SOLUTIONS

ST ANDREW'S SECONDARY SCHOOL

NAME | TEACHING GROUP

CHEMISTRY (G3)

17.1 Measuring Speed of Reaction
Assessment for Learning

SPEED OF REACTION

1 [A]
- Marble chips is also known as limestone, calcium carbonate ($CaCO_3$).

2 [A]
- Experiment investigates the rate of reaction by measuring the mass loss from the reaction.
- Mass loss = CO_2 produced.
- Cotton wool prevents the acid used from leaving the conical flask, at the same time allowing CO_2 gas to leave.

3 [B]
- Mass loss corresponds to the decrease in mass measured by the balance.
- Mass will not decrease to 0 g.

4 [D]
- No effervescence observed as the reaction did not proceed.
- H_2SO_4 forms a barrier from the ppt. produced around $CaCO_3$, thereby preventing any H^+ (aq) from reaction. $CaCO_3$ (s) + H_2SO_4 (aq) $\rightarrow$ $CaSO_4$ (s) + CO_2 (g) + H_2O (l)

5 [A]
- Combustion releases thermal energy.
- As the combustion proceeds, more thermal energy is produced. Remaining reactants will gain the thermal energy produced, thereby increasing the speed of reaction.

6 [A]
- The use of gas syringe suggests a gas (H_2) produced.

7 [C]
- Mass increases as magnesium gains oxygen from air during oxidisation. 2 Mg + O_2 $\rightarrow$ 2 MgO

8 [B]
- Gas produced is H_2. M + 2 HC*l* $\rightarrow$ MC*l*$_2$ + H_2
- H_2 gas is insoluble in water.

Apparatus 1 is **not** suitable: H_2 gas is less dense than air (M_r of H_2 = 2; M_r of air ≈ 28).

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CHEMISTRY (G3)

17.2 Factors Affecting Speed of Reaction
Assessment for Learning

SPEED OF REACTION

1 [D]

- Increasing both the concentration and temperature of acid will increase the rate of reaction.

2 [B]

- Decreasing the temperature = Reacting particles loses thermal energy.

Option **A**: Decreasing particle size = ↑ Surface area to volume ratio.
Option **C**: Decreasing the volume of the conical flask = ↑ Concentration of the acid.

$$\text{Concentration} \uparrow = \frac{\text{No. of moles}}{\text{Volume} \downarrow}$$

Option **D**: Using 1.5 mol/dm^3 nitric acid = ↑ Concentration of the acid.

↑ Speed of Rxn

3 [D]

- Using Mg ribbon = ↓ surface area to volume ratio.

1: Heating Mg = ↑ Thermal energy to the reacting particles.
2: Using a higher proportion of O_2 in air = ↑ Amount of reacting O_2.

↑ Speed of Rxn

4 [D]

- Increasing temperature of reaction = ↑ Rate of reaction.

Option **B** is wrong: Rate of reaction continues to increase with increasing temperature.
Rate does **not** stay constant after reaching a certain temperature.

5 [A]

- Increasing the concentration of the reactants = ↑ No. of reacting particles.
- Increasing the temperature = ↑ Thermal energy.
- Increasing the volume of H_2SO_4 = ↑ No. of reacting particles. (No. of moles = Concentration × Volume)

2: Increasing the size of the pieces of $MgCO_3$ = ↓ Surface area to volume ratio = ↓ Speed of reaction.

6 [D]

- ↑ Pressure of the reaction = ↓ Space between the reacting gaseous particles.

Option **A**: No change in speed of reaction.
Option **B**: ↓ No. of reacting particles.
Option **C**: ↓ Temperature of the reaction.

7 [A]

- Rate of reaction for Y is higher than that for X. Both X and Y produce the same volume of H_2 gas.
- The use of catalyst will not change the amount of products formed.

Option **B**: A ~~lower~~ *higher* temperature is used in Y.
Option **C**: ~~Larger~~ Smaller pieces of zinc are used in Y.
Option **D**: ~~Less~~ *More* concentrated acid is used in Y.

8 [D]

- The catalyst, MnO_2, does not decrease the activation energy of the reaction; however, it provides an alternative pathway with a lower activation energy for the reactants to react.

9 [B]

- Catalysts are usually transition metals or the compounds of transition metals.

10 [C]

11 [B]

Activation energy, E_A = the energy barrier that the particles have to overcome in order to react.

12 [B]

- The catalyst does not decrease the activation energy of the reaction; however, it provides an alternative pathway with a lower activation energy for the reactants to react.