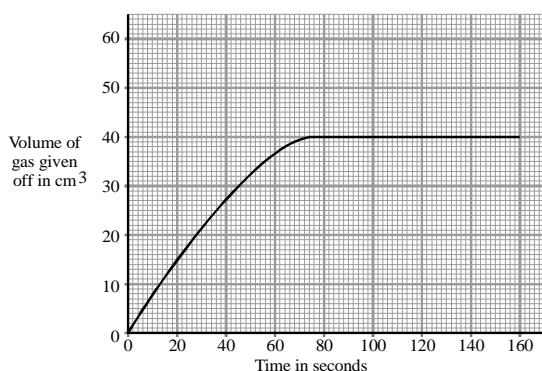
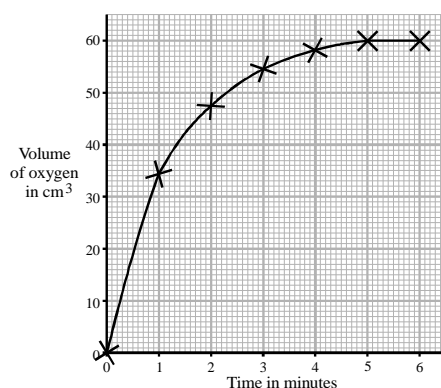


Rates of reaction

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
2. graph steeper 1 [4]
becomes horizontal 1
reaches twice the height, $40 \text{ cm}^3 \pm 1 \text{ cm}^3$ 1



3. (i) measure volume / mass of gas produced 1 [3]
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. (a) (i) H_2O must be formula 1
(ii) catalyst 1 [4]



(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]