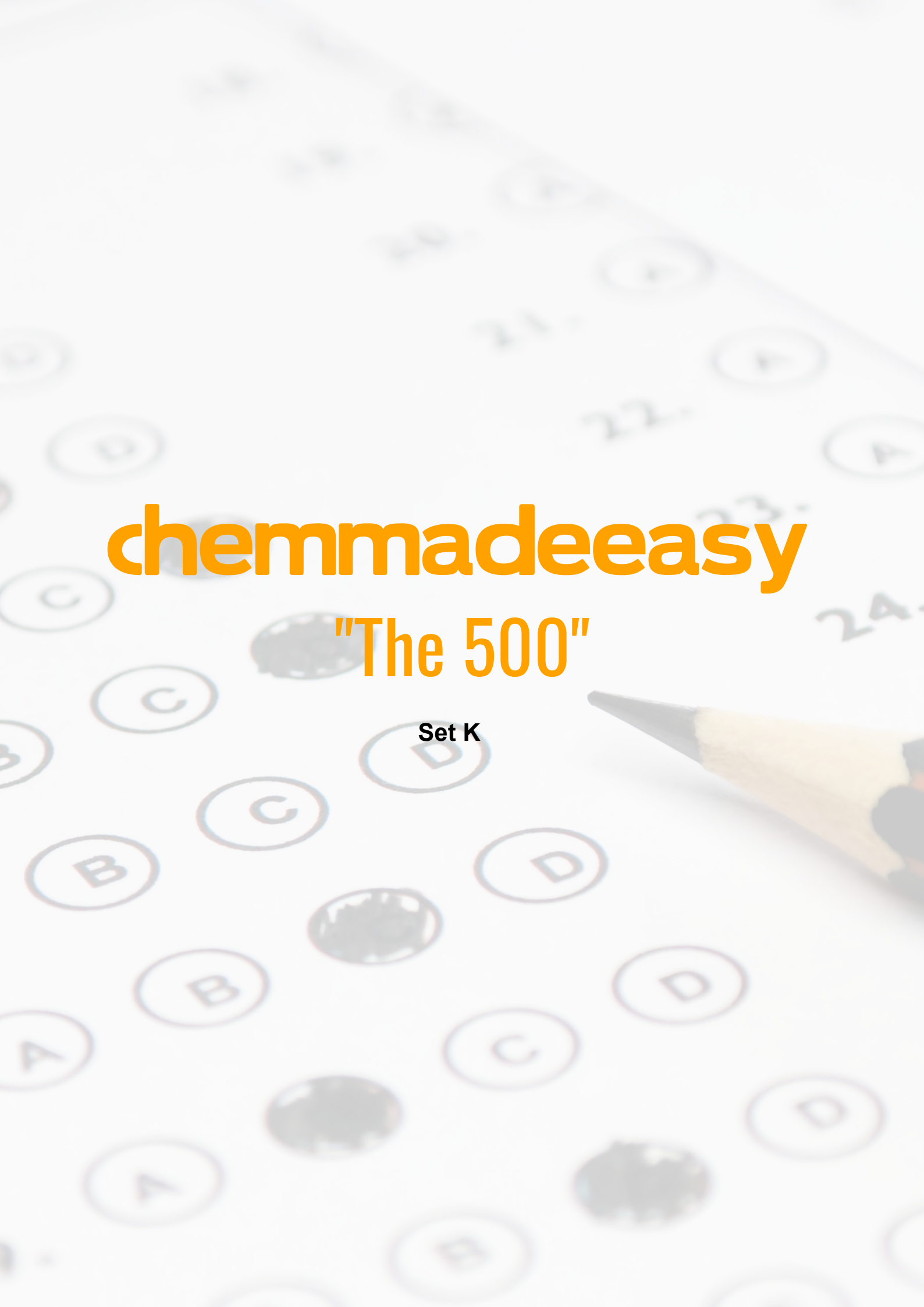
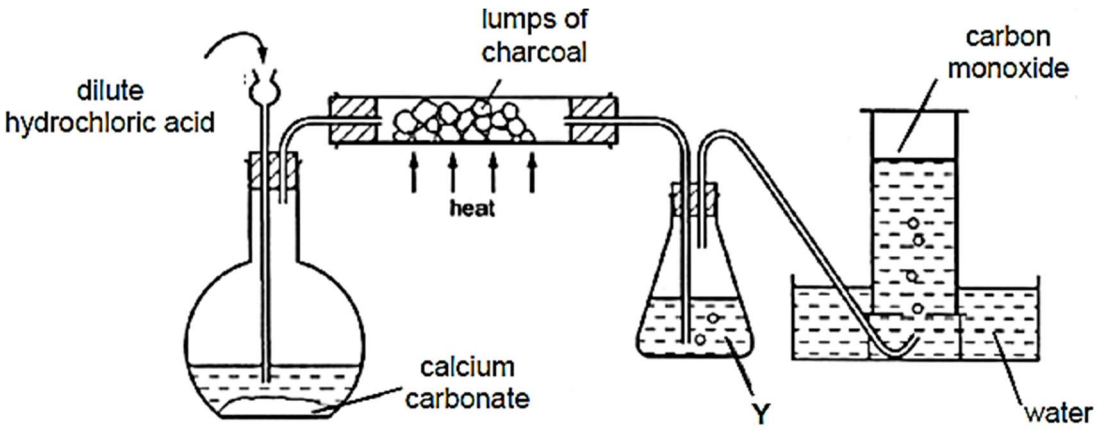


# chemmadeeasy

## "The 500"

**Set K**

**1** The diagram shows apparatus used to obtain carbon monoxide.



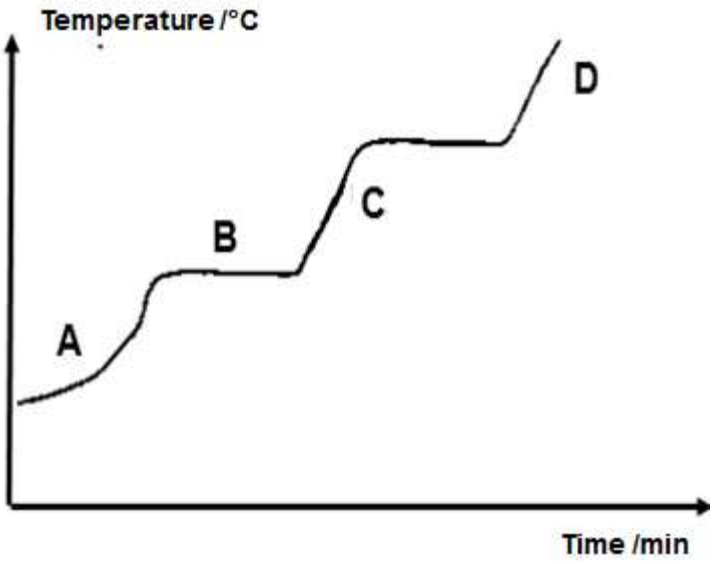

What is the main purpose of **Y**?

**A** to dry the gas
**B** to remove hydrogen chloride from the gas
**C** to remove carbon dioxide from the gas
**D** to prevent water being sucked back on to the hot carbon

**2** Which of the following substances is volatile at room temperature?

| | substance | melting point/°C | boiling point/°C |
|---|---|---|---|
| **A** | P | −100 | − 35 |
| **B** | Q | − 7 | 58 |
| **C** | R | − 6 | 225 |
| **D** | S | 44 | 280 |

**3** The graph shows the heating curve of a substance.




At which point along the curve does the substance have the largest volume?

**4** What is the best method for extracting maximum amount of pure ester from a mixture of concentrated sulfuric acid, alcohol and carboxylic acid during esterification?

**A** filtration

**B** fractional distillation

**C** chromatography

**D** sublimation

**5** An element has 8 protons and 8 neutrons in the nucleus of its atom.
Which of the following statements is **incorrect**?

**A** Its atom has a total of 10 electrons.
**B** Its atom has 2 electrons in the inner shell.
**C** It forms an anion.
**D** It has a valency of 2.

**6** Two statements were made about covalent compounds.

Statement 1: Covalent compounds usually melt at low temperature.

Statement 2: Covalent bonds are very weak.

Which of the following is correct?

**A** Both statements are correct and statement 2 explains 1.
**B** Both statements are correct but statement 2 does not explain statement 1.
**C** Statement 1 is correct but statement 2 is incorrect
**D** Statement 1 is incorrect but statement 2 is correct.

**7** A compound **X** contains chlorine and one other element. Which of the following properties of **X** indicates most clearly whether the bonds in X are ionic or covalent?

**A** **X** conducts electricity when molten.
**B** **X** does not conduct electricity when solid.
**C** **X** is insoluble in water.
**D** **X** is a crystalline solid at room temperature.

**8** **Q** is a non-metal. The oxide of **Q** has a very high melting point. Which of the following is **Q** most likely to be?

**A** carbon
**B** nitrogen
**C** silicon
**D** sulfur

**9** Alkali **X** has a higher pH than alkali **Y**.
Which of the following statements is true?

**A** Concentration of alkali **X** is higher than alkali **Y**.
**B** Concentration of alkali **Y** is higher than alkali **X**.
**C** Concentration of $OH^-$ ions is higher in alkali **X** than in **Y**
**D** Concentration of $OH^-$ ions is higher in alkali **Y** than in **X**.

**10** What is the ionic equation for the reaction between barium hydroxide and dilute sulfuric acid?

**A** $Ba^{2+} + SO_4^{2-} + 2\ H^+ \longrightarrow BaSO_4 + H_2O$
**B** $Ba^{2+} + SO_4^{2-} \longrightarrow BaSO_4$
**C** $H^+ + OH^- \longrightarrow H_2O$
**D** $Ba^{2+} + 2\ OH^- + SO_4^{2-} + 2\ H^+ \longrightarrow BaSO_4 + 2\ H_2O$

**11** Lime, CaO, is used to reduce acidity of soil and ammonium sulfate is a nitrogenous fertilizer, but the two are never mixed and used together by farmers.

Which of the following explains why they are not used together?

**A** Calcium sulfate produced will contaminate the soil.
**B** Sulfuric acid will be formed and the soil becomes too acidic.
**C** The dry mixture is explosive.
**D** When the soil is moist, ammonia gas will be given off.

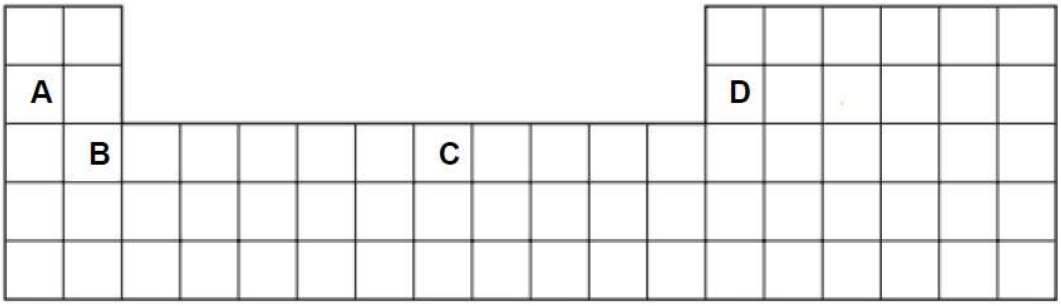
**12** Which statement describes a correct trend of the properties of Group VII elements?

Down the group,

**A** their boiling point and melting point decreases.
**B** their colour intensity decreases.
**C** their density decreases.
**D** their oxidising power decreases.

**13** The positions of four elements are shown in the outline of part of the Periodic Table. Element **X** has a high melting point and is a good conductor of electricity. It forms chlorides **X**C*l*$_2$ and **X**C*l*$_3$.

Which element (**A**, **B**, **C** or **D**) is **X**?




**14** Which of the following contains the same number of molecules as 18 g of $H_2O$?

**A** 16 g of $O_2$
**B** 23 g of Na
**C** 28 g of $N_2$
**D** 50 g of NaC*l*

**15** What is the volume of air needed for incomplete combustion of 100 $cm^3$ of ethane to form water and carbon monoxide only?

**A** 250 $cm^3$
**B** 350 $cm^3$
**C** 1250 $cm^3$
**D** 1750 $cm^3$

**16** When 0.004 mole of a metal **R** was reacted with an excess of dilute acid, 48 $cm^3$ of hydrogen, measured at room temperature and pressure, was evolved.

Which of the following is the correct equation for the reaction?

**A** $2\,\mathbf{R} + 6\,H^+ \longrightarrow 2\,\mathbf{R}^{3+} + 3\,H_2$
**B** $2\,\mathbf{R} + 2\,H^+ \longrightarrow 2\,\mathbf{R}^{+} + H_2$
**C** $\mathbf{R} + 2\,H^+ \longrightarrow \mathbf{R}^{2+} + 2\,H$
**D** $\mathbf{R} + 2\,H^+ \longrightarrow \mathbf{R}^{2+} + H_2$

**17** In an experiment, 25 g of hydrated copper(II) sulfate crystals ($M_r$ = 250) is obtained from 9.6 g of copper.
What is the percentage yield of the crystals?

**A** 9.6%
**B** 25.0%
**C** 38.4%
**D** 66.7%

**18** Metals **W**, **X**, **Y** and **Z** are placed in salt solutions as shown in the table.

| metal | result of placing metal in solution of | | | |
|---|---|---|---|---|
| | salt of **W** | salt of **X** | salt of **Y** | salt of **Z** |
| **W** | no reaction | **X** displaced | no reaction | **Z** displaced |
| **X** | no reaction | no reaction | no reaction | **Z** displaced |
| **Y** | **W** displaced | **X** displaced | no reaction | **Z** displaced |
| **Z** | no reaction | no reaction | no reaction | no reaction |

Which is the correct list of metals in ascending order of their strengths as reducing agents?

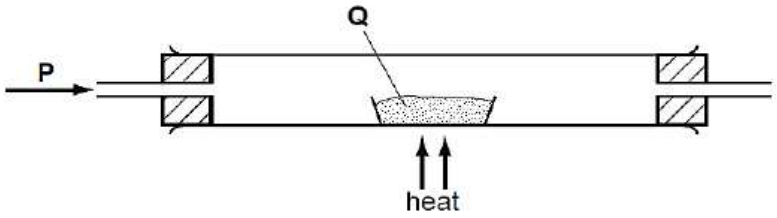
**A** **W**, **X**, **Z**, **Y**
**B** **Z**, **X**, **W**, **Y**
**C** **Y**, **Z**, **X**, **W**
**D** **Y**, **W**, **X**, **Z**

**19** An aluminium foil is initially unable to displace copper from copper(II) sulfate solution. When the foil is dipped into some concentrated hydrochloric acid and then dipped into the copper(II) sulfate solution again, a pink coating forms rapidly on the foil.

What is the role of the concentrated hydrochloric acid?

**A** To act as a catalyst in the reaction between aluminium and copper(II) sulfate solution.
**B** To dissolve the oxide layer on the surface of the foil.
**C** To form aluminium chloride which then displace copper from copper(II) sulfate solution.
**D** To react with copper(II) sulfate solution to form pink copper(II) chloride.

**20** In the apparatus shown, gas **P** is passed over solid **Q**. No visible reaction occurs.




What can gas **P** and solid **Q** be?

| | **P** | **Q** |
|---|---|---|
| **A** | hydrogen | zinc oxide |
| **B** | hydrogen | iron(II) oxide |
| **C** | oxygen | sulfur |
| **D** | oxygen | carbon |

**21** In which reaction does dilute sulfuric acid act both as an acid and an oxidising agent?

**A** $Mg + H_2SO_4 \longrightarrow MgSO_4 + H_2$
**B** $MgO + H_2SO_4 \longrightarrow MgSO_4 + H_2O$
**C** $Mg(OH)_2 + H_2SO_4 \longrightarrow MgSO_4 + 2\ H_2O$
**D** $MgCO_3 + H_2SO_4 \longrightarrow MgSO_4 + CO_2 + H_2O$

**22** What is the oxidation state of chlorine in $ClO_3^-$?

**A** − 1
**B** − 7
**C** + 5
**D** + 6

**23** Which of the following statements about oxidation numbers are true?

**I.** The oxidation number of an uncombined element is 0.
**II.** The oxidation number of hydrogen in a compound can be either −1 or −2.
**III.** The sum of the oxidation numbers of a neutral compound is 0.
**IV.** The sum of the oxidation numbers of a complex ion is the charge on the ion.

**A** I and II only
**B** III and IV only
**C** I, II and III
**D** I, III and IV

**24** In the Haber Process for the manufacture of ammonia, what are the usual operating conditions?

| | pressure (atm) | temperature (°C) | catalyst |
|---|---|---|---|
| **A** | 1 | 200 | nickel |
| **B** | 200 | 450 | nickel |
| **C** | 200 | 450 | iron |
| **D** | 450 | 200 | iron |

**25** Dilute sulfuric acid was added to a sample of alloy containing two metals. The mixture was filtered and aqueous sodium hydroxide was then added to the filtrate.
A precipitate was formed. Excess aqueous sodium hydroxide added caused the mass of the precipitate to decrease, leaving a dirty green solid and a colourless solution.

What are the two metals present in the alloy?

**A** aluminium and zinc
**B** copper and zinc
**C** iron and lead
**D** iron and zinc

**26** A student carried out the following series of tests on an aqueous solution of sodium carbonate and recorded his results as shown in the table.

Which test should be repeated because of an incorrect observation entered in the table?

| | test | observation |
|---|---|---|
| **A** | add barium chloride solution | white precipitate formed |
| **B** | add copper(II) sulfate solution | green precipitate formed |
| **C** | add dilute hydrochloric acid | effervescence formed |
| **D** | add sodium hydroxide solution | white precipitate formed |

**27** Which statement about the properties of ammonia is correct?

**A** It can be formed by reacting 1 part nitrogen with 3 parts hydrogen.
**B** It dissolves in water to form an acidic solution.
**C** It is formed by heating ammonium salts with sulfuric acid.
**D** It reacts with alkalis to form salts.

**28** Potassium chlorate solution can be decomposed according to the equation:

$$2\ KClO_3\ (aq) \longrightarrow 2\ KCl\ (aq) + 3\ O_2\ (g)$$

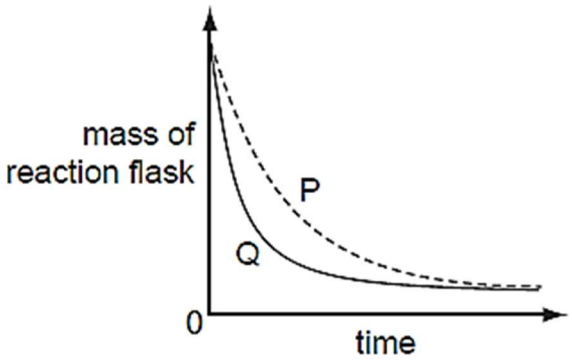
What would be the effect on the rate of reaction and the volume of oxygen produced, if an equal volume of water was added to the potassium chlorate solution before the reaction began?

| | rate | final volume of oxygen |
|---|---|---|
| **A** | decreased | unchanged |
| **B** | decreased | increased |
| **C** | unchanged | unchanged |
| **D** | increased | decreased |

**29** Which of the following acid solutions, when added to 5 g of zinc granules, would have the highest initial rate of reaction?

**A** 25 $cm^3$ of 2.00 mol/$dm^3$ sulfuric acid
**B** 25 $cm^3$ of 0.200 mol/$dm^3$ hydrochloric acid
**C** 50 $cm^3$ of 1.00 mol/$dm^3$ hydrochloric acid
**D** 100 $cm^3$ of 0.100 mol/$dm^3$ sulfuric acid

**30** A student investigates the rate of reaction between marble chips and hydrochloric acid by measuring the loss in mass of the reaction flask.
The graph shows the results of two experiments, **P** and **Q**.




Which change best explains the difference between **P** and **Q**?

**A** A catalyst is added in **P**.
**B** A higher temperature is used in **P**.
**C** Bigger marble chips are used in **Q**.
**D** Hydrochloric acid is more concentrated in **Q**.

**31** The table shows some bond energies.

| bond | average bond energy /kJmol $^{-1}$ |
|---|---|
| C – C | 356 |
| C = C | 598 |
| C – H | 416 |

What is the total energy needed to break all the bonds in one mole of propene?

**A** 3178 kJ
**B** 3304 kJ
**C** 3450 kJ
**D** 3525 kJ

**32** Burning fuels such as methane is an exothermic reaction.

$$CH_4 + 2\ O_2 \longrightarrow CO_2 + 2\ H_2O \qquad \Delta H = -890\ kJ$$

Which statement explains why the reaction is exothermic?

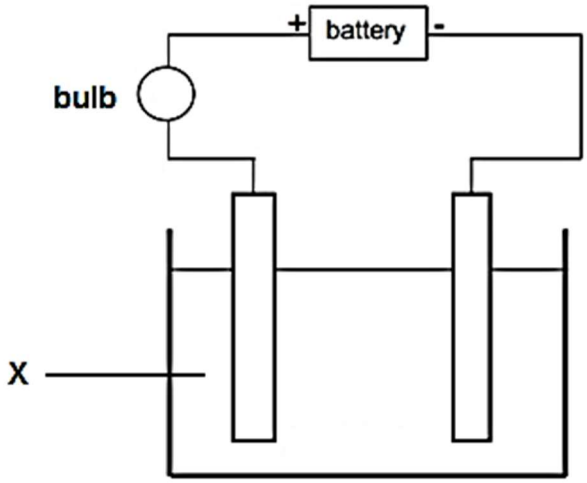
**A** Molecules release energy when they react.
**B** More bonds are formed than broken.
**C** The bonds formed are weaker than the bonds broken.

**D** The total energy needed to break bonds is less than that released to form bonds.

**33** Which element requires the smallest number of electrons for one mole of atoms to be liberated during electrolysis?

**A** aluminium
**B** calcium
**C** copper
**D** sodium

**34** When the experiment shown was set up, the bulb lit, but there was no decomposition of electrolyte **X**.




What is electrolyte **X**?

**A** aqueous sodium chloride
**B** bromine
**C** mercury
**D** molten sodium chloride

**35** Which statement is true about the hydrogen-oxygen alkaline fuel cell?

**A** Hydrogen gas is oxidised at the negative electrode to form water.
**B** Hydrogen gas is reduced at the negative electrode to form water.
**C** Oxygen gas is oxidised at the negative electrode to form hydroxide ions.
**D** Oxygen gas is reduced at the negative electrode to form hydroxide ions.

**36** In electroplating a chromium bracelet with silver, which of the following combinations is correct?

| | anode | cathode | electrolyte |
|---|---|---|---|
| **A** | bracelet | silver | silver nitrate |
| **B** | silver | bracelet | silver nitrate |
| **C** | bracelet | silver | chromium nitrate |
| **D** | silver | bracelet | chromium nitrate |

**Set K**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **1** | C | **11** | D | **21** | A | **31** | C |
| **2** | B | **12** | D | **22** | C | **32** | D |
| **3** | D | **13** | C | **23** | D | **33** | D |
| **4** | B | **14** | C | **24** | C | **34** | C |
| **5** | A | **15** | C | **25** | D | **35** | A |
| **6** | C | **16** | B | **26** | D | **36** | B |
| **7** | A | **17** | D | **27** | A | | |
| **8** | C | **18** | B | **28** | A | | |
| **9** | C | **19** | B | **29** | A | | |
| **10** | D | **20** | A | **30** | D | | |