IGCSE Cambridge Topical Past Papers

CHEMISTRY

0620 Paper 4

2017 — 2023

CHEMISTRY 0620

TOPICAL PAST PAPER WORKSHEETS

2017 - 2023 | Questions + Mark scheme

AVAILABLE PAPERS

P1	P2	P3	P4	P6
1362 Questions	1385 Questions	715 Questions	550 Questions	186 Questions

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TOPICS	P1	P2	P3	P4	P6
STATES OF MATTER	57	38	31	9	1
SEPARATING SUBSTANCES	71	66	24	12	33
ATOMS & ELEMENTS	82	67	65	50	1
ATOMS COMBINING	87	99	64	46	0
REACTING MASSES & CHEMICAL EQUATIONS	39	57	32	38	4
USING MOLES	5	13	2	28	3
REDOX REACTIONS	31	44	20	6	0
ELECTRICITY & CHEMICAL CHANGES	48	54	37	33	3
ENERGY CHANGES & REVERSIBLE REACTIONS	88	103	26	34	18
THE SPEED OF A REACTION	57	64	38	27	31
ACIDS & BASES	108	113	54	47	32
THE PERIODIC TABLE	133	114	57	28	0
THE BEHAVIOR OF METALS	74	76	44	19	3
MAKING USE OF METALS	73	71	30	30	1
AIR & WATER	69	67	41	16	2
SOME NON-METALS & THEIR COMPOUNDS	80	97	37	27	2
ORGANIC CHEMISTRY	172	151	62	50	1
POLYMERS	47	71	17	28	1
IN THE LAB (CHEMICAL TEST & SALT ANALYSIS)	41	20	34	22	50

1 – (0620/42_Winter_2017_Q1) – *States Of Matter*

(a) Dust particles in the air move around in a random way.

(i) What term describes the random movement of the dust particles?

..... [1]

(ii) Identify the particles in the air which cause the random movement of the dust particles.

..... [2]

(iii) Explain why the dust particles move in this way.

.....

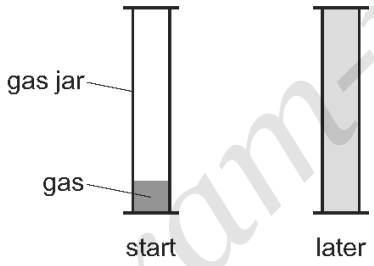
.....

..... [2]

(b) When chlorine gas, Cl_2, is put into a gas jar, it spreads out to fill the gas jar.

When bromine gas, Br_2, is put into a gas jar, it also spreads out to fill the gas jar.

The process takes longer for bromine gas than for chlorine gas.



(i) What term describes the way that the gas particles spread out?

..... [1]

(ii) Use **data** from the Periodic Table to explain why bromine gas takes longer to fill a gas jar than chlorine gas.

.....

.....

..... [2]

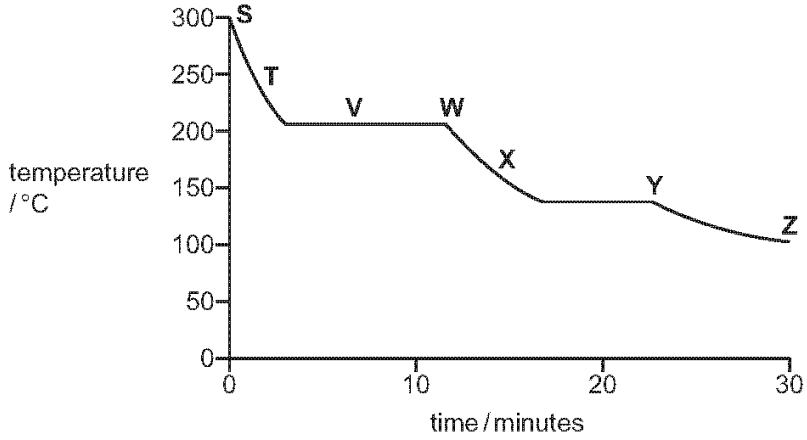
(iii) Explain why increasing the temperature increases the rate at which the gas particles spread out.

.....

..... [1]

2 – (0620/41_Winter_2017_Q2) – *States Of Matter*

The graph shows how the temperature of a substance changes as it is cooled over a period of 30 minutes. The substance is a gas at the start.



Each letter on the graph may be used once, more than once or not at all.

(a) Which letter, **S**, **T**, V, **W**, **X**, Y or **Z**, shows when

(i) the particles in the substance have the most kinetic energy,

..... [1]

(ii) the particles in the substance are furthest apart,

..... [1]

(iii) the substance exists as both a gas and a liquid?

..... [1]

(b) Use the graph to estimate the freezing point of the substance.

..... °C [1]

(c) Name the change of state directly from a solid to a gas.

..... [1]

(d) When smoke is viewed through a microscope, the smoke particles in the air appear to jump around.

(i) What term describes this movement of the smoke particles?

..... [1]

(ii) Explain why the smoke particles move in this way.

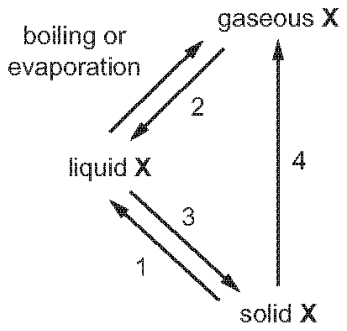
.....

.....

..... [2]

3 – (0620/42_Winter_2018_Q1) – *States Of Matter, Atoms And Elements*

Element **X** can undergo the following physical changes.



(a) (i) Give the scientific name for each of the numbered physical changes.

1 .....

2 .....

3 .....

4 .....

[4]

(ii) Explain why the changes shown are physical changes.

.....

..... [1]

(iii) One difference between boiling and evaporation is the rate at which the processes occur.

State **one** other difference between boiling and evaporation.

.....

..... [1]

(b) Describe the separation, arrangement and motion of particles of element **X** in the solid state.

separation .....

arrangement .....

motion .....

[3]

(c) Element **X** is a Group I metal. It burns in air to form an oxide X_2O.

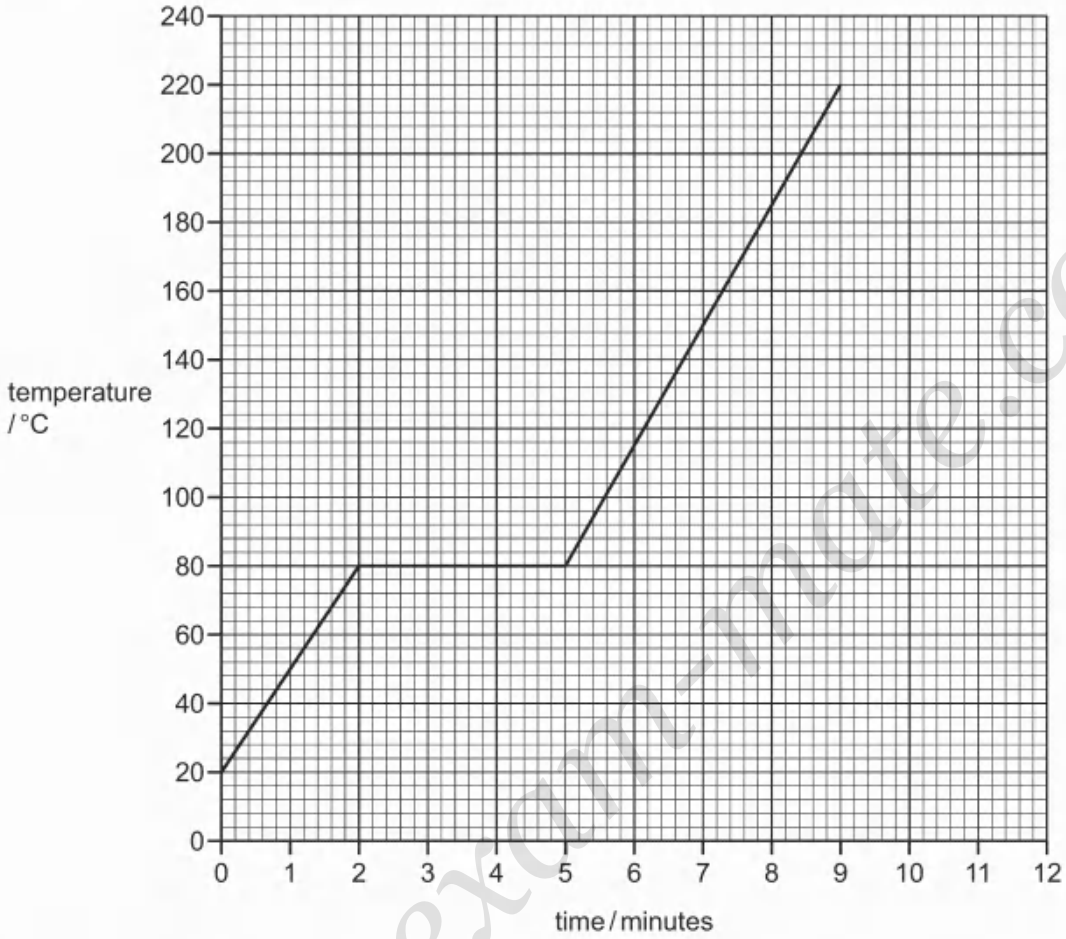
Write a chemical equation for this reaction.

..... [2]

4 – (0620/41_Summer_2019_Q2) – *States Of Matter*

Z is a covalent substance. In an experiment, a sample of pure solid **Z** was continually heated for 11 minutes.

The graph shows how the temperature of the sample of pure **Z** changed during the first 9 minutes.



(a) What is the melting point of pure **Z**?

..... °C [1]

(b) The sample of pure **Z** began to boil at 9 minutes. It was boiled for 2 minutes.

Use this information to sketch on the grid how the temperature of the sample of pure **Z** changed between 9 minutes and 11 minutes. [1]

(c) The sample of pure **Z** was continually heated between 2 minutes and 5 minutes.

Explain, in terms of attractive forces, why there was no increase in the temperature of the sample of pure **Z** between 2 minutes and 5 minutes.

.....

.....

..... [2]

(d) Describe how the motion of particles of pure **Z** changed from 0 minutes to 2 minutes.

.....

..... [2]

(e) The experiment was repeated using a solid sample of **impure Z**.

Suggest the differences, if any, in the melting point and boiling point of the sample of impure **Z** compared to the sample of pure **Z**.

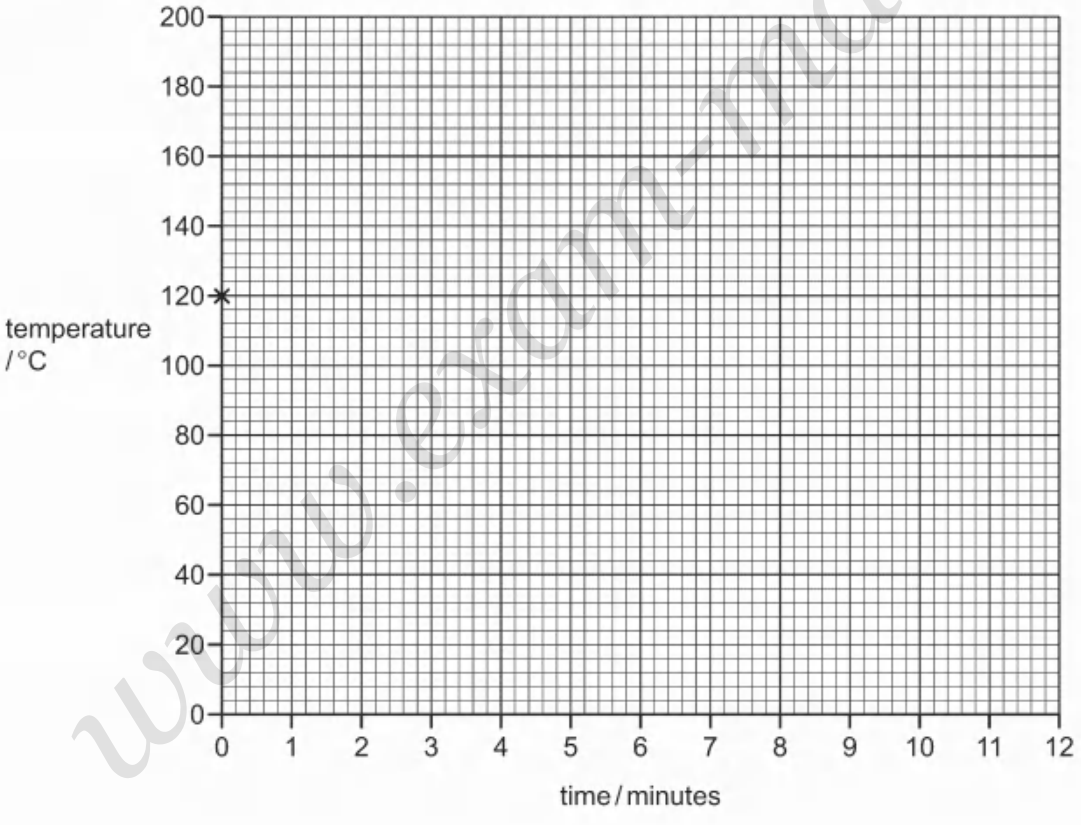
melting point .....

boiling point .....

[2]

(f) A sample of pure **Z** was allowed to cool from 120 °C to 20 °C. The total time taken was 8 minutes.

Starting from point ×, sketch on the grid how the temperature of the sample of pure **Z** changed between 0 minutes and 8 minutes.



[2]

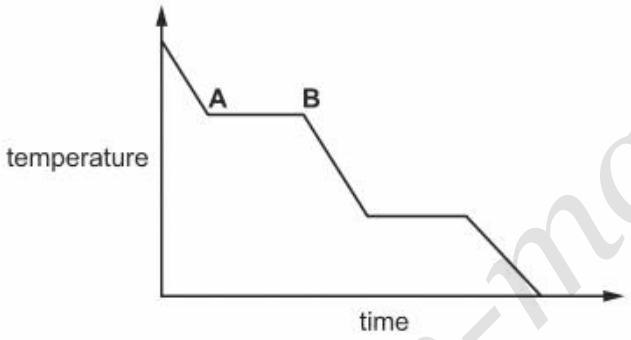
5 – (0620/43_Summer_2020_Q5) – *States Of Matter*

(a) Complete the table about solids, liquids and gases.

	particle separation	particle arrangement	type of motion
solid		regular	vibrate only
liquid	touching		random
gas	apart	random	

[3]

(b) The graph shows the change in temperature as a sample of a gas is cooled.



Name the change of state taking place between **A** and **B**.

..... [1]

(c) A bottle of liquid perfume is left open at the front of a room.

After some time, the perfume is smelt at the back of the room.

Name the **two** physical processes taking place.

1 .....

2 .....

[2]

6 – (0620/41_Winter_2020_Q3) – *Using Moles, In The Lab (chemical Test& Salt Analysis), States Of Matter*

(a) Aqueous ammonium sulfate, $(NH_4)_2SO_4$, is warmed with aqueous sodium hydroxide.

The pungent-smelling gas ammonia, NH_3, is produced.

Balance the equation for this reaction.

$$(NH_4)_2SO_4 + \text{.....}NaOH \rightarrow \text{.....}NH_3 + \text{.....}H_2O + Na_2SO_4$$ [1]

(b) A 2.8 g sample of impure ammonium sulfate is found to contain 0.7 g of impurities.

Calculate the percentage of ammonium sulfate in this sample.

percentage of ammonium sulfate = ... % [1]

(c) Describe a test for ammonia gas.

test .....

result .....

[2]

(d) Ammonia gas is prepared at the front of a laboratory.

The pungent smell of ammonia spreads throughout the laboratory slowly.

(i) Name the process that occurs when ammonia gas spreads throughout the laboratory.

..... [1]

(ii) Explain, using ideas about particles, why ammonia gas spreads throughout the laboratory.

.....

.....

.....

..... [2]

(iii) Explain why carbon dioxide gas, CO_2, will spread throughout the laboratory at a slower rate than ammonia gas, NH_3.

.....

..... [1]

ANSWERS

1 – (0620/42_Winter_2017_Q1) – *States Of Matter*

(a)(i)	Brownian (motion)	1
(a)(ii)	molecules	1
	nitrogen / N_2 / N **OR** oxygen / O_2 / O	1
(a)(iii)	nitrogen **OR** oxygen (particles) collide with / bombard / hit the dust (particles)	1
	(the bombarding particles) move **randomly**	1
(b)(i)	diffusion	1
(b)(ii)	Br_2 has an M_r of 160 **AND** Cl_2 has an M_r of 71 / bromine has an A_r of 80 **AND** chlorine has an A_r of 35.5	1
	(heavier) bromine (molecules / particles) diffuses more slowly	1
(b)(iii)	particles have more energy / move faster	1

2 – (0620/41_Winter_2017_Q2) – *States Of Matter*

(a)(i)	**S**	1
(a)(ii)	**S**	1
(a)(iii)	V	1
(b)	any value in the range 130–145 °C	1
(c)	sublimation	1
(d)(i)	Brownian motion	1
(d)(ii)	nitrogen / oxygen / carbon dioxide / air molecules hit / bombard the smoke particles	1
	(the bombarding particles) move randomly	1

3 – (0620/42_Winter_2018_Q1) – *States Of Matter, Atoms And Elements*

(a)(i)	M1 Melting M2 Condensing M3 Freezing M4 Sublimation	4
(a)(ii)	No new substances are made **or** The change can be reversed (by a physical process)	1
(a)(iii)	Boiling happens at a specific temperature **or** Evaporation happens over a range of temperatures	1
(b)	M1 Separation: Touching M2 Arrangement: Regular M3 Movement: Vibrate	3
(c)	$4X + O_2 \rightarrow 2X_2O$ M1 Species M2 Balance	2

4 – (0620/41_Summer_2019_Q2) – *States Of Matter*

(a)	80(°C) (1)	1
(b)	horizontal line from end of graph at minute 9 to minute 11 (1)	1
(c)	energy is used to break bonds / overcome attraction (1) between molecules (1)	2

(d)	vibrations (1) increase (1)	2
(e)	melting point decreases (1) boiling point increases (1)	2
(f)	decrease from 120 °C to 80 °C and horizontal line at 80 °C (1) decrease from horizontal line to finish at 20 °C at 8 mins (1)	2

5 – (0620/43_Summer_2020_Q5) – *States Of Matter*

(a)		particle separation	particle arrangement	type of motion	3
	solid	touching			
	liquid		random		
	gas			random	
(b)	condensing				1
(c)	evaporation diffusion				2

6 – (0620/41_Winter_2020_Q3) – *Using Moles, In The Lab (chemical Test& Salt Analysis), States Of Matter*

(a)(i)	$2 \rightarrow 2 + 2$	1
(b)	75(%)	1
(c)	test: (damp red) litmus paper (1) result: (litmus goes) blue (1)	2
(d)(i)	diffusion	1
(d)(ii)	particles move from an area of high to low concentration particles move randomly	2
(d)(iii)	CO_2 **molecules** are heavier (than NH_3)	1
(e)(i)	lower temperature: (rate of reaction) slower (1) higher pressure: expensive/specialist equipment	2
(e)(ii)	catalyst	1
(f)(i)	proton acceptor	1
(f)(ii)	any value greater than 7 up to 12	1