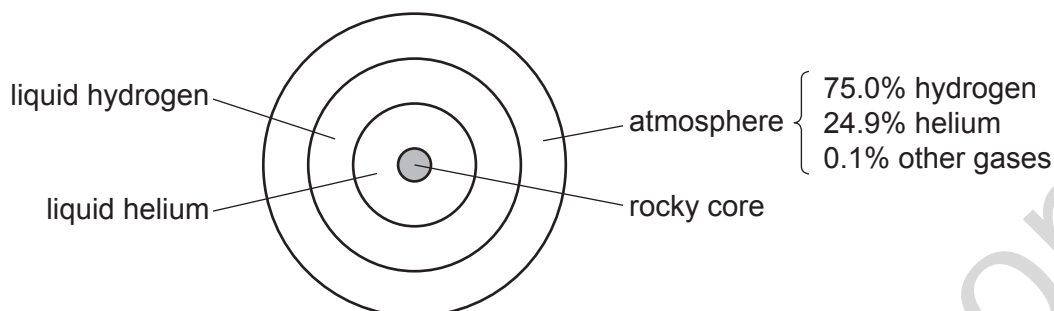
[1]

[Total: 13]

5 - (0620/32_Winter_2017_Q2)



The diagram shows the composition of the planet Saturn.



- (a) Describe how Saturn's atmosphere differs from the Earth's atmosphere. Give **three** differences.

1

.....

2

.....

3

.....

[3]

- (b) Some properties of hydrogen and helium are given in the table.

element	density of the liquid in g/cm ³	melting point in °C	boiling point in °C
hydrogen	0.07	-259	-253
helium	0.15	-272	-269

- (i) Use the information to suggest why the layer of liquid hydrogen in Saturn floats on top of the liquid helium.

..... [1]

- (ii) What is the physical state of hydrogen at -250 °C? Explain your answer.

.....

..... [2]

(c) The atmosphere of Saturn contains small amounts of ammonia.

(i) Describe a test for ammonia.

test

result

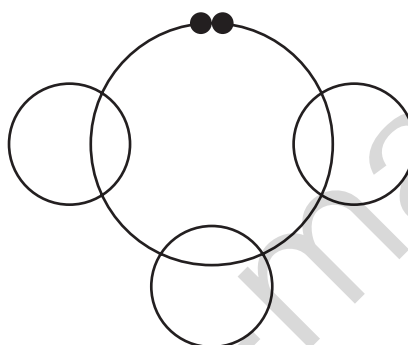
[2]

(ii) Ammonia is a covalent compound.

Complete the diagram to show

- the arrangement of electrons in a molecule of ammonia,
- the symbols of the atoms present.

Show outer electrons only.



[2]

(d) Saturn's atmosphere also contains small amounts of ammonium hydrosulfide.

Calculate the relative molecular mass of ammonium hydrosulfide, NH_4SH .
Use your Periodic Table to help you.

relative molecular mass = [2]

(e) Saturn's atmosphere also contains small amounts of methane.

Small amounts of methane are present in the Earth's atmosphere.
Methane is a greenhouse gas.

(i) Name another greenhouse gas present in the Earth's atmosphere.

..... [1]

(ii) Scientists are concerned about the increase in the amount of greenhouse gases in the Earth's atmosphere.

Explain why.

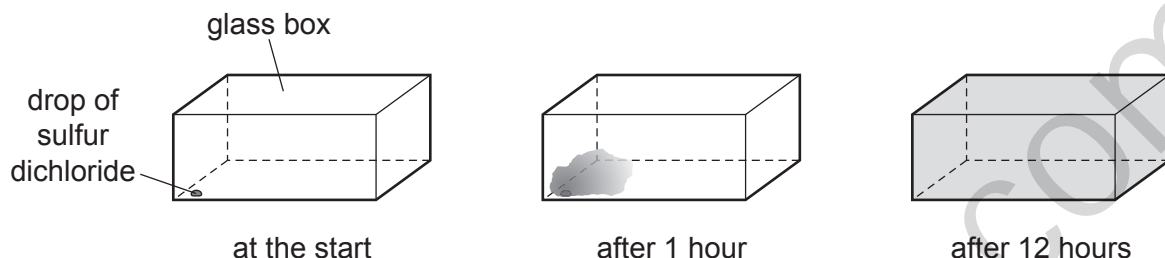
..... [1]

[Total: 14]

6 - (0620/32_Winter_2017_Q7) **ANSWER**

Sulfur dichloride, SCl_2 , is a red liquid which vaporises easily at room temperature and pressure.

- (a) A drop of sulfur dichloride was placed in the corner of a glass box. The glass box was closed and left for 12 hours. After 12 hours a red vapour had spread to fill the whole box.



Explain these observations using the kinetic particle model.

.....

.....

.....

.....

.....

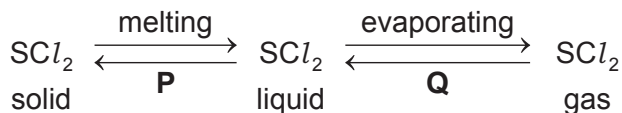
..... [3]

- (b) Sulfur dichloride can be made by passing chlorine through liquid disulfur dichloride, S_2Cl_2 . Complete the chemical equation for this reaction.



[2]

- (c) Some changes of state of sulfur dichloride are shown.



Name the changes of state represented by **P** and **Q**.

P

Q

[2]

[Total: 7]

1 - (0620/31_Summer_2017_Q3)



(a)	<p>any 5 of:</p> <p>X has covalent bonding</p> <p>X particles are randomly arranged / irregularly arranged</p> <p>X particles are moving rapidly / freely / randomly / irregularly</p> <p>Y has ionic bonding / ionic</p> <p>Y particles are regularly arranged / lattice / in rows / uniformly arranged</p> <p>Y particles (only) vibrate / do not move from place to place</p> <p>Z has covalent bonding</p> <p>Z particles are regularly arranged / lattice / in a tetrahedral shape</p> <p>Z particles (only) vibrate / do not move from place to place</p>	5
(b)	volum gets smaller	1
	particles get closer together	1
(c)	drill tips / drills / cutting (tools)	1
(d)	A / substance Y dissolves easily in water	1
	C / substance Y melts (at 8015 °C)	1
	the change can be reversed by altering the conditions	1

2 - (0620/32_Summer_2017_Q3)



(a)	any 5 of: X has ionic bonding / ionic X particles are regularly arranged / lattice / in rows / uniformly arranged X particles (only) vibrate / do not move from place to place Y has covalent bonding Y has irregular arrangement of particles / random arrangement Y particles are sliding over each other / moving slowly Z has covalent bonding Z particles are randomly arranged / irregularly arranged Z particles moving randomly / moving rapidly / moving freely / moving quickly / moving fast	5
(b)	volume increases / volume gets larger	1
	particles get further apart	1
(c)	white	1
	to blue	1
(d)	it has (two different types of) <u>atoms bonded / joined</u>	1

3 - (0620/33_Summer_2017_Q3)



(a)	<p>any 5 of:</p> <p>P has ionic bonding / ionic</p> <p>P particles are regularly arranged / lattice / in rows / uniformly arranged</p> <p>P particles (only) vibrating / not moving from place to place</p> <p>Q has covalent bonding</p> <p>Q has irregular arrangement of particles / random arrangement</p> <p>Q particles moving slowly / moving randomly / sliding over each other</p> <p>R no bonding (between atoms) / weak bonding between atoms / weak attractive forces between atoms</p> <p>R has irregular arrangement of particles / random arrangement</p> <p>R particles moving randomly / moving rapidly / freely moving / randomly (moving) / irregular (movement)</p>	5
(b)	volume increases	1
	particles get further apart	1
(c)	C / boils (at 1330 °C)	1
	D / dissolves (readily in water)	1
	the change can be reversed by altering the conditions	1
(d)	pencil (leads) / lubricant	1
	layers move OR slide over each other	1

4 - (0620/31_Winter_2017_Q7)



(a)	any 3 from: <ul style="list-style-type: none"> • diffusion • molecules move (from place to place) • (molecules move) randomly • molecules collide • molecules spread out / mix up • (bulk) movement of molecules from areas of where they are at higher concentration to where they are at lower concentration 	3
(b)(i)	$C_4H_6O_2Br_2$	1
(b)(ii)	carboxylic acid	1
(c)	average	1
	an element	1
	an atom	1
	12	1
(d)(i)	increasing the concentration of the <u>acid</u>	1
	increasing the temperature	1
	using <u>magnesium</u> powder / using smaller pieces of <u>magnesium</u>	1
(d)(ii)	4 (HBr)	1

5 - (0620/32_Winter_2017_Q2)



(a)	any 3 from: <ul style="list-style-type: none"> • greater percentage of helium (on Saturn) / less helium on Earth • greater percentage of hydrogen (on Saturn) / little hydrogen on Earth • no oxygen on Saturn / oxygen on Earth / Earth has 1/5 oxygen • lower percentage of other gases (on Saturn) / more of other gases on Earth • greater percentage of argon on Earth / less argon on Saturn • no OR very little nitrogen on Saturn / Earth has about 80% nitrogen / Earth has a lot of nitrogen 	3
(b)(i)	hydrogen is less dense than helium	1
(b)(ii)	gas	1
	-250 °C is above the boiling point	1
(c)(i)	(damp) <u>red</u> litmus	1
	turns blue	1
(c)(ii)	labels 'N' and 'H' in the correct circles	1
	one pair of electrons in each overlap area and no non-bonding electrons or extra bonding electrons added	1
(d)	51 IF full credit is not awarded, allow 1 mark for (S =) 32, (N =) 14 and (H =) 1	2
(e)(i)	carbon dioxide / CO ₂	1
(e)(ii)	global warming / effect of global warming, e.g. melting ice caps / desertification / more extreme weather / death of corals / more risk of flooding	1

6 - (0620/32_Winter_2017_Q7)



(a)	any 3 from: <ul style="list-style-type: none">• diffusion• molecules move (from place to place)• (molecules move) randomly• molecules collide• molecules spread out / mix up• (bulk) movement of molecules from areas of where they are at higher concentration to where they are at lower concentration	3
(b)	Cl_2	1
	2 (SCl_2)	1
(c)	P: freezing	1
	Q: condensing / condensation	1