Surname	Centre Number	Candidate Number
Other Names		0

GCSE

3445U20-1

S19-3445U20-1

APPLIED SCIENCE (Double Award)

UNIT 2: Space, Health and Life

FOUNDATION TIER

FRIDAY, 7 JUNE 2019 – AFTERNOON

1 hour 30 minutes

	For Examiner's use only		
	Question	**Maximum Mark**	**Mark Awarded**
Section A	**1.**	**6**	
	2.	**8**	
	3.	**6**	
	4.	**6**	
	5.	**7**	
	6.	**17**	
Section B	**7.**	**6**	
	8.	**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 4 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.

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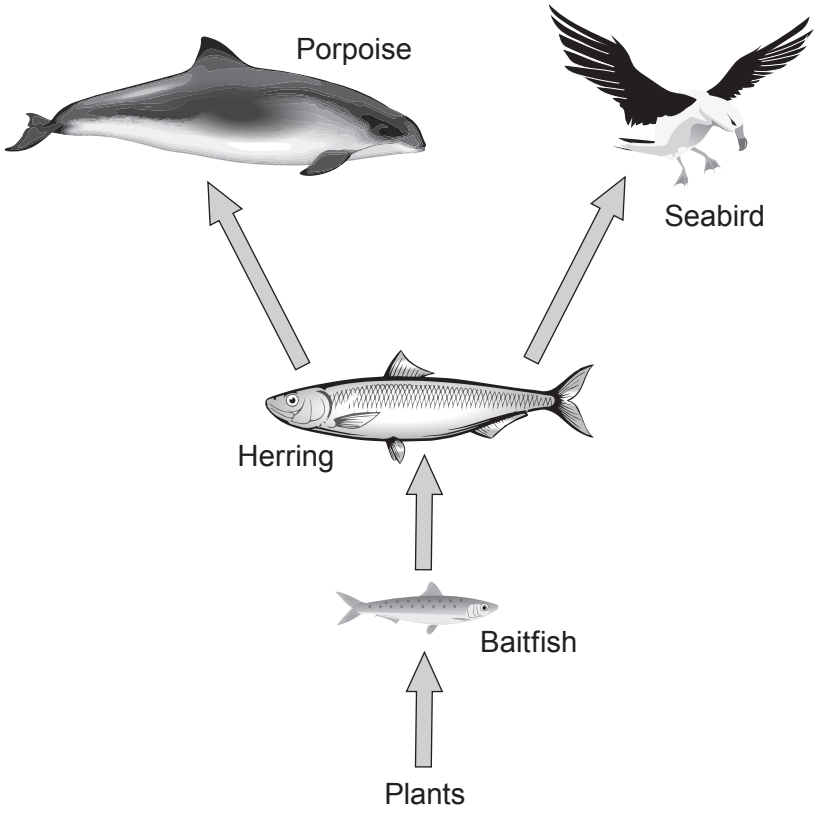
Section A

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

1. A marine food web is shown in the diagram below.



(a) Answer the following questions about the food web.

(i) Name the producer. ..... [1]

(ii) Name the herbivore. ..... [1]

(iii) State **two** effects on the food web if the herring are over-fished. [2]

1. .....

2. .....

(b) PCBs are man-made pollutants which are harmful to animals in this food web.

Explain why PCBs are more harmful to porpoises than to baitfish. [2]

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6

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2. As the human population ages, more people depend on drug treatments.

(a) (i) One of the stages involved in developing a new drug is computer modelling. State **three** other stages in testing a new drug. [3]

Stage 1 .....

Stage 2 .....

Stage 3 .....

(ii) State **two** ethical reasons against drug testing. [2]

1. .....

2. .....

(b) Aspirin is a widely used drug.

(i) Aspirin acts as a painkiller. Explain **one** other use of aspirin. [2]

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(ii) State **one** harmful side effect of taking aspirin for a long time. [1]

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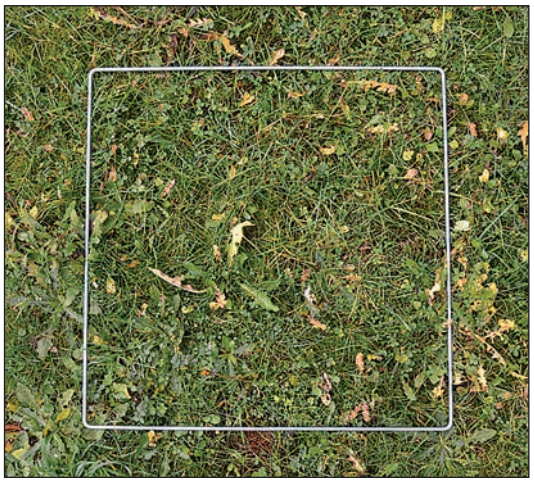
3. The numbers of a species in a habitat can be investigated by using quadrats.



The results of an investigation into the variety of snail species found in two habitats are shown below.

Habitat X

Quadrat	Number of snails				Total number of snails
	Species **A**	Species **B**	Species **C**	Species **D**	
1	0	2	3	1	6
2	0	0	3	2	5
3	0	1	3	1	5

Habitat Y

Quadrat	Number of snails				Total number of snails
	Species **A**	Species **B**	Species **C**	Species **D**	
1	0	0	1	2	3
2	0	0	4	3	7
3	0	0	1	3	4

(a) Use the data above to answer the following questions.

(i) State how many species of snail are found in habitat **X**. ..... [1]

(ii) State which species are found in both habitats. ..... [1]

(iii) Habitat **X** has an area equal to 15 quadrats. Estimate the total number of snails of species **C** you would expect to find in habitat **X**. [2]

Total number = ...

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(iv) State **one** way the experiment could be improved so you have more confidence in your answer in (iii). [1]

.....

(b) Snail **A** has the scientific name *Cornu aspersum*. State the advantage of using its scientific name rather than its common name. [1]

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6

4. State the names of the regions of the electromagnetic spectrum and describe how they can be used to take images of parts of the Universe. [6 QER]

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5. Humans are protected from the effects of disease by vaccination programmes and the use of antibiotics.

(a) (i) Tick (✓) **three** boxes next to the correct statements about vaccines. [3]

vaccines contain antigens	☐
vaccines contain lymphocytes	☐
vaccines stimulate the production of antibodies	☐
vaccines only protect against viruses	☐
vaccines can contain modified viruses	☐
vaccines contain antibodies	☐

(ii) Measles is a highly infectious viral illness that is uncommon in the UK because of the effectiveness of vaccines. The measles vaccine provides life-long protection against the disease.

Flu vaccines are also available. Unlike the measles vaccine, they need to be given every year.

State **one** reason why a flu vaccine needs to be given every year. [1]

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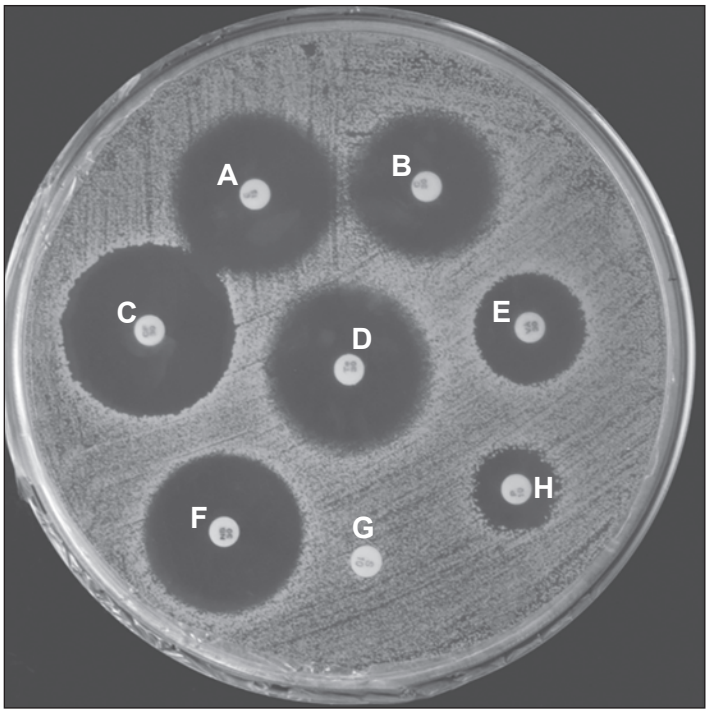
(b) An antibiotic is a substance that slows down or stops bacterial growth. Not all antibiotics work against all bacteria. Therefore it is important to know which antibiotics are most effective against different bacteria.

The photograph shows the results from an experiment to determine the effectiveness of different antibiotics against one type of bacteria.

Eight different antibiotics were tested. Each disc contains one of the antibiotics (**A** to **H**).



A website states that not all antibiotics are effective against this type of bacteria.
With reference to **all** antibiotics (**A-H**), explain whether you agree with the website. [3]

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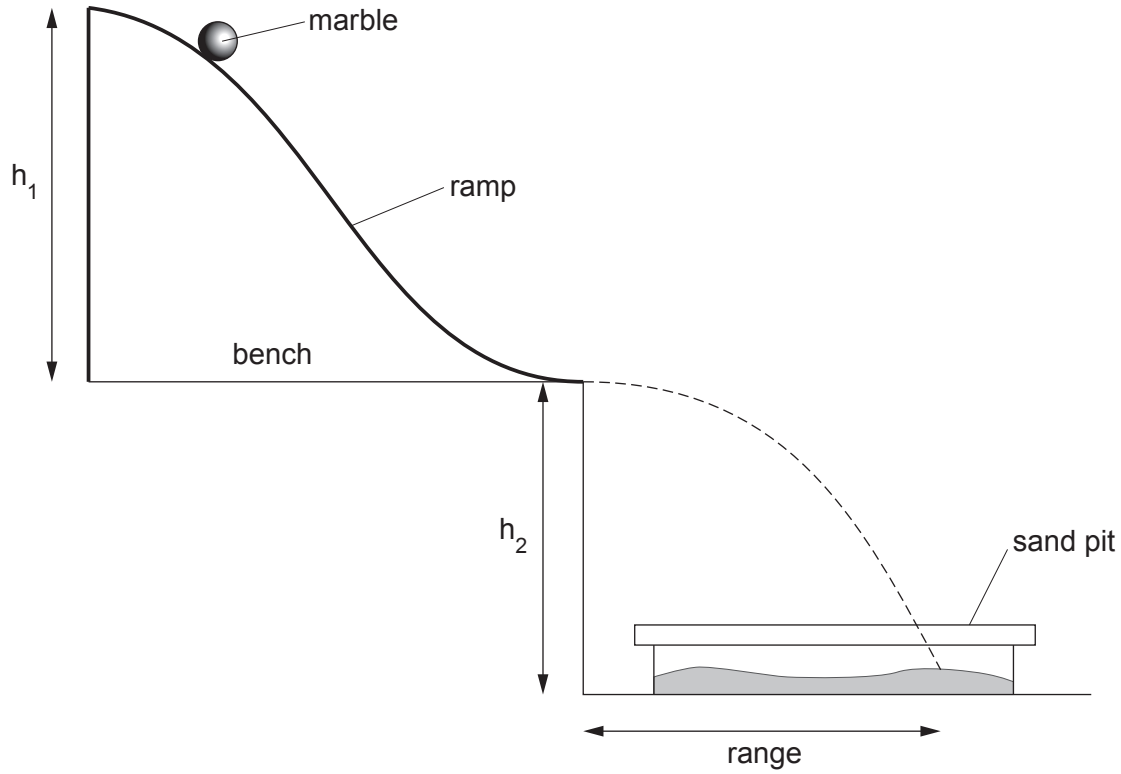
6. A model ski jump can be set up on a bench as shown in the diagram below.



The marble is released from rest at the top of the ramp. It leaves the bottom of the ramp with a certain velocity. It moves through the air and lands in the sand pit. The horizontal distance travelled in the air is called the **range**.

(a) (i) For one height (h_1) of the ramp, the mean range was measured as 45 cm and the time the marble was in the air was 0.5 s.

Use the equation:

$$\text{velocity} = \frac{\text{mean range}}{\text{time to travel the range}}$$

to calculate the velocity of the marble as it left the ramp. [2]

Velocity = ... cm / s

Examiner only

(ii) The time for the marble to run down the ramp was measured 5 times. The times were 1.2 s, 1.3 s, 1.7 s, 1.2 s and 1.1 s.

I. State which time was an anomalous result. ..... [1]

II. Calculate the mean time for the marble to travel down the ramp. [2]

Mean time to travel down ramp = ... s

(iii) Use your answers from (i) and (ii) and the equation:

$$\text{acceleration} = \frac{\text{velocity of marble as it left the ramp}}{\text{mean time to travel down the ramp}}$$

to calculate the acceleration of the marble down the ramp. [2]

Acceleration = ... cm/s^2

(b) Another experiment was carried out to find out how the acceleration of the marble depended on the height h_1 of the ramp.

(i) The same marble was used each time. State **two** other variables that should be controlled. [2]

1. .....

2. .....

(ii) The results of the experiment are shown in the table below.

Height h_1 (cm)	Acceleration (cm/s^2)
20	14
40	28
60	40
80	58
100	70

Use the data in the table to plot a graph on the grid opposite and draw a suitable line. [3]

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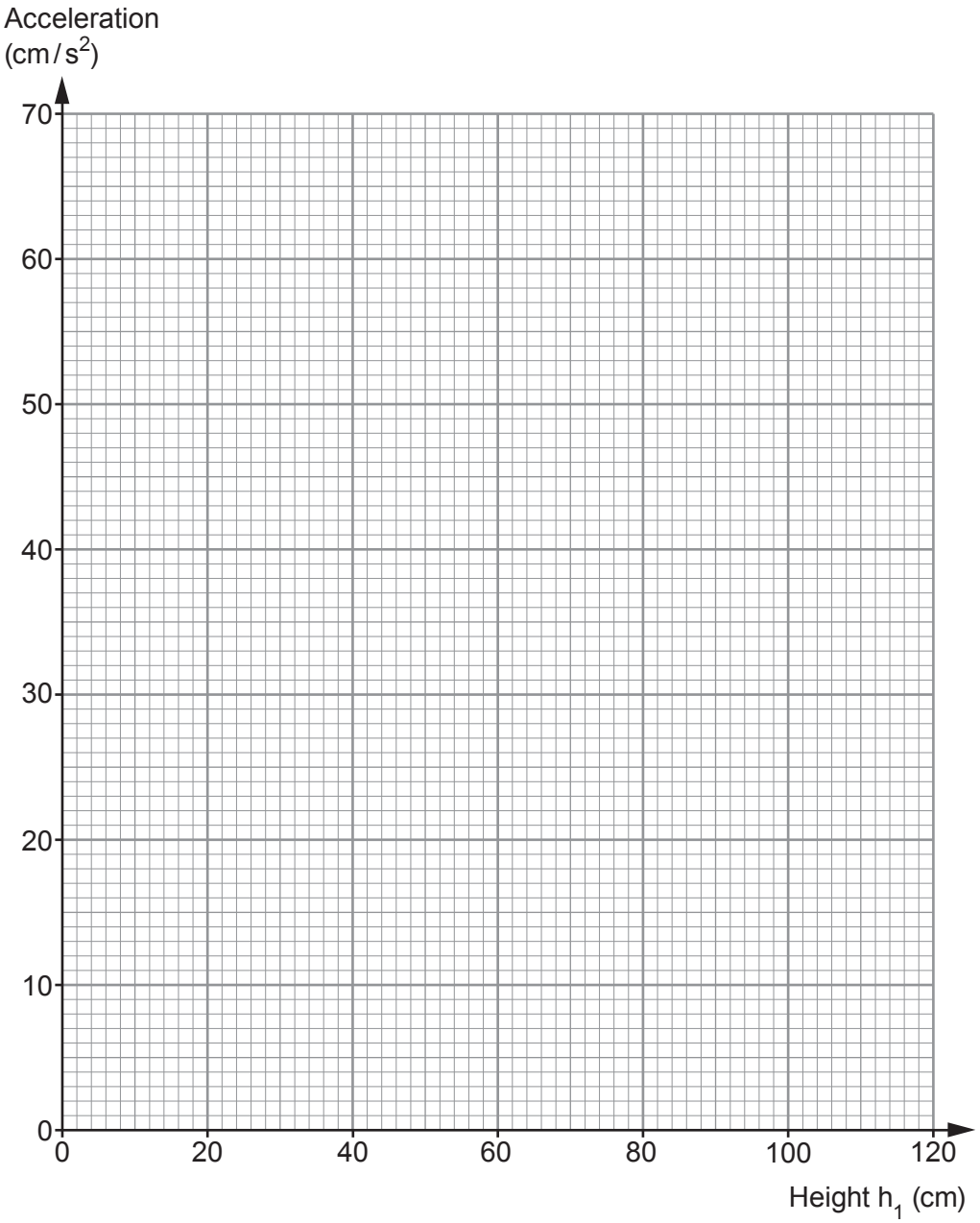

(iii) Use the graph to find the acceleration when the height h_1 is 50 cm. [1]

Acceleration = ... cm / s²

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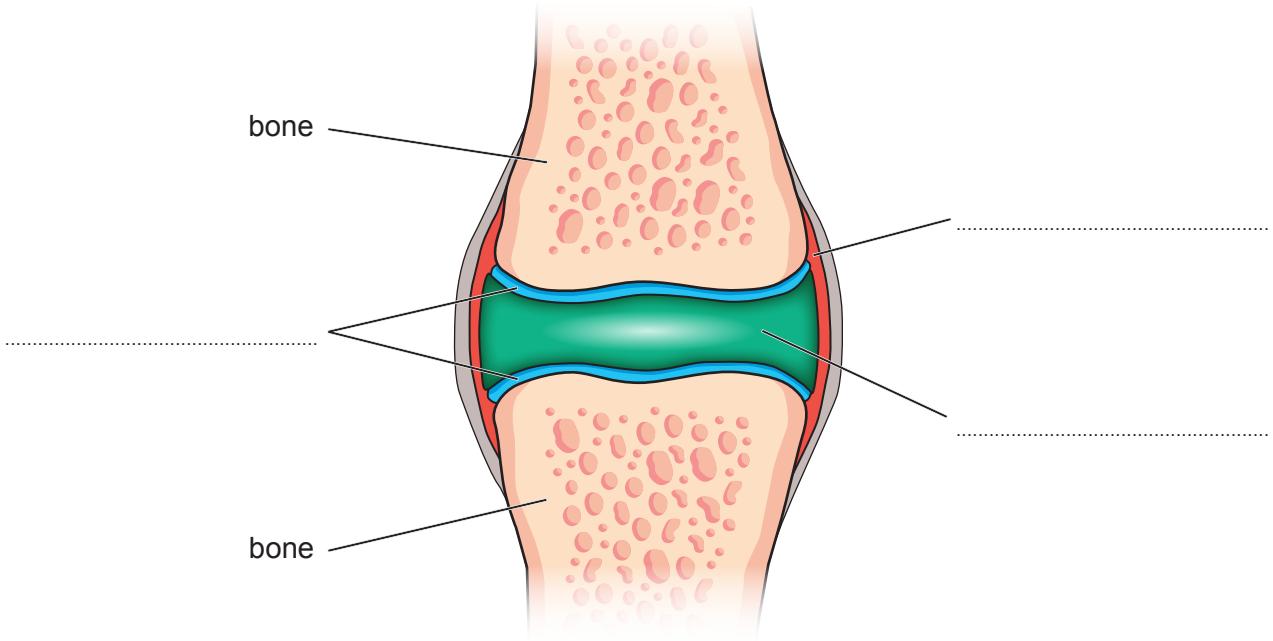
(c) Ski jumpers place their knee joints under considerable strain during their career.

(i) A simplified diagram of a knee joint is shown below. Use words from the box to **complete** the labelling of the diagram. [3]

tendon	ligament	cartilage	synovial fluid	synovial membrane



(ii) An X-ray was taken of a ski jumper's leg following an accident.

Complete the sentence by underlining the term in the brackets. [1]

The X-ray shows a **(simple / compound / green stick)** fracture of the leg.

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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.

7. *(a)* Use the information in **Figure 1** to answer the following questions.

(i) State how long it takes for a person's taste to improve once they stop smoking. [1]

.....

(ii) State how long it takes for their risk of lung cancer to drop to 50% of a smoker once a person stops smoking. [1]

.....

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

(i) State the first year in which the percentage of smokers who quit became greater than the percentage of current smokers. [1]

.....

(ii) Give **one** reason why you cannot be certain that your answer in *(b)*(i) above was the actual year for this to happen. [1]

.....

.....

(iii) In 2006, a ban on smoking in the workplace and enclosed public spaces was introduced. It also became illegal to buy cigarettes under the age of 18.

It was expected that this would quickly produce a large decrease in the percentage of current smokers.

Explain whether the data supports this expectation. [2]

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6

Examiner only

8. *(a)* Use the information in **Figure 3** to answer the following questions.

(i) A man drinks six 175 ml glasses of wine, three pints of lager and two 25 ml glasses of spirits. Calculate the total number of units of alcohol consumed. [1]

Number of units = ...

(ii) He stopped drinking at 11 pm. He is planning to drive at 1 pm the following day. Explain whether he can be **certain** that all units of alcohol will have been processed by this time so it will be safe for him to drive. Show your calculations. [2]

.....

.....

(b) Use the information in **Figures 4** and **5** to answer the following questions.

(i) Explain why it is difficult to accurately compare the nutrition facts for the three cereals shown. [2]

.....

.....

.....

(ii) Explain which cereal you would recommend for a 7-year-old child. [2]

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.....

.....

(c) Calculate the daily personal energy requirement (PER) for a 70 kg athlete who trains for 4 hours a day. [3]

PER = ... units

Examiner only

(d) Use the information in **Figures 6**, **7** and **8** to answer the following questions.

(i) State the mass at which a person of height 1.7 m has a high risk of developing health problems. [1]

Mass = ... kg

(ii) Explain whether you agree with the statement that 'BMI is proportional to body mass'. [2]

.....

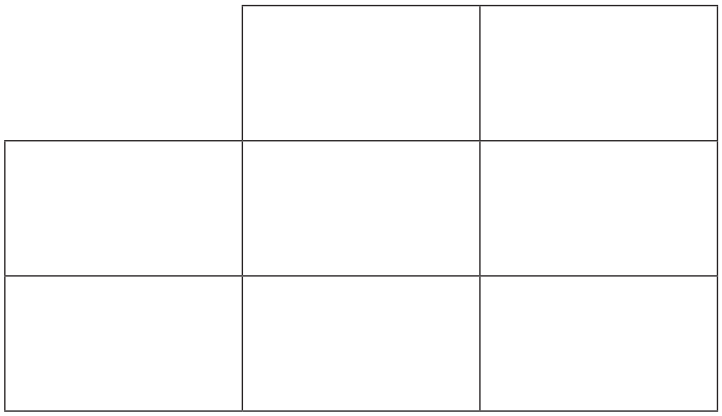
.....

.....

(iii) Calculate the BMI for a person of body mass 75 kg and height 1.6 m. [2]

BMI = ... kg/m^2

(e) (i) A woman suffers from maturity onset diabetes of the young (MODY). This is caused when one parent is heterozygous for the condition. Her partner is not diabetic. Complete the Punnett square, using **D** as the dominant allele, to show the possible genotypes of the children. [3]



(ii) State the chance of a child being born with MODY. [1]

Chance = ...

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END OF PAPER

THE PERIODIC TABLE

1	2	Group										3	4	5	6	7	0
							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