AP® BIOLOGY
2014 SCORING GUIDELINES

Question 5

Genetically modified crops have been developed that produce a protein that makes the plants resistant to insect pests. Other genetic modifications make the crops more resistant to chemicals that kill plants (herbicides).

(a) **Describe** TWO potential biological risks of large-scale cultivation and use of such genetically modified plants. (**2 points maximum**)

(b) For each of the risks you described in part (a), **propose** a practical approach for reducing the risk. (**2 points maximum**; LO 4.21, 2.23)

Description of risk (**1 point each; 2 points maximum**)	Proposed mitigation* + (**1 point each box; 2 points maximum**)
Unknown human/other animal health risk due to consuming GM proteins	• Testing/labeling product packaging • Isolate animals from crops
Disruption within food chain	• Intersperse GM plants with non-GM plants in culture • Provide alternative food source
Developed resistance in pest species	• Increased use of effective pesticides • Introduce pest predators • Further engineer the GMO to produce more resistance protein • Rotate GM and non-GM crops
Spread of genetic modifications to non-GM plants	• Contain pollen of GM plants • Disable the ability of GM plants to produce viable seeds
GM plants out-compete native species	• Contain/isolate GM plants • Disable GM plants' ability to produce viable seeds
Reduced numbers of pollinators	Contain/isolate GM plants
Loss of biodiversity	Intersperse GM plants with non-GM plants in culture
Use of herbicides harms non-target species	• Rotate GM and non-GM crops • Use organic/alternative herbicides
Invasive disease wiping out the monoculture	Intersperse GM plants with non-GM plants in culture

* Proposed mitigation of non-use of GM plants is acceptable for any described risk above.

+Mitigation must be practical for the risk given.

5A1

5A1

5. Genetically modified crops have been developed that produce a protein that makes the plants resistant to insect pests. Other genetic modifications make the crops more resistant to chemicals that kill plants (herbicides).

(a) **Describe** TWO potential biological risks of large-scale cultivation and use of such genetically modified plants.

(b) For each of the risks you described in part (a), **propose** a practical approach for reducing the risk.

PAGE FOR ANSWERING QUESTION 5

a.) One potential risk of cultivating genetically-modified crops is that the proteins produced to resist herbicides and pests may be harmful to humans. Another risk is that pesticides produced by the plants may destroy local insect populations, which may result in catastrophic imbalances in the local ecosystems.

b.) To reduce the risk of harming humans, research could be done to understand the effects and properties of the proteins and to ensure that the proteins are safe for human consumption. To protect the ecosystem, safe crops could be planted in the area as well in order to provide food for the insects in order to ensure their survival.

5B

5. Genetically modified crops have been developed that produce a protein that makes the plants resistant to insect pests. Other genetic modifications make the crops more resistant to chemicals that kill plants (herbicides).

   (a) **Describe** TWO potential biological risks of large-scale cultivation and use of such genetically modified plants.

   (b) For each of the risks you described in part (a), **propose** a practical approach for reducing the risk.

PAGE FOR ANSWERING QUESTION 5

One potential biological risk of the use of the genetically modified plants is the long-term effects they may have on the people consuming them. The protein that makes the plant the plant resistant may cause some damage to some bodily functions.

Another pitential risk is how the organisms inhabiting the areas of these genetically modified crops will be without food. This can interrupt the continuation of the ecosystems food chain as a species may no longer exist in that habitat.

If there is a possibility of damage to bodily function due to the genetically modified crops then it would be best to run tests to see the affects they can have on the consumers. This allows the risk of interuption of homeostasis to be reduced. To avoid the risk of killing organisms in and around the crops it is best to find natural chemicals to resist insects rather chemicals that can harm them.

5C

5. Genetically modified crops have been developed that produce a protein that makes the plants resistant to insect pests. Other genetic modifications make the crops more resistant to chemicals that kill plants (herbicides).

   (a) **Describe** TWO potential biological risks of large-scale cultivation and use of such genetically modified plants.

   (b) For each of the risks you described in part (a), **propose** a practical approach for reducing the risk.

PAGE FOR ANSWERING QUESTION 5

a) These crops may not be healthy for human consumption. This new protein made by the plants could have harmful effects on humans

b) To reduce the risk of harmful effects on humans, the crops need to be carefully regulated by the FDA. They should be tested for any possible negative effects on humans before being sold.

AP® BIOLOGY
2014 SCORING COMMENTARY

Question 5

Question 5 was written to the following Learning Objectives in the AP Biology Curriculum Framework: 2.23, 4.21

Overview

Question 5 focuses on the impact of humans on the stability of populations, communities, and ecosystems. Students were asked to describe two potential biological risks to the ecosystem due to the large-scale cultivation and use of genetically modified crops by humans. Students were then asked to provide a proposed mitigation to reduce the effects of genetically modified crops on the ecosystem for each of the proposed risks.

Sample: 5A
Score: 4

The response in Sample 5A earned 1 point in part (a) for describing that genetically modified plants can cause harm to humans. The response also earned 1 point in part (a) for describing that the cultivation of genetically modified plants can disrupt the food chain.

The response earned 1 point in part (b) for proposing that adequate testing can reduce the risk of harm to humans. The response also earned 1 point in part (b) for proposing that providing a safe food source for consumers would reduce the impact on the food chain.

Sample: 5B
Score: 3

The response in Sample 5B earned 1 point in part (a) for describing that genetically modified plants can cause harm to humans. The response also earned 1 point in part (a) for describing that genetically modified plants can disrupt the food chain.

The response earned 1 point in part (b) for proposing that adequate testing can reduce the risk of harm to humans.

Sample: 5C
Score: 2

The response in Sample 5C earned 1 point in part (a) for describing that consumption of genetically modified plants can cause harm.

The response earned 1 point in part (b) for proposing that adequate testing can reduce the risk of harm to humans.