"PLAN" 6 MARK QUESTIONS

C8 Rates of Reaction

Developing a technique to answer a **plan** question
(plan – write a method) Practical YouTube

- Step 1 – **read** the information supplied
- Sodium thiosulfate solution reacts with dilute hydrochloric acid. The solution becomes cloudy as the reaction takes place.
- The equation for the reaction is:

$$Na_2S_2O_{3(aq)} + 2\,HCl_{(aq)} \rightarrow 2\,NaCl_{(aq)} + SO_{2(g)} + H_2O_{(l)} + S_{(s)}$$

- Plan an investigation to show how the concentration of the sodium thiosulfate solution affects the rate of the reaction with dilute hydrochloric acid.
- Step 2 – **plan** your answer
- Plan your answer by writing logically ordered bullet points for each step in the method

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- Step 3 – **answer** the question
- Proof read your answer
- Check that your points flow logically e.g. have you filtered before heating or the other way around

Top tips for planning:

- *What key things happen in the practical which will affect the outcome of the experiment e.g. does it matter if you don't correctly measure out the volume of acid?*
- *Write in a logical order e.g. you can't record the time taken BEFORE you have added the two chemicals together*
- *What measurements will you take during the setup and as the experiment proceeds? (mention the variables)*

Example answer:

- MEASURE OUT 20CM^3 OF SODIUM THIOSULPHATE AND ADD IT TO A CONICAL FLASK. PLACE THE CONICAL FLASK ABOVE A PIECE OF WHITE PAPER WITH A BLACK CROSS ON IT. MEASURE OUT 20CM^3 OF HYDROCHLORIC ACID. ADD THE ACID TO THE CONICAL FLASK WHILST STARTING THE STOPCLOCK. STOP THE STOPCLOCK WHEN THE BLACK CROSS IS NO LONGER VISIBLE. REPEAT THIS AGAIN TO GET AN AVERAGE OF YOUR RESULTS. THEN REPEAT THE EXPERIMENT AGAIN USING DIFFERENT CONCENTRATIONS OF SODIUM THIOSULPHATE.

Answer Mark Scheme

- **Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.
- **5–6**
- **Level 2:** The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.
- **3–4**
- **Level 1:** The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.
- **1–2**

Indicative content

• measure (indicated) volume of sodium thiosulfate
• place sodium thiosulfate in (conical) flask
• measure (indicated) volume of hydrochloric acid
• place on cross or between light sensor **or** connect to a gas syringe **or** other suitable method for timing a change
• add hydrochloric acid to (conical) flask
• swirl
• start stopclock / stopwatch
• measure time for cross to become no longer visible **or** log light transmission over time **or** measure time for fixed volume of gas to be produced
• repeat and find mean
• repeat for different concentrations of sodium thiosulfate **or** change ratio of sodium thiosulfate volume : water volume

control variables

• concentration of hydrochloric acid
• volume of hydrochloric acid
• (total) volume of sodium thiosulfate solution