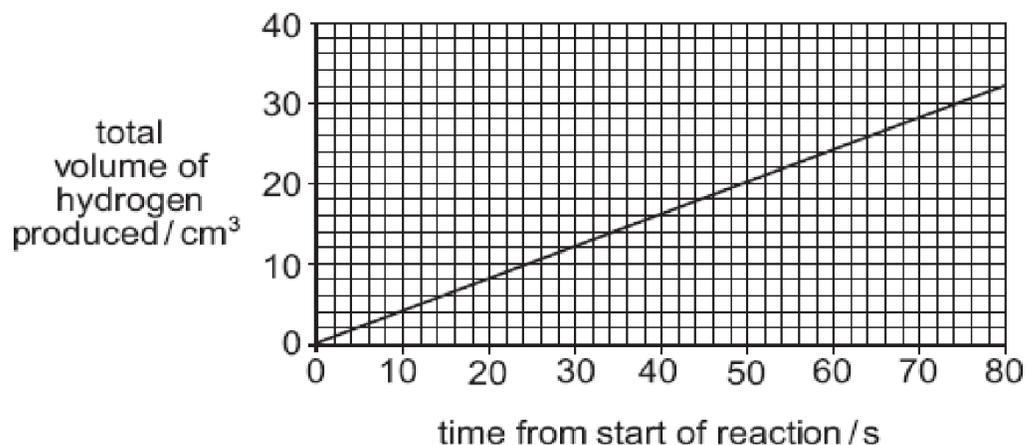


. Dilute hydrochloric acid was reacted with magnesium ribbon and the volume of hydrogen gas evolved was measured for the first 80 seconds.

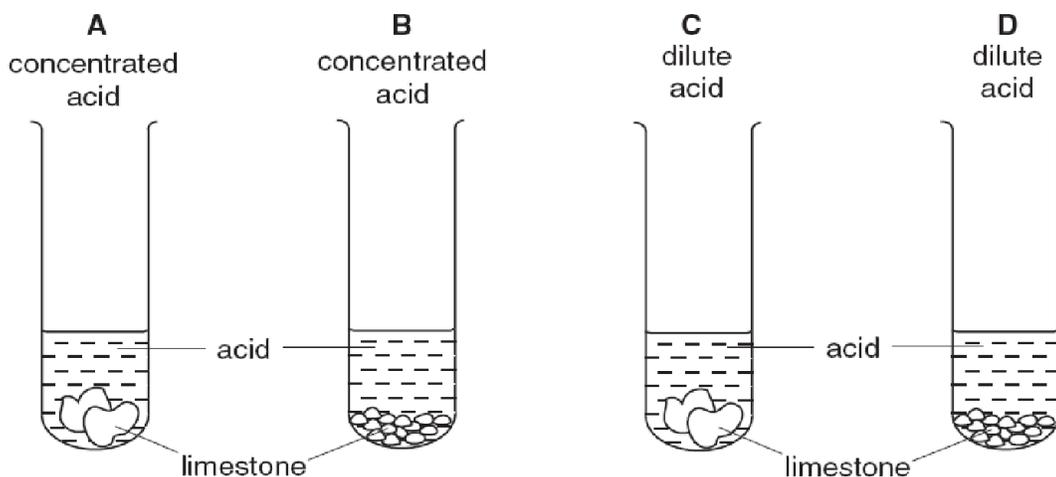


What was the average rate of production of hydrogen?

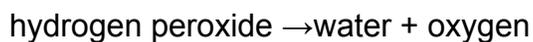
- A.  $0.4 \text{ cm}^3/\text{s}$       B.  $2.5 \text{ cm}^3/\text{s}$       C.  $4 \text{ cm}^3/\text{s}$       D.  $40 \text{ cm}^3/\text{s}$

2. The diagram shows an experiment to compare the speed of reaction when limestone chips are added to acid. **B**

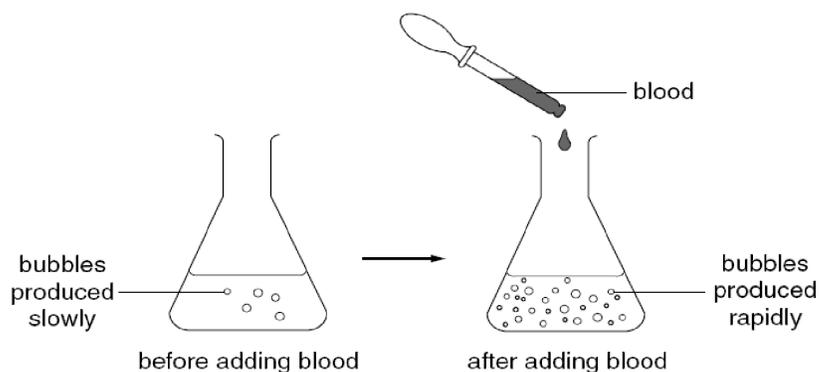
In which test-tube is the reaction most rapid?



3. A solution of hydrogen peroxide releases oxygen slowly at room temperature.



The diagrams show the effect of adding blood to the solution.



What could be the reason for the observed change?

- A. Blood contains an enzyme.**
- B. Blood contains water.
- C. The hydrogen peroxide becomes more concentrated.
- D. The hydrogen peroxide is neutralised by blood.

4. A student investigates if, at 30°C, the concentration of acid affects how rapidly it reacts with a known mass of magnesium. The student has a beaker, concentrated acid, water and the apparatus below.

P a balance

Q a clock

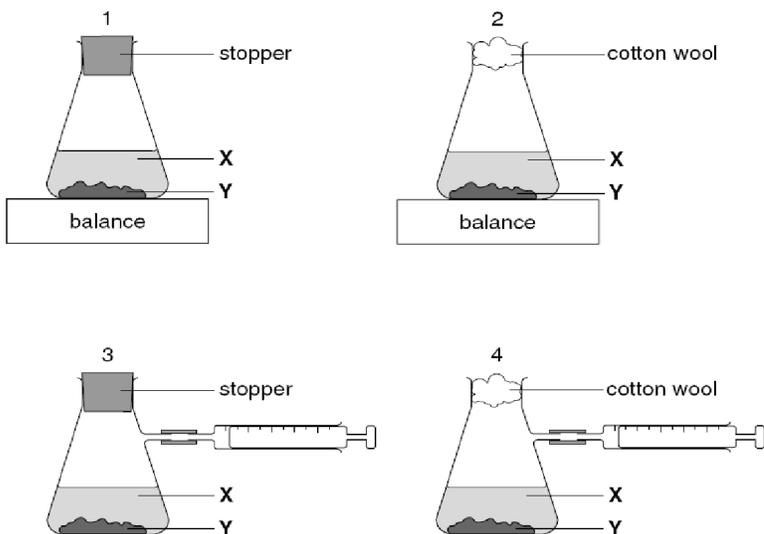
R a measuring cylinder

S a thermometer

Which of these pieces of apparatus does the student use?

- A. P, Q and R only                      B. P, Q and S only  
 C. Q, R and S only                      **D. P, Q, R and S**

5. A liquid **X** reacts with solid **Y** to form a gas. Which two diagrams show suitable methods for investigating the speed of the reaction?



- A. 1 and 3                      B. 1 and 4                      **C. 2 and 3**                      D. 2 and 4

6. What is the concentration of  $I_2$  molecules in a solution containing 2.54g of  $I_2$  in  $250\text{ cm}^3$  of solution?

- A.  $0.01\text{ mol/dm}^3$     B.  $0.02\text{ mol/dm}^3$     **C.  $0.04\text{ mol/dm}^3$**     D.  $0.08\text{ mol/dm}^3$

7. The relative atomic mass of oxygen is 16 and that of hydrogen is 1. This means that ...**(i)**... of oxygen has the same mass as ...**(ii)**... of hydrogen. Which words correctly complete the gaps?

	<b>i</b>	<b>ii</b>
<b>A</b>	an atom	thirty-two molecules
<b>B</b>	<b>an atom</b>	<b>eight molecules</b>

C	a molecule	sixteen atoms
<b>D</b>	<b>a molecule</b>	<b>eight atoms</b>

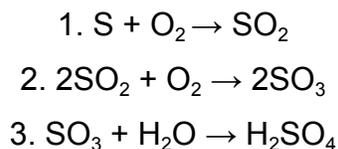
8. The corrosion of iron and its extraction from hematite are important processes. Which terms describe the corrosion of iron and its extraction from hematite?

	<b>corrosion</b>	<b>extraction</b>
<b>A</b>	oxidation	<b>oxidation</b>
<b>B</b>	<b>oxidation</b>	<b>reduction</b>
<b>C</b>	reduction	<b>oxidation</b>
<b>D</b>	<b>reduction</b>	<b>reduction</b>

9. Which methods can be used to prevent the rusting of an iron girder of a bridge?

	<b>coat it with grease</b>	<b>electroplate it</b>	<b>paint it</b>
<b>A</b>	✓	✓	✓
<b>B</b>	✓	✓	X
<b>C</b>	X	✓	✓
<b>D</b>	<b>X</b>	<b>X</b>	✓

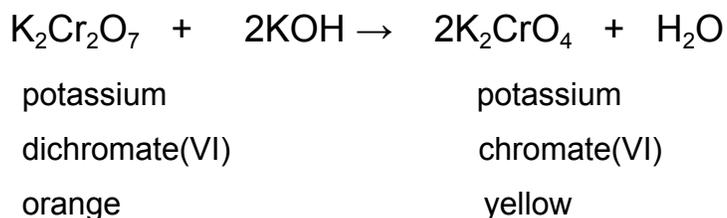
10. Three reactions used in the manufacture of sulphuric acid are shown.



Which of these reactions are redox reactions?

- A. 1 only      B. 3 only      **C. 1 and 2 only**      D. 2 and 3 only

11. The equation explains the colour change that occurs when aqueous potassium hydroxide is added to aqueous potassium dichromate(VI).



As a result of adding an excess of aqueous potassium hydroxide to aqueous potassium dichromate(VI), what happens to the oxidation state of the chromium and the pH of the reaction mixture? **D**

	oxidation state of the chromium	pH of the mixture
<b>A</b>	decreases	decreases
<b>B</b>	decreases	increases
<b>C</b>	stays the same	decreases
<b>D</b>	stays the same	increases

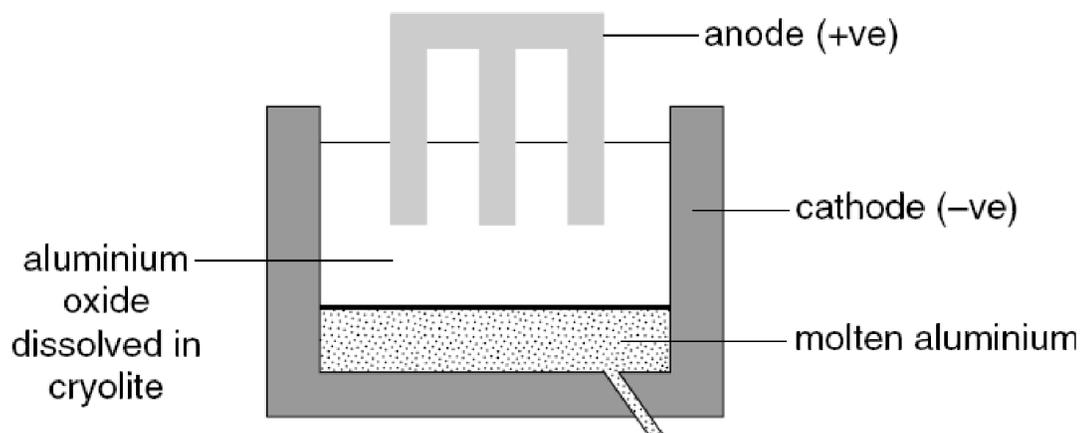
12. The position of metal X in the reactivity series is shown. K Na Mg Fe (H) X.  
Which statements about X and its oxide are correct? **D**

	reaction of X with dilute hydrochloric acid	reaction of oxide of X with carbon
<b>A</b>	hydrogen formed	no reaction
<b>B</b>	hydrogen formed	oxide reduced
<b>C</b>	no reaction	no reaction
<b>D</b>	no reaction	oxide reduced

13. Which process is not exothermic?

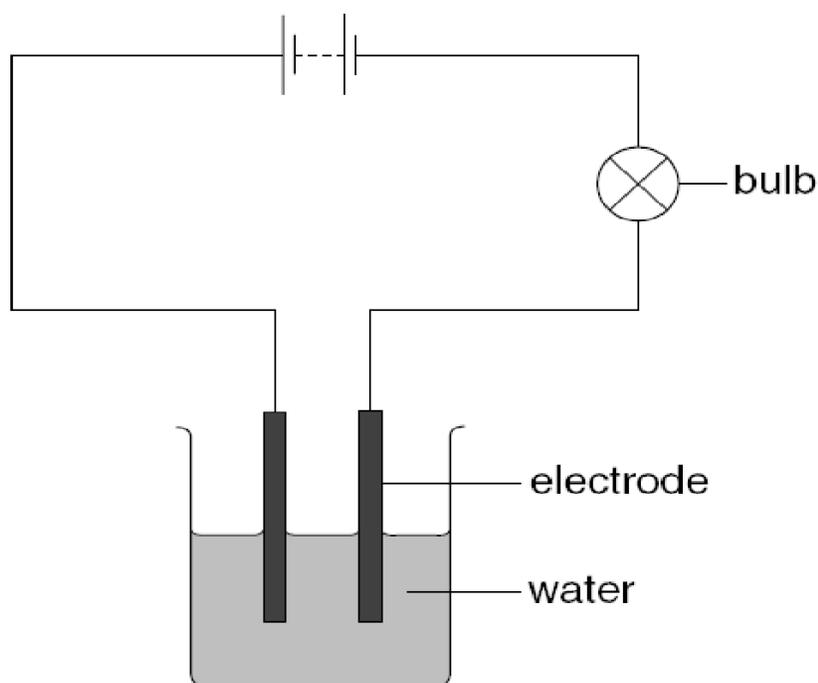
- A. burning a fossil fuel                      **B. obtaining lime from limestone**
- C. radioactive decay of  ${}_{235}\text{U}$               D. reacting hydrogen with oxygen

14. The diagram shows how aluminium is manufactured by electrolysis.



	Anode	Cathode
A	aluminium	aluminium
B	aluminium	graphite
C	graphite	aluminium
D	graphite	graphite

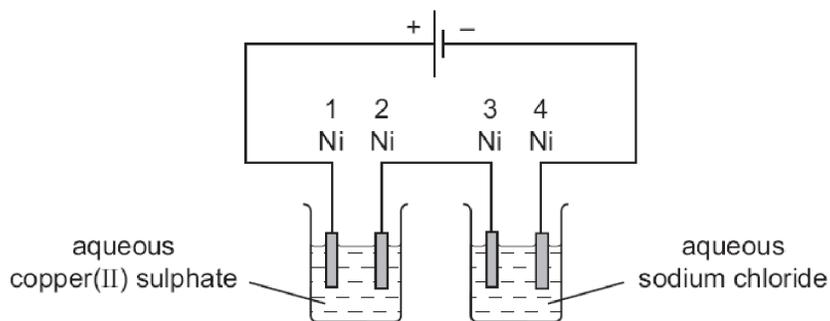
15. A student sets up the apparatus shown. The bulb does not light.



After the student adds substance **X** to the water, the bulb lights. What is **X**?

- A. calcium carbonate
- B. carbon
- C. copper(II) sulphate**
- D. ethanol

16. The diagram shows an electrolysis experiment to electroplate nickel with a different metal.



Which nickel electrodes are plated with a metal?

- A. 1 only,      B. 1 and 3 only,      **C. 2 only,**      D. 2 and 4 only

17. 2-bromo-2-methylpentane is a tertiary halogenoalkane. Which organic products are formed when 2-bromo-2-methylpentane reacts with a hot concentrated ethanolic solution of sodium hydroxide?

- A. 2-methylpent-1-ene only  
**B. 2-methylpent-1-ene and 2-methylpent-2-ene**  
 C. 2-methylpent-2-ene only  
 D. 2-methylpent-2-ene and 4-methylpent-2-ene

18. Poly(propene) is an addition polymer. What are the C–C–C bond angles along its polymer chain?

- A. They are all 109°.**  
 B. Half of them are 109° and half are 120°.  
 C. Half of them are 90° and half are 180°.  
 D. They are all 120°.

19. An alcohol has the molecular formula C<sub>5</sub>H<sub>12</sub>O. It has several isomers. Which isomer forms a yellow precipitate with alkaline aqueous iodine?

- A. 2,2-dimethylpropan-1-ol

B. 2-methylbutan-2-ol

**C. 3-methylbutan-2-ol**

D. pentan-3-ol

20. When compound X is heated under reflux with aqueous sodium hydroxide solution two products are formed: sodium ethanoate and hexan-1-ol. What is compound X? **D**

