

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

3445U20-1



APPLIED SCIENCE (Double Award)
Unit 2: Space, Health and Life
FOUNDATION TIER

FRIDAY, 16 JUNE 2017 – MORNING

1 hour 30 minutes

Section A	For Examiner's use only			
	Question	Maximum Mark	Mark Awarded	
	1.	9		
	2.	7		
	3.	7		
	4.	15		
	5.	12		
	Section B	6.	6	
		7.	19	
		Total	75	

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ADDITIONAL MATERIALS

In addition to this examination paper, you will require a separate Resource Folder, calculator, pencil and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

Question 5(a) is a quality of extended response (QER) question where your writing skills will be assessed.

You are reminded to show all your workings. Credit is given for correct workings even when the final answer given is incorrect.

A periodic table is printed on page 16.

Section A*Answer all questions in the spaces provided.*

1. There is a minimum charge of 5p for carrier bags in Wales. The aim of the charge is to reduce the number of plastic carrier bags being used.



- (a) (i) All plastic carrier bags are made from oil. State **one** benefit to our oil reserves if fewer plastic bags are made. [1]

.....

- (ii) Plastic bags end up in landfill sites. State **one** problem this causes. [1]

.....

- (iii) State **two** ways in which plastic bags can be a danger to animals. [2]

1.

2.

- (b) Before the introduction of charges, 350 million plastic bags were used every year. Five years later this figure had dropped to 70 million used every year.

- (i) Calculate the reduction in the number of bags used every year. [1]

reduction = million

- (ii) Calculate the percentage of bags used after five years compared with those used before charges were introduced. [2]

answer = %

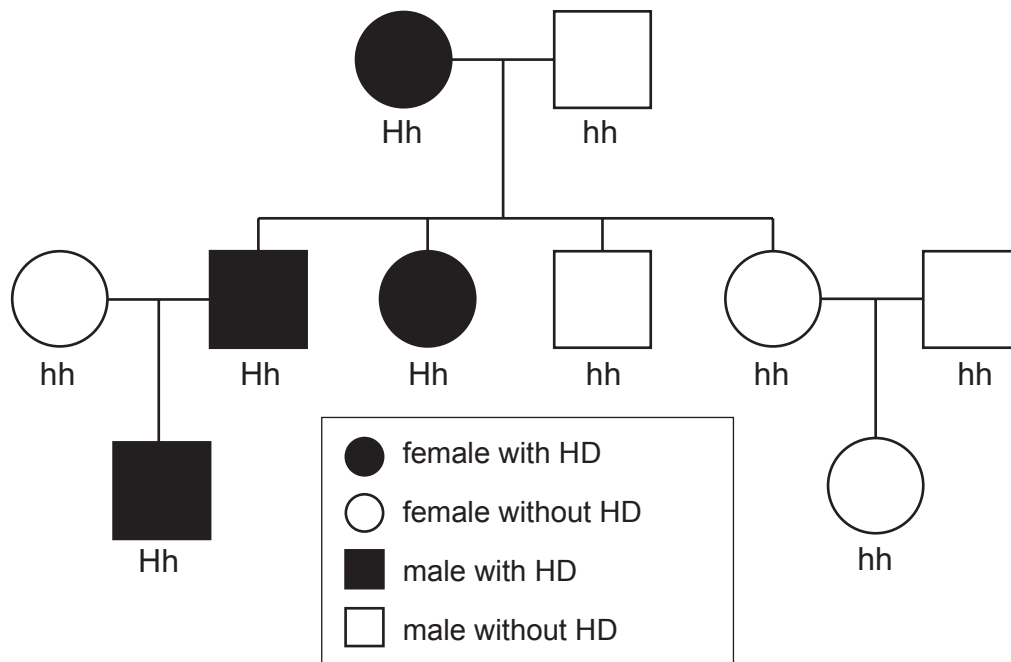
- (c) When researchers collected reused plastic bags from supermarket shoppers, they found large numbers of microorganisms in almost all carrier bags.

Underline the correct term in the brackets in the following sentences.

- (i) Microorganisms that cause disease are called (**antitoxins** / **vaccines** / **pathogens**). [1]
- (ii) The body defends itself against harmful microorganisms using (**white blood cells** / **red blood cells** / **nerve cells**). [1]

2. Huntington's disease (HD) is an inherited disease. People are born with the defective gene, but symptoms usually don't appear until middle age. Early symptoms of HD may include uncontrolled movements, clumsiness or balance problems. The disease is caused by an inherited defect in a single gene. With only one copy of the defective allele, a person can develop the disease.

The diagram shows a family tree identifying those who are unaffected (do not have HD) and those with HD.



- (a) (i) State the letter of the dominant allele. [1]
- (ii) State the genotype of a person with HD. [1]
- (b) **Complete** the Punnett squares and state the percentage chances of a child developing HD if:
- one parent does not have HD and one parent is heterozygous
 - both parents are heterozygous
- [4]

	H	h
h	.....	.....
h	.....	.....

% chance =

	H	h
H	.....	.....
h	.....	.....

% chance =

- (c) State **one** ethical problem faced by a person if they find out they have HD as a result of going for a genetic screening test. [1]

.....

.....

7

3. The diagram below shows an absorption spectrum of an object in space.



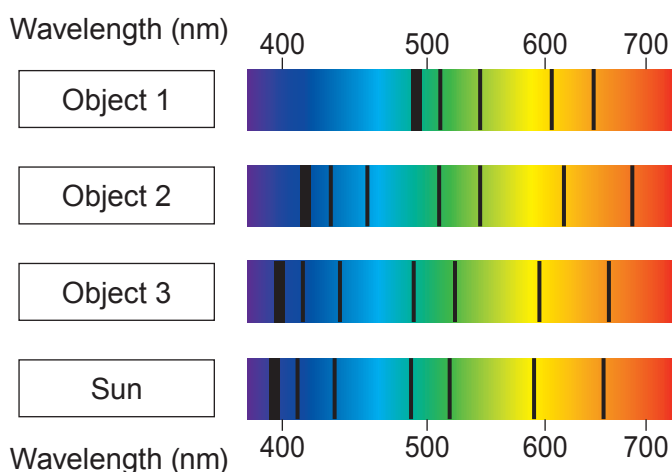
- (a) Complete the following sentences by underlining the correct word(s) in the brackets. [3]

The black lines are caused by light being (**absorbed** / **blocked** / **emitted**) by gases.

The spectrum provides information about the (**size** / **density** / **chemical makeup**) of the object.

The spectrum also provides information about how fast an object is (**expanding** / **using up its fuel** / **moving away from us**).

- (b) The diagram below shows absorption spectra from four different objects in space. The bottom spectrum is from our Sun.



Use the information in the absorption spectra above to answer the following questions. [4]

- (i) State which object is farthest away from Earth.
- (ii) State which object is moving away most slowly from Earth.
- (iii) State **one** conclusion you can make about the chemical makeup of all the objects.
.....
- (iv) State for which object the wavelength of the black lines has increased the most when compared with our Sun.
.....

4. A group of students were using dice to model radioactive decay. There were 120 dice in total.



- (a) (i) State the chance of any one of the dice landing with a 6 facing upward. [1]

.....

- (ii) Predict how many dice will land with a 6 facing up on the first throw. [1]

.....

- (iii) State what the students should do after throwing the 120 dice for the first time. [1]

.....

- (iv) Describe how they should continue the experiment. [2]

.....

.....

(b) The table shows the results.

Throw	Number of sixes	Number of dice remaining
0	0	120
1	.....	101
2	15	86
3	14	72
4	11	61
5	11	.....

(i) **Complete** the table. [2]

(ii) How many dice remain after **one** half-life? [1]

(iii) Use the data in the table to estimate the half-life of the 'dice'. [1]

half-life = throws

(iv) Calculate the number of half-lives that will occur for the number of dice to fall from 120 to 15. [2]

number of half-lives =

- (c) Radioisotopes have many medical uses. One use is to sterilise blood products for transfusion.



The table below lists some radioisotopes.

Radioisotope	Half-life	Type of emissions
chromium-51	28 days	gamma
caesium-137	30 years	beta and gamma
bismuth-209	2×10^{19} years	alpha

The radioisotope used to sterilise blood products is caesium-137.

- (i) Explain why caesium-137 is a better choice than chromium-51 for this purpose. [2]

.....

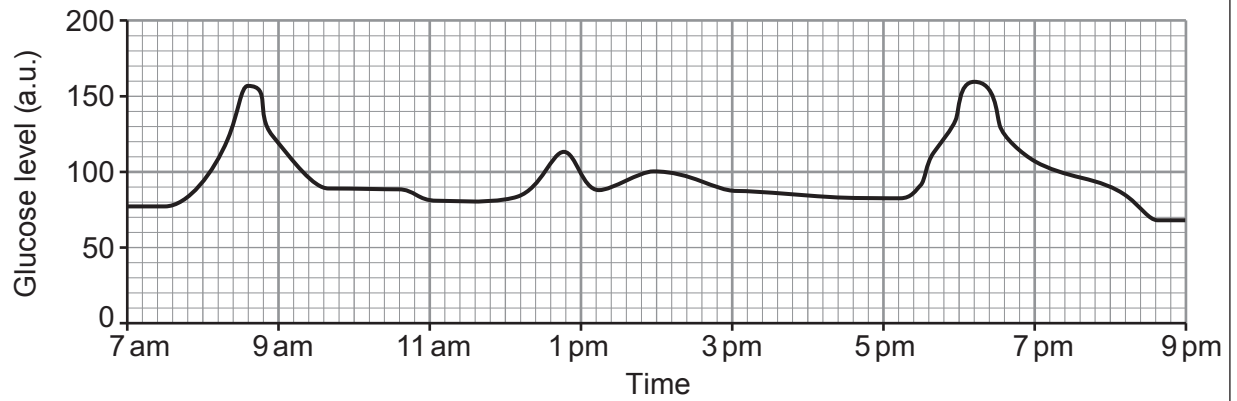
.....

- (ii) Explain why caesium-137 is a better choice than bismuth-209 for this purpose. [2]

.....

.....

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Use the information in the diagram and your own knowledge to explain how Nia's blood glucose is controlled. [6 QER]

- (b) Diabetics cannot control their blood glucose levels. State **two** ways in which diabetes can be treated. [2]

1.

2.

- (c) (i) State the test used to detect the presence of glucose in urine and describe how this test is carried out. [2]

test:

description:

- (ii) State what results would be observed in this test in a diabetic patient and a person not suffering from diabetes. [2]

diabetic:

non-sufferer:

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Section B

*Answer **all** questions in the spaces provided.*

Use the information in the separate Resource Folder to answer the following questions.

6. (a) Use the information in **Table 1** to answer the following questions.

(i) State the value of the emissions of methane from the UK in 2005. [1]

..... MtCO₂eq

(ii) In which year did the UK emit 40 MtCO₂eq of nitrous oxide? [1]

.....

(b) Use the information in **Table 2** to answer the following questions.

(i) Calculate the increase in the concentration of methane since the pre-industrial baseline. [1]

increase =

(ii) Name the gas that has only increased because of man-made additions. [1]

.....

(c) Use the information in **Graph 3** to describe how changes in the temperature anomaly compare with changes in sun spot number and CO₂ concentrations. [2]

.....

.....

.....

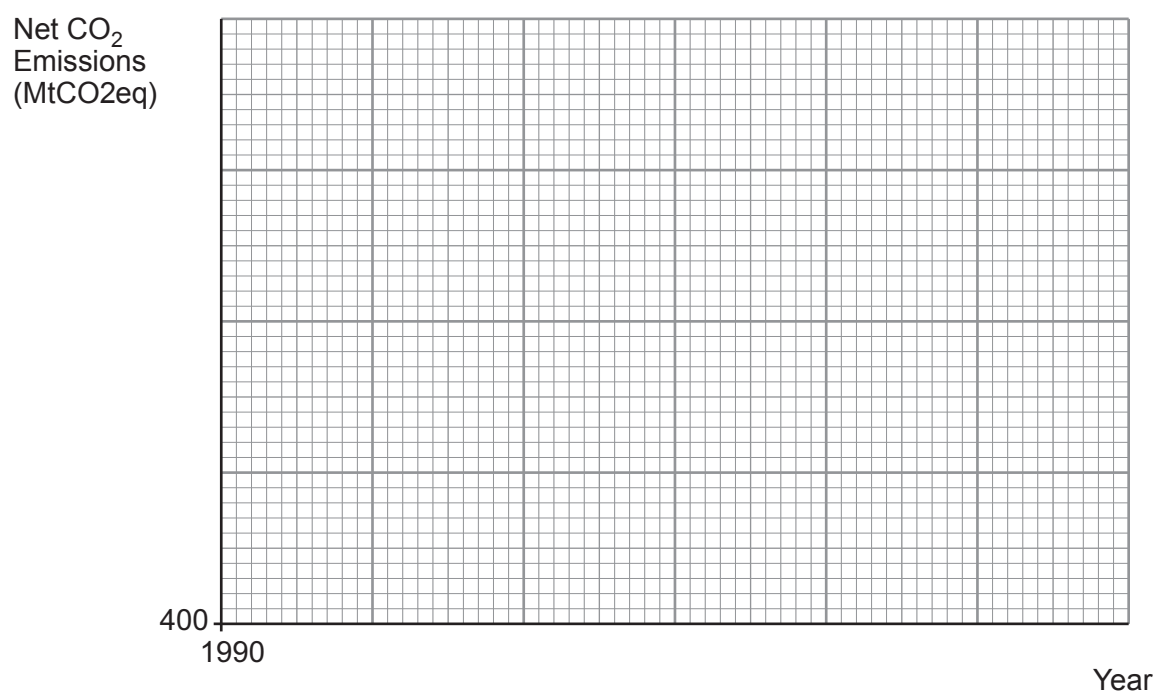
7. (a) (i) Use the information in **Table 1** to describe the trend in emissions of HFC between 1990 and 2014. [2]

.....

.....

.....

- (ii) Use the information in **Table 1** to plot a graph of net CO₂ emissions from the UK between 1990 and 2014. [4]



- (iii) Describe the trend shown in the graph. [2]

.....

.....

.....

- (iv) Describe how your graph (opposite) compares with the information in **Graph 1**. [2]

.....

.....

.....

- (v) Use your knowledge of the carbon cycle to account for the seasonal fluctuations in CO₂ concentration shown in **Graph 1**. Give reasons for your answer. [3]

.....

.....

.....

.....

- (b) Use the information in **Tables 2** and **3** and the equation:

$$\text{greenhouse contribution} = (\text{concentration in the atmosphere}) \times (\text{multiplier})$$

to complete the table below.

[3]

greenhouse contribution						
gas	multiplier	pre-industrial baseline	natural additions	man-made additions	total relative contribution	% of total contribution
carbon dioxide	1	288 000	.....	11 880	368 400	72.37
methane	21	17 808	12 117	.....	36 645	.....

- (c) Use the information in **Tables 2** and **4** to describe the effect on the data in the last column of **Table 2** when water vapour is included. [2]

.....

.....

- (d) State **one** conclusion that can be made from the information shown in **Chart 1** on page 4 of the resource folder. [1]

.....

.....

END OF PAPER

THE PERIODIC TABLE

1 2 3 4 5 6 7 0

Group

1 H Hydrogen 1 4 He Helium 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		
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18		
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 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		
86 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		
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	179 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		
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89																	
Key																			

Key

A_r	relative atomic mass
Symbol	
Name	
Z	atomic number