# Past-paper walk-through

## Solids, liquids and gases ▪ 1.1

eXercise

# Questions in this set

- 0620/21 N25 Q1 ▪ 1 mark
- 0620/22 N25 Q2 ▪ 1 mark
- 0620/23 N25 Q1 ▪ 1 mark
- 0620/42 N25 Q1 ▪ 13 marks
- 0620/21 J25 Q1 ▪ 1 mark
- 0620/22 J25 Q1 ▪ 1 mark
- 0620/23 J25 Q2 ▪ 1 mark
- 0620/22 M25 Q2 ▪ 1 mark

# Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

# Question 1

0620/21 N25 ▪ Q1 ▪ 1 mark

**1** A sealed balloon contains air.

The temperature of the balloon is increased.

Which row describes how the pressure in the balloon and the kinetic energy of the particles in air change?

| | pressure | kinetic energy of particles |
|---|---|---|
| **A** | decreases | decreases |
| **B** | increases | decreases |
| **C** | decreases | increases |
| **D** | increases | increases |

# Question 1

# Solution 1

Answer: **D**

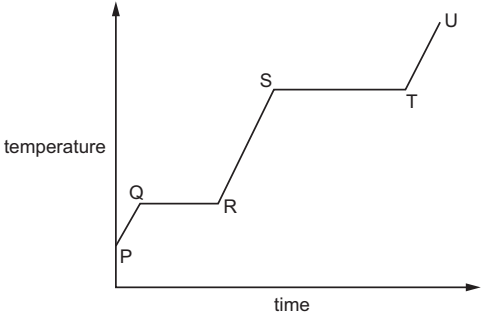
**Why**

- Heating gives the air particles more kinetic energy, so they move faster.
- They hit the balloon wall more often and harder.
- So both the pressure and the kinetic energy increase.

# Question 2

0620/22 N25 ▪ Q2 ▪ 1 mark

**2** The diagram shows the heating curve for a substance.



# Question 2

Between which two points do the particles of the substance change from being in fixed positions to being mobile?

**A** P and Q **B** Q and R **C** S and T **D** T and U

# Solution 2

Answer: **B**

**Why**

- Particles held in fixed positions means a solid; mobile particles mean a liquid.
- So the change being described is melting.
- Melting is the *first* flat section of a heating curve, where the temperature holds steady.

# Question 1

0620/23 N25 ▪ Q1 ▪ 1 mark

**1** What happens to the volume of a fixed mass of gas when pressure and temperature are separately increased?

| | volume of gas | |
|---|---|---|
| | pressure increased | temperature increased |
| **A** | increases | increases |
| **B** | no change | decreases |
| **C** | decreases | increases |
| **D** | no change | increases |

# Solution 1

Answer: **C**

**Why**

- Increasing the pressure squeezes a gas into a smaller space, so the volume decreases.
- Increasing the temperature makes the particles move faster and push out further, so the volume increases.
- So the two changes act in opposite directions on a fixed mass of gas.

# Question 1

0620/42 N25 ▪ Q1 ▪ 13 marks

**1** The three states of matter are solid, liquid and gas.

**(a)** Complete Table 1.1 to describe the structures of solids, liquids and gases in terms of particle separation, particle arrangement and particle motion.

**Table 1.1**

| state of matter | particle separation | particle arrangement | particle motion |
|---|---|---|---|
| solid | touching | | |
| liquid | | | |
| gas | | random | random |

# Question 1

[3]

**(b)** Substances can physically change.

Name each physical change:

# Question 1

# Question 1

# Question 1

[3]

**(c)** Gases diffuse.

**(i)** Describe, in terms of particles, why gases diffuse.

# Question 1

**(ii)** State what determines the relative rate of diffusion of gases at constant temperature.

# Question 1

**(d)** Gaseous oxides of nitrogen are atmospheric pollutants. One adverse effect of oxides of nitrogen is the formation of acid rain.

State **two other** adverse effects of oxides of nitrogen.

# Question 1

# Question 1

[2]

**(e)** In a catalytic converter, oxides of nitrogen are removed by reaction with the toxic gaseous product of the incomplete combustion of hydrocarbon fuels. Two non-toxic gases are formed in this reaction.

**(i)** Name the toxic gaseous product of the incomplete combustion of hydrocarbon fuels.

# Question 1

**(ii)** Name the **two** non-toxic gases formed in the catalytic converter.

# Question 1

[2]

[Total: 13]

# Solution 1

## (a) Mark scheme

- particle separation
- particle
- arrangement
- particle motion
- solid
- uniform
- vibrate
- liquid

# Solution 1

- touching
- random
- random
- gas
- apart
- 3

# Solution 1

**(b)**

**Mark scheme**

- M1 melting M2
- condensing / condensation M3
- dissolving
- 3

# Solution 1

**(c)(i)**

**Mark scheme**

- motion / movement of particles
- 1

**(c)(ii)**

**Mark scheme**

- relative molecular mass
- 1

# Solution 1

**(d)**

**Mark scheme**

- M1 photochemical smog M2
- respiratory problems
- 2

# Solution 1

**(e)(i)**

**Mark scheme**

- carbon monoxide
- 1

# Solution 1

**(e)(ii)**

**Mark scheme**

- nitrogen
- carbon dioxide
- 2

# Question 1

0620/21 J25 ▪ Q1 ▪ 1 mark

**1** A gas is placed in a sealed container with a fixed volume.

The gas is heated.

Which statements are correct?

1 The gas molecules move around faster.

2 The gas particles collide with the walls of the container more frequently.

3 The pressure in the container decreases.

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

# Solution 1

Answer: **A**

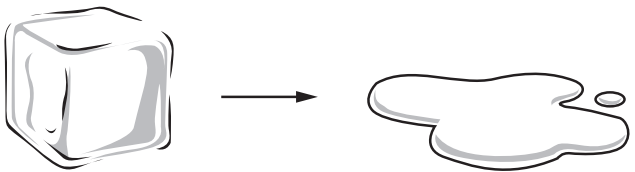
**Why**

- Heating gives the molecules more kinetic energy, so they move faster.
- Faster molecules hit the container walls more often and harder.
- The volume is fixed, so the pressure rises – but the number of molecules does not change.

# Question 1

0620/22 J25 ▪ Q1 ▪ 1 mark

**1** An ice cube melts.



ice cube pool of water

What happens to the molecules of water in the ice cube?

# Question 1

**A** They evaporate.

**B** They dissolve.

**C** They gain energy.

**D** They lose energy.

# Solution 1

Answer: **C**

**Why**

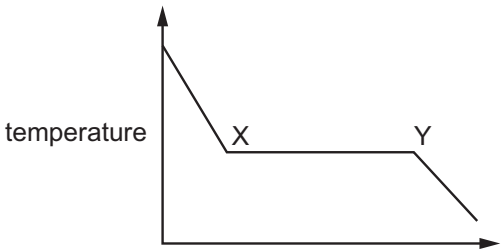
- Melting takes energy in, to overcome the forces holding the molecules in the lattice.
- So the molecules gain energy and can begin to move past one another.
- They are not evaporating (that is liquid to gas) and nothing is dissolving.

# Question 2

0620/23 J25 ▪ Q2 ▪ 1 mark

**2** Solid G is heated until it melts. It is then left to cool to room temperature.

The graph shows the cooling curve for G.



# Question 2

time

Four statements about the cooling curve between X and Y are listed.

1 The speed of the molecules of G decreases.

2 The molecules of G become less closely packed.

3 Thermal energy is released by the molecules of G to the surroundings.

4 G changes from solid to liquid.

Which statements are correct?

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

# Solution 2

Answer: **B**

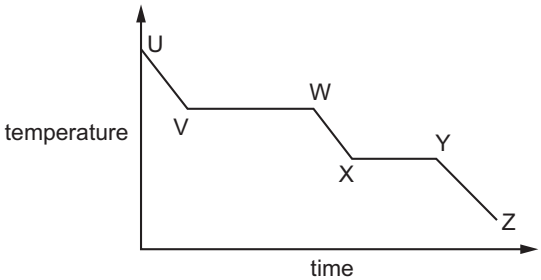
**Why**

- A flat section on a cooling curve is a change of state, with energy still being lost.
- The temperature stays constant because the energy released is exactly offsetting the bonds forming.
- During that plateau both liquid and solid are present together.

# Question 2

0620/22 M25 ▪ Q2 ▪ 1 mark

**2** A cooling curve for a substance is shown.




Which statement is correct?

# Question 2

**A** Between U and V, the substance is condensing.

**B** Between V and W, heat is being absorbed from the surroundings.

**C** Between W and X, the particles are close together and randomly arranged.

**D** Between Y and Z, the substance is changing from a liquid to a solid.

# Solution 2

Answer: **C**

**Why**

- On a cooling curve the sloping parts are one state cooling; the flat parts are a change of state.
- The first plateau is condensation (gas to liquid); the second is freezing (liquid to solid).
- Between the two plateaus the substance is entirely liquid and its temperature is falling.