

Candidate Name	Centre Number	Candidate Number
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General Certificate of Secondary Education

235/02

**SCIENCE
HIGHER TIER (Grades D-A*)
BIOLOGY 1**

P.M. TUESDAY, 15 January 2008
(45 minutes)

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	8	
3.	6	
4.	4	
5.	4	
6.	6	
7.	5	
8.	10	
Total	50	

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

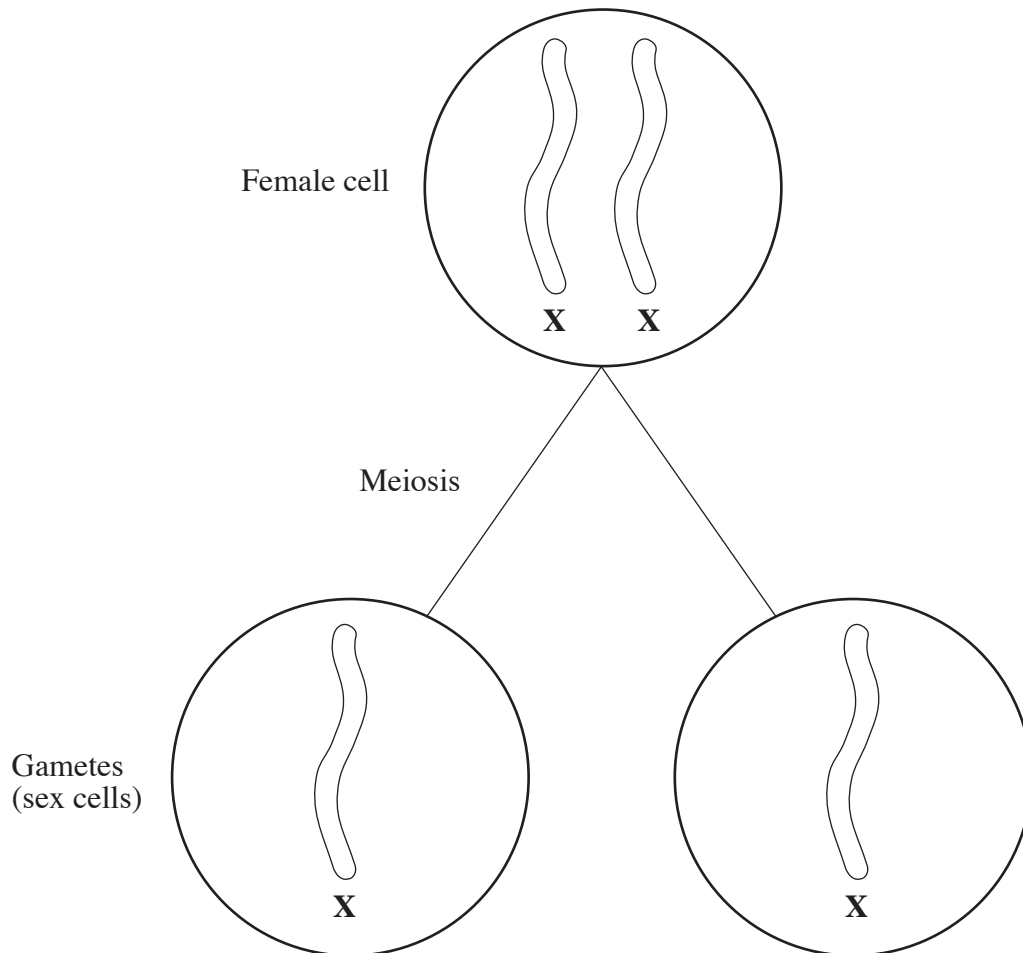
The number of marks is given in brackets at the end of each question or part-question.

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. The diagram below shows the sex chromosomes found in a cell in the ovary of a woman and the gametes (sex cells) produced.

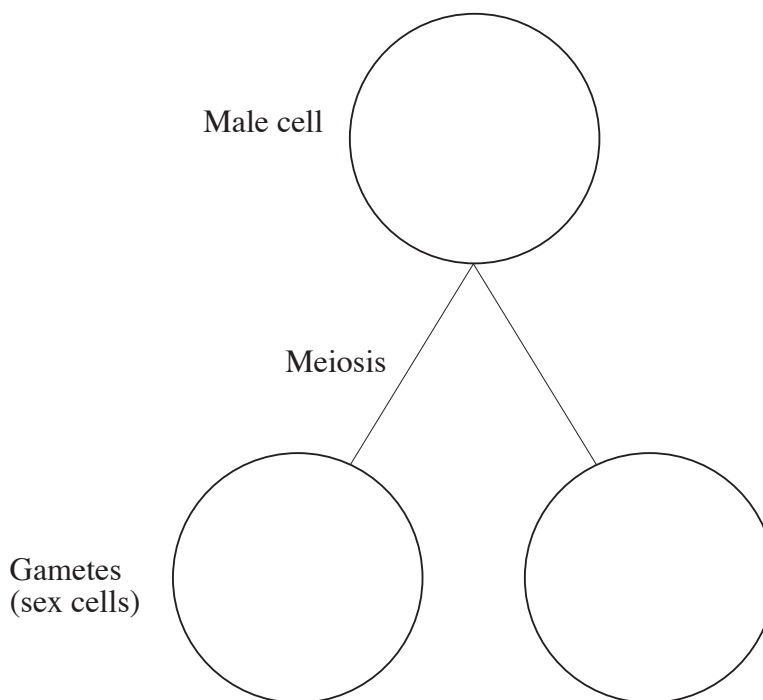


- (a) Name the gametes (sex cells) produced by the woman.

[1]

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- (b) (i) Complete the diagram below to show the **letters** which represent the sex chromosomes in the cell of a man and in the gametes (sex cells) he produces. [2]



- (ii) Name the gametes produced by the man. [1]

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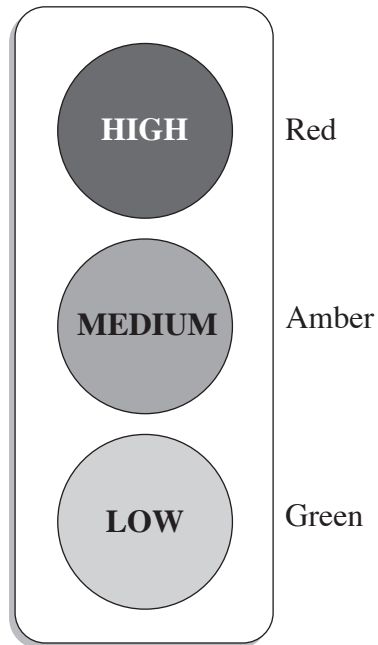
- (c) Complete the Punnett square below to show the letters which represent the sex chromosomes present in the children in the following cross. [2]

	Man	
	gametes	
Woman		

- (d) Give **one** difference between cell division by mitosis and meiosis. [1]

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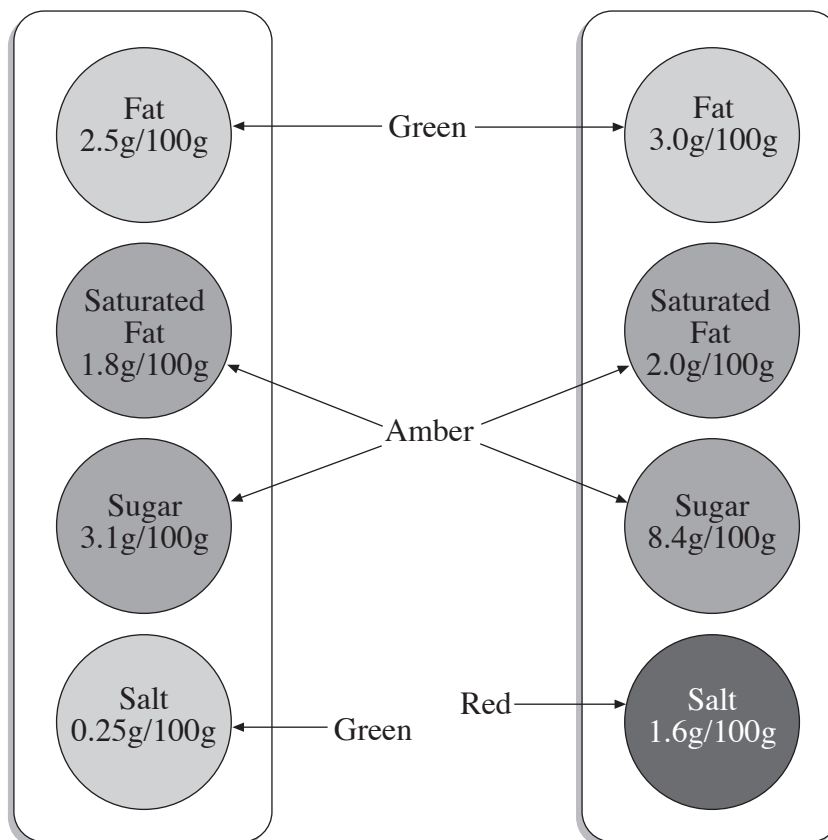
2. To help you make healthy food choices some supermarkets use ‘Traffic Light Labelling’ as shown below. Using traffic light colours you can quickly see if the food you are looking at has a high, medium or low amount of fat (especially saturated fat), added sugars and salt. You will also see the number of grams of each substance **per 100g** of the food.



- (a) You are in a supermarket looking at two similar ready meals trying to decide which to choose. You want to make the healthier choice.
The traffic light labels for each of the ready meals are shown on the next page.

Ready Meal A
(Mass of meal: 400g)

Ready Meal B
(Mass of meal: 400g)



Which of the two ready meals would you choose to buy to give you the healthier option?
Give **two** reasons for your answer. [2]

Meal

(i)

(ii)

- (b) The Guideline Daily Amount (GDA) of salt for men and women is 6 g per day. Calculate which of the ready meals gives you this amount if the mass of each ready meal is 400 g. Underline the food and show how you arrived at your answer. [2]

Ready meal A

Ready meal B

- (c) The table shows the nutrition label from a 450 g packet containing 6 teacakes.

NUTRITION		
Typical Values	Per Teacake	Per 100 g
Energy	876 kJ	1200 kJ
Protein	6.0 g	8.2 g
Carbohydrate of which sugars of which starch	39.2 g 15.0 g 24.2 g	53.7 g 20.5 g 33.2 g
Fat of which saturates of which monounsaturates of which polyunsaturates	2.9 g 0.5 g 1.2 g 1.0 g	4.0 g 0.7 g 1.7 g 1.4 g
Fibre	1.8 g	2.5 g
Salt of which sodium	0.5 g 0.2 g	0.8 g 0.3 g

- (i) How much unsaturated fat is there in 100 g of teacake?

[1]

..... g

- (ii) The table shows the GDAs of energy, protein, total sugars, fat, saturated fat and salt that average adults can have each day.

<i>GDA</i>	<i>Women</i>	<i>Men</i>
Energy	8250 kJ	10 500 kJ
Protein	45 g	55 g
Total sugars	90 g	120 g
Fat of which saturates	70 g 20 g	95 g 30 g
Salt	6.0 g	6.0 g

- I. How many teacakes would a woman need to eat to get the GDA of energy? [2]

Number of teacakes

- II. What happens to excess energy that is taken into the body? [1]

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- 3. Scientists have transferred human genes to the DNA of chickens. These genetically modified (GM) birds breed and industrial size flocks are produced, all members of which carry the human gene.

These GM chickens produce important human proteins in the whites of their eggs. The proteins are extracted from the eggs and may be used to produce medicines for the treatment of many human diseases.

The National Health Service (NHS) hopes that this technology will help to reduce its annual bill for medicines which was £8 billion in 2006.

- (a) State **two** possible advantages of producing these GM chickens. [2]

- (i)

- (ii)

- (b) There are many concerns about producing GM animals and plants. Suggest **one** reason why people are concerned. [1]

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- (c) Give the name of a GM crop plant. State what the genetic modification is and the advantage to the farmer of growing the GM crop. [3]

- (i) Name of GM crop plant

- (ii) Genetic modification

- (iii) Advantage to the farmer

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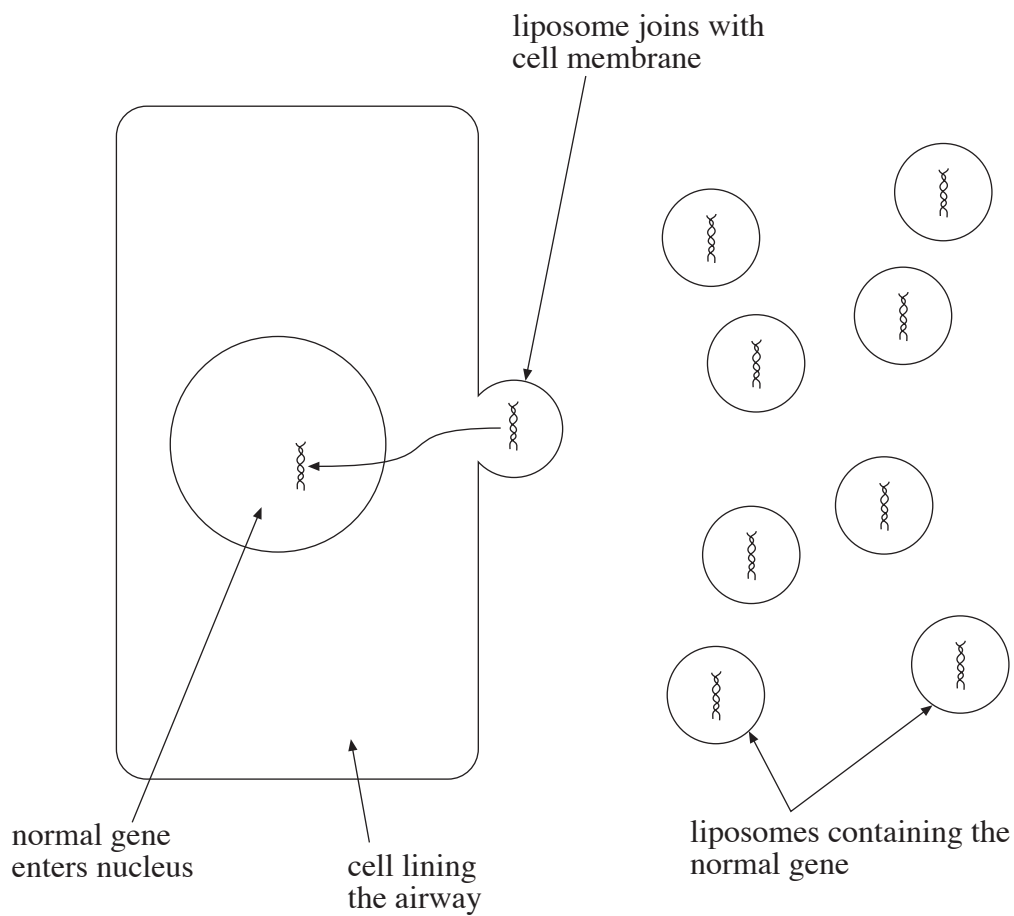
4. (a) Cystic fibrosis is an inherited disease that affects about 10 000 people in Britain. State the cause of cystic fibrosis. [1]

- (b) British researchers are to carry out large scale trials of a new gene therapy for cystic fibrosis.

The treatment involves inhaling a fine spray into the airways of the lungs. Within the spray are tiny bubbles called liposomes which contain the normal gene.

The liposomes join with the cell membranes of the cells lining the airways of the lungs and the normal gene passes into the nucleus.

The diagram below shows the process.



- (i) In early use of gene therapy for treating cystic fibrosis it was very difficult to get the normal gene into the cells lining the lungs. How does this new method overcome this problem? [2]

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- (ii) This large scale trial follows smaller trials on animals. Suggest **one** reason why organisations such as animal rights groups oppose the use of animals for such purposes. [1]

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5. The flow chart shows some of the effects of drinking alcohol.



How does the flow chart give evidence for the following.

(a) It is dangerous to drive a car after drinking alcohol. [1]

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(b) Alcohol prevents the proper control of heat loss from the body. [1]

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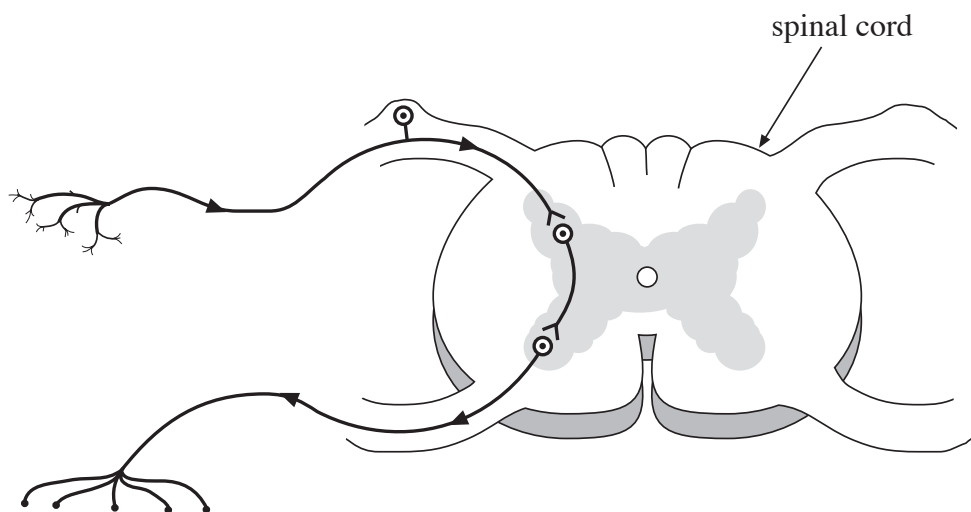
(c) Alcohol quickly affects people who drink without having eaten a meal. [1]

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(d) Alcohol directly affects people's ability to think clearly. [1]

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6. The diagram below shows a reflex arc.



(a) On the diagram, label

- (i) the sensory nerve cell;
- (ii) the connecting nerve cell;
- (iii) a synapse;
- (iv) the receptor.

[4]

(b) In some diseases the motor nerve cells are damaged.
Explain how this would affect reflex actions.

[1]

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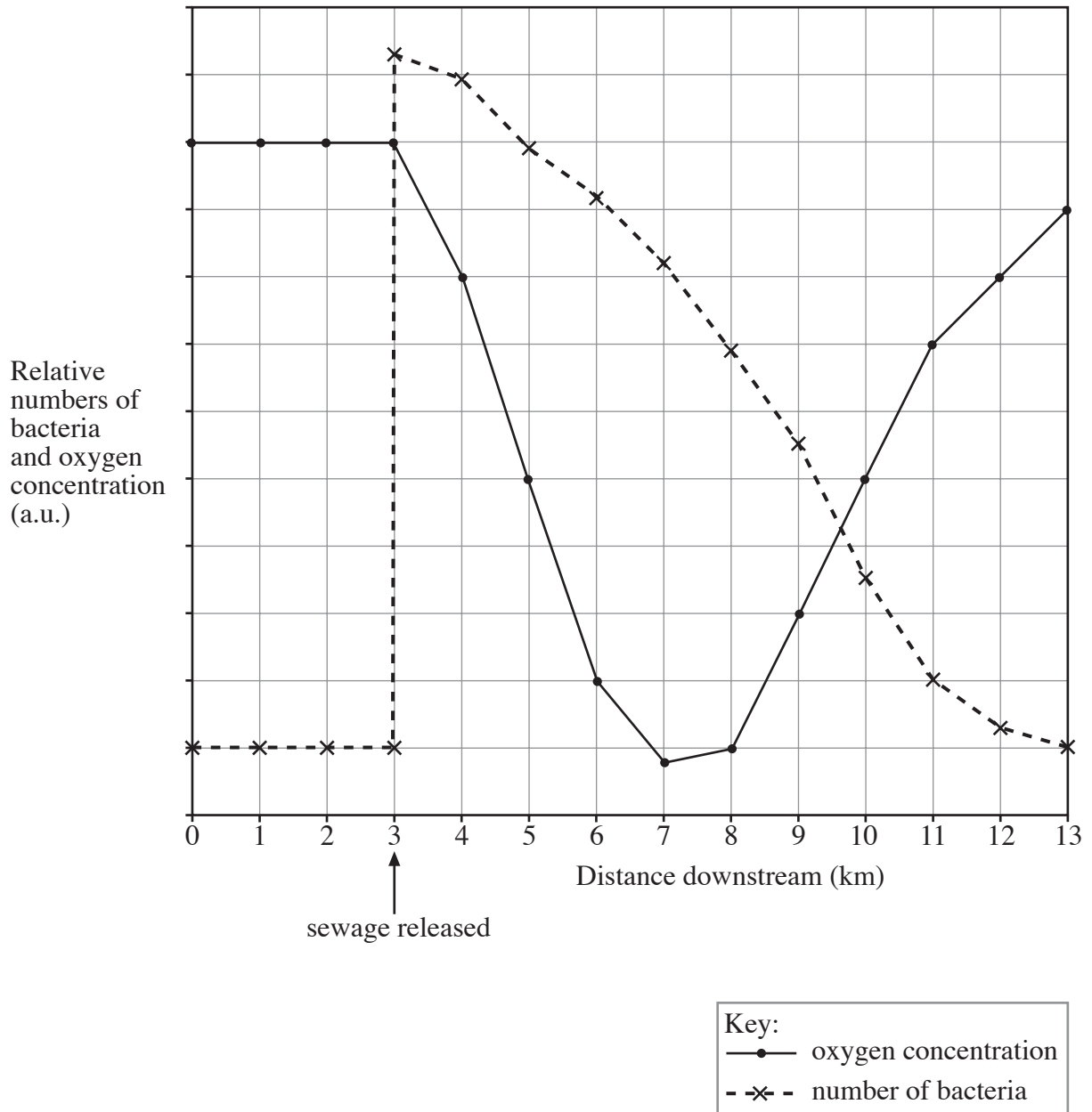
(c) When nerve impulses travel along nerves, chemical energy is changed into another form of energy. Name this form of energy.

[1]

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7. The graph below shows the oxygen content and the number of bacteria in a river before and after the point where sewage was released.



(a) (i) Describe what happens to the oxygen content the further downstream you travel from the point of sewage release. [1]

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(ii) Explain the decrease in the number of bacteria downstream from the sewage release. [1]

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(iii) At what distance downstream would you expect the smallest number of species to be present, other than bacteria?

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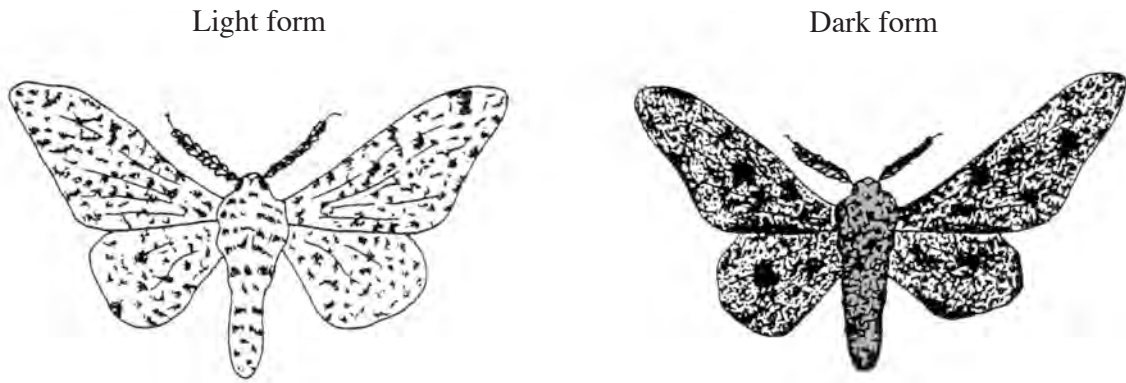
Explain your answer. [1]

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(b) What word is used to describe a species whose presence at a point in the river gives information about pollution? [1]

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8. The peppered moth exists as a light form and as a mutant dark form.



(a) What is meant by the term, mutation?

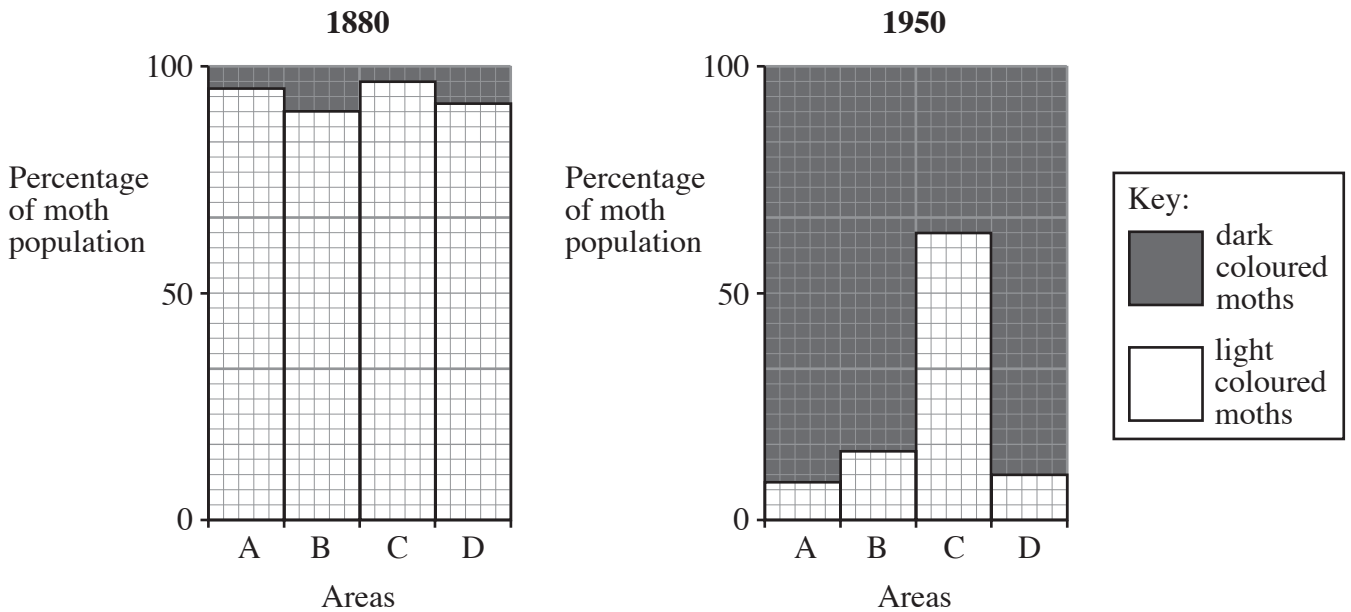
[1]

(b) Peppered moths can be eaten by birds.

In areas affected by air pollution, the surfaces on which moths land are covered by dark, sooty deposits.

The industrial revolution took place in the 1880s and was the cause of very high levels of air pollution by soot.

The graphs show the percentages of dark and light forms of moth in the same four areas of Britain A, B, C and D in 1880 and 1950.



- (i) Which area was least affected by air pollution? [1]

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- (ii) Using your knowledge and the information in the graphs, explain how peppered moths have been affected by natural selection. [5]

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(c) Since the Clean Air Act of 1956, industrial areas have become much less polluted.

- (i) State and explain the expected effect on the number of light coloured moths surviving in areas A, B, C and D. [2]

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- (ii) Suggest why it might be an advantage to the species for dark mutants to occur even in a non-polluted environment. [1]

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