



Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. density
2. relative density
3. element
4. atom
5. molecule
6. compound
7. physical change
8. chemical change

K • 4

Each carries 0.5 mark.

2 Multiple choice

- i. **a. 1 g/cm^3** K • 1
Water's density is 1 g/cm^3 , which is the same as 1000 kg/m^3 (not 1000 g/cm^3 : watch the units).
- ii. **b. the smallest particle having all the properties of the substance** K • 1
A molecule is the smallest particle of an element or compound that still has **all the properties of that substance**. (The smallest particle of an element taking part in a reaction is the atom.)
- iii. **a. breaking a lump of salt, cooling water to make ice, making furniture from wood** U • 1
In the first group no new substance is made. Each other group has a chemical change in it: making curd, or rusting.
- iv. **c. Its atomic number is 19 and its symbol is K, from its Latin name, kalium.** U • 1
Potassium has 19 protons, and its symbol K comes from kalium. P is phosphorus, whose atomic number is 15.
- v. **b. it sinks, because wax is denser than kerosene** A • 1
What matters is the density of the wax **compared with the liquid it is in**. Wax (0.9) is denser than kerosene (0.8), so it sinks in kerosene, even though it would float in water (1.0). The mass doesn't matter: a big piece and a small piece of wax do the same thing.

3 Label the diagram

- | | |
|------------------------|---------------------|
| 1. steam (water vapor) | 4. drops of water |
| 2. kettle | 5. cold steel plate |
| 3. heat | 6. water collected |

K • 3

Each carries 0.5 mark.

4 Very short answers

- a. **MARKING SCHEME** K • 1
✓ kg/m^3 .
- b. **MARKING SCHEME** K • 1
✓ $1/1837 \text{ amu}$.
- c. **MARKING SCHEME** K • 1
✓ Na.
- d. **MARKING SCHEME** U • 1
✓ Two hydrogen atoms and one oxygen atom.



5 Short answers

a. MARKING SCHEME

U • 2

- ✓ Any one difference, e.g. a chemical change forms a new substance; a physical change forms none.
- ✓ Any second difference, e.g. a chemical change is permanent, a physical change can usually be reversed (or the molecules change; or an example of each: burning wood; melting ice).

b. MARKING SCHEME

U • 2

- ✓ An egg is a little denser than pure water, so it sinks.
- ✓ Dissolving a lot of salt makes the water denser than the egg, and an object floats in a liquid denser than itself.

c. MARKING SCHEME

U • 2

- ✓ An atom has the same number of protons (positive) and electrons (negative).
- ✓ Their equal and opposite charges cancel, so the atom has no charge.

d. MARKING SCHEME

A • 2

- ✓ Iron rusts when air and moisture reach it, so paint is needed to keep them away.
- ✓ Aluminium at once forms a thin, tough layer of aluminium oxide that stops any further reaction.

6 Long answer

ANSWER

U • 4

- An **element** is made of one kind of atom (H, O, Cl).
- Atoms join to form **molecules**. Two atoms of the same element make a molecule of that element (H₂, O₂, Cl₂).
- When atoms of **different** elements join chemically, in a fixed ratio, they make molecules of a **compound** (H₂O, HCl), a new substance.
- When molecules of different substances are only mixed together, not joined, they make a **mixture**: here hydrogen, oxygen and water molecules, each keeping its own properties.

MARKING SCHEME

- ✓ An element is made of one kind of atom (e.g. H, O, Cl).
- ✓ Atoms of the same element join to make molecules of that element (e.g. H₂, O₂).
- ✓ Atoms of different elements join chemically, in a fixed ratio, to make molecules of a compound (e.g. H₂O, HCl).
- ✓ Molecules of different substances only mixed together, not joined, make a mixture; each keeps its own properties.

7 Numerical problems

a. ANSWER

A • 2

$$m = D \times V = 2700 \text{ kg/m}^3 \times 2 \text{ m}^3 = 5400 \text{ kg.}$$

MARKING SCHEME

- ✓ $m = D \times V = 2700 \text{ kg/m}^3 \times 2 \text{ m}^3$.
- ✓ 5400 kg.

b. ANSWER

A • 2

$$RD = \text{density of milk} \div \text{density of water at } 4^\circ\text{C} = 1030 \text{ kg/m}^3 \div 1000 \text{ kg/m}^3 = 1.03 \text{ (no unit).}$$

MARKING SCHEME

- ✓ $RD = 1030 \text{ kg/m}^3 \div 1000 \text{ kg/m}^3$.
- ✓ 1.03 (no unit).



8 Think

ANSWER

HA · 2

Iron (7800 kg/m^3) is denser than water, so a solid block sinks. Most of the box's volume is air, so its mass divided by its whole volume is less than water's density (1000 kg/m^3), and it floats. That is how steel ships float.

MARKING SCHEME

- ✓ Solid iron is denser than water (7800 kg/m^3 against 1000 kg/m^3), so the block sinks.
- ✓ The box is mostly air, so its mass ÷ whole volume is less than water's density, and it floats.

9 Activity: Which things float? (Activity 9.3)

(not marked)

WHAT STUDENTS SHOULD FIND

The wood and the plastic cap float; the stone and the spoon sink. Things that sink are denser than water (relative density more than 1); things that float are less dense than water (relative density less than 1).

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	12	13	7	2	34

