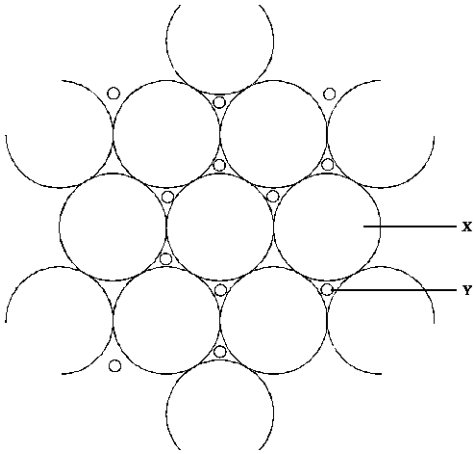
HIGHER TIER CHEMISTRY MINI-MOCK UNIT 2 [C2.1, C2.2&C2.3, C2.4, C2.5, C2.6 and C2.7]

C2.1 Structure and Bonding Questions

Q1. The diagram shows a model of part of the giant lattice of a metal.



(a) Name particles **X** and **Y**.

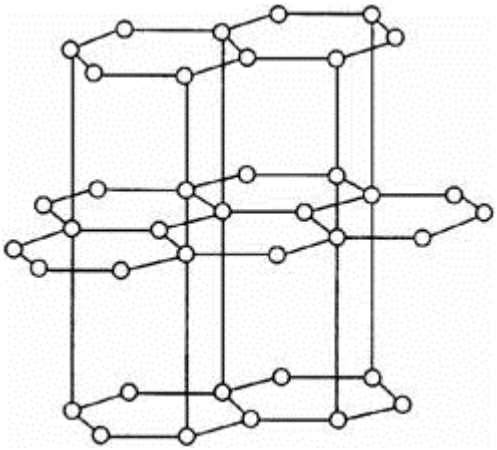
X .....

Y .....**(2)**

(b) Explain, in terms of the giant structure above, why is it possible to bend a piece of metal. **(2)**

(Total 4 marks)

Q3. The diagram represents the structure of graphite.



Use your knowledge and understanding of the structure of graphite to explain why graphite can be used:

(a) in the 'leads' of pencils;

.....
.....

(b) as an electrical conductor.

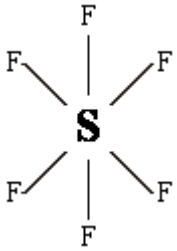
.....

(Total 5 marks)

Q4. Sulphur hexafluoride is a colourless, odourless, non-flammable gas, which is insoluble in water and extremely unreactive. It is used as an insulator in high voltage transformers and switchgear.

The diagram below represents a molecule of sulphur hexafluoride.

a)



a) What type of chemical bond holds the sulphur and fluorine atoms together in sulphur hexafluoride molecules? **(1)**

(b) Explain why sulphur hexafluoride has a low boiling point. **(2)**

(c) Explain how **three** of the properties of sulphur hexafluoride make it suitable for us an insulator inside electrical transformers. **(3)(Total 6 marks)**

UNIT 2.2 AND UNIR 2.3 ATOMIC STRUCTURE AND PROPERTIES Questions

Q1. Silicon is an important element used in the electronics industry.

(a) Silicon can be made by heating a mixture of sand (silicon dioxide) with magnesium powder. The equation for this reaction is shown below.

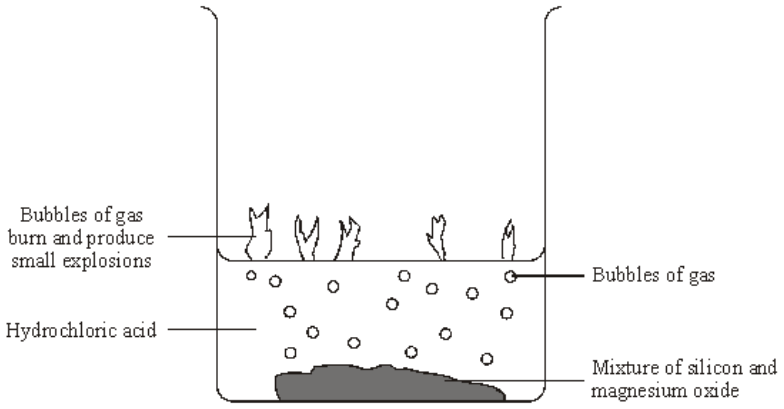
$$SiO_2\ (s) + 2Mg\ (s) \rightarrow 2MgO\ (s) + Si\ (s)$$

Calculate the mass of silicon dioxide needed to make 1 g of silicon.

Relative atomic masses: O = 16; Si = 28 Mass = ...g

(3)

(b) The resulting mixture of magnesium oxide and silicon is added to a beaker containing hydrochloric acid. The silicon is then filtered from the solution.



(i) The magnesium oxide reacts with the hydrochloric acid and forms magnesium chloride ($MgCl_2$) solution and water.

magnesium oxide + hydrochloric acid → magnesium chloride solution + water

Write a balanced symbol equation for this reaction, including state symbols. **(2)**

(ii) The gases produced are a mixture of several silicon hydrides.

One of the gases produced in the reaction is the silicon hydride with the formula SiH_4. The structure of this molecule is similar to methane, CH_4.

Draw a diagram to show the bonding in a molecule of SiH_4. Represent the electrons as dots and crosses and only show the outer shell (energy level) electrons.

(1)

(iii) A sample of a different silicon hydride was found to contain 1.4 g of silicon and 0.15 g of hydrogen. Calculate the formula of this silicon hydride. You must show all your working to gain full marks.Relative atomic masses: H = 1; Si = 28

(4)

(iv) The silicon hydrides react immediately they come into contact with oxygen in the air. They burst into flames with a small explosion and give out energy.

Which letter, **A** to **H**, best describes this reaction? **[1 mark]**

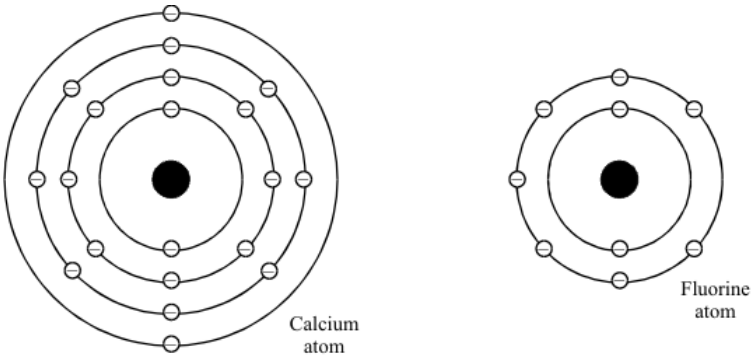
Energy involved in breaking and forming bonds	Activation energy	Rate of reaction	Letter
The energy released from forming new bonds is greater than the energy needed to break existing bonds	high	fast	**A**
		slow	**B**
	low	fast	**C**
		slow	**D**
The energy needed to break existing bonds is greater than the energy released from forming new bonds	high	fast	**E**
		slow	**F**
	low	fast	**G**
		slow	**H**

(c) The structure of silicon is similar to the structure of diamond. Describe the structure of silicon and explain why it has a high melting point. You may draw a diagram if this helps. **(4)(Total 15 marks)**

Q2. Uranium metal can be produced by reacting uranium hexafluoride with calcium.

$UF_6 + 3Ca \rightarrow 3CaF_2 + U$

(a) Describe how calcium and fluorine bond together to form calcium fluoride. The electron arrangement of each atom is shown.



(5)

(b) Uranium has two main isotopes, $^{235}_{92}U$ and $^{238}_{92}U$. Use these as examples to explain what is meant by the word isotope.

(4)

(c) At the start of a reaction there was 174.5 g of uranium hexafluoride, UF_6.

Relative atomic masses: F 19; U 235

(i) Calculate the relative formula mass of uranium hexafluoride, UF_6.

Relative formula mass UF_6 = ... g

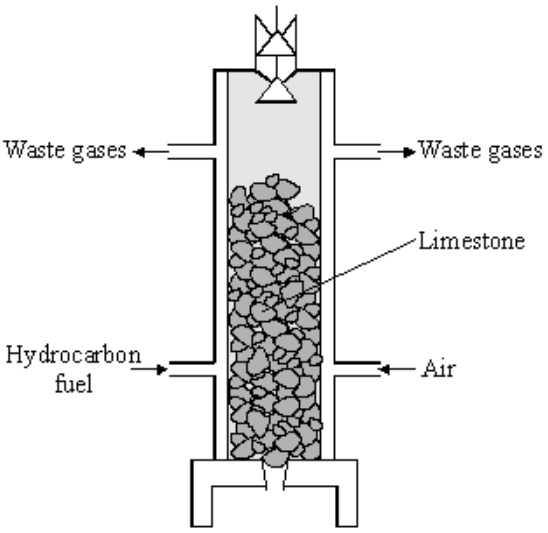
(1)

(ii) Calculate the mass of uranium that would be produced from 134.5 g of uranium hexafluoride.

Mass of uranium = ... g (**2**)

(Total 12 marks

Q3. Limestone is a useful mineral. Every day, large amounts of limestone are heated in limekilns to produce lime. Lime is used in the manufacture of iron, cement and glass and for neutralising acidic soils.



$$CaCO_3 \rightleftharpoons CaO + CO_2$$

(i) The decomposition of limestone is a *reversible* reaction. Explain what this means.

(2)

(ii) Calculate the mass of lime, CaO, that would be produced from 250 tonnes of limestone, $CaCO_3$.

Relative atomic masses: C 12; O 16; Ca 40.

Mass of lime = ... tonnes

(3)

(Total 5 marks)

Q5. Iron is the most commonly used metal. Iron is extracted in a blast furnace from iron oxide using carbon monoxide.

$$Fe_2O_3 + 3CO \rightarrow Fe + 3CO_2$$

(a) A sample of the ore haematite contains 70% iron oxide.

Calculate the amount of iron oxide in 2000 tonnes of haematite.

Amount of iron oxide = ... tonnes

(1)

(b) Calculate the amount of iron that can be extracted from 2000 tonnes of haematite.
(Relative atomic masses: O = 16; Fe = 56)

Amount of iron = ... tonnes

(4)

(Total 5 marks)

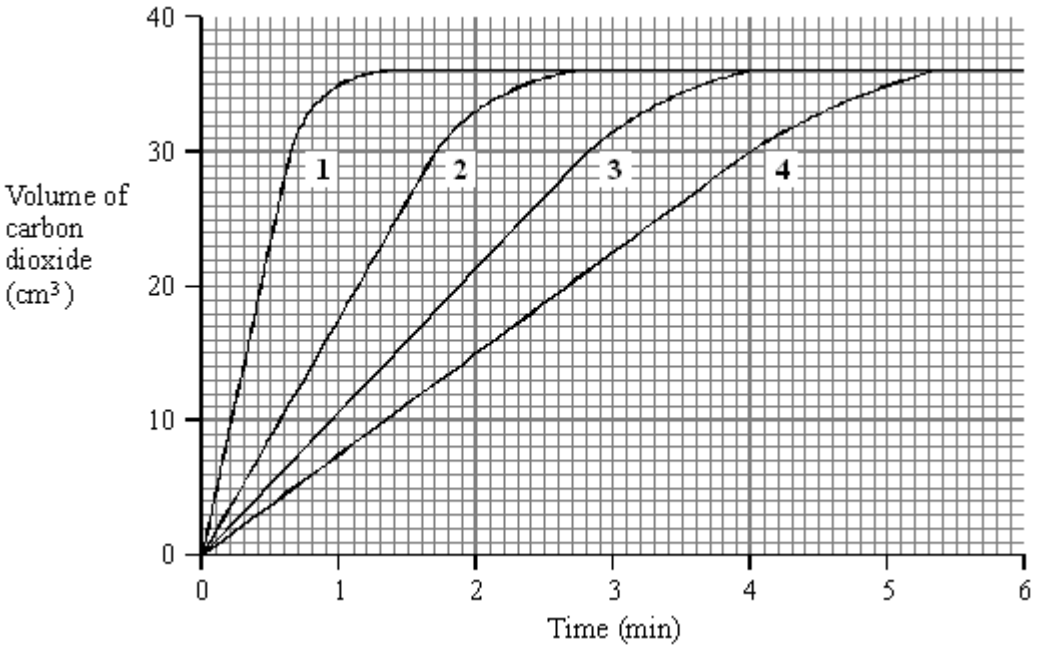
C2.4 Rates of Reaction Questions

Q2. Calcium carbonate reacts with dilute hydrochloric acid as shown in the equation below.

$$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$$

The rate at which this reaction takes place can be studied by measuring the amount of carbon dioxide gas produced.

The graph below shows the results of four experiments, 1 to 4. In each experiment the amount of calcium carbonate, the volume of acid and the concentration of the acid were kept the same but the temperature of the acid was changed each time. The calcium carbonate was in the form of small lumps of marble.



(a) Apart from altering the temperature, suggest **two** ways in which the reaction of calcium carbonate and hydrochloric acid could be speeded up.

(2)

(b) Which graph, 1 to 4, shows the results of the experiment in which the acid had the highest temperature and explain fully how you know?

(2)

(c) (i) In experiment 2, how does the rate of reaction after one minute compare with the rate of reaction after two minutes?

(1)

(ii) Explain, as fully as you can, why the reaction rate changes during experiment 2.

(2)

(Total 7 marks)

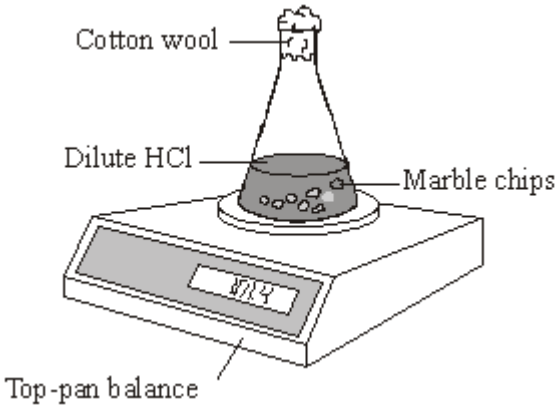
Q3. A student investigated the rate of reaction between marble and hydrochloric acid.

The student used an excess of marble.

The reaction can be represented by this equation.

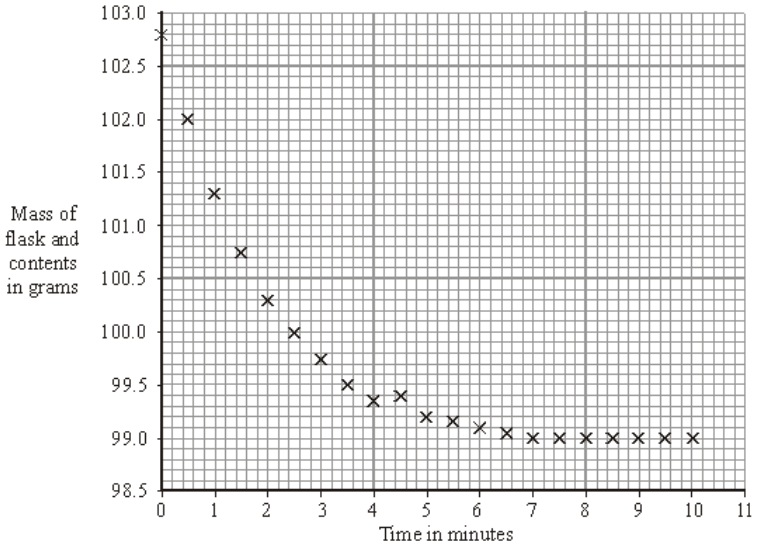
$CaCO_3$ (s) + 2HC1 (aq) → $CaC1_2$ (aq) + H_2O (l) + CO_2 (g)

The student used the apparatus shown in the diagram.



The student measured the mass of the flask and contents every half minute for ten minutes.

The results are shown on the graph. Use the graph to answer the questions.



(a) **Complete the graph** opposite by drawing a line of best fit.

(1)

(b) Why did the mass of the flask and contents decrease with time?

(1)

(c) After how many minutes had all the acid been used up?

.....
minutes

(1)

(d) The student repeated the experiment at a higher temperature. All other variables were kept the same as in the first experiment. The rate of reaction was much faster.

(i) Draw a line **on the graph** to show what the results for this second experiment might look like.

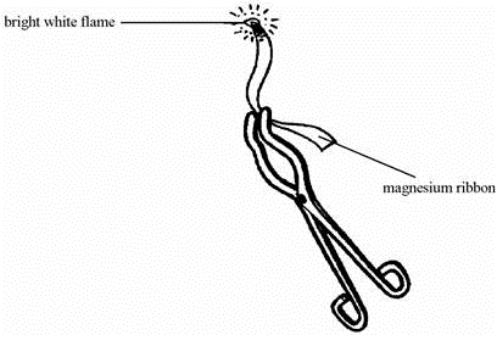
(2)

(ii) Why does an increase in temperature increase the rate of reaction?

(3)(Total 8 marks)

Unit C2.5 Exothermic Endothermic Questions

Q1. The diagram shows some magnesium ribbon burning.



(a) Choose words from the list to complete the sentences below.

electrical heat light kinetic

an endothermic an exothermic a neutralisation a reduction

When magnesium burns, it transfers .....and ..... energy to the surroundings. We say that it is ..... reaction.

(3)

(b) Complete the word equation for the reaction.

magnesium + _____ ⟶ magnesium oxide

(1)

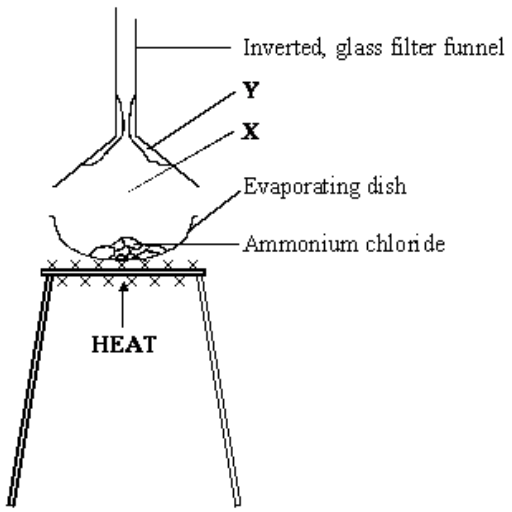
(Total 4 marks)

Q4. (a) The equation for the reaction that takes place when ammonium chloride is heated is:

$NH_4Cl(s)$ ⇌ $NH_3(g)$ + $HCl(g)$

ammonium chloride ⇌ ammonia + hydrogen chloride

The diagram shows how a teacher demonstrated this reaction. The demonstration was carried out in a fume cupboard.



(i) Apart from the gases normally in the atmosphere, which two gases would be at **X**?

.....

and (**1**)

(ii) Name the white solid that has formed at **Y**.**(1)**

(iii) Why was the demonstration carried out in a fume cupboard? **(1)**

(iv) Complete the **four** spaces in the passage.

The chemical formula of ammonia is NH_3. This

shows that there is one atom of

..... and three atoms of ..... in each

..... of ammonia. These atoms are joined by bonds that

are formed by sharing pairs of electrons. This type of bond is called

a ..... bond.

(4)

(b) Electrons, neutrons and protons are sub-atomic particles.

(i) Complete the **three** spaces in the table.

Name of sub-atomic particle	Relative mass	Relative charge
.....	1	+1
.....	1	0
.....	$\frac{1}{1840}$	–1

(2)

(ii) Which **two** sub-atomic particles are in the nucleus of an atom?

..... and .....

(1)

(Total 10 marks)

C2.6 Acids, Bases Salts Questions

Q1. Acids and bases are commonly found around the home.

(a) Baking powder contains sodium hydrogencarbonate mixed with an acid.

(i) When water is added, the baking powder releases carbon dioxide. How could you test the gas to show that it is carbon dioxide?

Test .....Result of test

(2)

(ii) Complete and balance the chemical equation for the reaction of sodium hydrogencarbonate with sulphuric acid.

$NaHCO_3$ + H_2SO_4 → ..... + ... + ...

(2)

(b) Indigestion tablets contain bases which cure indigestion by neutralising excess stomach acid

(i) One type of indigestion tablet contains magnesium hydroxide. This base neutralises stomach acid as shown by the balanced chemical equation.

$Mg(OH)_2$ + 2HCl → $MgCl_2$ + $2H_2O$

Write a balanced **ionic** equation for the neutralisation reaction.

(2)

(ii) How does the pH in the stomach change after taking the tablets?

(1)

(c) Ammonium sulphate is used as a lawn fertiliser.Using ammonia solution, describe how you would make the fertiliser ammonium sulphate.

(3)

(Total 10 marks)

Q2. The salt sodium hydrogen phosphate (Na_2HPO_4) is used as a softening agent in processed cheese. It can be made by reacting phosphoric acid (H_3PO_4) with an alkali.

(a) Complete the name of an alkali that could react with phosphoric acid to make sodium hydrogen phosphate.

..... hydroxide

(1)

(b) What is the name given to a reaction in which an acid reacts with an alkali to make a salt?

(1)

(c) How would the pH change when alkali is added to the phosphoric acid solution?

(1)

(d) What ions are present when any acid is dissolved in water?

(1)

(e) What ions are present when any alkali is dissolved in water?

(1)

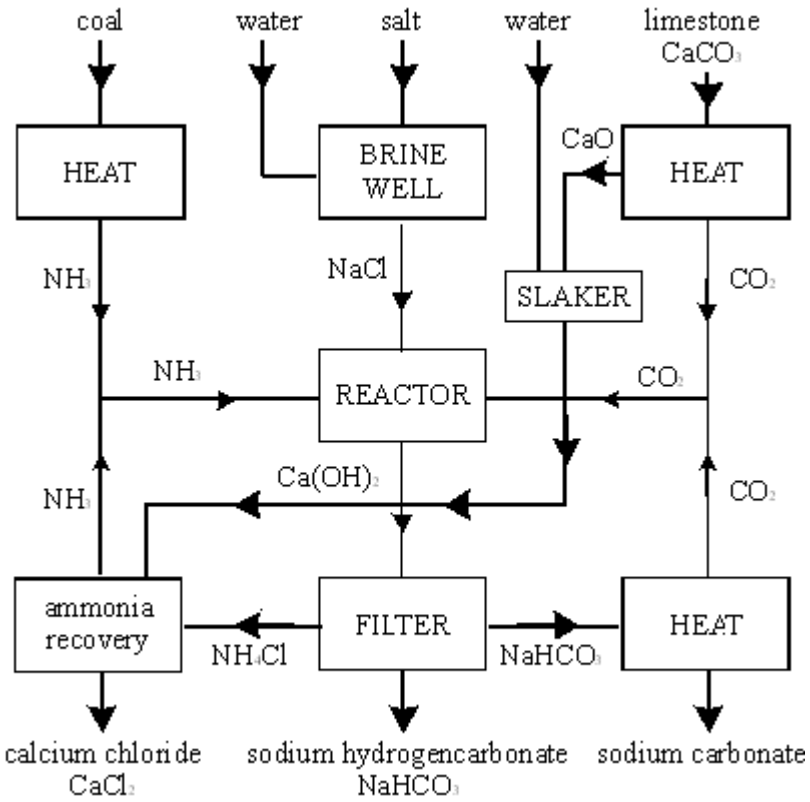
(f) Write a chemical equation for the reaction which takes place between the ions you have named in (e) and (f).

(1)

(Total 6 marks)

Q4. Sodium carbonate is a useful chemical that can be made from sodium chloride.

(a) The flow chart below shows one way in which sodium carbonate can be made.



(i) Write the formula of sodium carbonate **(1)**

(ii) Give **one** example of a thermal decomposition reaction shown in the flow chart. **(1)**

2. Explain what is meant by a thermal decomposition reaction. **(2)**

(iii) Name **one** substance that is recycled in this process. **(1)**

(b) When sodium carbonate solution is added to zinc sulphate solution a white solid is precipitated.

(i) Use the Data Sheet to help you to name the white solid that is produced in this reaction. **(1)**

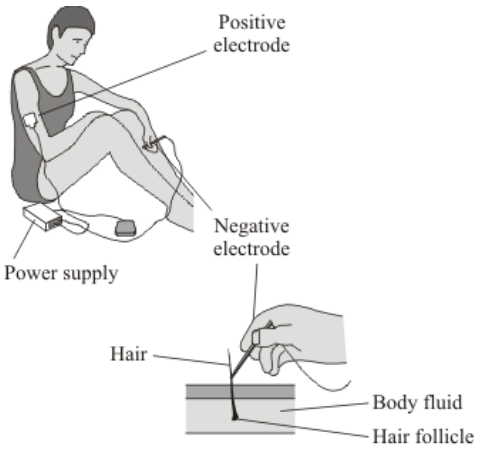
(ii) State why this solid is formed.

(1)

(Total 7 marks)

C2.7 Electrolysis Questions

Q1. Electrolysis can be used to remove unwanted hair from the skin. The hair is first coated with a layer of gel containing ions in solution. The positive electrode is connected by a patch to the skin.The negative electrode is connected to the hair. Electricity flows through the gel and causes electrolysis of the body fluid around the hair follicle.



(a) Metal wires conduct electricity to the electrodes. Explain how metals conduct electricity. **(2)**

(b) Explain why the gel containing ions in solution can conduct electricity. **(1)**

(c) The body fluid is a solution that contains sodium chloride. The electricity causes the electrolysis of a small amount of this solution.

This solution contains hydrogen ions that move to the negative electrode.

(i) The half equation represents the reaction at the negative electrode.

$2H^+ + 2e^- \rightarrow H_2$ Explain why this reaction is a reduction. **(1)**

(ii) As a result of the electrolysis of sodium chloride solution, an alkali forms which kills the hair follicle. What is the name of this alkali?

(1)

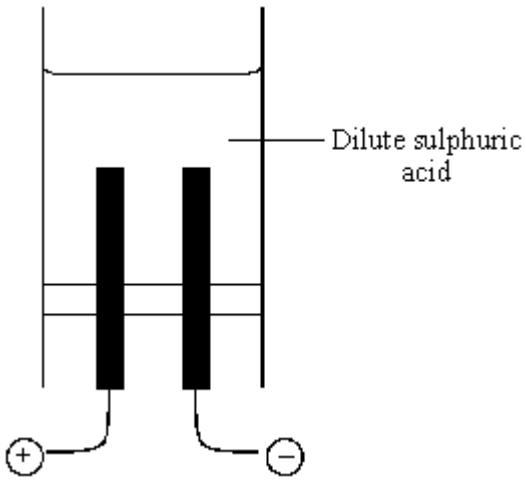
(iii) Complete the half equation for the reaction at the positive electrode.

$Cl^- \rightarrow Cl_2$

(1)

(Total 6 marks)

Q2. An electric current was passed through dilute sulphuric acid. The apparatus used is shown. Oxygen was formed at the anode.



(a) What name is given to solutions which decompose when electricity is passed through them? **(1)**

(b) The ionic equation for the reaction at the anode is:

$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$ Explain this type of reaction. **(2)**

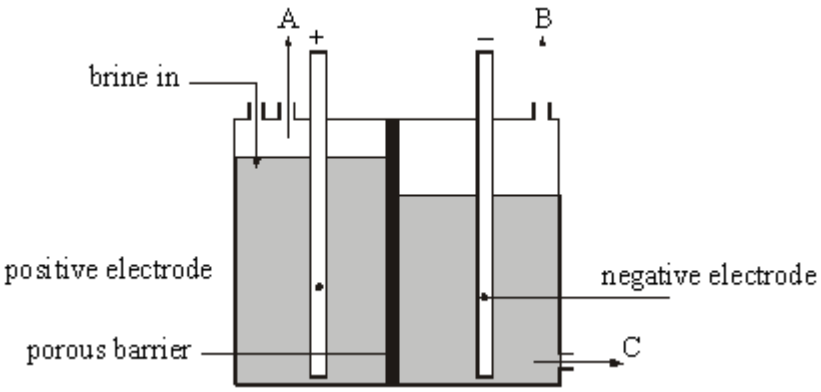
(c) Write a **balanced** ionic equation for the reaction at the cathode. **(2)**

(d) What happens to the concentration of the sulphuric acid as the electricity is passed through it?

Explain your answer. **(3)**

(Total 8 marks)

Q3. Sodium hydroxide, hydrogen and chlorine can all be made in one industrial process. Electricity is passed through aqueous sodium chloride solution (brine). The diagram below shows a cell that can be used for this process.



(a) Name A, B and C.

Gas A .....

Gas B .....

Solution C .....

(2)

(b) Balance the equations for the reactions at the electrodes.

(i) ..... Cl^- – ..... e^- → Cl_2

(ii) ..... H^+ + ... e^- → H_2

(2)

(c) Name the compound in this cell which produces the hydrogen ions. **(1)**

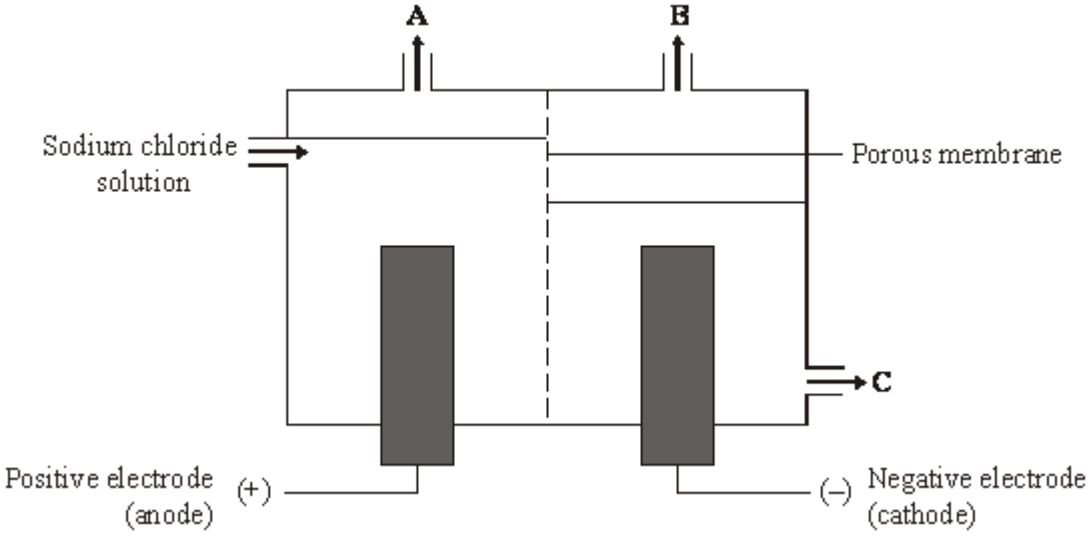
(d) Which type of particles must be able to pass through the barrier to allow the electrolysis to take place? **(1)**

(Total 6 marks)

Q4. The *electrolysis* of sodium chloride solution produces useful substances.

(a) Explain the meaning of *electrolysis*. **(2)**

(b) The diagram shows an apparatus used for the electrolysis of sodium chloride solution.



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The electrolysis produces two gases, chlorine and Gas **A.**

Name Gas **A** .....

(1)

(c) The electrodes used in this process can be made of graphite. Explain why graphite conducts electricity.

..... **(2)**

(Total 5 marks)

C2.1 Structure and Bonding Answers [max 25]

M1. (a) **X** – (metal) atom / ion

1

Y – electron

1

(b) free electrons or electrons move

1

(allow metal) atoms / ions to slide over each other

OR

bonding non - directional for 2 marks

1

[4]
[6

M3. (a) made of layers
of carbon atoms
weak forces of attraction between layers (owtte) / weak
vertical bonds i.e.
candidate refers to the diagram
layers can slide over each other
layers peel off
each for 1 mark

(b) because there are electrons
which are free (to move)
reason for free electrons / each carbon atom has 3 covalent bonds
each for 1 mark
to max 5

[5]

M4.

(a) covalent/description of covalent

1

(b) forces/bonds between the molecules/particles (<u>not</u> atoms) are weak

2

(c) non-flammable so it will not burn etc.
extremely unreactive so it will not react with materials in the transformer,
does not conduct electricity so it can insulate the transformer
gas so it has freedom to move and insulate whole area

3

[6]

UNIT 2.2 AND UNIR 2.3 ATOMIC STRUCTURE AND PROPERTIES Answers

M1. (a) M_r (SiO_2) = 60

1

60 g SiO_2 → 28 g Si

1

2.14 g SiO_2 → 1 g Si

OR M_r (SiO_2) = 60 (1)

moles if silicon needed = $\frac{1}{28}$ = 0.0357 mass of SiO_2 needed = 0.0357 × 60 (1) = 2.14 g (1)

OR M_r (SiO_2) = 60 (1)

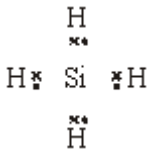
mass SiO_2 = 1 × $\left(\frac{60}{28}\right)$ (1) = 2.14 g (1)

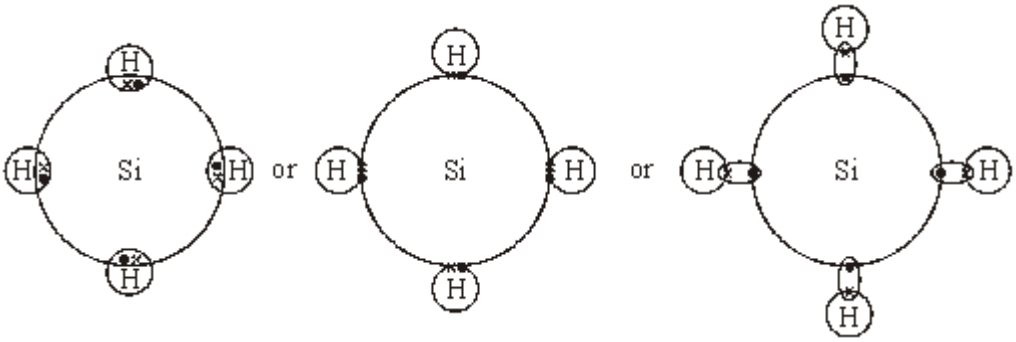
3

(b) (i) $MgO(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(l)$

2

(ii)





(iii)

Si	**H**
$\frac{1.4}{28}$	$\frac{0.15}{1}$

1

= 0.05 = 0.15

1

1 3

for whole number ratio can be implied

1

SiH_3

evidence of mass / A_r ***1*** *mark*
proportions of each ***1*** *mark*
whole number ratio ***1*** *mark*
correct formula ***1***

mark

1

(iv) **C**

accept c

1

(c) any **four** from:

- giant structure / macromolecule / lattice / giant molecule
  allow giant molecular / giant atomic structure
- each silicon atom joined to four other atoms
  (or diagram)
- covalent bonds
- bonds are strong **or** large amount of energy needed to break bonds
  accept hard to break bonds
- large number of bonds to be broken
  *mention of giant **ionic** structure **or** intermolecular forces **or** intermolecular bonds max **1** mark*
  *diamond **or** carbon discussion max **3** marks unless clearly linked to silicon*

4

[15]

M2. (a) calcium atom loses two electrons

accept diagrams with correct labelling

1

(each) fluorine atom gains one electron

*accept two electrons transfer from a calcium atom to the two fluorine atoms for these first **two** marks*

1

forming full (outer) shells of electrons

*accept forming full (outer) energy levels **or** noble gas electronic structures*

*do **not** accept stable unless qualified*

1

giving the ions Ca^{2+} and F^{-}

1

attraction between ions of opposite charges

accept electrostatic attraction between ions

*if candidate mentions sharing **or** pairing of electrons then no credit*

*if explanation is entirely correct but they state this is called covalent bonding, the maximum mark is **four***

1

(b) atoms of the same element

1

atomic number is same

accept each contains 92 or same number of protons

1

mass numbers differ **or** each has a different number of neutrons

1

one has 146 neutrons the other has 143 neutrons

*accept one has three more **or** less neutrons than the other*

1

(c) (i) 349

1

(ii) 349g UF_2 produces 235g U [1]

first mark can be awarded if answer is incorrect

answer = 117.5

1

[12]

M3. (i) a reaction in which the products can be changed back to reactants

*accept a reaction that can go forwards **or** backwards*

1

under certain conditions

1

(ii) M_r $CaCO_3$ = 100

1

M_r CaO = 56

1

mass of CaO = 140 (tonnes)

1

[5]

M5. (a) 1400

1

(b) 980

correct answer gains full credit

160 tonnes Fe_2O_3 produces 112 tonnes Fe

if incorrect allow one mark for relative formula mass iron oxide = 160
allow e.c.f.

1400 tonnes Fe_2O_3 will produce 1400 / 160 × 112 tonnes Fe

use of 2000 tonnes Fe_2O_3 – deduct one mark only if working out is correct

4

[5]

C2.4 Rates of Reaction Answers

M2. (a) increase concentration of acid; increase surface area of solid **or** grind up the solid;add a catalyst

2

(b) 1;it is the one that makes the gas fastest (steeper curve etc)

2

(c) (i) faster after one minute, slower after 2 minutes

1

(ii) the reactants get used up;so concentration decreases/less chance of collision

2

[7]

M3. (a) sensible line of best fit which goes through or close to all the points **except** the anomalous point; *allow wobbly / short double lines*

1

(b) loss of gas / loss of CO_2*; idea of gas produced / formed*

1

(c) 7

1

(d) (i) steeper line from around the same starting point and left of the points

1

levelling off at 99; *accept short level line at 99*

1

(ii) any **three** from:

- particles / molecules / atoms/ ions have more energy; *allow given / gain / get energy*
- move faster
- collide more often **or** more chance of collisions **or** bump into each other more
- collide with more force / energy **or** more particles have the activation energy **or** more collisions result in reaction **or** more collisions are successful

3

[8]

Unit C2.5 Exothermic Endothermic Answers

M1. (a) heat
light
an exothermic

in any order for 1 mark each

3

(b) oxygen / O_2

for 1 mark

1

[4]

M4. (a) (i) ammonia and hydrogen chloride

both required either order
accept formulae if correct in every detail

1

(ii) ammonium chloride / NH_4Cl

do not credit ammonia chloride

1

(iii) the fumes / gases / are poisonous / toxic

or *ammonia and hydrogen chloride are poisonous / toxic / lethal*
accept just ammonia is poisonous / toxic
accept just hydrogen chloride is poisonous / toxic
accept vapour is poisonous / toxic
do not credit just fumes are dangerous
or *harmful*

1

(iv) nitrogen

1

hydrogen

1

molecule

1

covalent

1

(b) (i) proton ; neutron; electron

2

(ii) protons and neutrons

both required in either order

1

[10]

C2.6 Acids, Bases Salts Answers

M1. (a) (i) test: limewater

accept calcium hydroxide solution

1

result: 'goes' cloudy

*accept white **or** milky*

*do **not** accept misty **or** chalky test must be correct before result mark can be considered*

1

(ii) $2\ NaHCO_3 + H_2SO_4 \rightarrow$

$Na_2SO_4 + (2)\ H_2O + (2)\ CO_2$

1

correctly balanced

1

(b) (i) $H^+ + OH^-$

1

$\rightarrow H_2O$

deduct **one** mark if incorrectly balanced

accept H_3O^+ instead of H^+ then $2H_2O$ needed for balance

1

(ii) pH increases

accept numerical indication

1

(c) addition of sulphuric acid

1

correct use of an indicator *accept idea of forming a neutral solution*

1

crystallisation (of neutral solution) *accept description using evaporation*

1

[10]

M2. (a) sodium

1

(b) neutralisation

1

(c) increase/inc. number

1

(d) H^+

1

(e) OH^-

1

(f) $H^+ + OH^- \rightarrow H_2O$

1

[6]

M4. (a) (i) Na_2CO_3 or $(Na+)_2\ CO_3^{2-}$ must be completely correct

1

(ii) (1) decomposition of limestone
or decomposition of coal
or decomposition of sodium hydrogen carbonate (owtte.)
allow equations even if not
correctly balanced

1

(2) breakdown/split up **not** decomposed by heat

2

(iii) carbon dioxide or ammonia [CO_2] or [NH_3]

1

(b) (i) zinc carbonate or zinc hydroxide
allow formulae if completely correct

1

(ii) (zinc carbonate) is insoluble (in water)
((i) and (ii) are independent marks)

1

[7]

C2.7 Electrolysis Answers

M1. (a) any **two** from:

- outer shell electrons / electrons in highest energy level (in metals)
- electrons are delocalised / sea of electrons
- electrons are free **or** electrons move around **or** electrons are free to flow **or** electrons attracted to positive terminal
- electrons carry charge / current **or** electrons form the current / electrons transfer charge / electrons pass charge

2

(b) ions can move / are attracted to electrode; *accept ions are free*; *allow 'they' for ions*

Or attracted to named electrode **OR** ions are charged **or** ions form / carry the current **or** ions form the charge

1

(c) (i) electron gain *ignore hydrogen reduces charge*

1

(ii) sodium hydroxide **or** NaOH **or** caustic soda

1

(iii) $2Cl^- - 2\ e^- \rightarrow Cl_2$ **or** $2Cl^- \rightarrow Cl_2 + 2\ e^-$

1

[6]

M2. (a) electrolytes

1

(b) oxidation

1

electrons lost

1

(c) $2H^+ + 2e^- \rightarrow H_2$

2

(d) concentration increases

1

OH^- discharged from water / water decomposes

1

H^+ concentration increases / H_2 and O_2 evolved

1

[8]

M3. (a) Gas A = Chlorine / Cl_2 not Cl and Gas B = Hydrogen / H_2 not H

Solution C = sodium hydroxide/NaOH/spent brine

2

(b) (i) 2, 2

(ii) 2, 2

2

(c) water/H_2O/hydrogen oxide not hydrogen hydroxide

1

(d) ions/positive ions/negative ions/cations/anions
not charged particles/positive particles/negative particles
not H^+ / Cl^-/Na^+ / OH^-
Allow hydrogen ions etc.
not sulphate ions

1

[6]

M4. (a) electric current / electricity

1

plus **one** from:

- is passed through ionic compound / substance / electrolyte
- passed through molten/aqueous compound / substance
  must be linked to electricity
  allow liquid compound / substance
  *do **not** allow solution / liquid alone*
- causing decomposition
  accept split up / breakdown / breaking up owtte
  ignore separated
  accept elements are formed
  ignore new substances form

1

(b) hydrogen; *accept H_2*; *do **not** accept H / H^2*

1

(c) one electron from each atom
accept each carbon is bonded to three other carbon atoms leaving one (unbonded) electron owtte

1

is delocalised / free (to move)
must be linked to electrons
*answers of delocalised / free electrons only, gains **1** mark*
*accept each carbon is bonded to three other carbon atoms leaving delocalised / free electrons = **2** marks*
***maximum 1** mark if graphite described as a metal / giant ionic lattice*

1[5]