

IGCSE Chemistry P2

%) \$+ A7 Qs with Keys

2009-2022

Compiled By:

M. NOUMAN AHMAD

A Level Chemistry Teacher at:
Aitchison College, Lahore

Endorsed By:

NIAZ AHMED AWAN

Senior A Level Chemistry at Lahore Grammar School
Beaconhouse (Newlands & JT Campuses)
LGS, KIMS, The City School, SICAS, LACAS

HAMID MAHMOOD

Senior Chemistry Teacher at
Roots School System, Mirpur AJK
+923227126666

UMAR ZAMAN KHATTAK

HOD: Garrison Academy for
Cambridge Studies

MUHAMAD ASHFAQ

O & A Level Chemistry Teacher at:
LACAS, LGS, Lahore Lyceum

MUHAMMAD SAQIB

Chemistry Teacher at:
Lahore Grammar School JTC

SHAHBAZ YASEEN

O & A Level Chemistry Teacher at:
LACAS, Johar Town

 **STUDENTS RESOURCE**

Airport Road :
Shop 23-24,
Basement Faysal Bank,
Near Yasir Broast,
Airport Road, Lahore.
Mob: 0321-4567519
Tel: 042-35700707

DHA Ph-V:
Plaza No. 52-CCA, Ph-5
DHA Lahore Cantt.
Mob: 0321-4924519
Tel: 042-37180077

Johar Town :
Opp. Beaconhouse JTC
Adjacent Jamia Masjid PIA
Society Shadawal Chowk,
Johar Town Lahore.
Mob: 0313-4567519
Tel: 042-35227007

Bahria Town:
70 - Umer Block
Main Boulevard
Commercial Area
Bahria Town Lahore.
Mob: 0315-4567519
Tel: 042-35342995

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Compiled By: **Nouman Ahmad (0323-9149918)**
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ANSWER KEY

*** &***

Chapter 1

States of Matter

Chemistry0620 Topical Paper 2

Nouman Ahmad

03239149918



In this Unit

You will practice the following topics:

1.1: Solid, Liquids and Gases

1.2: Diffusion



Topic 1.1: Solids, Liquids and Gases

1 0620/12/O/N/10/Q1

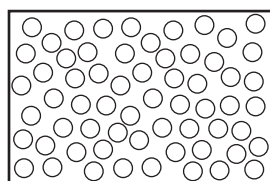
In which changes do the particles move further apart?



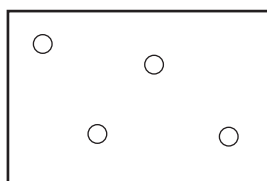
- A W and X B W and Z C X and Y D Y and Z

2 0620/12/M/J/11/Q1

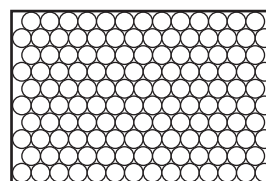
The diagrams show the arrangement of particles in three different physical states of substance X.



state 1



state 2



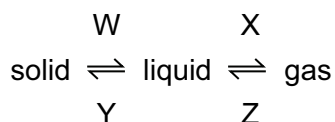
state 3

Which statement about the physical states of substance X is correct?

- A Particles in state 1 vibrate about fixed positions.
 B State 1 changes to state 2 by diffusion.
 C State 2 changes directly to state 3 by condensation.
 D The substance in stage 3 has a fixed volume.

3 0620/12/O/N/12/Q1 0620/11/O/N/12/Q1

What are the processes W, X, Y and Z in the following diagram?



	W	X	Y	Z
A	condensing	boiling	freezing	melting
B	condensing	freezing	melting	boiling
C	melting	boiling	freezing	condensing
D	melting	freezing	condensing	boiling

4 0620/12/M/J/15/Q2

The results of some tests on a colourless liquid X are shown.

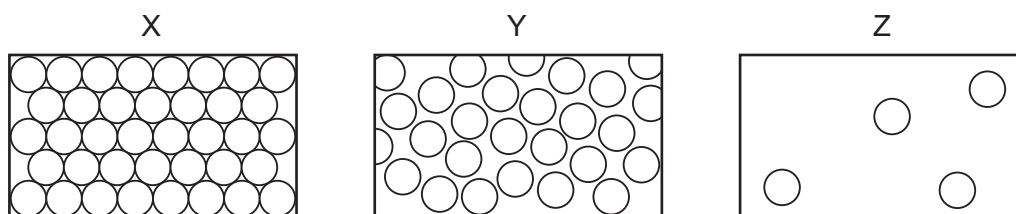
- Boiling point = 102 °C
- Universal Indicator turns green

What is X?

- A** ethanol **C** pure water
B hydrochloric acid **D** sodium chloride (salt) solution

5 0620/11/O/N/15/Q1

Diagrams X, Y and Z represent the three states of matter.



Which change occurs during boiling?

- A** X to Y **B** Y to Z **C** Z to X **D** Z to Y

6 0620/12/O/N/15/Q1

Which change of state takes place during evaporation?

- A** gas to liquid **B** liquid to gas **C** liquid to solid **D** solid to gas

7 0620/13/O/N/15/Q1

In which process do particles move closer together but remain in motion?

- A** condensation **B** diffusion **C** evaporation **D** freezing

8 0620/23/M/J/17/Q14

Which changes are physical changes?

- 1 melting ice to form water
- 2 burning hydrogen to form water
- 3 adding sodium to water
- 4 boiling water to form steam

- A** 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

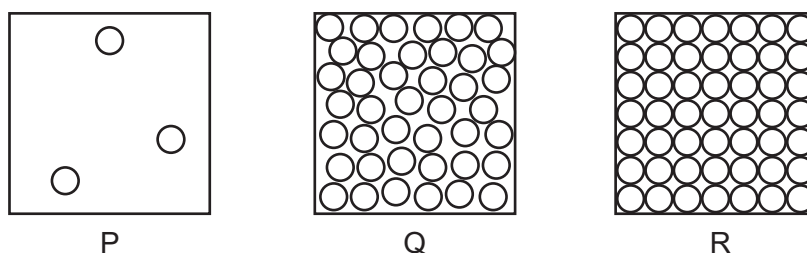
9 0620/21/O/N/17/Q1

Which process causes the greatest increase in the distance between particles?

- A** condensation **B** freezing **C** melting **D** sublimation

10 0620/22/O/N/17/Q1

The diagram shows the arrangement of particles in the three states of matter.



Solid carbon dioxide (dry ice) sublimates to gaseous carbon dioxide.

Which row describes the initial and final states?

	initial state	final state
A	P	R
B	Q	P
C	R	P
D	R	Q

11 0620/23/O/N/17/Q1

Which statement describes sublimation?

- A** Particles moving slowly past each other speed up and move further apart.
- B** Particles vibrating next to each other become mobile and move slowly past each other.
- C** Particles vibrating next to each other start to move rapidly and move further apart.
- D** Rapidly moving particles slow down and move closer together.

12 0620/22/F/M/20/Q14

Which change is a physical change?

- A** Copper(II) carbonate changes colour from green to black when it is heated, and stays black when it cools.
- B** Ethanol reacts with oxygen to form carbon dioxide and water.
- C** Hydrogen peroxide decomposes into water and oxygen when it is boiled.
- D** Ice forms liquid water when it is heated.

13 0620/22/F/M/20/Q1

The formula of methane is CH_4 and the formula of ethane is C_2H_6 .

Which row describes diffusion and the relative rates of diffusion of methane and ethane?

	description of diffusion	relative rate of diffusion
A	particles move from a high concentration to a low concentration	ethane diffuses more quickly than methane
B	particles move from a high concentration to a low concentration	methane diffuses more quickly than ethane
C	particles move from a low concentration to a high concentration	ethane diffuses more quickly than methane
D	particles move from a low concentration to a high concentration	methane diffuses more quickly than ethane

14 0620/21/O/N/20/Q1 0620/22/O/N/20/Q1

Which gas has the slowest rate of diffusion?

- A** H_2 **B** NH_3 **C** CH_4 **D** CO_2

15 0620/21/O/N/21/Q1

Decane has a freezing point of -30°C and a boiling point of 174°C .

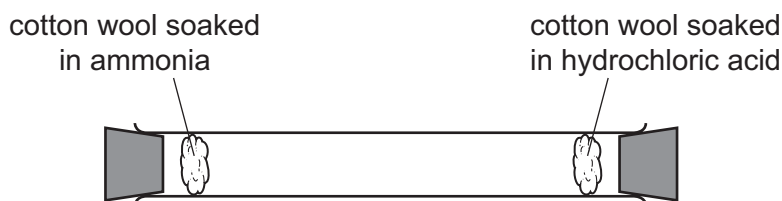
A small sample of decane is placed in an open beaker in an oven at a temperature of 120°C and at atmospheric pressure for 24 hours.

What happens to the sample of decane?

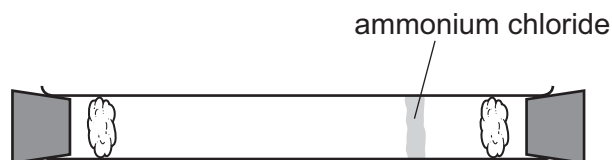
- A** It boils. **B** It evaporates. **C** It melts. **D** It sublimes.

16 0620/22/O/N/21/Q1

An experiment is set up as shown.



After several minutes, a white ring of ammonium chloride appears as shown.



Which statement explains the observation after several minutes?

- A Ammonia gas diffuses faster than hydrogen chloride gas because its molecules have a lower molecular mass.
- B Ammonia gas diffuses faster than hydrogen chloride gas because its molecules have a higher molecular mass.
- C Ammonia gas diffuses slower than hydrogen chloride gas because its molecules have a lower molecular mass.
- D Ammonia gas diffuses slower than hydrogen chloride gas because its molecules have a higher molecular mass.

17 0620/23/O/N/21/Q1

Brownian motion and the diffusion of gases provide evidence for the particulate nature of matter.

Which row identifies an example of Brownian motion and how molecular mass determines the rate of diffusion of gas molecules?

	Brownian motion	diffusion
A	pollen grains in water are seen to move randomly	heavier gas molecules diffuse more quickly
B	pollen grains in water are seen to move randomly	lighter gas molecules diffuse more quickly
C	salt dissolves faster in hot water than in cold water	heavier gas molecules diffuse more quickly
D	salt dissolves faster in hot water than in cold water	lighter gas molecules diffuse more quickly

18 0620/22/F/M/22/Q1

Which gas has the fastest rate of diffusion?

- A H₂ B CH₄ C CO₂ D SO₂

19 0620/22/F/M/22/Q1

In which state does 1 dm³ of methane contain the most particles?

- A gas at 100 °C
B gas at room temperature
C liquid
D solid

20 0620/21/M/J/22/Q1 0620/22/M/J/22/Q1 0620/23/M/J/22/Q1

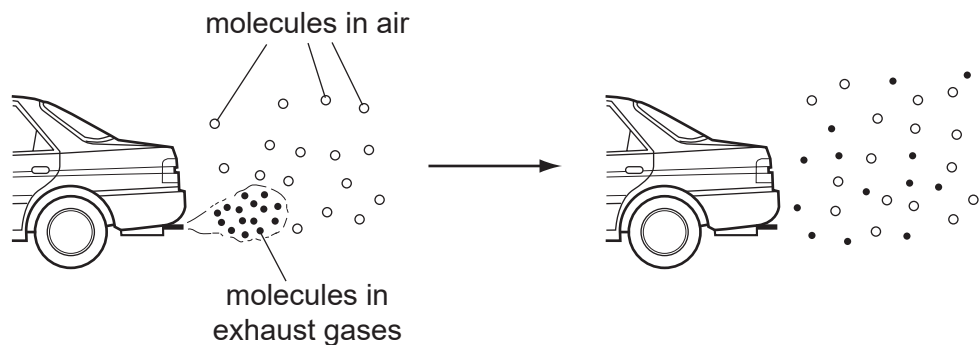
Which two gases will diffuse at the same rate, at the same temperature?

- A carbon monoxide and carbon dioxide
B carbon monoxide and nitrogen
C chlorine and fluorine
D nitrogen and oxygen

Topic 1.2: Diffusion

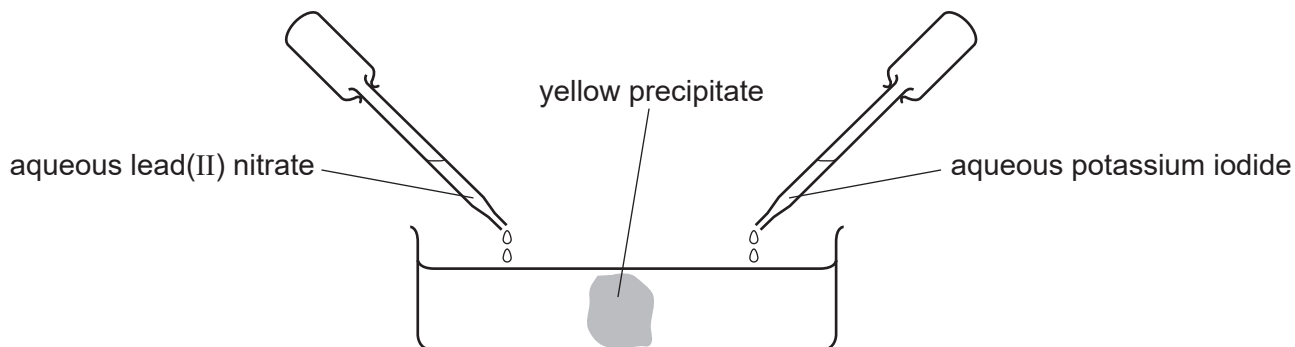
1 0620/12/M/J/09/Q1

The diagram shows how the molecules in the exhaust gases diffuse into the air.



Which statement describes what happens to these molecules next?

- A The molecules fall to the ground because they are heavier than air molecules.
 - B The molecules go back together as they cool.
 - C The molecules spread further into the air.
 - D The molecules stay where they are.
- 2 0620/12/O/N/09/Q2
- Aqueous lead(II) nitrate and aqueous potassium iodide are added to a dish containing water, as shown.



A yellow precipitate forms after a few minutes.

Which process occurs before the precipitate forms?

- A diffusion
- B distillation
- C fermentation
- D filtration

3 0620/12/M/J/10/Q1 0620/11/M/J/13/Q1 0620/12/M/J/13/Q1 0620/13/M/J/13/Q1

The diagram shows a cup of tea.

Which row describes the water particles in the air above the cup compared with the water particles in the cup?

	moving faster	closer together
A	✓	✓
B	✓	x
C	x	✓
D	x	x



4 0620/11/O/N/11//Q1 0620/12/O/N/11/ Q1

In which substance are the particles close together and slowly moving past each other?

- A** air **B** ice **C** steam **D** water

5 0620/12/M/J/12/Q1

Which diagram shows the process of diffusion?

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

key
 ○ } different atoms
 ● }

6 0620/13/O/N/12/Q1 0620/22/O/N/16/Q1 0620/23/O/N/16/Q1

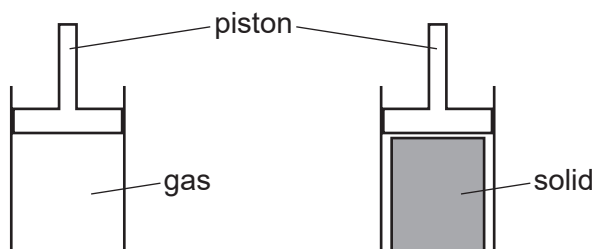
'Particles moving **very slowly** from an area of high concentration to an area of low concentration.'

Which process is being described above?

- A a liquid being frozen
- B a solid melting
- C a substance diffusing through a liquid
- D a substance diffusing through the air

7 0620/12/O/N/13/Q1

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



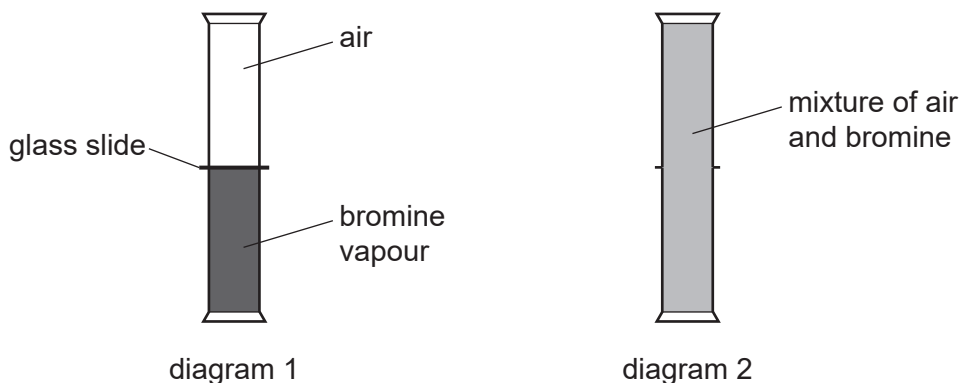
Which substance would be compressed and what is the reason for this?

	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

8 0620/13/O/N/13/Q1

A gas jar of bromine vapour and a gas jar of air are set up as shown in diagram 1.

The glass slide is removed. Diagram 2 shows the appearance of the gas jars after one hour.

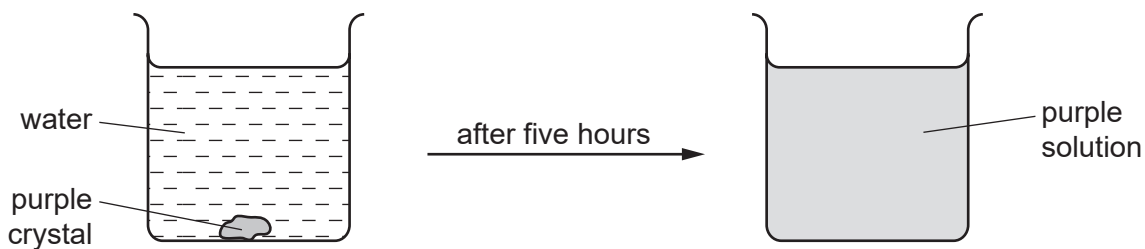


Which statement explains why the bromine and air mix together?

- A Bromine is denser than air.
- B Bromine is lighter than air.
- C Bromine molecules moved upwards and molecules in air moved downwards.
- D Molecules in bromine and air moved randomly.

9 0620/13/M/J/14/Q1 0620/11/M/J/14/Q1

The diagram shows the result of dropping a purple crystal into water.



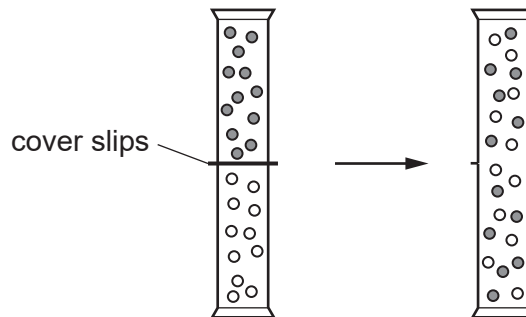
Which processes take place in this experiment?

	chemical reaction	diffusing	dissolving
A	✓	✓	✓
B	✓	x	✓
C	x	x	✓
D	x	✓	✓

10 0620/12/M/J/14/Q1

Two gas jars each contain a different gas. The gas jars are connected and the cover slips are removed.

The diagram shows what happens to the particles of the gases.



Which process has occurred?

- A** chemical reaction **B** condensation **C** diffusion **D** evaporation

11 0620/12/O/N/14/Q2

Which statement is an example of diffusion?

- A** A kitchen towel soaks up some spilled milk. **B** Ice cream melts in a warm room.
C Pollen from flowers is blown by the wind. **D** The smell of cooking spreads through a house.

12 0620/13/O/N/14/Q1

A few drops of perfume were spilled on the floor. A few minutes later the perfume could be smelt a few metres away.

Which two processes had taken place?

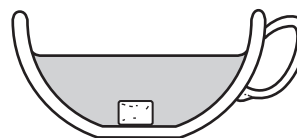
- A** distillation and condensation
B distillation and diffusion
C evaporation and condensation
D evaporation and diffusion

13 0620/12/M/J/15/Q1

The diagram shows a sugar lump in a cup of tea.

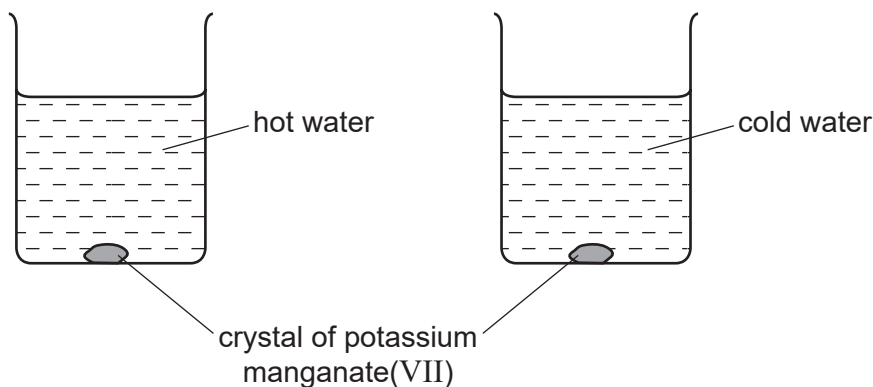
Which two processes must happen to spread the sugar evenly in the tea?

	first process	second process
A	diffusion	dissolving
B	dissolving	diffusion
C	dissolving	melting
D	melting	diffusion



14 0620/12/F/M/15/Q1

A crystal of purple potassium manganate(VII) was added to each of the beakers shown in the diagram.



One beaker contained hot water and the other beaker contained cold water.

In both beakers the purple colour of the potassium manganate(VII) spreads out.

Which result and explanation are correct?

	result	explanation
A	colour spreads faster in cold water	particles move faster at a higher temperature
B	colour spreads faster in cold water	particles move slower at a higher temperature
C	colour spreads faster in hot water	particles move faster at a higher temperature
D	colour spreads faster in hot water	particles move slower at a higher temperature

15 0620/13/M/J/15/Q1

A sugar cube is dropped into a hot cup of tea.

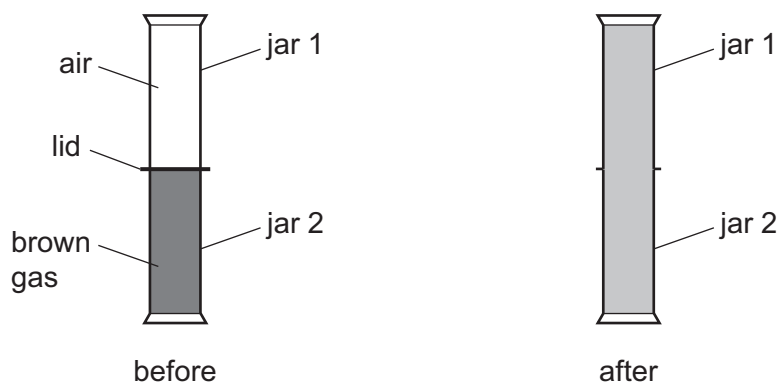
The tea is not stirred.

Which statement explains why the tea becomes sweet?

- A** The heated water molecules penetrate the sugar cube.
- B** The hot tea causes the sugar to melt.
- C** The sugar cube dissolves and its molecules diffuse.
- D** The sugar molecules get hot and evaporate.

16 0620/22/F/M/16/Q1

Two gas jars are set up as shown.



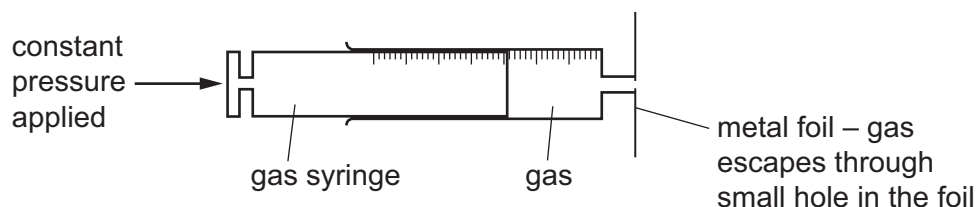
The lid is removed and the gas jars are left to stand. After some time the contents of both gas jars are brown.

Which process causes this to happen?

- A condensation C evaporation
 B diffusion D filtration

17 0620/21/M/J/16/Q1

The rate of diffusion of two gases, methane, CH_4 , and ethene, C_2H_4 , is measured using the apparatus shown.

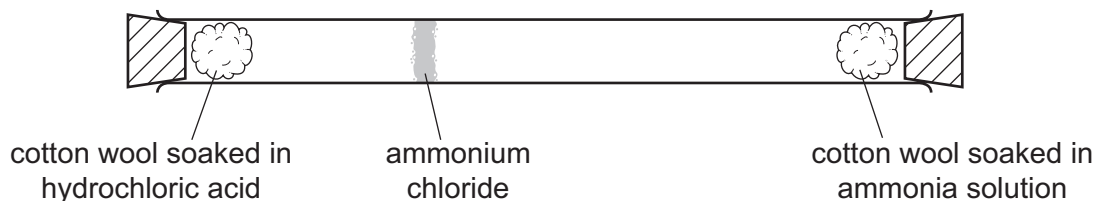


Which gas diffuses faster and why?

	gas that diffuses faster	reason
A	ethene	Ethene molecules are heavier and so move faster.
B	ethene	Ethene molecules have a double bond which makes them more reactive.
C	methane	Methane molecules are lighter and so move faster.
D	methane	Methane molecules are smaller so they can get out of the small hole more easily.

18 0620/23/M/J/16/Q1

The diagram shows an experiment to demonstrate diffusion.



Which statement explains why the ring of ammonium chloride appears as shown?

- A Ammonia solution only produces a gas which moves until it meets the hydrochloric acid.
- B Both solutions produce a gas, but ammonia moves quicker than hydrogen chloride because it is lighter.
- C Hydrochloric acid produces hydrogen chloride which stays at one end of the tube until the ammonia reaches it.
- D The two solutions run along the tube until they meet.

19 0620/21/O/N/16/Q1

'Particles moving **very slowly** from an area of higher concentration to an area of lower concentration.'

Which process is being described?

- A a liquid being frozen
- B a solid melting
- C a substance diffusing through a liquid
- D a substance diffusing through the air

20 0620/22/F/M/17/Q1

A gas is released at point Q in the apparatus shown.



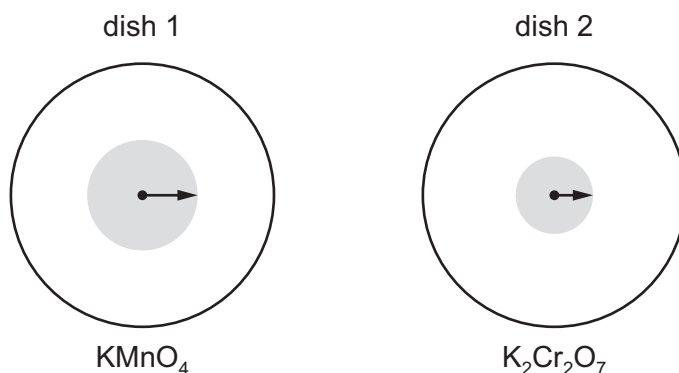
Which gas changes the colour of the damp Universal Indicator paper most quickly?

	gas	relative molecular mass
A	ammonia	17
B	carbon dioxide	44
C	chlorine	71
D	hydrogen	2

21 0620/23/M/J/17/Q1 0620/22/M/J/17/Q1 0620/21/M/J/17/Q1

Small crystals of purple KMnO_4 ($M_r = 158$) and orange $\text{K}_2\text{Cr}_2\text{O}_7$ ($M_r = 294$) were placed at the centres of separate petri dishes filled with agar jelly. They were left to stand under the same physical conditions.

After some time, the colour of each substance had spread out as shown.



The lengths of the arrows indicate the relative distances travelled by particles of each substance.

Which statement is correct?

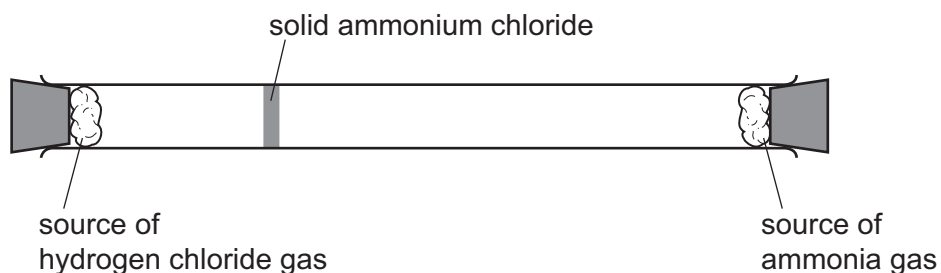
- A Diffusion is faster in dish 1 because the mass of the particles is greater.
- B Diffusion is faster in dish 2 because the mass of the particles is greater.
- C Diffusion is slower in dish 1 because the mass of the particles is smaller.
- D Diffusion is slower in dish 2 because the mass of the particles is greater.

22 0620/22/F/M/18/Q1

Hydrogen chloride gas, HCl , reacts with ammonia gas, NH_3 , to form solid ammonium chloride.

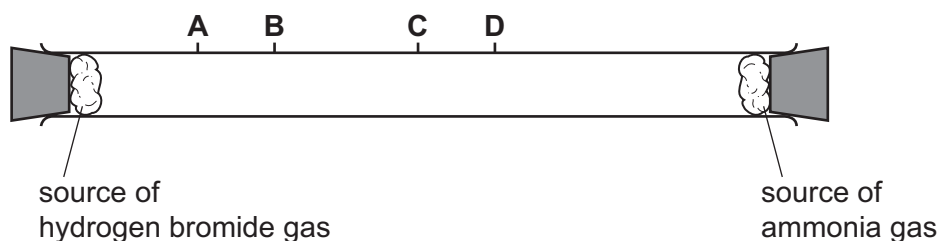
The apparatus is set up as shown.

After a few minutes, solid ammonium chloride forms where the two gases meet.



The experiment is repeated using hydrogen bromide, HBr , in place of hydrogen chloride.

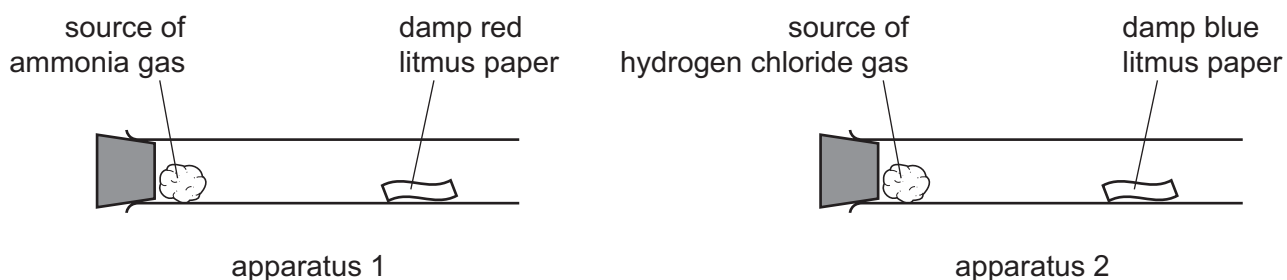
How far along the tube does the solid ammonium bromide form?



23 0620/21/M/J/18/Q1

A student investigated the diffusion of ammonia gas, NH_3 , and hydrogen chloride gas, HCl .

Two sets of apparatus were set up as shown at room temperature and pressure.



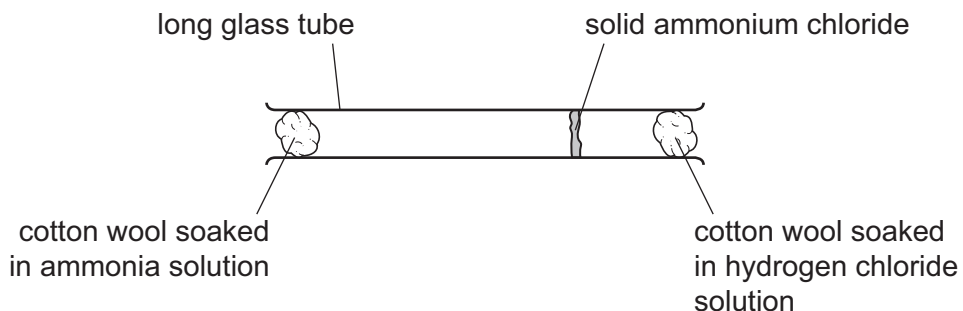
The damp red litmus paper in apparatus 1 changed colour after 30 seconds.

How long does it take for the damp blue litmus paper to change colour in apparatus 2?

- A** 64 seconds **C** 21 seconds
B 30 seconds **D** The blue litmus paper would not change colour.

24 0620/23/M/J/18/Q1

Ammonia gas is reacted with hydrogen chloride gas using the apparatus shown. Solid ammonium chloride is produced.



Which statement explains why the solid ammonium chloride is formed nearer to the hydrogen chloride?

- A Ammonia solution is a base and hydrogen chloride solution is an acid.
- B Ammonia molecules diffuse more slowly than hydrogen chloride molecules.
- C Hydrogen chloride has a greater molecular mass than ammonia.
- D Hydrogen chloride moves by Brownian motion.

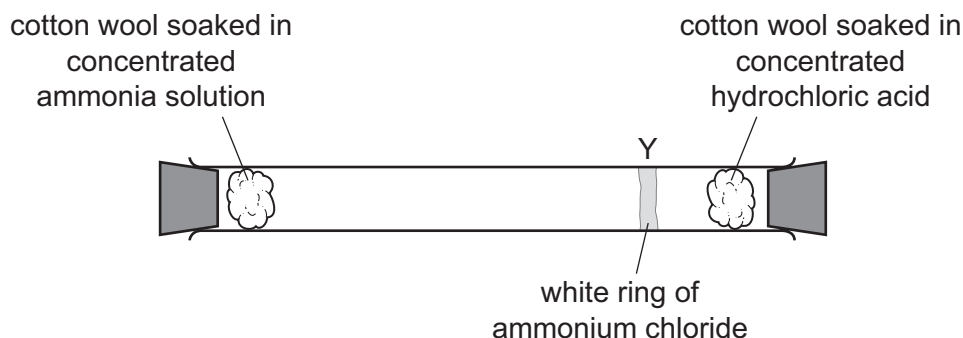
25 0620/21/M/J/19/Q1

Which statement explains why ammonia gas, NH_3 , diffuses at a faster rate than hydrogen chloride gas, HCl ?

- A Ammonia expands to occupy all of the space available.
- B Ammonia has a smaller relative molecular mass than hydrogen chloride.
- C Ammonia is an alkali and hydrogen chloride is an acid.
- D Ammonia molecules diffuse in all directions at the same time.

26 0620/22/M/J/19/Q1

The apparatus shown is set up. After 20 minutes a white ring of ammonium chloride is seen at position Y.



Which statement about the molecules of ammonia and hydrogen chloride is correct?

- A Molecules in ammonia have a larger M_r than molecules of hydrogen chloride and so they move more slowly.
- B Molecules in ammonia have a larger M_r than molecules of hydrogen chloride and so they move more quickly.
- C Molecules in ammonia have a smaller M_r than molecules of hydrogen chloride and so they move more slowly.
- D Molecules in ammonia have a smaller M_r than molecules of hydrogen chloride and so they move more quickly.

27 0620/21/O/N/19/Q1

Samples of four gases are released in a room at the same time.

The gases are carbon dioxide, CO_2 , hydrogen chloride, HCl , hydrogen sulfide, H_2S , and nitrogen dioxide, NO_2 .

Which gas diffuses fastest?

- A carbon dioxide
- B hydrogen chloride
- C hydrogen sulfide
- D nitrogen dioxide

28 0620/22/O/N/19/Q1

The rate of diffusion of a gas depends on its molecular mass and the temperature.

Which combination of molecular mass and temperature gives the slowest rate of diffusion?

	molecular mass	temperature
A	high	high
B	high	low
C	low	high
D	low	low

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The formula of methane is CH_4 and the formula of ethane is C_2H_6 .

Which row describes diffusion and the relative rates of diffusion of methane and ethane?

	description of diffusion	relative rate of diffusion
A	particles move from a high concentration to a low concentration	ethane diffuses more quickly than methane
B	particles move from a high concentration to a low concentration	methane diffuses more quickly than ethane
C	particles move from a low concentration to a high concentration	ethane diffuses more quickly than methane
D	particles move from a low concentration to a high concentration	methane diffuses more quickly than ethane

30 0620/21/M/J/20/Q1 0620/22/M/J/20/Q1 0620/23/M/J/20/Q1

A mixture of ice and water is left to stand and the ice melts.

Which row describes what happens as the ice is melting?

	temperature of mixture	energy changes
A	increases	average kinetic energy of particles increases
B	increases	energy is used to overcome attractive forces
C	stays the same	average kinetic energy of particles increases
D	stays the same	energy is used to overcome attractive forces