

1. Why does molten sodium chloride conduct?

- ☐ Its ions can move
- ☐ Its atoms become electrons
- ☐ Its molecules contain no charge

2. Which substance is a compound?

- ☐ Water, H<sub>2</sub>O
- ☐ Oxygen, O<sub>2</sub>
- ☐ Helium, He

3. What supported Mendeleev's gaps?

- ☐ Later elements matched predicted properties
- ☐ He knew every undiscovered electron configuration
- ☐ Every gap had to be filled alphabetically

4. How many shared pairs join the two nitrogen atoms in N<sub>2</sub>?

- ☐ Three
- ☐ One
- ☐ Two

5. What explains electrical conduction in a solid copper wire?

- ☐ Mobile delocalised electrons carry charge
- ☐ Copper ions stream from one end to the other
- ☐ Covalent molecules melt before current can flow

6. Calculate the amount in 22 g CO<sub>2</sub> using molar mass 44 g per mol.

\_\_\_\_\_ mol

7. 25.0 cm<sup>3</sup> NaOH reacts with 15.0 cm<sup>3</sup> of 0.200 mol per dm<sup>3</sup> H<sub>2</sub>SO<sub>4</sub>. Using the stated 1:2 ratio, find NaOH concentration.

\_\_\_\_\_ mol per dm<sup>3</sup>

8. A particle model has 15 H<sup>+</sup> and 9 OH<sup>-</sup> ions. After complete neutralisation, how many excess H<sup>+</sup> ions remain?

\_\_\_\_\_ ions

\_\_\_\_\_ °C

10. A comparable fixed endpoint takes 40 s. Find the reciprocal-time proxy.

\_\_\_\_\_ per s

1. Its ions can move

Sodium chloride is ionic; melting frees the ions from the lattice so they can move and carry charge. The solid does not conduct because its ions are fixed, and there are no neutral molecules or free atoms becoming electrons.

2. Water, H<sub>2</sub>O

A compound contains two or more DIFFERENT elements chemically joined: water has hydrogen and oxygen. O<sub>2</sub> and helium each contain one element, so they are not compounds, whatever their particle count.

3. Later elements matched predicted properties

Mendeleev left gaps and predicted the missing elements’ properties; when gallium and germanium were discovered matching those predictions, the table gained acceptance. He knew nothing of electron configuration.

4. Three

Each nitrogen has five outer electrons and needs three more for a full shell, so the atoms share three pairs - a triple bond in N<sub>2</sub>. One pair is a single bond, two pairs a double.

5. Mobile delocalised electrons carry charge

Only the delocalised electrons are free to move through the lattice, so they carry the charge. The copper ions vibrate about fixed positions, and melting is irrelevant to conduction in a solid.

6. 0.5 mol

The result is 0.5 mol. Known: 22 g of CO<sub>2</sub>; molar mass 44 g per mole. Use amount = mass / molar mass. Amount = 22/44 = 0.5 mol. That is 0.5 x 6.02 x 10<sup>23</sup> molecules of CO<sub>2</sub>.

7. 0.24 mol per dm<sup>3</sup>

The result is 0.24 mol per dm<sup>3</sup>. Known: 15.0 cm<sup>3</sup> of 0.200 mol per dm<sup>3</sup> H<sub>2</sub>SO<sub>4</sub>; ratio 1:2. Acid moles = 0.200 x 0.0150 = 0.00300 mol. NaOH moles = 2 x 0.00300 = 0.00600 mol. Concentration = 0.00600/0.0250 = 0.24 mol per dm<sup>3</sup>, using the NaOH volume 25.0 cm<sup>3</sup> = 0.0250 dm<sup>3</sup>.

8. 6 ions

The result is 6 ions. Known: 15 H<sup>+</sup> and 9 OH<sup>-</sup> ions; they pair one-to-one forming water. Excess H<sup>+</sup> = 15 - 9 = 6 ions left over, so the mixture stays acidic. Neutralisation consumes equal numbers of each ion.

9. 29.5 °C

The result is 29.5 °C. Known: repeat temperatures 29.2 and 29.8 degrees C. Mean = (29.2 + 29.8)/2 = 29.5 degrees C. Both repeats are kept; none may be dropped without a recorded reason.

10. 0.025 per s

The result is 0.025 per s. Known: endpoint at 40 s. Use the reciprocal-time proxy = 1/time. Proxy = 1/40 = 0.025 per second. The proxy doubles when the endpoint time halves, under the same observation threshold.