**C8.4 Types of chemical reactions**

* Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light.
* Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating.
* Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.
* During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy).
* If the energy released is greater than the energy required, the reaction is exothermic.
* If the reverse, it is endothermic.

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| --- | --- |
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|  |  |

|  |  |
| --- | --- |
| **Keyword** | **Definition** |
| **Fuel** | Stores energy in a chemical store which itcan release as heat. |
| **Chemical reaction** | A change in which a newsubstance is formed. |
| **Physical change** | One that changes the physicalproperties of a substance, but no new substance is formed. |
| **Reactants** | Substances that react together,shown before the arrow in an equation. |
| **Products** | Substances formed in a chemicalreaction, shown after the reaction arrow in an equation. |
| **Conserved** | When the quantity of something doesnot change after a process takes place. |

Complete the columns, stating in each case whether a new substance is produced and whether the change is physical or chemical.

|  |  |  |
| --- | --- | --- |
| Change | Is a new substance produced ...? (Y/N) | Is the change physical or chemical …? |
| … when oxygen is mixed with a substance |  |  |
| … when a boiling kettle releases water vapour |  |  |
| … when you heat a substance and there is a colour change and a gas is given off |  |  |
| … when something combines with oxygen and gives out a lot of heat energy |  |  |
| … when sugar ferments to make alcohol |  |  |
| … when salt is added to water to make salt solution |  |  |
| … when an iodine block is heated to give off a vapour |  |  |
| … when a bonfire burns |  |  |
| … when glow sticks give out light |  |  |
| … when a battery powers a torch |  |  |

For each equation below, decide what type of reaction it is and then complete the table.

|  |  |  |
| --- | --- | --- |
| **Equation** | **Type of chemical reaction** | **Reason for choice** |
| petrol + oxygen → carbon dioxide + water |  |  |
| sodium + magnesium chloride → magnesium + sodium chloride |  |  |
| magnesium carbonate → magnesium oxide + carbon dioxide |  |  |
| ethane + oxygen → carbon dioxide + water |  |  |
| magnesium + oxygen → magnesium oxide |  |  |
| lead + silver sulphate → lead sulphate + silver |  |  |
| zinc nitrate → zinc oxide + nitrogen dioxide + oxygen |  |  |
| kerosene + oxygen → carbon dioxide + water |  |  |
| sodium + oxygen → sodium oxide |  |  |

This particle diagram shows the reaction between Methane and Oxygen

**H**

**H**

**O**

Methane + oxygen 🡪 Carbon dioxide + water

**H**

**H**

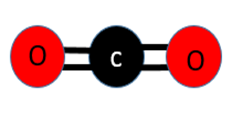
**C**

**H**

**H**

|  |  |
| --- | --- |
| Type of Atom | Number of atoms in the reactants |
| C |  |
| H |  |
| O |  |

|  |  |
| --- | --- |
| Type of Atom | Number of atoms in the products |
| C |  |
| H |  |
| O |  |



**H**

**H**

**O**

**O**

**O**

**O**

**O**

+

water

carbon dioxide

oxygen

+

methane

What do you notice?

Why?

For each equation below, decide what type of reaction it is and then try to complete the word equation.

a) Type of reaction:

wood + oxygen → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) Type of reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_ → silver oxide

c) Type of reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

sodium carbonate (+ heat) → \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_

d) Type of reaction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

potassium + iron chloride → \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ + iron

**Complete these and draw particle diagrams**:​

1. Iron carbonate → \_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_​
2. Sodium carbonate → \_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_​
3. Copper carbonate → \_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_​
4. Zinc carbonate → \_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_​

**Questions**

1. Combustion is a scientific word for:
   1. Exploding
   2. Burning
   3. Evaporating
   4. Getting hotter
2. A fuel is:
   1. A a substance formed from living organisms that lived a long time ago
   2. a substance that explodes
   3. a substance that contains hydrocarbons
   4. a substance that transfers energy usefully, usually by heating.
3. When hydrogen reacts with oxygen, the product is:
   1. Water
   2. Oxide
   3. Carbon dioxide
   4. Hydrogen
4. Many pollutants are formed by the combustion of fossil fuels such as petrol and diesel. Two of these pollutants are carbon monoxide and carbon dioxide.
5. a)

i)Name one non-metal oxide pollutant that is produced from the combustion of an impurity in fossil fuels.

ii) Name one non-metal oxide pollutant that is produced by the high temperatures inside a vehicle engine when it is burning fossil fuels.

b) Fossil fuel combustion can cause acid rain. Explain how.

c) Explain how carbon monoxide is formed in a car engine.

d) Explain how the amount of carbon monoxide released into the air from a car exhaust can be reduced.

e) Explain why carbon dioxide from fossil fuel combustion is a problem.

**Task**

Create an information poster about the types of reactions using the links bellow to help you.

* <https://www.bbc.co.uk/bitesize/guides/zqd2mp3/revision/1>
* <https://www.youtube.com/watch?v=RV8wMapGvQk>
* <https://www.youtube.com/watch?v=cRnpKjHpFyg>
* <https://www.youtube.com/watch?v=BgM3e8YZxuc>
* <https://www.youtube.com/watch?v=5iowJs6MryI>