1 Mendel crossed together pure breeding pea plants with purple flowers and pure breeding pea plants with white flowers. The offspring plants all had purple flowers.

(a) Explain which phenotype is dominant.

(2)

.....

.....

.....

.....

.....

(b) In a second cross, the purple offspring plants were self-pollinated (pollen from a flower put on the stigma of the same flower).

Suggest how Mendel made sure that all the purple offspring plants were self-pollinated.

(2)

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.....

.....

.....

.....

(c) (i) Use a genetic diagram to show the ratio of plants expected by crossing the purple offspring plants in part (b).

Show the parental genotypes and gametes, and the offspring genotypes and phenotypes. Use **F** and **f** to represent the alleles.

(4)

Parent genotypes

Gametes

Offspring genotypes

Offspring phenotypes

(ii) The plants actually produced in this cross were 36 purple and 8 white flowered plants.

Calculate the ratio of purple to white flowered plants.

(1)

Answer .....

(iii) Suggest why the actual ratio of phenotypes differs from the one predicted by your genetic diagram.

(2)

.....

.....

.....

.....

.....

(d) A student suggested that purple flowers are more likely to be visited by bees than white flowers.

Use your knowledge of natural selection to suggest how this might affect the number of purple and white flowers in the wild.

(5)

(Total for Question = 16 marks)

2 The following passage describes inheritance.

Complete the passage by writing a suitable word or words on each dotted line.

(6)

A gene is a section of a double-stranded molecule known as ..... .

This molecule is found within the ..... of the cell,

contained in threadlike structures called ..... .

The two strands form a double helix linked by a series of paired bases.

The base adenine is always linked to ..... and the base cytosine

is always linked to ..... .

Sometimes the genetic material of a cell changes. This is known as a ..... .

These changes occur very rarely but their incidence can be increased by chemicals or ionising radiation.

(Total for Question = 6 marks)

3 Global warming may affect the number of insect pests by increasing their ability to produce offspring. An experiment was carried out to find out the effect of different air temperatures on the ability of insects to produce offspring.

Five tubes were set up at an air temperature of 16 °C. Each tube contained a male and a female insect and some food. This procedure was repeated at air temperatures of 25 °C, 30 °C, 35 °C and 45 °C.

The insects were allowed to mate and the number of offspring they produced after two weeks was counted.

The table shows the results.

Temperature in °C	Number of offspring in each tube					Total number of offspring
	Tube 1	Tube 2	Tube 3	Tube 4	Tube 5	
16	14	17	14	15	12	72
25	88	92	95	100	87	462
30	39	36	90	40	36	241
35	19	17	15	22	16	89
45	**0**	0				0

(a) Identify the anomalous result in the table and suggest a reason for the anomaly.

(2)

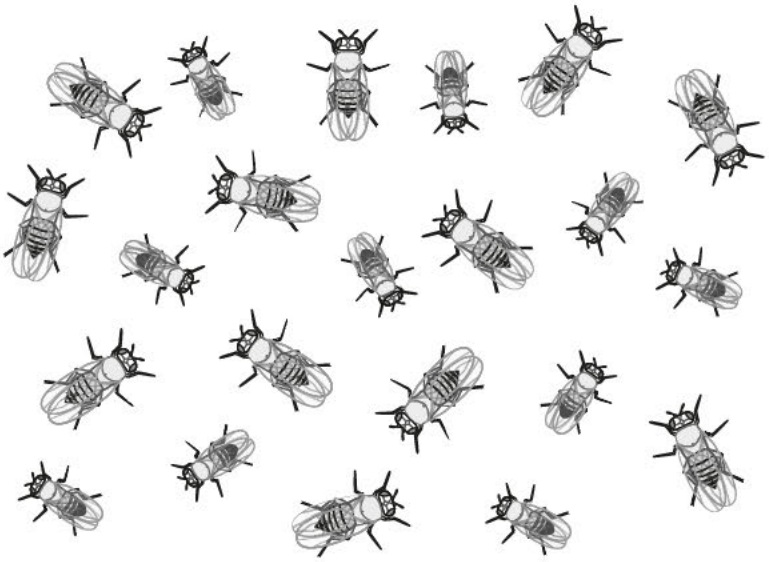
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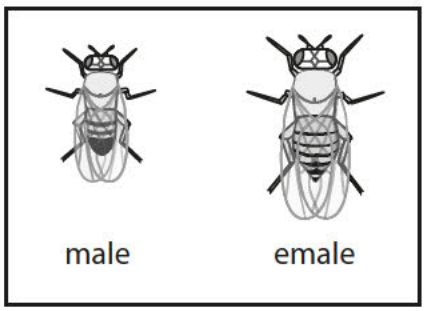
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(b) The diagram shows the insect offspring collected from one of the tubes in the experiment.





(i) Use the key to count the number of male and female offspring in this tube.

(1)

number of males .....

number of females .....

(ii) Which tube did these insect offspring come from?

(1)

.....

(c) Explain why the results in the table are reliable.

(2)

(d) Describe the results in the table and write a conclusion for this experiment.

(3)

(Total for Question = 9 marks)

4 The sex of a baby is determined by the chromosomes it inherits from its parents.

(a) Explain which parent determines the sex of the baby.

(2)

(b) Describe how cell division by meiosis is different from cell division by mitosis.

(4)

(Total for Question = 6 marks)

5 The table lists different places in the world arranged in order, from the warmest to the coldest. It also shows the average mass of a mouse found in each place.

Climate	Place in world	Average mass of a mouse in g
warmest	Enewetak (a tropical coral island)	9.2
↓	Hawaii in the mid Pacific	11.6
	Southern England	13.4
	Isle of May in Scotland	17.0
coldest	South Georgia in Antarctica	18.6

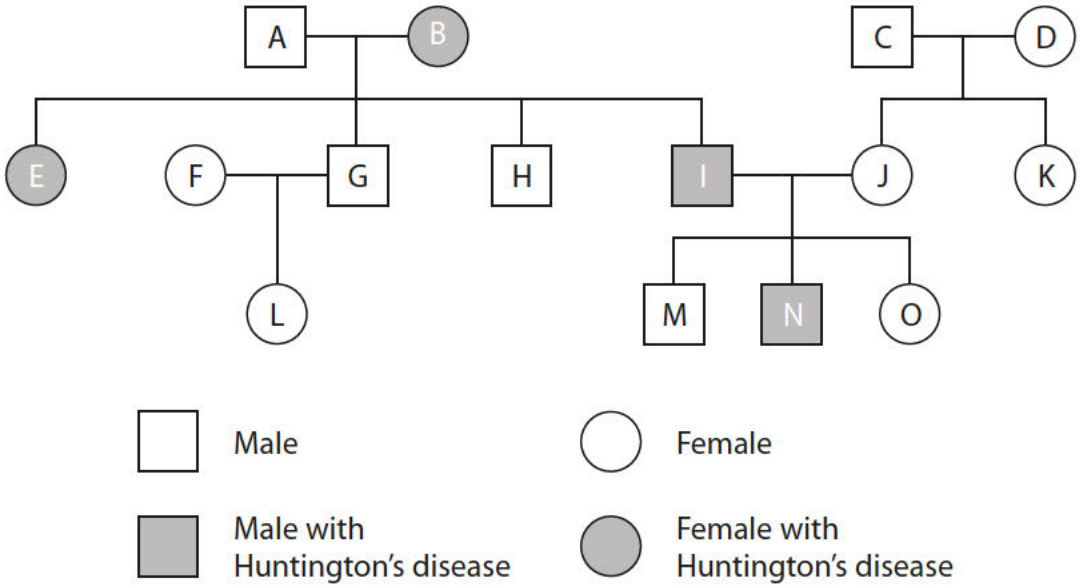
Use your understanding of natural selection to suggest why the mice in Antarctica have the biggest average mass.

(5)

(Total for Question = 5 marks)

6 Huntington's disease causes damage to the nervous system. It is an inherited condition caused by a dominant allele (H). Only individuals who are homozygous for the recessive allele (h) are protected from the disease.

The diagram shows the inheritance of Huntington's disease in a family.



(a) Complete the table to show how many people in the diagram fit each description. The first one has been done for you.

(4)

Description	Number of people who fit the description
male	7
female with Huntington's disease	
homozygous recessive	
heterozygous	
homozygous dominant	

(b) Individuals A and B have both male and female children.

Draw a genetic diagram to show how they can produce both male and female children.

(3)

(Total for Question = 7 marks)