Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	2	4	2	/	0	1	Signature	

Paper Reference(s)

6242/01

Examiner's use only

Team Leader's use only

Edexcel GCE

Chemistry

Advanced Subsidiary

Unit Test 2

Wednesday 4 June 2008 – Morning

Time: 1 hour

Question Number	Leave Blank
1	
2	
3	
4	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Candidates may use a calculator.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper. The paper reference is shown above.
Answer **ALL** the questions. Write your answers in the spaces provided in this question paper.
Do not use pencil. Use blue or black ink.
Show all the steps in any calculations and state the units.

Information for Candidates

The total mark for this paper is 60. The marks for individual questions and parts of questions are shown in round brackets: e.g. **(2)**. There are 16 pages in this question paper.
A Periodic Table is printed on the back cover of this question paper. All blank pages are indicated.

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.
You will be assessed on your Quality of Written Communication in this paper.

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Answer ALL the questions. Write your answers in the spaces provided.

1. (a) Chlorine and sodium hydroxide are manufactured by the electrolysis of a concentrated aqueous solution of sodium chloride, using a membrane cell.

(i) State the materials from which the anode and cathode are made.

Anode material .....

Cathode material .....

(2)

(ii) Write the ionic half-equations for the reactions at the anode and at the cathode.

Anode .....

Cathode .....

(2)

(iii) Write the overall **ionic** equation for this process.

.....

(1)

(iv) Give ONE major use for chlorine.

.....

(1)

Leave blank

(b) The reaction used in the production of sodium chlorate(I), NaOCl, is shown by the following equation.

$$Cl_2 + 2NaOH \rightarrow NaOCl + NaCl + H_2O$$

(i) Complete the following, for the reaction above:

Species oxidised ..... Oxidation product .....

Species reduced ..... Reduction product .....

(2)

(ii) Calculate the minimum volume of chlorine required to produce a solution containing 100 g of sodium chlorate(I).

(molar volume of chlorine under the conditions of this experiment = 24.0 $dm^3 mol^{-1}$)

(2)

Q1

(Total 10 marks)

Leave blank

2. This question is about the manufacture of sulphuric acid, H_2SO_4.

(a) The first stage in the manufacture of sulphuric acid is the combustion of sulphur.

The following equation shows the reaction taking place when the standard enthalpy of combustion of sulphur is measured.

$$S(s) + O_2(g) \rightarrow SO_2(g)$$

Define the term **standard enthalpy of combustion**.

.....

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.....

.....

(3)

(b) In the second stage of the manufacture of sulphuric acid, sulphur dioxide is oxidised to sulphur trioxide as shown in the following equation:

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad \Delta H = -196\ \text{kJ mol}^{-1}$$

(i) State the temperature and pressure used for this reaction and identify the catalyst.

Temperature .....

Pressure .....

Catalyst .....

(3)

(ii) Explain, in terms of collision theory, why the rate of a reaction is increased by increasing the temperature and by the addition of a catalyst.

Temperature

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Catalyst

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(4)

Leave blank

(iii) State and explain the effect, if any, of increasing the temperature on the equilibrium yield of sulphur trioxide.

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(2)

(iv) State and explain the effect, if any, of an increased pressure on the equilibrium yield of sulphur trioxide.

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(2)

Leave blank

(c) The following equation represents the overall reaction for the manufacture of sulphuric acid from sulphur, oxygen and water.

$$2S(s) + 2H_2O(l) + 3O_2(g) \rightarrow 2H_2SO_4(l)$$

Use the data below to calculate the enthalpy change for this reaction.

Substance	$\Delta H_f^{\ominus}$ / kJ mol^{-1}
$H_2O(l)$	–286
$H_2SO_4(l)$	–814

(2)

(d) State ONE large-scale use of sulphuric acid.

.....

(1)

Q2

(Total 17 marks)

Leave blank

3. (a) (i) State TWO features that members of a homologous series have in common.

.....

.....

.....

.....

(2)

(ii) Name the homologous series to which propene belongs.

.....

(1)

(iii) Propene can be converted into a mixture of 2-chloropropane (as the major product) and 1-chloropropane.

Classify the reaction involved and identify the reagent required.

Classification .....

Reagent .....

(2)

(b) (i) 1-chloropropane can be converted into butanenitrile, $CH_3CH_2CH_2CN$.

Classify the reaction involved. Identify the reagent required and state ONE essential condition.

Classification .....

Reagent .....

Condition .....

.....

(3)

(ii) Define the term **structural isomers**.

.....

.....

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(2)

Leave blank

(iii) Draw the **full** structural formula of any structural isomer of butanenitrile, showing **all** the bonds.

(1)

(c) 1-chloropropane and 1-bromopropane both react with ammonia to give 1-propylamine.

State and explain, in terms of bonding and kinetics, which of 1-chloropropane and 1-bromopropane would react faster with ammonia.

.....

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(3)

(d) 1-chloropropene, $CH_3CH{=}CHCl$, can be polymerised to form poly(1-chloropropene).

Draw the repeat unit of poly(1-chloropropene).

(2)

Leave blank

(e) Explain why 1-chloropropene exists as two different geometric isomers, but propene does not.

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(2)

Q3

(Total 18 marks)

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4. (a) Consider the following series of reactions.

$$\underset{\textbf{Ethene}}{CH_2{=}CH_2} \xrightarrow{\text{reaction 1}} \underset{\text{Compound } \textbf{A}}{CH_2OHCH_2OH} \xrightarrow{\text{reaction 2}} \underset{\text{Compound } \textbf{B}}{CH_2BrCH_2Br}$$

(i) Identify the reagent required for **reaction 1**.

.....

(1)

(ii) Name compound **B**.

.....

(1)

(iii) Identify the TWO reagents required for **reaction 2**.

.....

.....

(2)

(iv) Compound **A** can be oxidised by heating with an acidified solution of potassium dichromate(VI).

Give the colour change that would be observed and draw the full structural formulae of TWO possible oxidation products, showing all bonds.

Colour from ..... **to** .....

Oxidation products

(3)

Leave blank

(v) Suggest the name **or** formula of a compound that would be obtained if compound **B** were reacted with ethanolic potassium hydroxide.

.....

(1)

(b) (i) Compound **B** can be produced by reacting **ethane** with bromine in the presence of ultra-violet light.

Suggest why a good yield of compound **B** would **not** be obtained and identify another organic product that would be formed during the reaction.

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(2)

(ii) Write an equation for the complete combustion of ethane.

.....

(2)

(iii) Define the term **empirical formula**.

.....

.....

(1)

(iv) Give the empirical formula for ethane.

.....

(1)

QUESTION 4 CONTINUES ON THE NEXT PAGE

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(v) Give the formula of an alkane, containing more than one carbon atom, whose molecular and empirical formulae are the same.

(1)

Q4

(Total 15 marks)

TOTAL FOR PAPER: 60 MARKS

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THE PERIODIC TABLE

Period	Group 1	2										3	4	5	6	7	0
1	1 H Hydrogen 1																4 He Helium 2
2	7 Li Lithium 3	9 Be Beryllium 4										11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
3	23 Na Sodium 11	24 Mg Magnesium 12										27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
4	39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	63.5 Cu Copper 29	65.4 Zn Zine 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
5	85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	99 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
6	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
7	223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															

Key

Molar mass g mol^{-1}

Symbol

Name

Atomic number

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	(147) Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	163 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	(231) Pa Protactinium 91	238 U Uranium 92	(237) Np Neptunium 93	(242) Pu Plutonium 94	(243) Am Americium 95	(247) Cm Curium 96	(245) Bk Berkelium 97	(251) Cf Californium 98	(254) Es Einsteinium 99	(253) Fm Fermium 100	(256) Md Mendelevium 101	(254) No Nobelium 102	(257) Lr Lawrencium 103