Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE

General Certificate of Secondary Education

CYD-BWYLLGOR ADDYSG CYMRU

Tystysgrif Gyffredinol Addysg Uwchradd

235/02

SCIENCE

HIGHER TIER (Grades D-A*)

BIOLOGY 1

P.M. TUESDAY, 16 January 2007

(45 minutes)

For Examiner's use only	
Total Marks	

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator.

INSTRUCTIONS TO CANDIDATES

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.

You are reminded of the necessity for good English and orderly presentation in your answers.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

Answer **all** *questions.*

1. Gregor Mendel made important discoveries on how characteristics or traits are passed from parents to offspring.
In one of his experiments he crossed pea plants that produced seeds with round coats with plants that produced seeds with wrinkled coats.

Seeds with wrinkled coats

Seeds with round coats

R. W. Van Norman/Visuals Unlimited

The result of this cross were plants (F1) that only produced round coated seeds. Mendel explained this by saying that pea plants passed on **factors** (alleles) from one generation to the next. He also said that the factor for round seeds is dominant over the factor for wrinkled seeds.

Use the information in the passage and your knowledge to answer the following questions.

(a) (i) Complete the following to show how the F1 plants were produced in Mendel's experiment.

R = allele for round seeds
r = allele for wrinkled seeds

Phenotype of parents	Round	×	Wrinkled
Genotype of parents	**RR**		**rr**
Gametes	....		.... [1]

1

(ii) Complete the Punnett square to show the genotypes produced in this cross. [2]

F1

gametes		

(b) (i) Mendel then crossed two of these F1 plants together. Draw your own Punnett square and complete it to show the genotypes of the offspring that would be produced. [2]

(ii) What is the ratio of round to wrinkled seeds produced above? [1]

..... round: ..... wrinkled

(iii) When Mendel carried out the cross shown on pages 2 and 3 he repeated the experiment hundreds of times. These are some of the results he obtained:

Experiment number	*Number of seeds obtained*	
	Round	*Wrinkled*
1	27	8
2	24	7
3	32	11
4	74	24
5	17	6

How do the results of Mendel's experiments compare to your answer in *(b)*(ii) on page 3?

[1]

.....

(iv) Why did Mendel repeat this experiment hundreds of times? [1]

.....

(c) Why was the importance of Mendel's discovery about inheritance not recognised until long after his death? [1]

.....

.....

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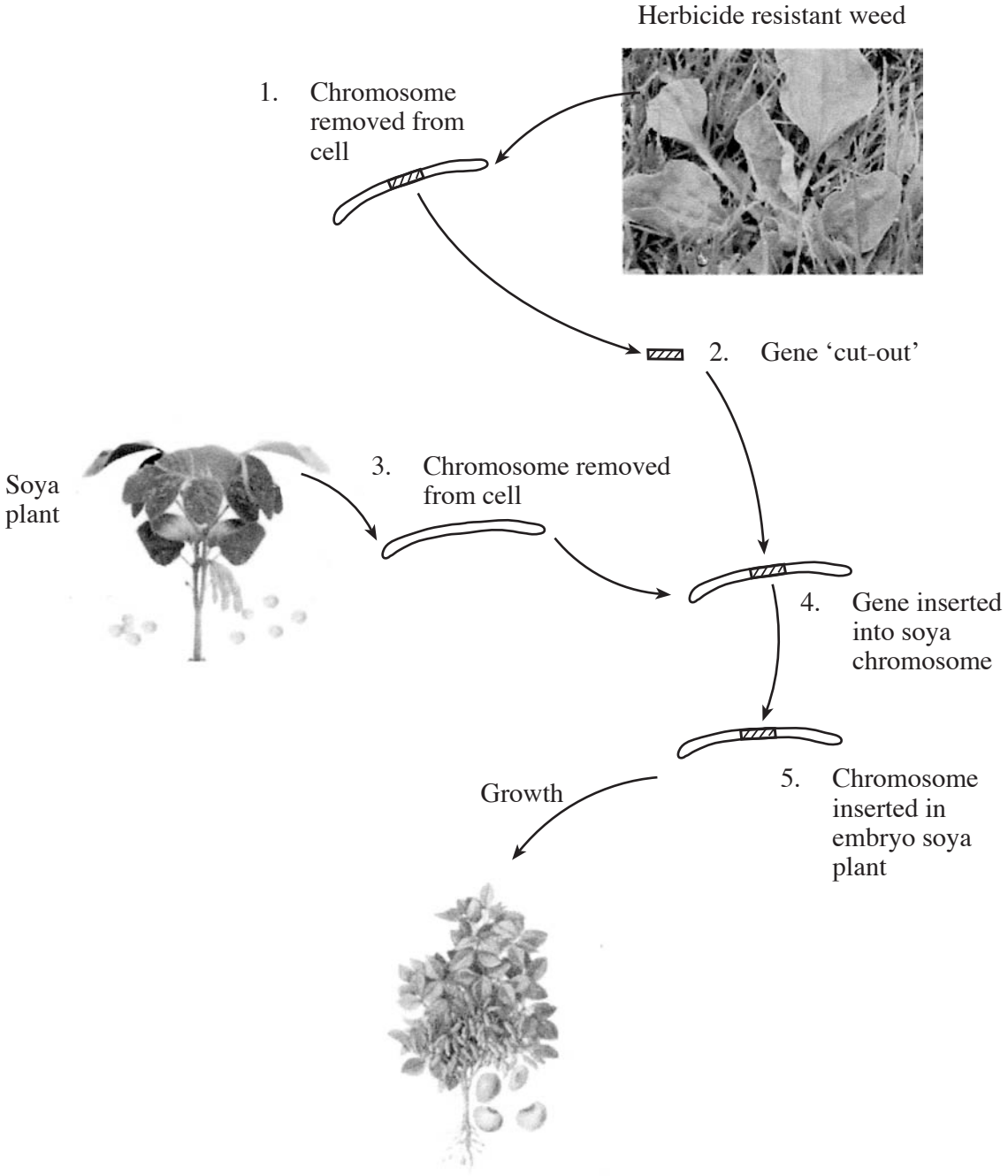
2. Weeds compete with crops for water, sunlight and space. They therefore reduce crop quality and deposit weed seeds in crops.
The diagram below (not drawn to scale) shows how soya bean plants have been genetically modified (GM) so that they are resistant to a herbicide (weedkiller) called 'Roundup'.



GM soya resistant to weed killer

(a) (i) Which gene was removed from the weed? [1]

.....

(ii) State why the GM soya plant develops resistance to the weedkiller 'Roundup'. [1]

.....

(b) Suggest **two** possible advantages that a farmer gets from growing a soya bean crop genetically modified for herbicide resistance. [2]

I. .....

II. .....

(c) In 1999 the UK government asked researchers to investigate how growing GM herbicide resistant crops might affect farmland wildlife.
The research involved investigating and reporting on 266 field trials in the UK.
In 2003 the researchers reported that there were differences in the abundance of wildlife between GM and non-GM crops.

Compared to the numbers found in the non-GM crop, the researchers found the following:

	Numbers compared to crops not genetically modified		
GM crop plant / *Wildlife*	*GM winter rape*	*GM beet*	*GM maize*
Bees and butterflies	fewer	fewer	more
Springtails (soil insects)	more	more	more

(i) In March 2004 the UK government announced that two of the above crops would not be grown in the UK in the near future. Suggest which **two** crops they are: [1]

..... and .....

(ii) State the reason for the government's decision. [1]

.....

.....

3. The information below shows the classification of the lion and tiger.

Classification Group	*Feature of classification group*	*Lion*	*Tiger*
Kingdom	moves in search of its food	Animalia	Animalia
Phylum/Division	have a vertebral column	Chordata	Chordata
Class	feed young on milk	Mammalia	Mammalia
Order	canine teeth with jaws that move only up and down	Carnivora	Carnivora
Family	can sheath their claws	Felidae	Felidae
Genus	roaring cats over 3m long	*Panthera*	*Panthera*
Species	produce fertile offspring when they breed	*leo*	*tigris*

(a) Use the information in the table to answer the following questions:

(i) Write down the full scientific name of the lion. [1]

.....

(ii) Why are both the lion and the tiger placed in the class mammalia? [1]

.....

(iii) When kept in captivity the lion and the tiger can be interbred (bred together).
A male lion mated with a female tiger produced offspring which are known as 'ligers'. These offspring are infertile.
Which classification group above informs you that lions and tigers when interbred will produce infertile offspring? [1]

.....

(b) In 1865 Mendel published the results of his experiments on inheritance in German, his native language. However, he always gave the garden pea its Latin scientific name, *Pisum sativum*.
Why did Mendel use the scientific name of the garden pea and not its local common name? [1]

.....

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4. The following extract appeared in a document published by the Scottish Government in 2003.

> For centuries, people in Scotland lived active lives – but not anymore. As a nation, Scotland is inactive, unfit and increasingly overweight (obese). The health of two-thirds of the Scottish adult population is now at risk from a lack of physical activity making it the most common factor for coronary heart disease in Scotland today. Perhaps most worryingly, this trend starts before young people have left school.

(a) What is meant by physical activity? [1]

.....

(b) The following list shows three ways in which the Scottish government could have collected the data. Which would produce the most reliable results?

Underline the correct answer below. [1]

(i) survey 10000 people;

(ii) from an internet search;

(iii) survey 100 people.

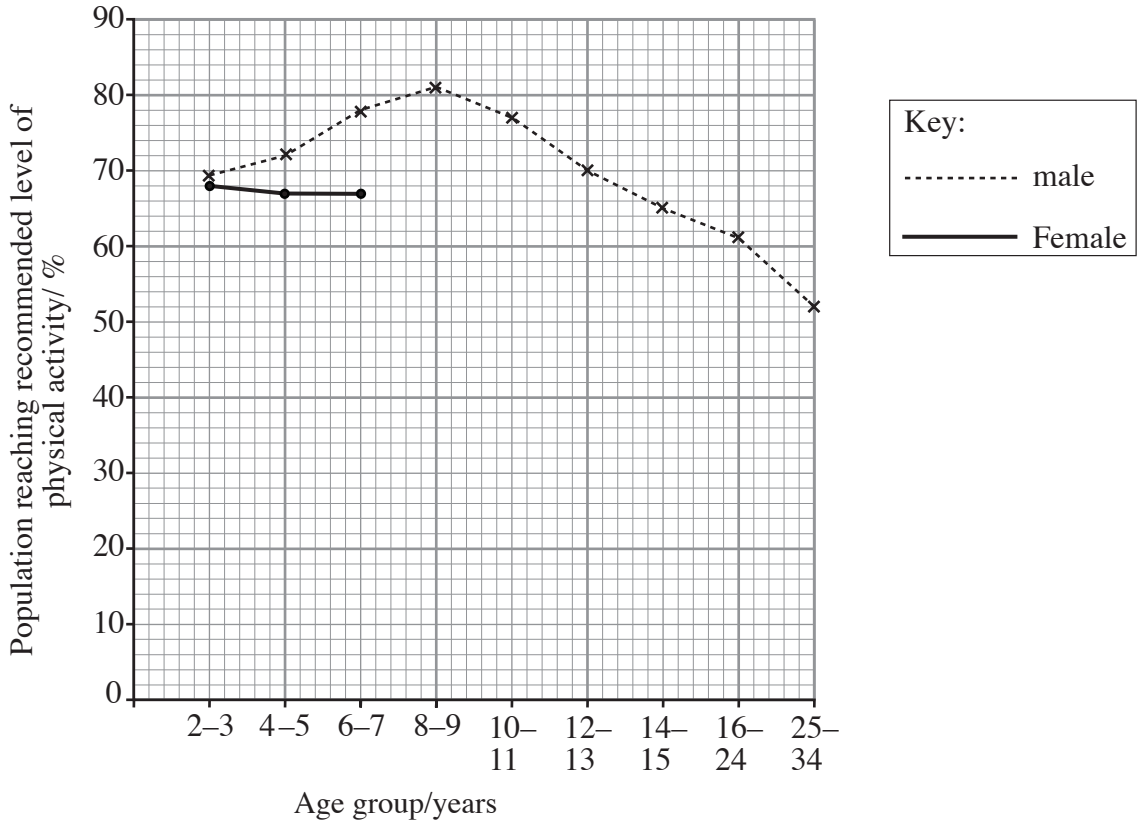
(c) The data shows the percentage of the population in Scotland reaching the recommended level of physical activity.

Age group / years	*Male / %*	*Female /%*
2 - 3	69	68
4 - 5	72	67
6 - 7	78	67
8 - 9	81	65
10 -11	77	66
12 -13	70	49
14 -15	65	35
16 -24	61	35
25 -34	52	33

Adapted from Scottish Health Survey, 1998.

(i) Complete the plotting of the data for the female percentage (%) on the chart below. Join the plots with a ruler. [2]

The first three have been plotted for you.



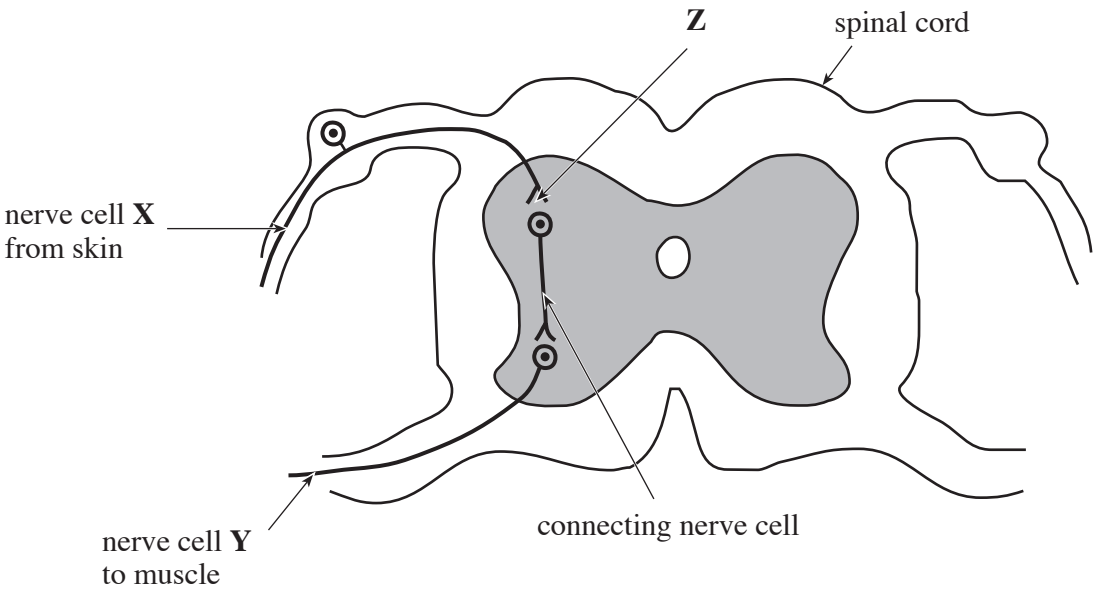
(ii) From the chart identify **one** factor that affects the level of physical activity. [1]

.....

(d) Apart from physical inactivity state **one other** lifestyle factor that may contribute to coronary heart disease. [1]

.....

5. The diagram shows some parts of the nervous system involved in a reflex such as a withdrawal reflex.



(a) What type of nerve cell is [2]

(i) **X**; .....

(ii) **Y**? .....

(b) In what form is information passed along **X**? [1]

.....

(c) Name **Z**. [1]

.....

(d) Complete the sentence: [3]

In this withdrawal reflex the skin acts as the ..... , the spinal cord acts as the ..... and the muscle acts as the ..... .

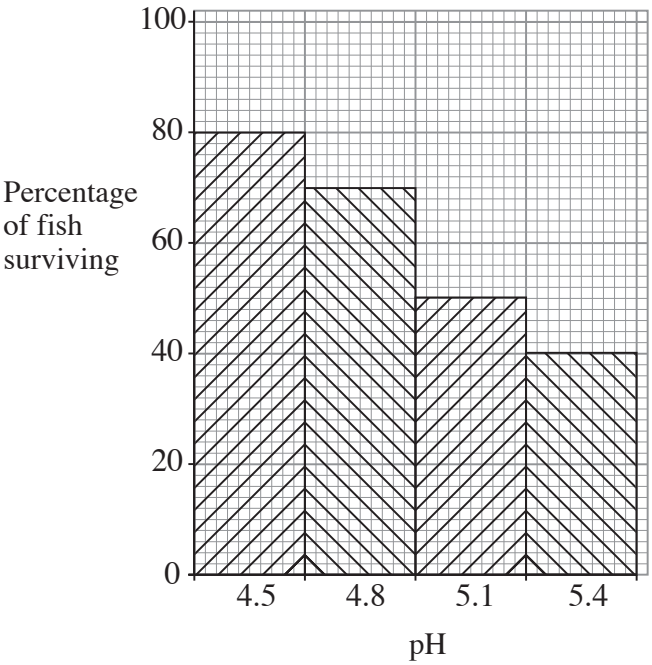
(e) Give an example of a withdrawal reflex. [1]

.....

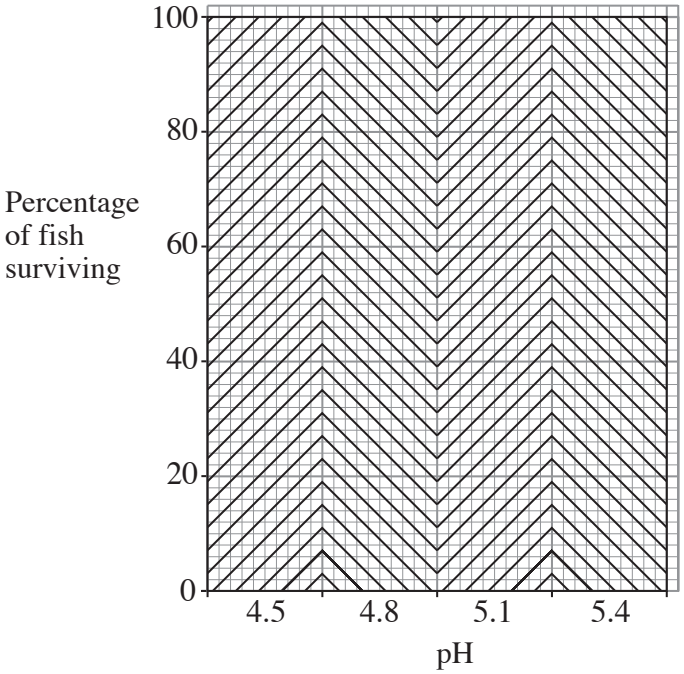
6. Soil contains aluminium compounds as pollutants. Rain washes these aluminium compounds out of the soil and into rivers and lakes.

(a) Graphs **X** and **Y** show the survival of fish in lakes at different pH values. The results were obtained from four lakes containing aluminium compounds and four without aluminium compounds.

Graph X
Lakes with aluminium compounds



Graph Y
Lakes without aluminium compounds



(i) What percentage of fish survive at pH 4·8 in the lake containing aluminium compounds? [1]

.....

(ii) What percentage of fish survive in the most acidic lake containing aluminium compounds? [1]

.....

(iii) What evidence from the graphs shows that aluminium compounds have greater effect than pH on fish survival? [1]

.....

.....

(b) A scientist wanted to show that fish could be used as indicators of the pollution of lakes by aluminium compounds. Make a list of four factors, other than pH, that must be considered if a conclusion is based on a fair test. [4]

(i) .....

(ii) .....

(iii) .....

(iv) .....

7. Warfarin has been used as a poison to kill animals which compete with humans for stored grain.

(a) Name these animals. [1]

.....

(b) Some of these animals have become resistant to Warfarin. A change took place in certain parts of their chromosomes.

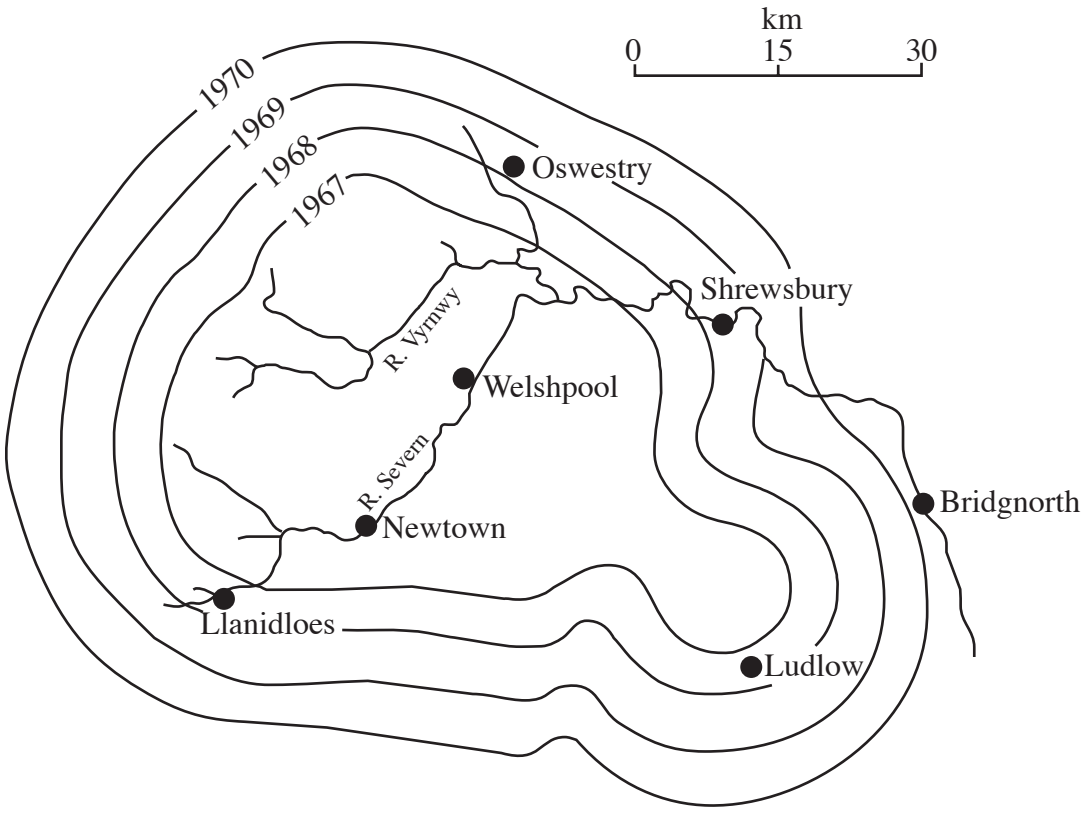
(i) What is the name given to this change? [1]

.....

(ii) Name the parts of the chromosomes which changed. [1]

.....

(c) In 1959, Warfarin-resistant animals appeared in Welshpool in mid-Wales and began to spread. The spread of Warfarin resistance between 1967 and 1970 is shown in the map below.



Explain how Warfarin resistance has increased and spread as shown. [5]

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(d) Suggest how the development of Warfarin resistance can be used to support Charles Darwin's theory of evolution. [2]

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