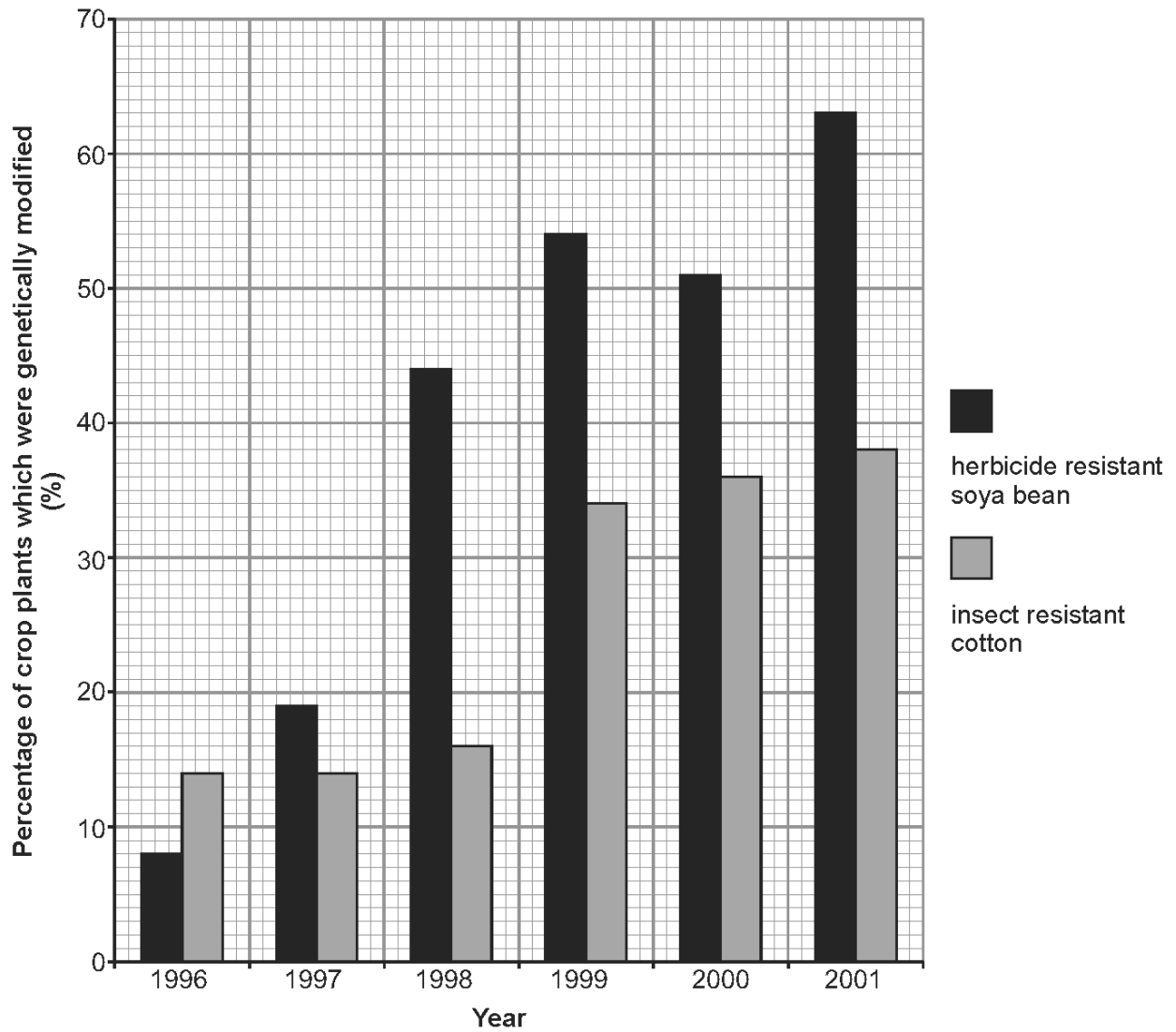


WJEC (Eduqas) Biology GCSE
Topic 7.4 Selective Breeding and
Gene Technology
Questions by Topic

1.

Soya bean and cotton are crop plants grown in the USA. The bar chart shows the percentage of these crops grown between 1996 and 2001 which were genetically modified (GM).



(a) What does the general trend shown in the bar chart suggest about the attitude towards planting GM crops between 1996 and 2001 in the United States? [1]

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(b) Describe how soya bean plants could be made resistant to herbicide using GM crop technology. [2]

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(c) The effect of insects on the yield of cotton has been investigated for GM insect resistant cotton plants and for non-GM cotton plants. The results are shown in the table:

	GM insect resistant cotton plants	non-GM cotton plants
mean number of insecticide sprays per month needed to control leaf eating insects	0.6	3.7
mean number of insecticide sprays per month needed to control sap sucking insects	3.6	3.5
yield (kg per hectare)	1500.0	800.0

State three conclusions that can be drawn from the data in the table. [3]

I.

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II.

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III.

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2.

The photograph below shows crops being sprayed with herbicides.



(a) Explain how herbicides increase crop yield. [2]

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(b) Plants can be genetically modified (GM) to make them resistant to herbicides.

(i) The statements below show how this genetic modification takes place, but they are not in the correct order.

- 1 insert the gene into the seeds of the crop plant
- 2 grow many different types of plants
- 3 find and cut out the gene for resistance from the surviving plants
- 4 spray the plants with herbicide
- 5 collect the surviving plants
- 6 trial for many years to test the safety of the method

Complete the sequence below to show the statements (1-6) in the correct order. One has been done for you.

..... → → 5 → → → [4]

The table below gives some arguments for and against growing GM plants which are resistant to herbicide.

- (ii) Place a tick (✓) next to each argument for **or** a cross (✗) next to each argument against growing GM crop plants. Two have been done for you. [1]

argument	✓ or ✗
increased crop yield	✓
less herbicide used	✓
reduced biodiversity	
cheaper food	
long term effects unknown	



Soya bean plant

- (iii) GM herbicide resistant soya has been grown in Argentina for many years. Seeds from the GM soya have spread widely and the plant is now a serious pest growing in fields of crops such as maize. Farmers now have to use increased concentrations of herbicide to try to kill the pest soya.

From the information above, suggest reasons why the price of maize is likely to rise. [2]

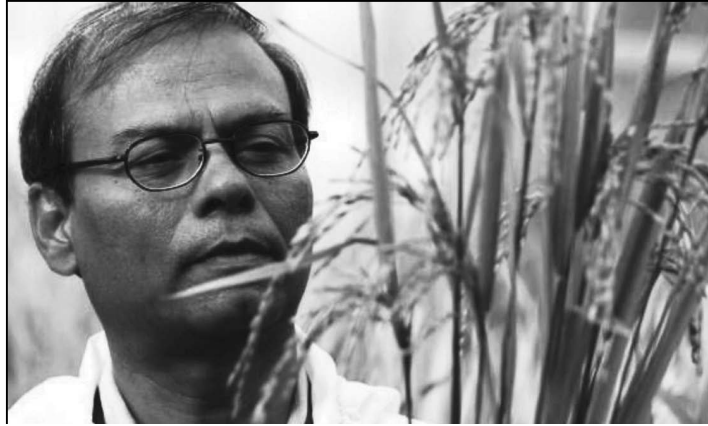
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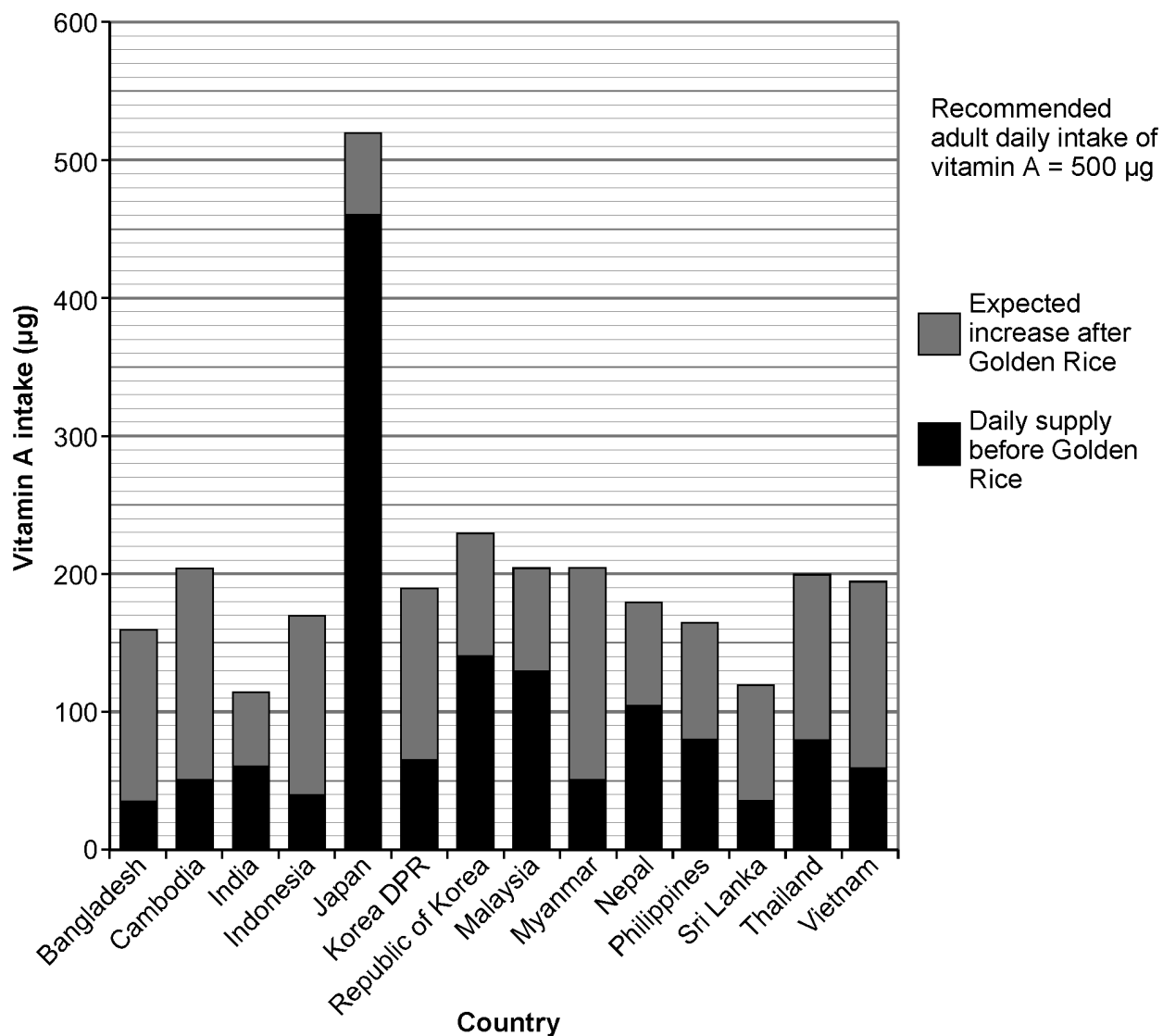
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3. Vitamin A deficiency occurs when humans do not obtain enough of this vitamin from their food. It is very common in developing countries. It can result in blindness and between 250 000 and 500 000 children in these countries go blind each year from vitamin A deficiency. Approximately half of these children die within one year of becoming blind.

Golden Rice is a genetically modified (GM) crop plant which contains high levels of vitamin A. It was developed to help prevent vitamin A deficiency and has been grown in field trials in the Philippines, Taiwan and other countries.



- (b) The graph below shows the mass of additional vitamin A which could be obtained each day if the countries indicated were to replace the rice varieties they grow with Golden Rice.



- (i) In which of the countries in the graph would the people have sufficient vitamin A each day if they grew Golden Rice? [1]

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- (ii) In how many of the countries shown could the people increase the intake of vitamin A per day by 50% or more, if they grew Golden Rice? [1]

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- (iii) Since the data for the graph were obtained, a new variety of golden rice, Golden Rice 2, has been developed. The table below shows the potential benefits of Golden Rice 2 in Bangladesh.

	Adults	Children under 7 years of age
Recommended daily intake of vitamin A (μg)	500	450
Vitamin A provided by Golden Rice 2 (μg)	775	338
Vitamin A provided by other food eaten (μg)	245	112

Explain the effect of a diet containing Golden Rice 2 on the number of cases of blindness caused by vitamin A deficiency in Bangladesh. [2]

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- (c) In August 2013 a crop of Golden Rice that was being grown in a field trial was destroyed by protesters in the Philippines. The protesters said they had many concerns about the growth of GM crops.

Suggest what **two** of these concerns might have been. [2]

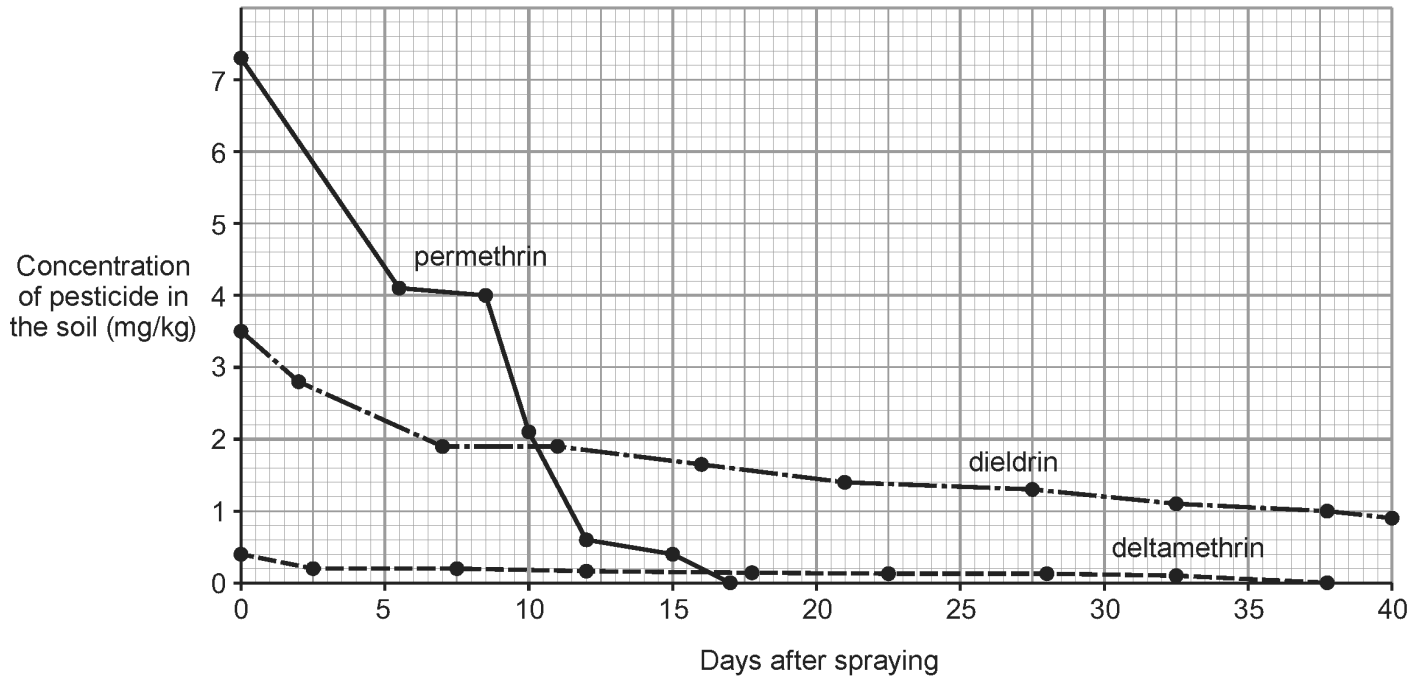
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4.

The graph shows the results of a field trial in which three different pesticides, dieldrin, permethrin, and deltamethrin were sprayed on different parts of a field of wheat. The concentration of the pesticides remaining in the soil of the wheat field was measured at intervals over the next 40 days after spraying. Some pesticides can be broken down by sunlight to harmless chemicals and can also be dispersed by wind and water.



- (a) Use the data in the graph to state which of the three pesticides is likely to accumulate in food chains. Give a reason for your answer. [1]

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- (b) In the 1990s it was discovered that some insects had undergone a gene mutation. As a result, the insects were resistant to several pesticides because they made a protein (an enzyme) that broke the pesticide down to harmless chemicals. Scientists have recently transferred the mutated gene from the insects to bacteria that live in soil.

- (i) Explain how the mutated gene is transferred from the insect to the bacterium. [2]

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