# The Particulate nature of matter – 2019 June

**1.** 0620/11/M/J/19/No.1

Sodium chloride is a liquid at 900 °C.

How are the particles arranged and how do the particles move in sodium chloride at 900 °C?

| | arrangement of particles | motion of particles |
|---|---|---|
| **A** | regular | vibrate about a fixed point |
| **B** | regular | move randomly |
| **C** | random | vibrate about a fixed point |
| **D** | random | move randomly |

**2.** 0620/12/M/J/19/No.1

Which row describes the arrangement and motion of particles in a solid?

| | arrangement | motion |
|---|---|---|
| **A** | random | move in all directions |
| **B** | random | stay in one place |
| **C** | regular | move freely |
| **D** | regular | vibrate about a fixed point |



**3.** 0620/13/M/J/19/No.1

Which row describes the arrangement and motion of the particles in a liquid?

| | arrangement | motion |
|---|---|---|
| **A** | irregular and most particles touching | moving slowly |
| **B** | irregular spaces between all particles | moving slowly |
| **C** | regular and most particles touching | moving slowly |
| **D** | regular spaces between all particles | moving quickly |

**4.** 0620/21/M/J/19/No.1

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.

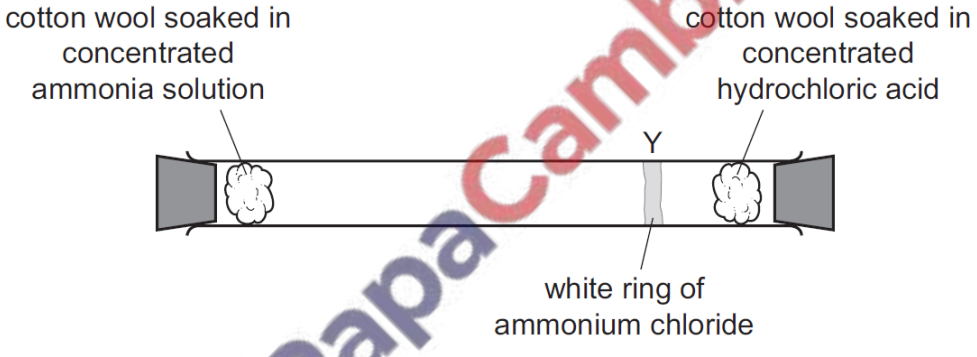
**B** Ammonia has a smaller relative molecular mass than hydrogen chloride.

**C** Ammonia is an alkali and hydrogen chloride is an acid.

**D** Ammonia molecules diffuse in all directions at the same time.

**5.** 0620/22/M/J/19/No.1

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.

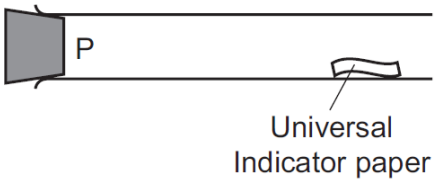
**C** Molecules in ammonia have a smaller $M_r$ than molecules of hydrogen chloride and so they move more slowly.

**D** Molecules in ammonia have a smaller $M_r$ than molecules of hydrogen chloride and so they move more quickly.

**6.** 0620/23/M/J/19/No.1

Hydrogen chloride gas ($M_r$ = 36.5) is released at P in the apparatus shown.

The Universal Indicator paper turns red after 38 s.




The experiment is repeated using sulfur dioxide ($M_r$ = 64).

What is the result for sulfur dioxide?

| | Universal Indicator turns | time for Universal Indicator to change colour / s |
|---|---|---|
| **A** | blue | 26 |
| **B** | blue | 51 |
| **C** | red | 26 |
| **D** | red | 51 |



**7.** 0620/12/F/M/19/No.1

Four processes are listed.

1 Brownian motion

2 condensation

3 diffusion

4 evaporation

Which processes involve a change of state?

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

**8.** 0620/22/F/M/19/No.1

Pure water boils at 100 °C.

What happens to the water particles when water boils?

**A** They gain energy and move further apart.

**B** They gain energy and stay close together.

**C** They lose energy and move further apart.

**D** They lose energy and stay close together.