Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	2	5	2	/	0	1	Signature	

Paper Reference(s)

6252/01

Edexcel GCE

Chemistry (Nuffield)

Advanced Subsidiary

Unit Test 2

Wednesday 18 January 2006 – Morning

Time: 1 hour 30 minutes

Materials required for examination
Nil

Items included with question papers
Passage for Section B

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and your signature.
Answer ALL questions in Section A and Section B in the spaces provided in this question paper.
The passage for Section B is provided on a separate sheet.
Final answers to calculations should be given to an appropriate number of significant figures.

Information for Candidates

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

Advice to Candidates

You are advised to show all steps in any calculations.
You should aim to spend no more than 55 minutes on Section A and 35 minutes on Section B.
You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking into account your use of grammar, punctuation and spelling.
Up to 2 marks will be awarded for the Quality of Written Communication used in Section B.

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
Total	

Turn over

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Answer ALL the questions in the spaces provided.

SECTION A

You should aim to spend no more than 55 minutes on this section.

1. (a) (i) Draw the **displayed** formula of propene, C_3H_6.

(1)

(ii) Draw a 'dot and cross' diagram for propene. You should show outer shell electrons only.

(1)

(b) A sample of propene can be prepared in the laboratory by the catalytic cracking of liquid paraffin.

Draw a labelled diagram of the apparatus which could be used to carry out this process and collect the propene formed.

(4)

Leave blank

(c) (i) In order to test for the presence of alkenes, such as propene, the gas collected can be shaken with a small quantity of bromine water.
Describe the colour change accompanying this reaction.

From ..... To .....

(1)

(ii) Give the structural formula of the product formed in the reaction between propene and bromine water.

(1)

(d) In industry, propene is manufactured by the catalytic dehydrogenation of propane at a temperature of about 450 °C.

$$C_3H_8(g) \rightleftharpoons C_3H_6(g) + H_2(g) \qquad \Delta H = +122 \text{ kJ mol}^{-1}$$

(i) If the pressure is increased, what will be the effect on the yield of propene obtained at equilibrium? Justify your answer.

.....

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.....

.....

(2)

(ii) State why the yield of propene at equilibrium increases with increasing temperature.

.....

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(1)

(iii) What effect does the catalyst have on the yield of propene at equilibrium?

.....

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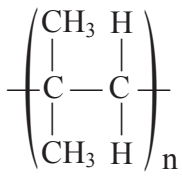
(1)

Leave blank

(e) An addition polymer has the structure shown below.



Give the structural formula and the name of the monomer from which this polymer is made.

Structural formula

Name .....

(2)

Q1

(Total 14 marks)

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2. (a) Calculate the enthalpy change of atomisation, ΔH_{at}, in kJ mol^{-1}, for but-2-ene, $CH_3CH{=}CHCH_3$

$$CH_3CH{=}CHCH_3(g) \longrightarrow 4C(g) + 8H(g)$$

Use the following average bond energies.

	Average bond energy /kJ mol^{-1}
C—C	+347
C═C	+612
C—H	+413

(3)

(b) The enthalpy changes of atomisation and the boiling points of some alkenes are shown below.

Alkene	ΔH_{at} /kJ mol^{-1}	Boiling point /°C
Ethene, C_2H_4	+2260	–103.6
Propene, C_3H_6	+3440	–47.3
But-1-ene, C_4H_8		–6.2
Pent-1-ene, C_5H_{10}	+5800	+30.0
Hex-1-ene, C_6H_{12}	+6990	+63.4

(i) On the grid opposite, plot values for the enthalpy change of atomisation (vertical axis) against the number of carbon atoms in the alkene molecule (horizontal axis).

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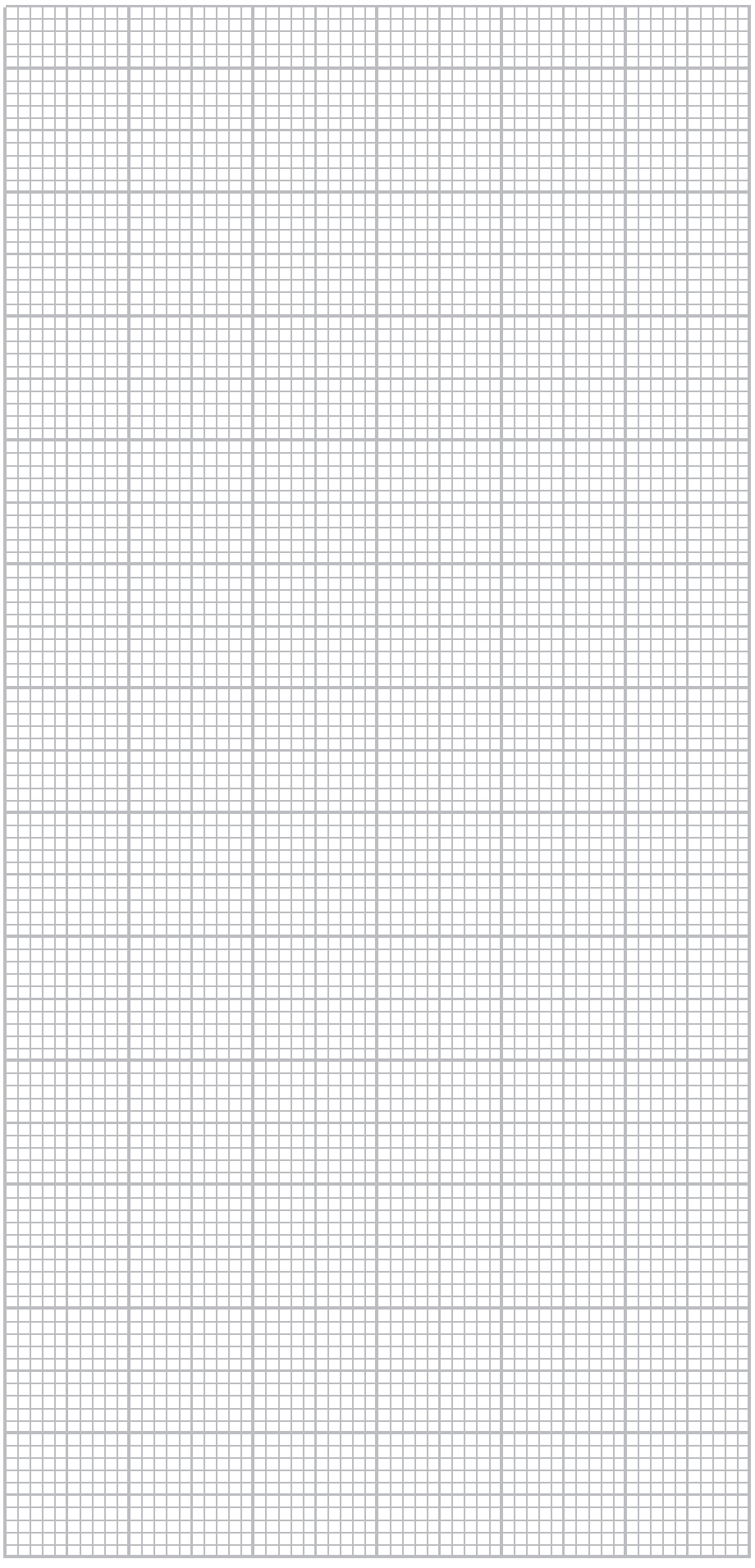

(3)

Leave blank

(ii) Explain why these enthalpy changes rise regularly.

.....

.....

.....

.....

(2)

(iii) Use your graph to estimate the value of the enthalpy change of atomisation for but-1-ene.

..... kJ mol^{-1}

(1)

(c) (i) Which intermolecular force occurs between alkene molecules?

.....

(1)

(ii) Explain why the boiling points increase from ethene to hex-1-ene.

.....

.....

.....

.....

.....

(2)

(iii) There are two boiling points for $CH_3CH{=}CHCH_3$, but only one for $CH_3CH_2CH{=}CH_2$. Why is this?

.....

.....

(1)

Leave blank

(iv) 2-methylbut-1-ene, $CH_3CH_2C(CH_3)=CH_2$, is an isomer of pent-l-ene.

Predict which of these isomers has the higher boiling point. Justify your answer.

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(2)

(d) By considering the intermolecular forces in water, suggest why liquid alkenes do not mix with water.

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.....

(2)

Q2

(Total 17 marks)

Leave blank

3. This question is concerned with some redox reactions of iodine.

(a) Iodide ions can be converted into iodine using chlorine.
In the laboratory this can be carried out by adding an aqueous solution of chlorine to one of sodium iodide.

(i) Write an ionic equation, with state symbols, but omitting spectator ions, for the reaction which takes place.

.....

(2)

(ii) A hydrocarbon solvent is added to the reaction mixture, which is then shaken for a few minutes, and the layers allowed to settle. What colour is this hydrocarbon layer?

.....

(1)

(iii) The procedure above is repeated using an aqueous solution of sodium bromide, instead of sodium iodide. Give the colour of the hydrocarbon layer in this case.

.....

(1)

(b) Iodine molecules can be converted into iodide ions using sulphur dioxide. An **unbalanced** equation is given below.

$$I_2(aq) + SO_2(aq) + H_2O(l) \longrightarrow I^-(aq) + SO_4^{2-}(aq) + H^+(aq)$$

(i) Give the oxidation number of

iodine in I_2 ..... iodine in I^- .....

sulphur in SO_2 ..... sulphur in SO_4^{2-} .....

(2)

(ii) Identify, with a reason, the reducing agent in this reaction.

.....

.....

(1)

(iii) Use the information above, or any other means, to balance the equation below.

$$I_2(aq) + SO_2(aq) + H_2O(l) \longrightarrow I^-(aq) + SO_4^{2-}(aq) + H^+(aq)$$

(1)

Leave blank

(c) The reaction between iodine and sulphur dioxide can be used to estimate the concentration of sulphur dioxide, which is used as a preservative in wines.

In such a determination, a sample of red wine was treated with activated charcoal in order to decolorise it. After filtration to remove the activated charcoal, 25.0 cm^3 portions of the decolorised wine were titrated with 0.00100 mol dm^{-3} aqueous iodine, using starch as the indicator. An average titre of 12.2 cm^3 was obtained.

(i) Why is there a need to decolorise the red wine before samples are titrated?

.....

(1)

(ii) What is the colour change at the end-point of this titration?

.....

(1)

(iii) Use the information above and the balanced equation in (b)(iii) to calculate:

- the number of moles of iodine used in each titration

- the number of moles of sulphur dioxide with which this iodine reacted

- the concentration, in mol dm^{-3}, of sulphur dioxide in the red wine.

(3)

(iv) Suggest why the use of activated charcoal leads to an inaccurate estimate of the sulphur dioxide content of the wine.

.....

.....

(1)

Q3

(Total 14 marks)

TOTAL FOR SECTION A: 45 MARKS

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SECTION B

You should aim to spend no more than 35 minutes on this section. The passage needed for this section is provided on a separate sheet.

4. Read the passage on **Halothane – the first designer anaesthetic** straight through, and then more carefully. Answer the following questions.

(a) What is the formula of nitrogen(I) oxide?

.....

(1)

(b) Explain the link between the search for good refrigerants and good anaesthetics.

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(1)

(c) Explain why it was desirable to choose CFCs with CF_2 and CF_3 groups as potential anaesthetics.

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(1)

(d) (i) Suggest why the molecule CF_3CH_2Cl is more polar than CF_3CCl_3.

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(1)

(ii) According to the text, which of these two molecules is likely to be the safer to use as an anaesthetic? Justify your answer.

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(1)

Leave blank

(e) Give the systematic name for halothane.

.....

(1)

(f) Estimate the value of the COC bond angle in **enflurane**.

.....

(1)

(g) Describe in no more than 100 words:

- the advantages of using halothane over earlier anaesthetics and other CFCs
- why its use eventually declined in favour of more modern anaesthetics.

(8)

You are NOT asked to summarise the whole passage, nor to include equations in your summary. At the end of your summary state the number of words you have used.

Credit will be given for answers written in good English, using complete sentences and using technical words correctly and chemical names rather than formulae. Avoid copying long sections from the original text. Numbers count as one word, as do standard abbreviations, units and hyphenated words. Any title you give your passage does not count in your word total.

There are penalties for the use of words in excess of 100.

START YOUR SUMMARY ON PAGE 14

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TOTAL FOR SECTION B: 15 MARKS

TOTAL FOR PAPER: 60 MARKS

END

THE PERIODIC TABLE

Period	Group 1	2											3	4	5	6	7	0
1	1 H Hydrogen 1																	2 He Helium 4
2	3 Li Lithium 7	4 Be Beryllium 9											5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 Ne Neon 20
3	11 Na Sodium 23	12 Mg Magnesium 24											13 Al Aluminium 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulphur 32	17 Cl Chlorine 35.5	18 Ar Argon 40
4	19 K Potassium 39	20 Ca Calcium 40	21 Sc Scandium 45	22 Ti Titanium 48	23 V Vanadium 51	24 Cr Chromium 52	25 Mn Manganese 55	26 Fe Iron 56	27 Co Cobalt 59	28 Ni Nickel 59	29 Cu Copper 63.5	30 Zn Zinc 65.4	31 Ga Gallium 70	32 Ge Germanium 73	33 As Arsenic 75	34 Se Selenium 79	35 Br Bromine 80	36 Kr Krypton 84
5	37 Rb Rubidium 85	38 Sr Strontium 88	39 Y Yttrium 89	40 Zr Zirconium 91	41 Nb Niobium 93	42 Mo Molybdenum 96	43 Tc Technetium (99)	44 Ru Ruthenium 101	45 Rh Rhodium 103	46 Pd Palladium 106	47 Ag Silver 108	48 Cd Cadmium 112	49 In Indium 115	50 Sn Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 I Iodine 127	54 Xe Xenon 131
6	55 Cs Caesium 133	56 Ba Barium 137	57 ► La Lanthanum 139	72 Hf Hafnium 178	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Rhenium 186	76 Os Osmium 190	77 Ir Iridium 192	78 Pt Platinum 195	79 Au Gold 197	80 Hg Mercury 201	81 Tl Thallium 204	82 Pb Lead 207	83 Bi Bismuth 209	84 Po Polonium (210)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium (226)	89 ►► Ac Actinium (227)	104 Unq Unnil-quadium (261)	105 Unp Unnil-pentium (262)	106 Unh Unnil-hexium (263)												

Key

Atomic Number
Symbol
Name
Molar mass in g mol^{-1}

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