

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

3445UB0-1



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

FRIDAY, 16 JUNE 2017 – MORNING

1 hour 30 minutes

	For Examiner’s use only		
	Question	Maximum Mark	Mark Awarded
Section A	1. (a)(b)(c)(d)	19	
	1. (e)	6	
Section B	2.	14	
	3.	10	
	4.	10	
	5.	10	
	6.	6	
	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 1(e) 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.

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

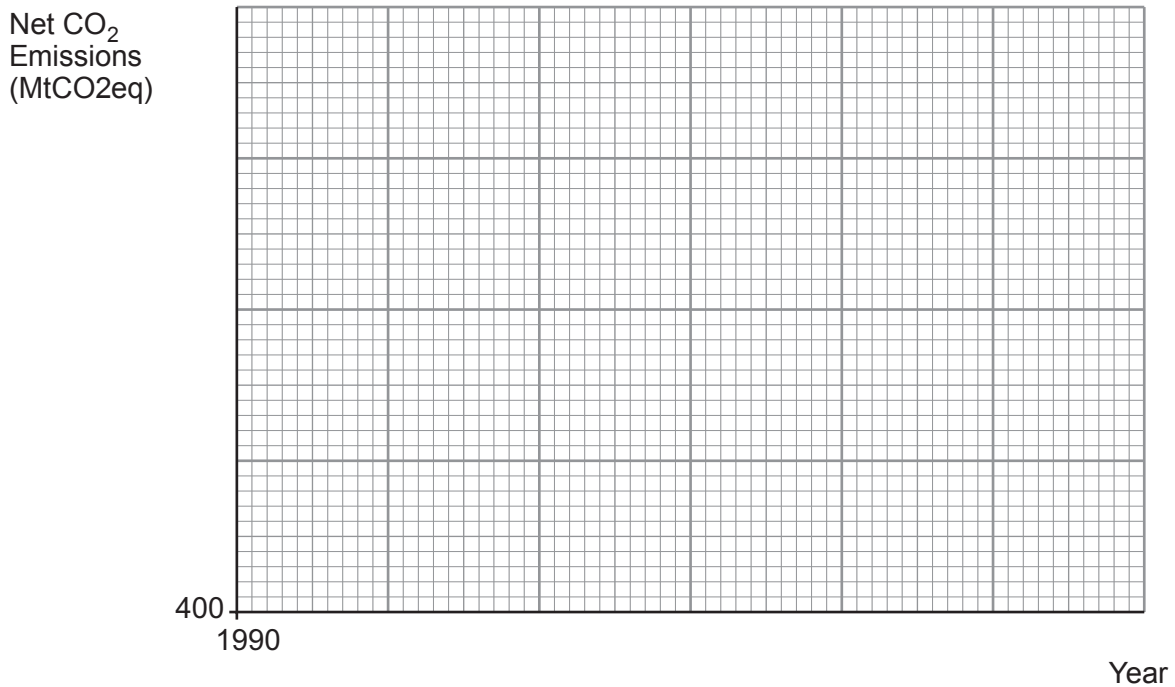
1. (a) (i) Use the information in **Table 1** to describe the trend in emissions of HFC between 1990 and 2014. [2]

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- (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]

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

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- (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]

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- (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]

gas	greenhouse contribution					
	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]

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

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Section B

Answer all the questions in the spaces provided.

2. A class of students were using dice to model radioactive decay. There were 10 groups of students in the class. Each group of students had 90 dice.



- (a) (i) Describe how they should carry out the experiment.

[3]

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- (ii) State the number of dice you would expect to land with a 6 facing up on the first throw in **each** group.

[1]

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- (iii) Each group's results were added together to give the class results. Give **one** advantage of using a bigger sample size.

[1]

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(b) The table shows the results for the **whole class**.

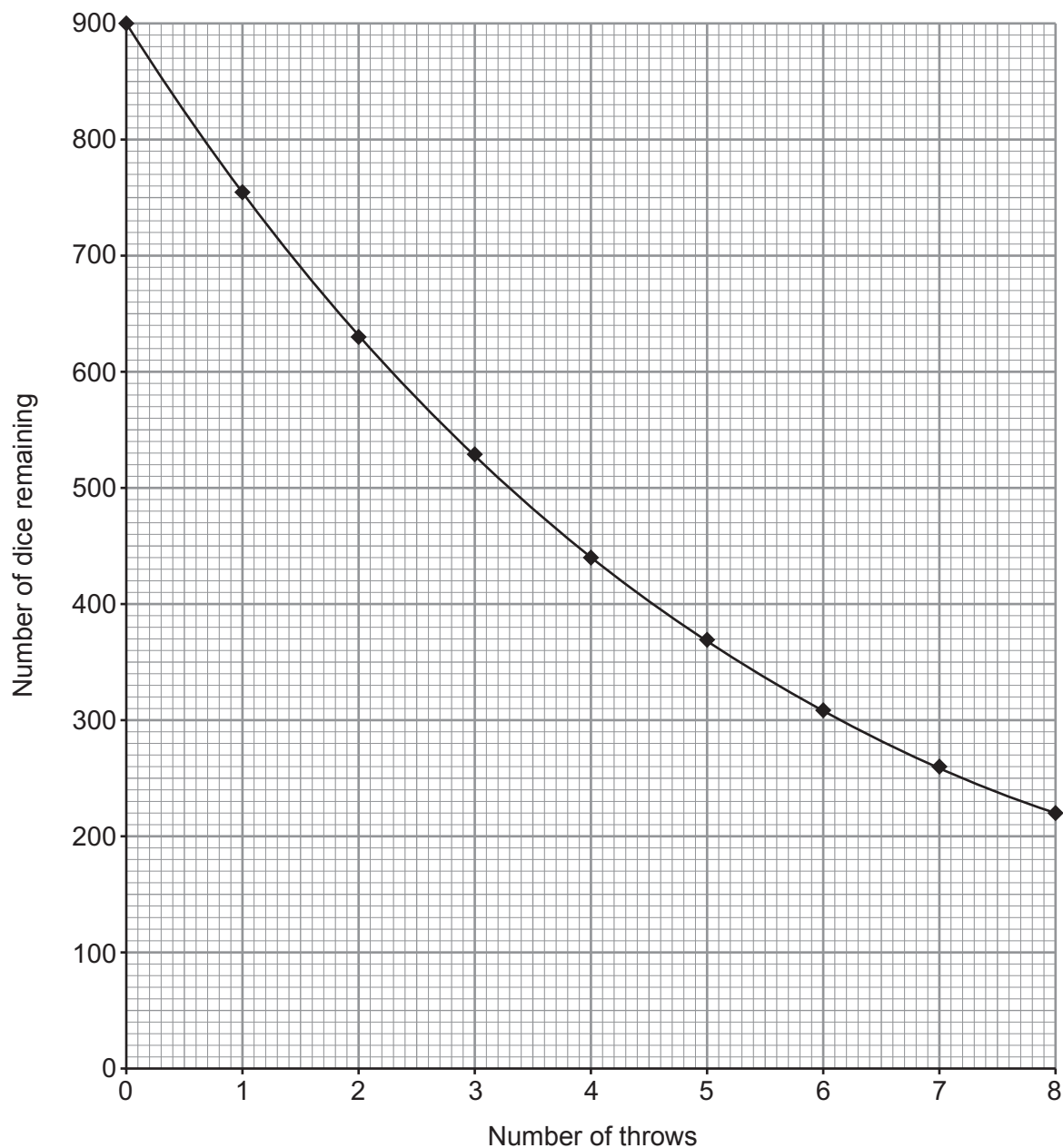
Throw	Number of sixes	Number of dice remaining
0	0	900
1	146	754
2	124	630
3	103	527
4		442
5	72	370
6	61	309
7	52	257
8	38	219
9	34	

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

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

half-life = throws

(c) Some of the data in the table is plotted on the grid below.



(i) **Draw lines** on your graph to find the half-life of the dice.

[2]

half-life = throws

(ii) State **one** reason why finding the half-life using the graph is a better method than the one used in part (b)(ii).

[1]

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

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- (i) Select from the table below the most suitable radioisotope for this purpose. [1]

Radioisotope	Half-life	Type of emissions
bismuth-213	46 minutes	alpha
chromium-51	28 days	gamma
caesium-137	30 years	beta and gamma
bismuth-209	2×10^{19} years	alpha

- (ii) Give **two** reasons for your choice. [2]

1.
2.

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3. Huntington's disease (HD) is an inherited disease that causes nerve cells in the brain to degenerate. 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 dominant allele (**H**), a person can develop the disease.

(a) State the meaning of the following terms:

[3]

(i) allele

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(ii) dominant allele

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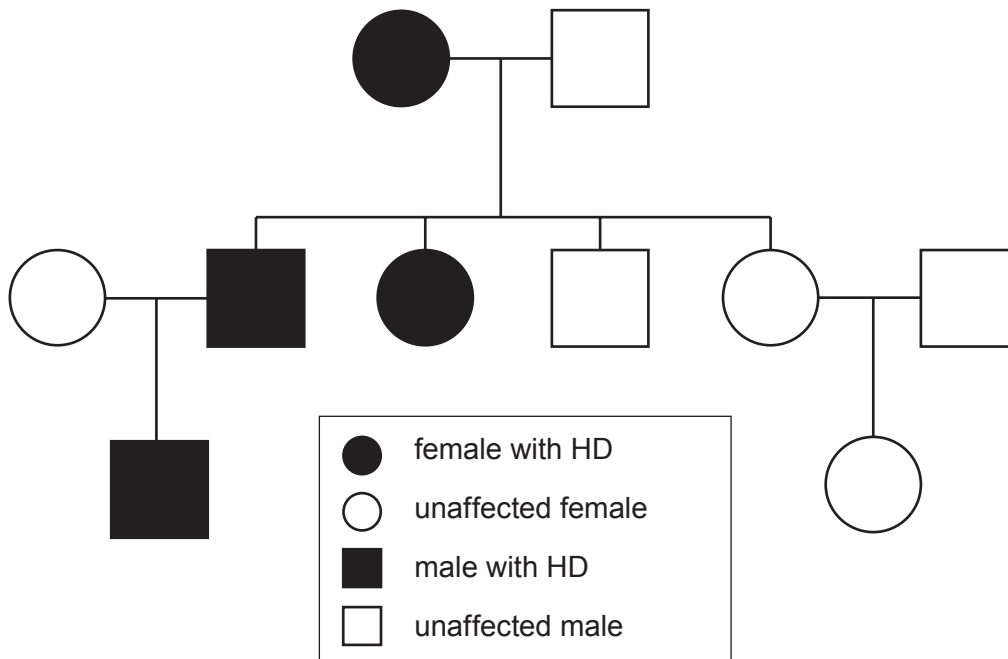
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(iii) genotype

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



Draw **two** Punnett squares and **compare** the percentage chances of a child developing HD if:

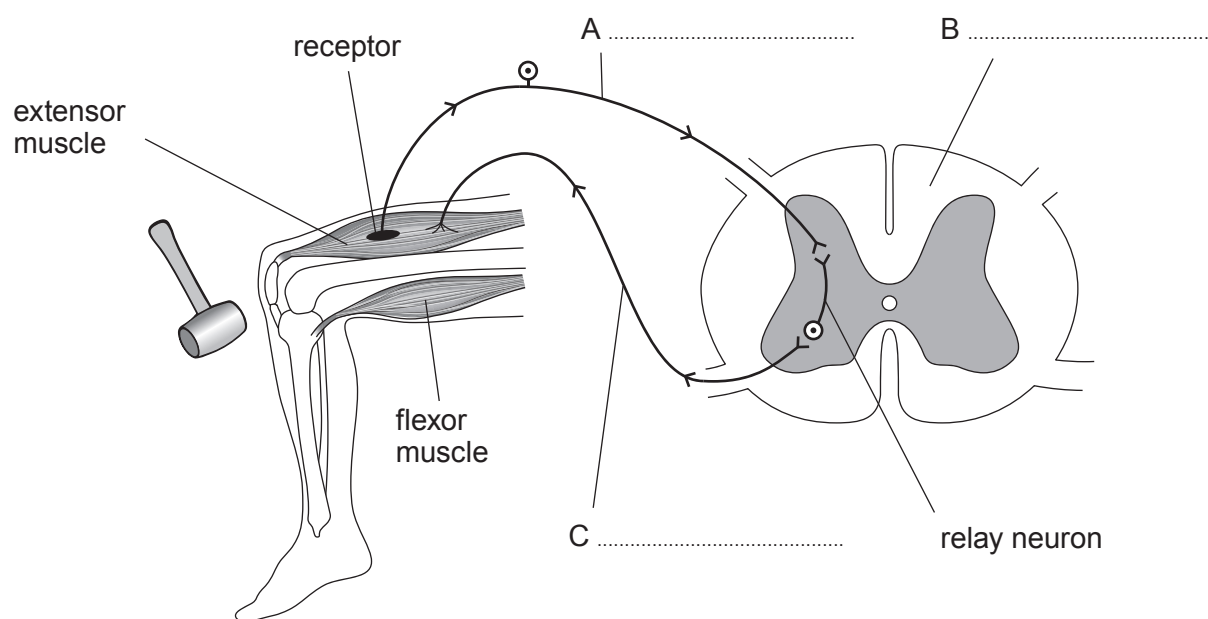
- one parent is unaffected and one parent is heterozygous
- both parents are heterozygous

[5]

- (c) Discuss the ethical problems which may arise when an individual undergoes genetic screening and finds out they have the allele for HD. [2]

4. The diagram shows a reflex arc.

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(i) **Label** the diagram. [3]

(ii) A doctor checks the reflexes of a patient by tapping the knee sharply which should result in the lower leg moving up quickly. Describe how the tap on the knee results in the lower leg moving up. Refer to the information in the diagram in your answer. [4]

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(iii) Describe the function of the antagonistic pair of muscles shown in the diagram. [3]

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5. Since October 2011 there has been a minimum charge of 5p for carrier bags in Wales.

- (a) (i) Explain in terms of our natural resources why we should reduce our use of plastic carrier bags. [2]

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- (ii) Describe **three** benefits to the environment if fewer plastic bags are used. [3]

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- (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. Before a charge was introduced in England, 7 500 million plastic carrier bags were used per year. If the same success is achieved as in Wales, calculate the number of plastic carrier bags that will be in use per year in England five years later. [3]

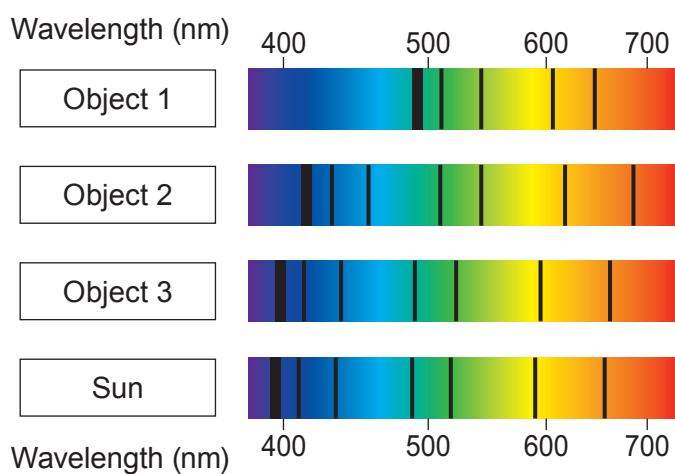
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- (c) When researchers collected reused plastic bags from supermarket shoppers they found large numbers of bacteria in almost all carrier bags. Explain why this is a concern. [2]

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6. The diagram below shows absorption spectra from four different objects in space. The bottom spectrum is from our Sun.



- (a) Explain how an absorption spectrum is produced.

[3]

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- (b) Explain how you can deduce, from the spectra, that objects 1, 2 and 3 have the same chemical composition as the Sun and are moving away from Earth at different speeds.

[3]

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END OF PAPER

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Group	
1	2
1	2
3	3
4	4
5	5
6	6
7	7
0	0

Key

Ar	Symbol	Name	Z
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