Candidate Name	Centre Number	Candidate Number
		0

GCSE

SCIENCE (Double Award)

UNIT 4: (Double Award) BIOLOGY 2
FOUNDATION TIER

SAMPLE ASSESSMENT MATERIALS

(1 hour 15 minutes)

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	8	
2.	4	
3.	4	
4.	10	
5.	8	
6.	5	
7.	6	
8.	6	
9.	9	
Total	60	

ADDITIONAL MATERIALS
In addition to this paper you will require a calculator.

INSTRUCTIONS TO CANDIDATES
Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid.
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 **7** is a quality of extended response (QER) question where your writing skills will be assessed.

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*Answer **all** questions*

1.   The diagram shows a section through the skin.

blood vessels
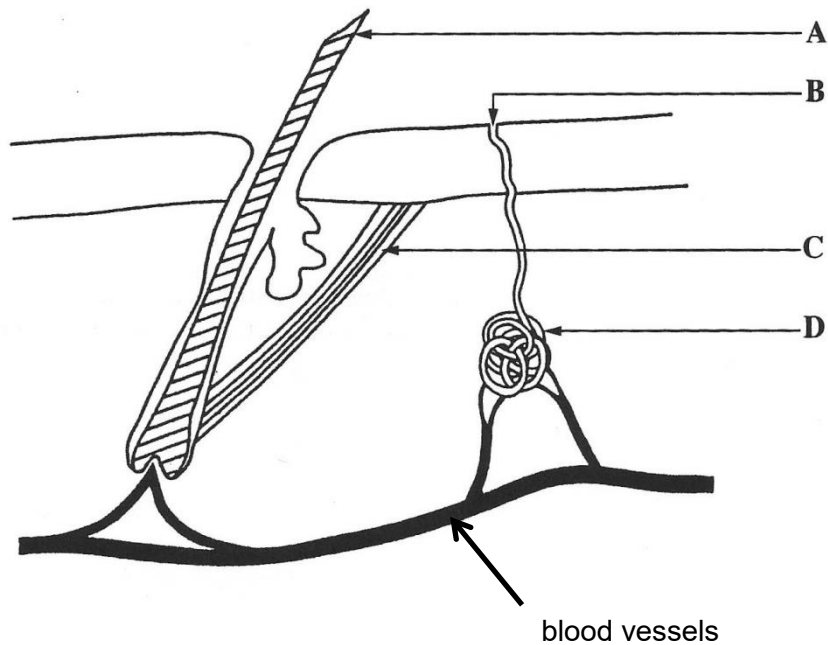
(a)   Name the structures labelled **A – D**.   [4]

A   …………………………………………………..

B   …………………………………………………..

C   …………………………………………………..

D   …………………………………………………..

(b)   Complete the following sentences by using the words from the list below.   [4]
      The words may be used once, more than once or not at all.

dilate   more   evaporation

less   constrict   radiation

In hot weather the blood vessels in the skin ………………………… so that

……………………….. blood passes through them. Therefore …………………

heat is lost from the skin by ………………………………….. .

8

2. The diagram shows a cell dividing by mitosis.

mother cells

Chromosome
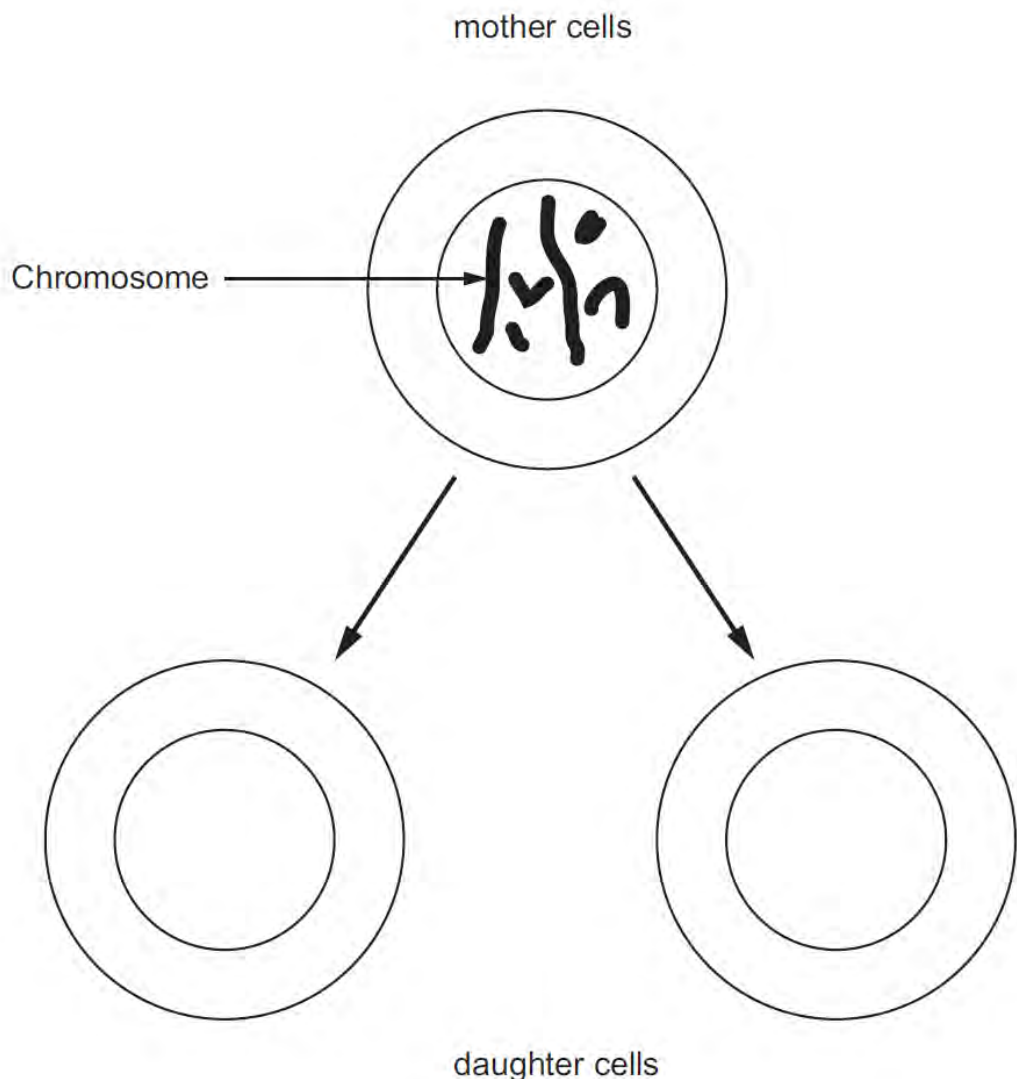
daughter cells

(a) **Complete the diagram** by drawing in the chromosomes present in **both** daughter cells. [1]

(b) State **one** function of mitosis. [1]

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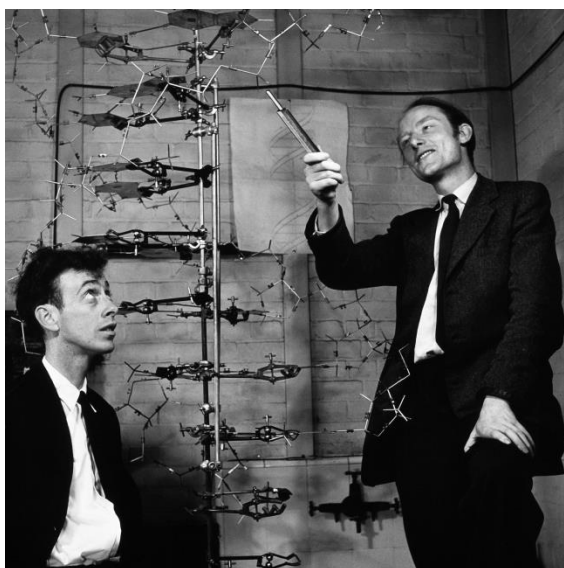
(c) State **two** ways in which the daughter cells produced by meiosis differ from the daughter cells produced by mitosis. [2]

I ....

II ....
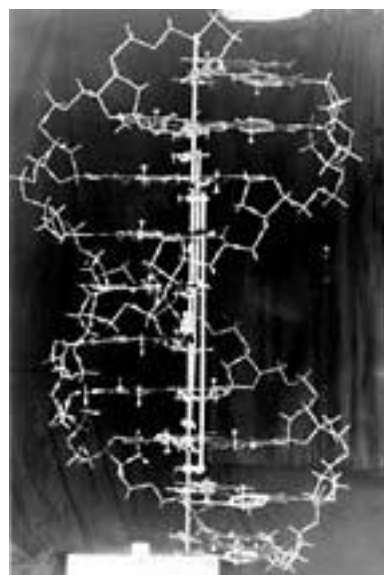
4

3.   Francis Crick and James Watson first proposed the structure of DNA in 1953.

| This photograph shows them working on an early model of DNA | Photograph showing one of Crick and Watson's later models of DNA |

(a)   Crick and Watson described the shape of the DNA molecule as a   [1]

……………………………….. .

(b)   Crick and Watson soon realised that their model of the DNA molecule could be untwisted to form a structure shaped like a ladder. The uprights of the ladder represented molecules of sugar and phosphate and the rungs of the ladder represented bases.

Phosphate and sugar →

A
G
T
G
A
A
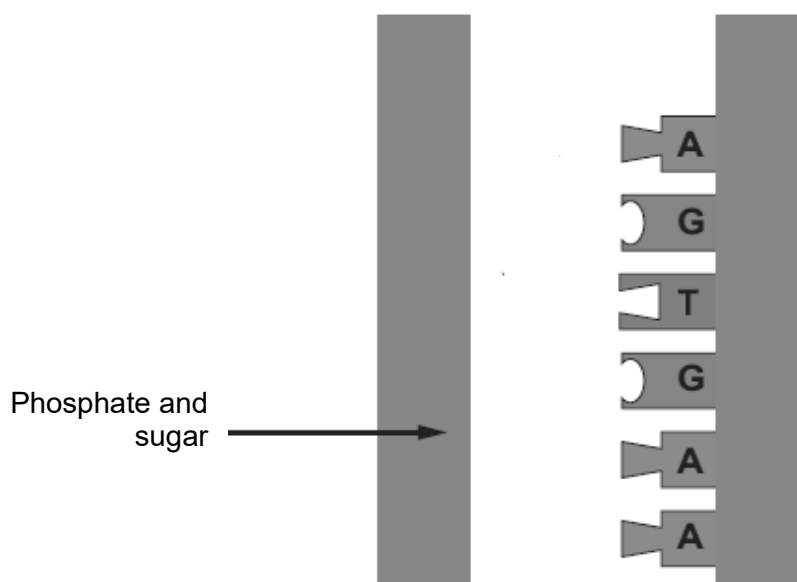
(i)   **Complete the diagram** above to show the complementary base pairing.   [2]

(ii)   Modern technology has enabled scientists to identify the uniqueness
       of every person's DNA. This has led to the development of genetic
       profiling.
       State **one** use that can be made of genetic profiling.   [1]

………………………………………………………………………………….

4

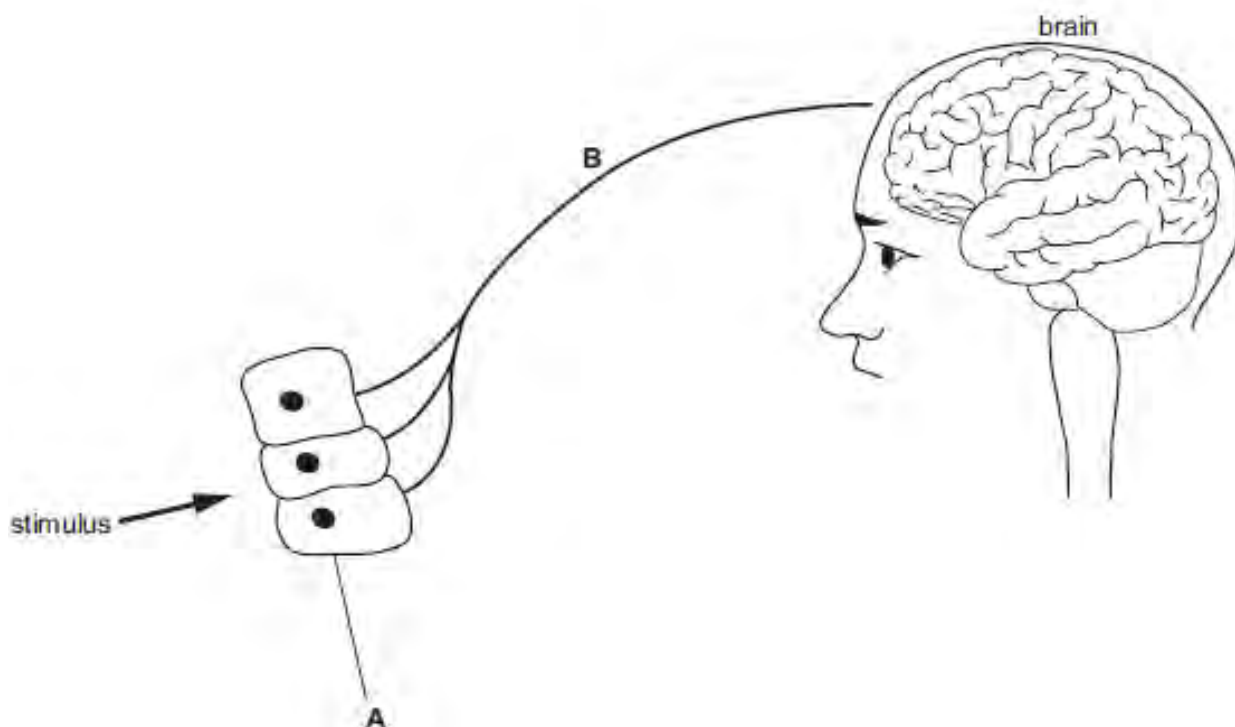4.   The diagram shows part of the nervous system.

(a)   (i)   Name parts **A** and **B** in the diagram above.   [2]

                  A   …………………………………………………..

                  B   …………………………………………………..

         (ii)   Light and sound both act as stimuli. Give **two** *other* stimuli to which
                  the body reacts.   [1]

                  I   …………………………………………………..

                  II   …………………………………………………

(b)   Helen investigated reaction times in a school laboratory. She wanted to
         investigate two aspects of reaction times. The two aspects were:

         1.   age
         2.   gender

         Helen selected five people and asked each person to observe a red light on a
         computer screen. They had to click the mouse as soon as the light turned to
         green. The time taken for the light to change varied randomly between 1 and
         7 seconds. The time taken for each subject to react to the light change was
         recorded by the computer program.
         Helen tested each person three times. One of the people was another student
         in Helen's class and the other four were teachers. The results are shown in
         the following table.

	Person		Reaction time (s)			Mean reaction time (s)
Name	Age	Gender	Test 1	Test 2	Test 3	
Liz	15	♀	0.213	0.266	0.253	0.244
Mike	27	♂	0.202	0.216	0.201	0.206
Jane	34	♀	0.254	0.249	0.251	0.251
Hywel	42	♂	0.284	0.276	0.271	0.277
Mair	56	♀	0.296	0.274	0.279	....

♀ = female; ♂ = male

(i) Calculate the mean reaction time for Mair.
Write your answer in the table. [2]

(ii) Why did the software that Helen developed have a random time period delay of between 1 and 7 seconds? [1]

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(iii) Helen made the following conclusions from the results she obtained.

1. As age increases reaction time become slower.
2. That gender has no effect on reaction time.

I Why is Helen's first conclusion not supported by the data? [1]

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....

II Helen was unsure about her second conclusion and asked Dafydd, another student in her class, to review her method and results. Dafydd said that *'the second conclusion was unreliable and that Helen needed to change her method to increase her confidence in her conclusion.*
Give **three** ways in which Helen could increase her confidence in her conclusion. [3]

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10

5. The map shows the world distribution of three fox species, the fennec fox, the red fox and the arctic fox. The map also shows the mean annual temperatures of the regions where these three species are found.

Key:
Arctic fox   Red fox
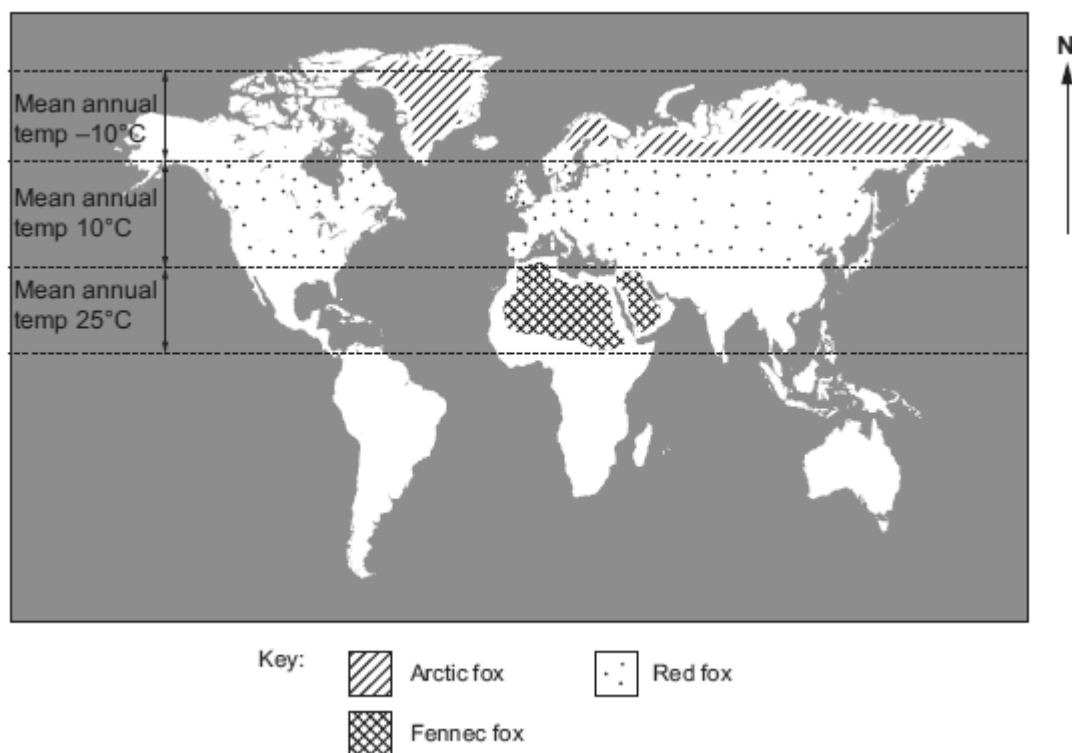
Fennec fox

Profiles	fennec fox *(Vulpes zerda)*	red fox *(Vulpes vulpes)*	arctic fox *(Vulpes lagopus)*
Distribution	Sahara and Arabian deserts (Equator to 35° N)	temperate regions of North America and Eurasia (35° N to 60° N)	arctic and sub-arctic tundra (60° N to 85° N)
Body mass (kg)	1.0 - 1.5	4.0 – 8.0	6.5 – 17.0
Ear length (cm)	15.0	8.0	4.0
Coat colour	sandy cream	red - brown	white (winter)

(a) (i) Bergmann's rule states that ***body size is correlated with latitude***. This means that the further north you travel the larger the body size becomes.

Study the profiles of the foxes. Does Bergmann's rule apply to them? Explain your answer by referring to each of the foxes. [3]

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(ii) Suggest how:

I the body mass of the fennec fox is an adaptation for living in a very hot environment; [1]

……………………………………………………………………………

……………………………………………………………………………

II the winter coat colour of the Arctic fox is an adaptation for living in a very cold climate. [1]

……………………………………………………………………………

……………………………………………………………………………

(iii) The three foxes have different ear lengths. Underline **one** statement from the list below which best describes the reason for this. [1]

The smaller the ears the more heat they lose.

The smaller the animal the larger the ears have to be to listen for prey.

The larger the ears the more heat they lose.

The ears only appear bigger in smaller foxes.

(b) What information in the profile tells you that these three foxes are very closely related to one another? [1]

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(c)   As well as being known by 'common' names these three foxes also have scientific names. Why is the use of scientific names important?   [1]

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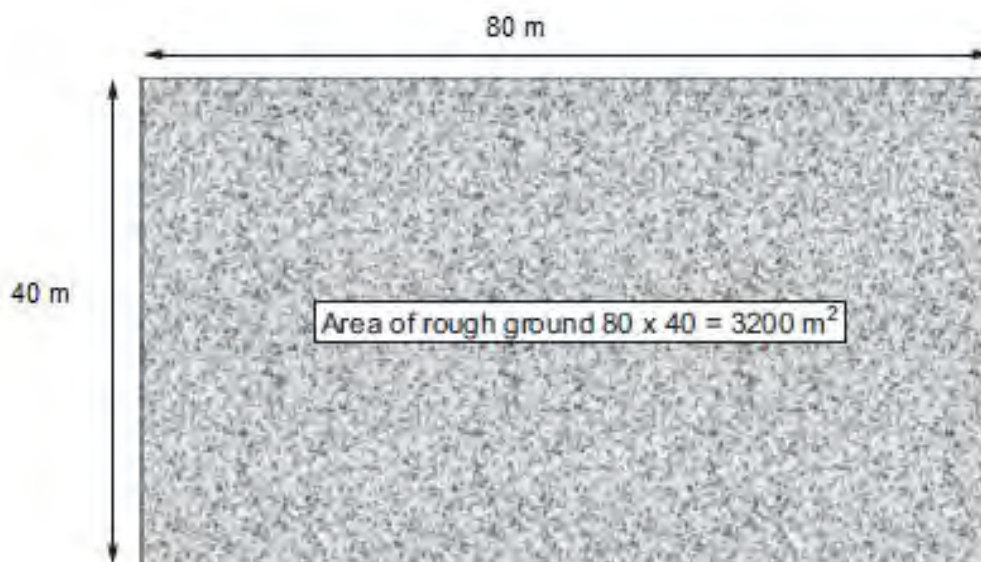
………………………………………………………………………………………………..

8

6. Natalie was asked to estimate the number of poppies growing on an area of rough ground in the Gower using a 1m^2 quadrat.

The area of rough ground was 80 metres by 40 metres.

80 m

40 m

Area of rough ground 80 x 40 = 3200 m^2

(a)   Which is the correct way of using the quadrat in this sampling exercise?
       Tick **one** box only.   [1]

	Tick (✔)
Place the quadrats where the most poppies are growing	
Place the quadrats where an average number of poppies are growing	
Place the quadrats randomly	

(b)   Describe the technique Natalie should use when estimating the number of
       poppies on this area of rough ground.   [4]

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7.   Explain how the body defends itself against disease.   [6 QER]

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6

8.   The early history of diabetes.

Aretaeus of Cappadocia

Diabetes was given its name by the Greek physician Aretaeus of Cappadocia (30 – 90CE). He recorded a disease with the three symptoms of constant thirst (polydipsia), excessive urination (polyuria) and loss of weight. He named the condition 'diabetes', meaning 'a flowing through.'

In 1674, English physician Thomas Willis was the first in modern medical literature to observe the relationship between diabetes and a sweet taste to the patient's urine. He wrote in his notes that *'the pee was wonderfully sweet as if it were imbued with honey'*. This led him to add the term 'mellitus' to the name for this form of diabetes, from the Latin word for honey.

(a)   Explain any **two** of the three symptoms of diabetes, as recorded by Aretaeus.
        [2]

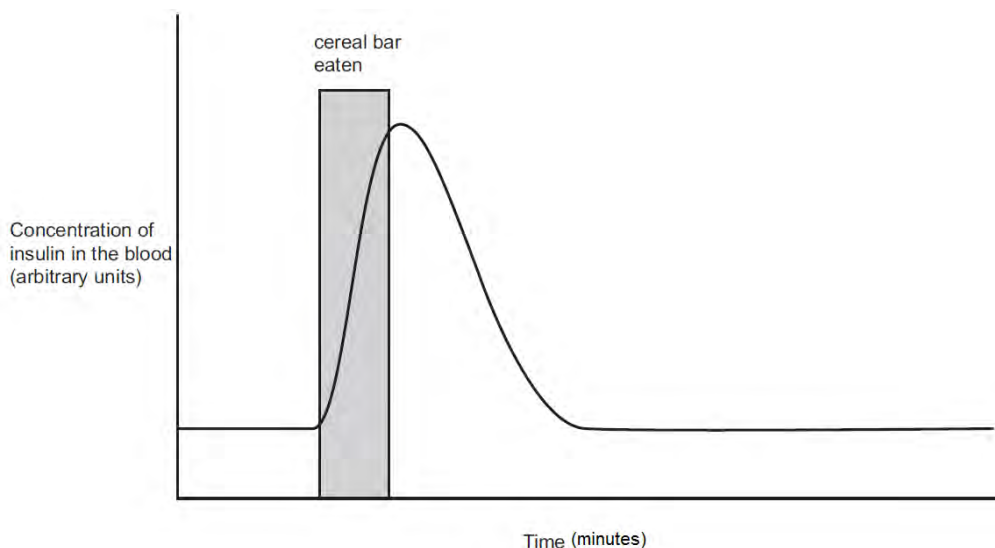Symptom …………………………………………………………………………………...

Explanation …………………………………………………………………………………...

………………………………………………………………………………………………...

Symptom …………………………………………………………………………………...

Explanation …………………………………………………………………………………...

………………………………………………………………………………………………...

(b)   The graph shows the level of insulin in the blood of a person without diabetes
        before and after eating a breakfast cereal.

(i)   Explain what happens to the concentration of insulin in the blood as
        the breakfast cereal is being eaten.   [3]

        ……………………………………………………………………………………

        ……………………………………………………………………………………

        ……………………………………………………………………………………

        ……………………………………………………………………………………

(ii)   How would the graph above differ if the insulin levels of a person with
        untreated **Type 1** diabetes had been recorded?   [1]

        ……………………………………………………………………………………

6

9.	PSSM1 is a muscle disease in horses. It results in muscle stiffness and a reluctance to move. One of the characteristics of PSSM1 is a very high level of glycogen stored in muscle tissue.

(a)	Suggest which class of food should be reduced in the diet of a horse suffering from PSSM1 and explain the reason for your answer.	[2]

…………………………………………………………………………………………………..

…………………………………………………………………………………………………..

(b)	The following table describes the number and percentage of randomly sampled horses that tested positive for the PSSM1.

Breed of horse	Number tested	Number with PSSM1	Prevalence (%)
Quarter horse	335	22	6.6
Paint	195	15	7.7
Appaloosa	152	9	5.9
Morgan	214	2	……….
Percheron*	149	93	62.0
Belgian*	149	58	39.0
Shire*	200	……….	0.5
Clydesdale*	48	0	0.0
Belgian draught*	37	34	92.0
Trekpaard*	23	17	74.0
Comtois*	88	70	80.0
Breton*	51	32	63.0

(i)	Explain what a prevalence of 62.0% amongst Percheron horses means.	[1]

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………………………………………………………………………………………….

(ii)	**Complete the table** by calculating

I	the prevalence of PSSM1 amongst the Morgan horses tested;	[1]

II	the number of Shire horses that had the PSSM1 gene.	[1]

(iii)   In the table opposite the horses marked with an asterisk (*) are heavy working or draught horses.
For environmental reasons a commercial forestry owner wants to replace some of his heavy tracked vehicles with draught horses.
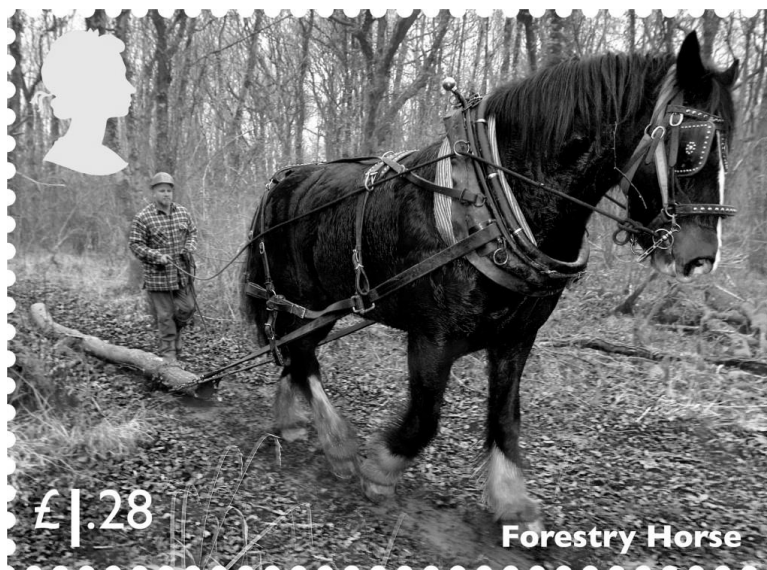
Which **three** breeds of horse would you recommend to the forestry owner so that the horses have an active working life?   [1]

I   ……………………………………………………..

II   ……………………………………………………..

III   ……………………………………………………..

(c)   PSSM1 is caused by a mutation and is inherited as a dominant allele, **(B)**.
A horse, heterozygous for PSSM1, is mated with a horse that does not suffer from the condition.

(i)   Complete the Punnett square below to show this mating.   [2]

Gametes		

(ii)   State the ratio of PSSM1 horses to non-PSSM1 horses in the offspring.   [1]

PSSM1 : …………………. non-PSSM1

9

END OF PAPER