

(Measuring rates (practicals))

Q1. (2018)

sulfur (formed)

(which is a) precipitate

Q2. (2018)

a gas is produced

(which) escapes

Q3. (2018)

all eight points plotted correctly

line of best fit

Q4. (2018)

correctly drawn tangent at
0.95 g

correct value for x step **and** y
step from tangent

(rate =) $\frac{\text{value for y step}}{\text{value for x step}}$

correctly evaluated and rounded
to 2 sig figs

Q5. a). (2019)

(aq)

Q5. b). (2019)

(gas) syringe

stopclock / stopwatch

Q5. c). (2019)

all points plotted correctly

line of best fit

Q5. d). (2019)

(rate) decreases

(rate decreases) more slowly as
time increases

(rate) becomes zero at 60 s

Q5. e). (2019)

more bubbles were produced in
the first 10 seconds

the magnesium was used up
more quickly

Q6. (2019)

glowing splint

(which) relights

Q7. a). (2021)

(delivery) tube is in (sulfuric)
acid

Q7. b). (2021)

reaction has stopped

(because a) reactant is used up

Q7.c). (2021)

any **one** from:

- the line (for 0.05 mol/dm³ sulfuric acid) is less steep
- (0.05 mol/dm³ sulfuric acid) produces less gas in a fixed time
- the reaction (using 0.05 mol/dm³ sulfuric acid) takes longer to finish

Q7. d). (2021)

tangent drawn at 80 s on 0.05
mol/dm³ curve

(from tangent)
value for x-step
and
value for y-step

$$(\text{rate} =) \frac{\text{value for y-step}}{\text{value for x-step}}$$

calculation of rate

answer to 2 significant figures

Q8. (2022)

$$\begin{aligned} &(\text{energy} =) \\ &\frac{2.00}{238} \times 88.1 \end{aligned}$$

$$= 0.740336134 \text{ (kJ)}$$

$$= 0.740 \text{ (kJ)}$$

Q9. (2022)

(sulfur is a) precipitate / solid

or

(sulfur is an) insoluble
substance

Q10. a). (2022)

correctly drawn tangent at 30 s

correct values for x step **and** y
step from tangent

$$(\text{ratio} =) \frac{\text{value for y step}}{\text{value for x step}}$$

correct calculation of ratio

(conversion
rate = ratio $\times 7.1 \times 10^{-5}$)
correct evaluation of rate (mol/s)

Q10. b). (2022)

rate decreases

(because) concentration of
reactants decreases

alternative approach:

greatest rate at start (1)

(because) greatest
concentration of reactants at
start (1)

Q10. c). (2022)

(hydrochloric) acid is used up

Q10. d). (2022)

decreasing curve starting at
(0,95) **and** steeper initially than
curve for 0.10 mol/dm³ sodium
thiosulfate solution

levelling at 24%

Q10. e). (2022)

stop light from other sources
reaching the light sensor

Q10. f). (2022)

repeatable

Q11. a). (2022)

$V \propto m$

Q11. b). (2022)

volume of sodium thiosulfate
solution **and** volume of
hydrochloric acid at any fixed
mass

$$\left(\frac{\text{volume of Na}_2\text{S}_2\text{O}_3 \text{ solution}}{\text{volume of hydrochloric acid}} = \right)$$

0.25

1 : 4

Q12. a). (2023)

to reduce the escape of gas

Q12. b). (2023)

$$\begin{aligned} & \text{(mean rate =)} \\ & \frac{0.78 + 0.81 + 0.81}{3} \end{aligned}$$

$$0.80 \text{ (cm}^3\text{/s)}$$

$$0.80 = \frac{20}{\text{mean time taken}}$$

$$\text{(mean time taken =)} \frac{20}{0.80}$$

$$= 25 \text{ (s)}$$

Q12. c). (2023)

use a lower temperature

use sulfuric acid of a lower
concentration

Q12. d). (2023)

(test)
burning / lit splint

(result)
burns with a (squeaky) pop
sound

Q13. (2023)

(oxygen is) a gas

(which) escaped from the flask

Q14. a). (2023)

correct value for x step **and** y
step from tangent

$$(\text{rate} =) \frac{\text{value for y step}}{\text{value for x step}}$$

correct calculation of rate

answer to 2 significant figures

Q14. b). (2023)

line starting at 0,0 which is less
steep than existing line

which becomes level at 0.80 g

Q15. a). (2024)

(some) hydrogen / gas escapes
(from the flask)

(because the reaction starts)
before the stopper is put in

Q15. b). (2024)

$$(\text{volume} = 39 - 25 =) 14 \text{ (cm}^3\text{)}$$

$$(14 \text{ cm}^3 =) 0.014 \text{ (dm}^3\text{)}$$

(moles of hydrogen =)

$$\frac{0.014}{24}$$

$$= 5.8 \times 10^{-4} \text{ (mol)}$$

Q15. c). (2024)

tangent drawn at 45 s

correct values for y step **and**
x step from tangent

$$(\text{rate} =) \frac{\text{value for y step}}{\text{value for x step}}$$

correct calculation of rate
(mol/s)

rate given in standard form
(mol/s)

Q15. d). (2024)

line starting at 0,0.000 and less
steep than existing line

becomes level at 0.0084 mol

Q15. e). (2024)

(increasing the temperature)
increases the rate of reaction

(because) particles have more
energy

(so) the frequency of collisions
increases