Centre No.						Paper Reference (complete below)							Surname	Initial(s)
Candidate No.										/			Signature	

Paper Reference(s)

6242/P.01

Edexcel GCE

Chemistry

Advanced Level/Advanced Subsidiary

Unit Test 2

Monday 4 June 2001 – Afternoon

Time: 1 hour 20 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname and initials, the paper reference and your signature. The paper reference is shown above. If more than one paper reference is shown, you should write the one for which you have been entered.
Answer ALL questions in the spaces provided in this question paper.
Show all the steps in any calculations and state the units. Calculators may be used.
Final answers to calculations should be given to an appropriate number of significant figures.
Include diagrams in your answers where these are helpful.
Additional answer sheets may be used.

Information for Candidates

A periodic table is printed on the back cover of this question paper.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).
There are eight questions in this question paper.
The total mark for this paper is 75.

Advice to Candidates

You are reminded of the need to organise and present information, ideas, descriptions and arguments clearly and logically, taking account of your use of grammar, punctuation and spelling.

Turn over

Printer's Log. No.
N5437

S2019/R6242 7/5/2/16,100

Edexcel

1. (a) (i) Explain the term **homologous series**.

Leave blank

.....

.....

.....

(2)

(ii) To which homologous series does ethene, C_2H_4, belong?

.....

(1)

(b) Draw the full structural formulae, showing all the bonds, for each of the following:

(i) The organic product of the reaction of ethene, C_2H_4, with aqueous potassium manganate(VII) and sulphuric acid.

(2)

(ii) 3,4-dimethylhex-2-ene.

(2)

(iii) A repeating unit of poly(propene).

(2)

(c) Ethene reacts with hydrogen chloride gas to form C_2H_5Cl.

Leave blank

(i) What type of reaction is this?

.....

(2)

(ii) Give the systematic name for C_2H_5Cl.

.....

(1)

Q1

(Total 12 marks)

2. (a) But-2-ene, $CH_3CH{=}CHCH_3$, exists as geometric isomers.

Leave blank

(i) Draw the geometric isomers of but-2-ene.

(2)

(ii) Explain how geometric isomerism arises.

.....

.....

(1)

(b) (i) Draw the structural formula of a compound which is an isomer of but-2-ene but which does not show geometric isomerism.

(1)

(ii) Explain why the isomer drawn in (i) does not show geometric isomerism.

.....

.....

(1)

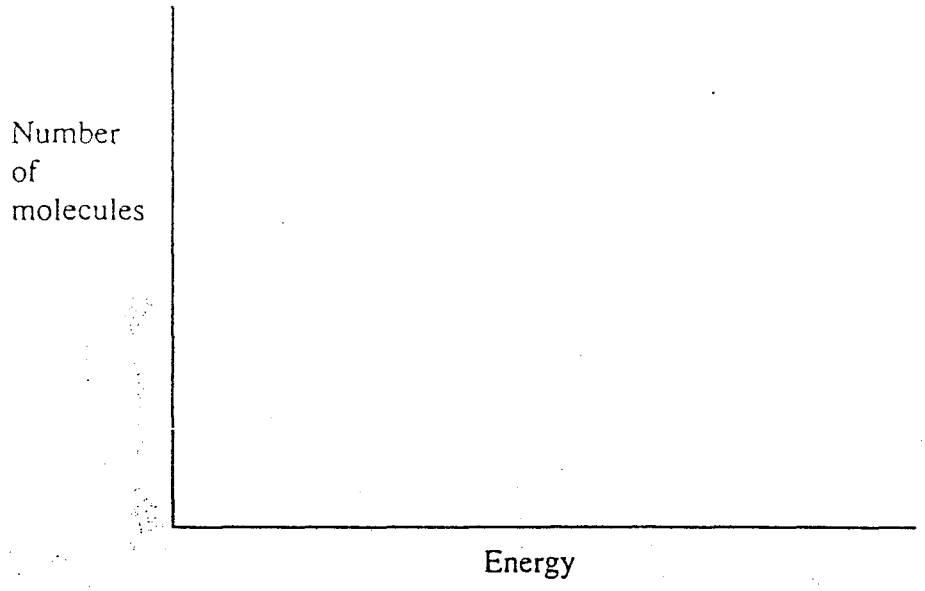
Q2

(Total 5 marks)

3. The rate of any chemical reaction is increased if the temperature is increased.

Leave blank

(a) Draw a diagram to represent the Maxwell-Boltzmann distribution of molecular energies at a temperature T_1 and at a higher temperature T_2.



(3)

(b) Use your diagram and the idea of activation energy to explain why the rate of a chemical reaction increases with increasing temperature.

.....

.....

.....

.....

.....

.....

.....

.....

(4)

Q3

(Total 7 marks)

4. The reaction between sulphur dioxide and oxygen is a dynamic equilibrium.

Leave blank

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

(a) Explain what is meant by **dynamic equilibrium**.

.....

.....

.....

(2)

(b) In the table below state the effect on this reaction of increasing the temperature and of increasing the pressure.

	Effect on the rate of the reaction	Effect on the position of equilibrium
Increasing the temperature	Increases	
Increasing the pressure		

(3)

(c) This reaction is one of the steps in the industrial production of sulphuric acid. The normal operating conditions are a temperature of 450 °C, a pressure of 2 atmospheres and the use of a catalyst.

Leave blank

Justify the use of these conditions.

(i) A temperature of 450 °C:

.....

.....

.....

(3)

(ii) A pressure of 2 atmospheres:

.....

.....

.....

(2)

(iii) A catalyst:

.....

.....

.....

(1)

(d) Give the name of the catalyst used.

.....

(1)

(e) Give one large scale use of sulphuric acid.

.....

(1)

Q4

(Total 13 marks)

5. (a) State Hess's Law.

Leave blank

.....

.....

.....

(2)

(b) Define the term standard enthalpy change of combustion.

.....

.....

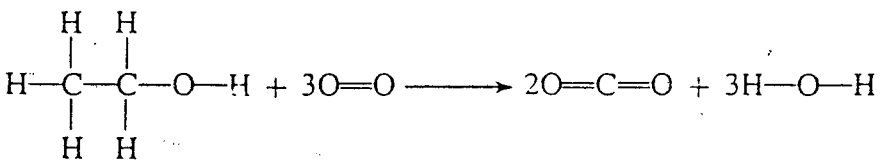
.....

(3)

(c) The equation for the combustion of ethanol in air is

$$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$$

and the structural representation of this is:



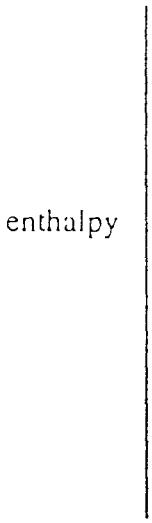
(i) Calculate the enthalpy change for this reaction using the average bond enthalpy values given below.

Bond	Average bond enthalpy/kJ mol^{-1}	Bond	Average bond enthalpy/kJ mol^{-1}
C—H	+412	C—C	+348
C—O	+360	O—H	+463
O=O	+496	C=O	+743

(3)

(ii) Draw and label an enthalpy level diagram to represent this reaction.

Leave blank



(2)

Q5

(Total 10 marks)

6. The enthalpy change of combustion of two fuels is listed below.

Leave blank

fuel	enthalpy of combustion/kJ mol^{-1}
hydrogen, H_2	−280
octane, C_8H_{18}	−5510

(a) Calculate the enthalpy change per unit mass for each of the fuels.

Hydrogen:

Octane:

(3)

(b) Suggest, giving two reasons, which substance is the more useful as a fuel for motor cars and give your reasoning.

Reason 1 .....

.....

Reason 2 .....

.....

(2)

(c) Suggest one disadvantage of using the fuel chosen in (b)

.....

(1)

Q6

(Total 6 marks)

7. Aluminium metal is manufactured by a process in which purified bauxite, dissolved in molten cryolite, is electrolysed at 800 °C. Graphite electrodes and a current of about 120 000 amperes are used.

Leave blank

(a) (i) Give the ionic equations for the reactions taking place at each electrode.

Anode .....

Cathode .....

(2)

(ii) State which of these reactions is an oxidation process.

.....

(1)

(iii) Explain why the anodes need to be replaced frequently.

.....

.....

(2)

(iv) Explain why an electrolyte of pure molten bauxite is not used.

.....

.....

.....

(2)

(b) The production of aluminium is expensive.

(i) Explain why, despite this high cost, aluminium is manufactured in large quantities.

.....

.....

.....

(2)

(ii) Explain why it is worthwhile to recycle aluminium.

.....

.....

.....

(2)

Q7

(Total 11 marks)

8. (a) Predict the structural formula of the organic product from the reaction of 1-bromopropane, $CH_3CH_2CH_2Br$, with;

Leave blank

(i) aqueous potassium cyanide solution.

(1)

(ii) ammonia gas.

(1)

(b) Give details of a chemical test you could do to distinguish between 2-chlorobutane and butan-2-ol, including the expected observations with each compound.

.....

.....

.....

(2)

(c) (i) Draw the full structural formula showing all the bonds for the isomer of butan-2-ol that is a tertiary alcohol.

(1)

(ii) Give details of a chemical test you could do to distinguish between butan-2-ol and its isomer drawn in (i) and the observations you would expect to make.

Leave blank

.....

.....

.....

.....

.....

.....

(4)

(iii) Explain the chemistry involved in the test you described in part (ii).

.....

.....

.....

.....

(2)

Q8

(Total 11 marks)

TOTAL FOR PAPER: 75 MARKS

END

THE PERIODIC TABLE

Period	1	2	Group										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	[illegible] 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 Zinc 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
[illegible] 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