

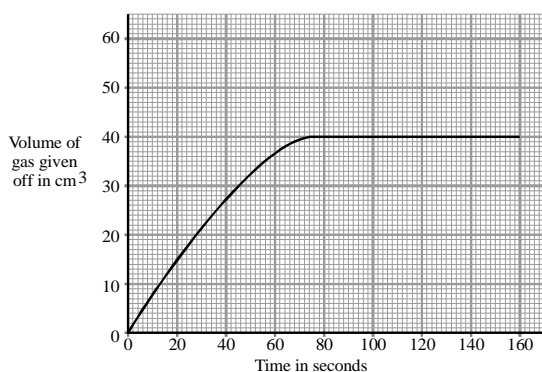
Rates of reaction

Mark scheme

1. (a) any **two** from:
- increases *owtte allow 'goes up'*
 - until reaches maximum / levels off *owtte*
 - quickly at first *owtte*
 - then more slowly / rate decreases 2
- allow reaction finished; ignore rate increases*
- (b) use a more concentrated acid *list principle applies* 2
 use zinc powder

[4]

2. graph steeper 1
 becomes horizontal 1
 reaches twice the height, $40 \text{ cm}^3 \pm 1 \text{ cm}^3$ 1

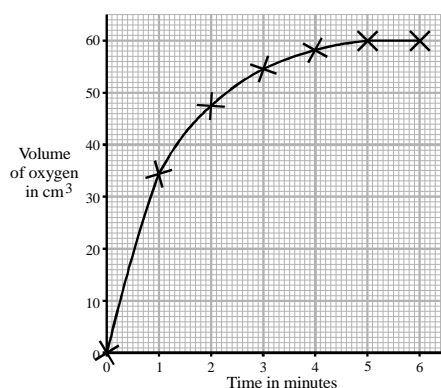


[3]

3. (i) measure volume / mass of gas produced 1
 in a certain time period 1
- 1 mark is for a sensible way of measuring the amount of product produced and 1 mark is for the idea of timing*
- e.g. measure volume of gas produced at regular time intervals
or time taken to fill a test tube with the gas **or** collect a certain volume of gas
(measuring the rate at which bubbles are produced e.g. number of bubbles in 30 seconds gains only 1 mark unless an enclosed system is used)
- or** measure decrease in mass of flask and contents at regular time intervals
or time taken for the mass to decrease by certain amount
- (ii) increases rate (*owtte*) 1
- (ii) change the concentration **or** add a catalyst **or** 1
 change the surface area **or** lower the temperature
- accept 'expose to sunlight' (owtte) **or** change the amount of water / powder / solution used; ignore 'stirring'*

[4]

4. (a) (i) H_2O must be formula 1
 (ii) catalyst 1



(b)

(i)

correct plotting

2

1 mark deducted per error to a maximum of 2

do **not** accept a complete dot-to-dot line

do **not** accept a bar chart if the (0,0) point is missing and line to one minute missing then maximum mark is 2

best fit single line

1

if curve correct but no obvious points award 3marks

(ii) 4.5 – 5 no units required

1

(iii) all hydrogen peroxide had reacted

1

accept all hydrogen peroxide had decomposed **or** been used up
accept no hydrogen peroxide (particles) left

(c) (i) remains lower than previous line

1

do **not** accept bar chart

line levels off lower than 60cm³

1

correct points but no line drawn then maximum 1 mark

(ii) decrease of (hydrogen peroxide) concentration

1

accept concentration is less

accept fewer collisions (of particles)

do **not** accept weaker solutions **or** dilute solutions

[10]

5. Factor 1

- heating the solution / heat / increasing temperature / candidates can gain one mark here for the idea of the water evaporating faster with increased heat (so heating the reactants faster).
- particles (of fat and sodium hydroxide) move faster (not vibration / not just move more) / more kinetic energy
- collide more often / more collisions
- have more energy when they collide / more successful collisions

Factor 2

- concentrated (solution of alkali)
- more (sodium hydroxide) particles (in a given volume) particles closer/ morecrowded etc.
- more collisions / greater chance of successful collisions each for 1 mark
- Possible alternative answer
- size of fat pieces / small pieces of fat
- have larger surface area
- more collisions / greater chance of collisions

7

[7]