Centre No.			Pape	r Refer	ence			Surname	Initial(s)
Candidate No.	6	2	5	2	/	0	1	Signature	

## 6252/01

## **Edexcel GCE**

# **Chemistry (Nuffield) Advanced Subsidiary**

Unit Test 2

Time: 1 hour 30 minutes

Materials	required	for	exami	ination
Nil				

Items included with question papers

Summary passage for Section B

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	Question	Leave

Examiner's use only

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## **Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initials and 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. Calculators may be used.

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). There are 5 questions in this question paper. The total mark for this paper is 60.

There are 16 pages in this question paper. Any blank pages are indicated.

### **Advice to Candidates**

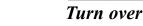
You are advised to show all steps in any calculations.

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 account of your use of grammar, punctuation and spelling. Up to 2 marks will be awarded for the Quality of Written Communication used in Section B.

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#### Answer ALL questions in the spaces provided.

#### **Section A**

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

1. Iodine is obtained from three sources: sea water, seaweed and nitrate ores.

(a) (i) Sea water containing iodide ions is concentrated, and then chlorine gas is bubbled through the solution.

Write the balanced **ionic** equation, including state symbols, for the reaction between chlorine gas and iodide ions.

(iii) Balance the ionic equation for the reaction between iodate ions and sulphur dioxide gas to produce iodide ions and sulphate ions.

sulphate ions,  $SO_4^{2-}$ 

 $IO_3^-(aq) + ......SO_2(g) + ......H_2O(l) \rightarrow I^-(aq) + ......SO_4^{2-}(aq) + ......H^+(aq)$  (2)

sulphur dioxide, SO<sub>2</sub> .....



(c) (i) The next step is to add a small quantity of a solution containing iodate ions. These react with the iodide ions present to form an iodine solution.  Iodine can be extracted from this solution by the addition of a hydrocarbon solvent and separation of the hydrocarbon solution using a separating funnel.  Draw a diagram of a separating funnel and its contents. Indicate which is the hydrocarbon layer and state its colour. [Density of the hydrocarbon is 0.660 g cm <sup>-3</sup> ]  Colour of hydrocarbon layer		
These react with the iodide ions present to form an iodine solution.  Iodine can be extracted from this solution by the addition of a hydrocarbon solvent and separation of the hydrocarbon solution using a separating funnel.  Draw a diagram of a separating funnel and its contents. Indicate which is the hydrocarbon layer and state its colour. [Density of the hydrocarbon is 0.660 g cm <sup>-3</sup> ]  Colour of hydrocarbon layer		
Colour of hydrocarbon layer  Colour of hydrocarbon layer  (3)  (ii) How might solid iodine be obtained from the hydrocarbon layer?		
Colour of hydrocarbon layer		
(ii) How might solid iodine be obtained from the hydrocarbon layer?  (1)  Q1	nydrocarbon layer and state its colour. [Density of the hydrocarbon is	
(ii) How might solid iodine be obtained from the hydrocarbon layer?  (1) Q1		
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(ii) How might solid iodine be obtained from the hydrocarbon layer?  (1)  Q1		
(ii) How might solid iodine be obtained from the hydrocarbon layer?  (1) Q1	Colour of hydrocarbon layer	
(1) Q1		
	How might solid iodine be obtained from the hydrocarbon layer?	
(Total 11 marks)	(1)	Q1
	(Total 11 marks)	



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	ne flo	
e	thar	$ne \rightarrow ethene \rightarrow 1,2-dichloroethane \rightarrow chloroethene \rightarrow poly(chloroethene)$
(a)	(i)	Ethane is converted to ethene by dehydrogenation.
		Write a balanced equation, including state symbols, for this equilibrium reaction.
		(1)
	(ii)	Explain why conditions of high pressure are less favourable for ethene production.
		w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms.
		w a labelled diagram of an ethene molecule, showing the electron density
		w a labelled diagram of an ethene molecule, showing the electron density
	dist	w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms.
(c)	dist	w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms.
(c)	Giv Stat	w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms. (2) we a chemical test which would distinguish between ethane and ethene.
(c)	Giv Stat Test	w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms. (2) the a chemical test which would distinguish between ethane and ethene. The the result of your test with ethene.
(c)	Giv Stat Test Res	w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms. (2) the a chemical test which would distinguish between ethane and ethene. The the result of your test with ethene.
(c) (d)	Giv Stat Test Res	w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms.  (2)  The early chemical test which would distinguish between ethane and ethene.  The the result of your test with ethene.
(c) (d)	Giv Stat Test Res	w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms. (2) the a chemical test which would distinguish between ethane and ethene. The the result of your test with ethene.
(c) (d)	Giv Stat Test Res 1,2-	w a labelled diagram of an ethene molecule, showing the electron density ribution in the $\sigma$ and $\pi$ bonds between the carbon atoms.  (2)  The early chemical test which would distinguish between ethane and ethene.  The the result of your test with ethene.

		Reagent
		Conditions
		(2)
	(ii)	Name <b>both</b> types of intermolecular force between chloroethene molecules.
		(1)
f)	(i)	Write a balanced equation for the formation of poly(chloroethene) from chloroethene.
		(2)
	(ii)	Poly(chloroethene) is also known by the name polyvinylchloride, PVC.
	( )	Give TWO common uses of poly(chloroethene).
		(2) (Total 16 marks)
		(come co manetal)



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Phosphi	ine, PH <sub>3</sub> , is a hydride of the Group 5 element, phosphorus.
(a) (i)	Draw a 'dot-and-cross' diagram of a phosphine molecule. You should include only outer shell electrons.
(ii)	Draw the shape you would expect for the phosphine molecule, suggesting a value for the HPH bond angle.
	HPH bond angle(2)
(iii)	Explain the shape of the phosphine molecule you have given in your answer in (ii).
	Justify your value for the HPH bond angle.
	(2)

3.

(1)
Use your answer to (i) and the data below to calculate the standard enthalpy change of atomisation of phosphine at 298 K. Include a sign and units in your answer.
$\Delta H_f^{\oplus}$ [PH <sub>3</sub> (g)] = + 5.4 kJ mol <sup>-1</sup>
$\Delta H_{at}^{\oplus} \left[ \frac{1}{2} H_2(g) \right] = +218.0 \text{ kJ mol}^{-1}$
$\Delta H_{at}^{\oplus} [P(s)] = +314.6 \text{ kJ mol}^{-1}$
(3)
Calculate a value for the bond energy of the bond between phosphorus and hydrogen, using your answer to (ii).

	nich compound has the stronger van der Waals forces?
Jus	tify your answer.
	(1)
(b) (i)	The boiling points of ammonia and phosphine are:
	Ammonia 240 K Phosphine 185 K
	Name the intermolecular force responsible for the higher boiling point of ammonia.
	(1)
(ii)	Use <b>displayed</b> formulae to show this intermolecular bond between two ammonia molecules.
(ii)	
(ii)	molecules.
(ii)	molecules.  Clearly mark and label the bond angle <b>between</b> the molecules.
(ii)	molecules.  Clearly mark and label the bond angle <b>between</b> the molecules.
(ii)	molecules.  Clearly mark and label the bond angle <b>between</b> the molecules.
(ii)	molecules.  Clearly mark and label the bond angle <b>between</b> the molecules.

	Silver	Silver	Silver
	chloride	bromide	iodide
Dilute ammonia solution			
Concentrated ammonia solution			
			(2
			(-
Ammonia can also be	used to test for hyd	lrogen chloride gas.	
(i) What would you	<b>see</b> if a glass rod.	dipped in ammonia s	solution, is placed i
hydrogen chloride		rr	, p
••••••	••••••		(1
(ii) Write a balanced	equation for this rea	action.	
			/4
			(1
			(Total 8 marks
		TOTAL EOD SECT	(Total 8 marks
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Paper Reference(s)

6252/01

# **Edexcel GCE**

**Chemistry (Nuffield)** 

**Advanced Subsidiary** 

Unit Test 2: Passage for Section B





Turn over



#### THE DANGERS OF EXPOSURE TO THE SUN AND HOW TO AVOID THEM

During the latter part of the twentieth century a suntan became associated with fitness, youth and health. Increasing leisure time and cheap travel have helped certain populations to increase their lifetime ultraviolet radiation (UVR) exposure way beyond previous generations. Unfortunately this level of UVR exposure has increased the risk of damage to the skin caused by sunlight, called cutaneous photodamage. This photodamage has two potentially undesirable effects – premature ageing of the skin, called photoaging, and skin cancer.

When skin is exposed to ultraviolet radiation a proportion of the energy of the radiation is absorbed. Initially electrons in molecules in the skin are promoted to higher energy levels, producing electronically excited molecules. These electronically excited molecules may react in several ways. They might simply break up heterolytically to produce fragment ions which react to produce toxic photoproducts. They may form highly reactive free radicals, or powerful oxidising agents by reaction with oxygen, which damage cells or other biologically important molecules. Finally, they may directly interact with cells in a damaging way.

There are three ways of reducing the risk from UVR exposure. These are directly limiting sun exposure by avoiding going out in the sun, the use of appropriate clothing and the careful use of sunscreen products.

Directly limiting sun exposure is effective. However, it is socially unacceptable and, with a desirable increase in outdoor activities like jogging, it is impractical.

Clothing which is made of opaque fabric is effective. It is important that the fabric is not flimsy or 'seethrough'. It should also be noted that many fabrics lose as much as 70% of their sun protection factor when wet. Broad-brimmed hats can reduce head and neck exposure significantly, but will still allow about 30% of damaging radiation exposure from reflected light, particularly when near sand or water.

There are two main types of sunscreen preparations, those that reflect the sun's rays, and those that filter out the harmful UVR.

Historically, the first reflective preparation was issued to soldiers during the Second World War. Known as 'Red Vet Pet', it was a suspension of iron(III) oxide in petroleum jelly. It was extremely effective but was thick, greasy and gave a bizarre appearance. Nowadays similar effective preparations, which reflect harmful UVR, use zinc oxide or titanium dioxide. The only problem with these is one of cosmetic acceptability. As well as reflecting UVR, they tend to reflect visible light giving the user the appearance of a circus clown. Recently this problem has been overcome by using a very fine particle size of titanium dioxide which limits the reflection of visible wavelengths. This type of sunscreen has the major advantage of reflecting all wavelengths of ultraviolet radiation.

A wide variety of chemicals are used in filter preparations. These include esters of 4-aminobenzoic acid, esters of cinnamic acid, benzophenones, salicylates, and anthranilates. These usually act by absorbing harmful ultraviolet radiations. The disadvantage is that these chemicals only absorb over a small range of ultraviolet frequencies, so some harmful radiations will still reach the skin. The key is to check on the package of sunscreen that it is effective against both UVA and UVB, the two ranges of UVR frequencies which are known to be harmful.

(533 words)

(Source: Adapted from 'The benefits of lifetime photoprotection' by J Gray and J L M Hawk published by the Royal Society of Medicine Press, and 'Sun damaged skin' by Ronald Marks published by Dunitz.)

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### **SECTION B**

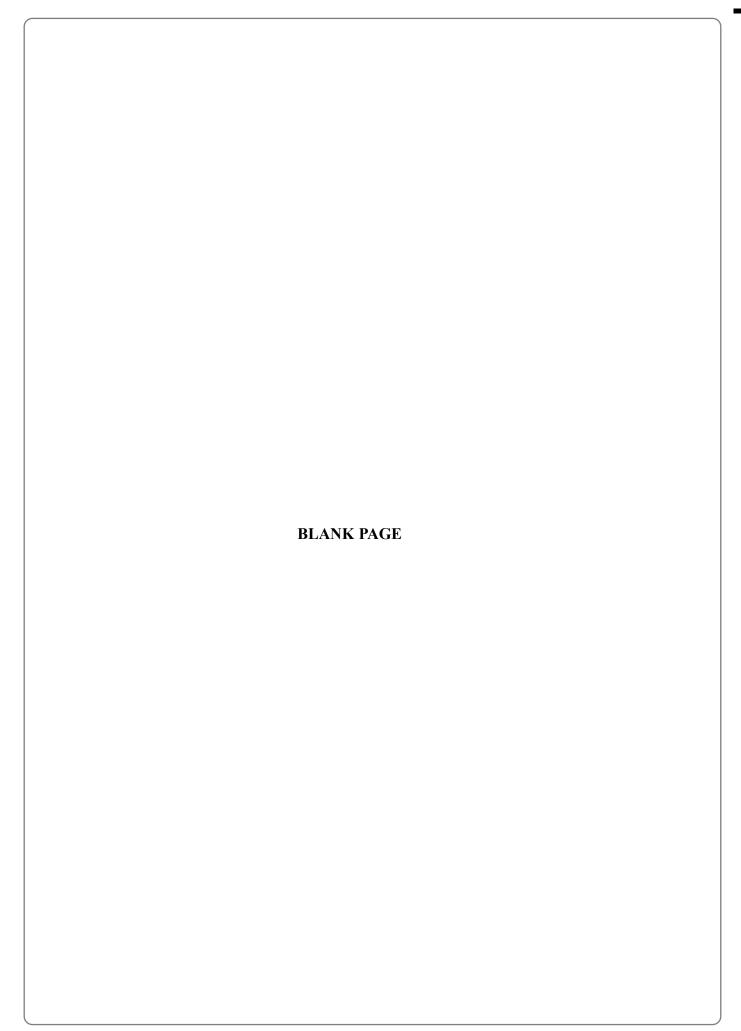
You should aim to spend no more than 35 minutes on this section. The passage needed for this section is provided on a separate sheet.

(a)	What are the TWO reasons for increased exposure to the sun nowadays?	
		(
(b)	What are the TWO undesirable effects of exposure to ultraviolet radiation?	
		•••••
		(
(c)	What is meant by the following terms:	
(c)	What is meant by the following terms:  (i) heterolytically	
(c)		
(c)		
(c)		
(c)	(i) heterolytically	
(c)	(i) heterolytically	
(c)	(i) heterolytically	

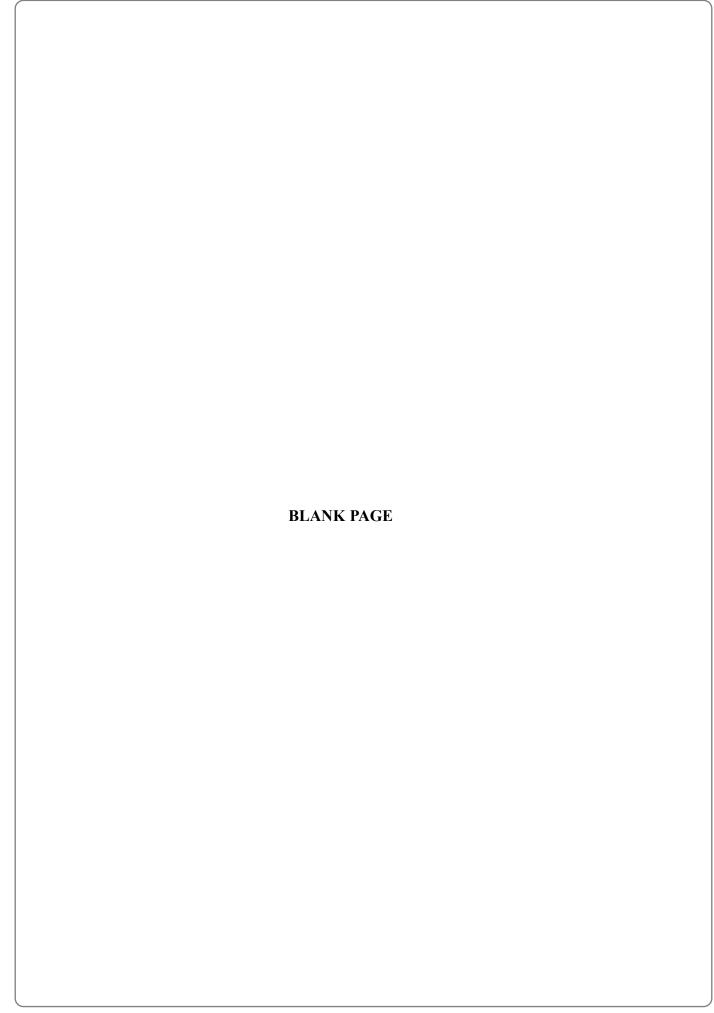
(d) Write a summary, in no more than 100 words, describing the methods for avoiding exposure to ultraviolet radiation and how effective they are.	Leave blank
(9)	
You are NOT asked to summarise the whole passage, or to include equations in your summary.	
At the end of your summary state the number of 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.	

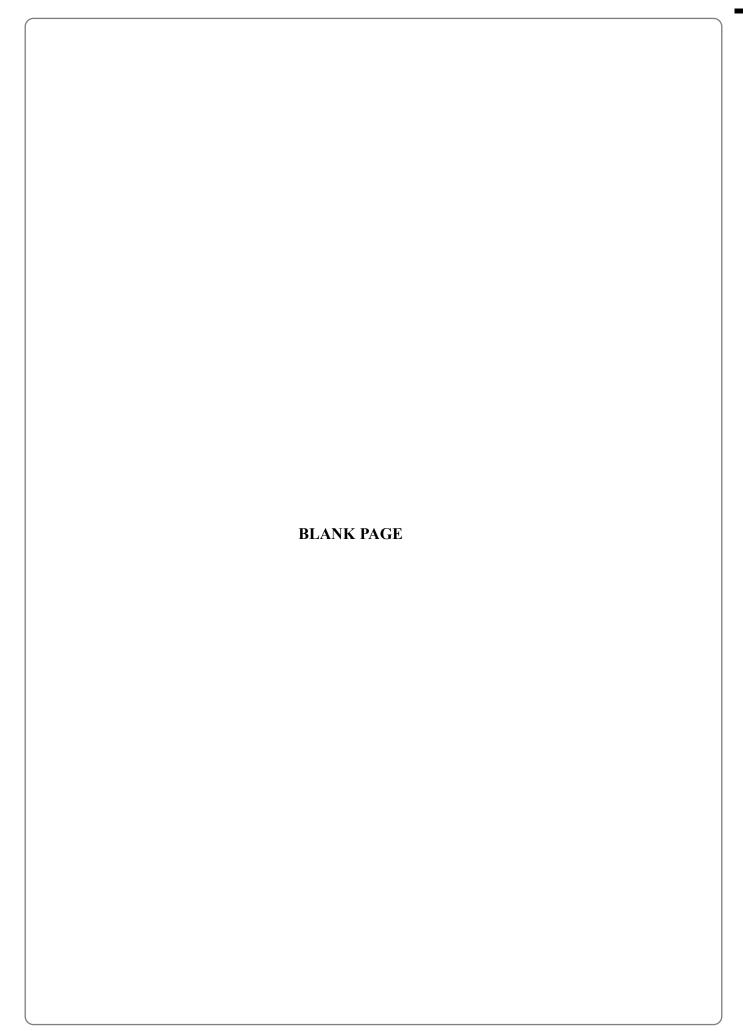


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(Total 15 marks)	
TOTAL FOR SECTION B: 15 MARKS	
TOTAL FOR PAPER: 60 MARKS END	











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