



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. reactants
2. products
3. word equation
4. unbalanced
5. coefficient
6. conservation of mass
7. exothermic
8. endothermic

K • 4

Each carries 0.5 mark.

2 Label the diagram

1. Exothermic: heat given out
2. quicklime

3. baking soda in vinegar
4. Endothermic: heat taken in

U • 2

Each carries 0.5 mark.

3 Multiple choice

- i. d. A, B and C

K • 1

In a reaction, atoms combine, molecules break apart, and atoms exchange partners. Friction between atoms has nothing to do with it.

- ii. b. $C + O_2 \rightarrow CO_2$

K • 1

A formula equation uses symbols and formulae. The first is the word equation for the same reaction, and the third is just a sentence.

- iii. c. cooking rice, decaying of dead animals, digestion of food in the stomach

U • 1

Cooking rice, decay and digestion all make new substances. Each other group has a physical change in it: freezing water, water turning to vapor, and shaping wood or mud into toys.

- iv. a. the reaction is exothermic

U • 1

The mixture gets hot because the reaction gives out heat: an exothermic reaction. An endothermic reaction would make the test tube cold.

- v. d. zinc and hydrochloric acid

A • 1

The products contain zinc, chlorine and hydrogen, so the other reactant must bring both hydrogen and chlorine: hydrochloric acid, HCl. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$.

4 Very short answers

- a. MARKING SCHEME

K • 1

✓ Coefficient.

- b. MARKING SCHEME

K • 1

✓ Dissolved in water (aqueous).

- c. MARKING SCHEME

U • 1

✓ Changing a subscript changes the substance (e.g. H_2O into H_2O_2).



5 Short answers

a. MARKING SCHEME

U • 2

- ✓ Any one difference, e.g. a balanced equation has the same number of atoms of each element on both sides; an unbalanced one doesn't.
- ✓ Any second difference, e.g. a balanced equation obeys the law of conservation of mass and gives the ratio of masses that react; an unbalanced one doesn't.

b. MARKING SCHEME

U • 2

- ✓ Any one difference, e.g. an endothermic reaction absorbs heat; an exothermic reaction gives out heat.
- ✓ Any second difference, e.g. in an endothermic reaction heat must be supplied or the surroundings get colder; in an exothermic one the surroundings get hotter; or a correct example of each ($\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$; $\text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \text{heat}$).

c. MARKING SCHEME

A • 2

- ✓ The burning of the firewood is exothermic: it gives out heat and light ($\text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \text{heat}$).
- ✓ The cooking of the food is endothermic: it takes in the fire's heat and stops when the fire goes out.

6 Long answer

ANSWER

A • 4

- Reactants: iron and oxygen; product: ferric oxide, Fe_2O_3 .
- Iron 4 and $2 \times 2 = 4$; oxygen $3 \times 2 = 6$ and $2 \times 3 = 6$.
- $4 \times 56 = 224$ parts of iron and $3 \times 32 = 96$ parts of oxygen give $2 \times 160 = 320$ parts of ferric oxide ($224 + 96 = 320$).
- For example: the number of molecules that react (4 atoms of iron, 3 molecules of oxygen, 2 molecules of ferric oxide), and the type of reaction (two substances combine into one).

MARKING SCHEME

- ✓ i. Iron and oxygen; ferric oxide (Fe_2O_3).
- ✓ ii. Fe 4 = 4 and O 6 = 6.
- ✓ iii. 224 parts of iron and 96 of oxygen give 320 of ferric oxide.
- ✓ iv. Any two, e.g. the number of molecules that react, and the type of reaction.

7 Balancing equations

a. MARKING SCHEME

A • 1

- ✓ $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$ (correct formulae $\frac{1}{2}$, balanced $\frac{1}{2}$).

b. MARKING SCHEME

A • 1

- ✓ $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$.

c. MARKING SCHEME

A • 1

- ✓ $3\text{Ca} + \text{N}_2 \rightarrow \text{Ca}_3\text{N}_2$.

d. MARKING SCHEME

A • 1

- ✓ Na_2SO_4 as the product (0.5) and $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ (0.5).

e. ANSWER

A • 2

$2\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$. Check: Ca 1 = 1; N 2 = 2; O $6 + 2 = 8$ and $6 + 2 = 8$; H $2 + 2 = 4$ and $2 \times 2 = 4$.

MARKING SCHEME

- ✓ The atoms counted on both sides (Ca, N, O, H).
- ✓ $2\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$.



8 Think

ANSWER

HA · 2

The reaction takes the heat it needs from the nearest place: the liquid, the glass and your hand. As they lose heat they cool down; the cold you feel is heat leaving your hand into the glass.

MARKING SCHEME

- ✓ The endothermic reaction takes its heat from the liquid and the glass around it, so they cool down.
- ✓ Heat then flows from your hand into the cooler glass, which feels cold.

9 Activity: Hot or cold?

(not marked)

WHAT STUDENTS SHOULD FIND

Vinegar and baking soda, and lemon juice and baking soda, fizz (carbon dioxide) and get slightly cooler, often by 3 to 5 °C: endothermic. Quicklime and water hiss and get very hot, even boiling: exothermic ($\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{heat}$).

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	8	9	13	2	32

