ANSWER KEY.

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Genetic Engineering

Biology | ANSWER KEY

Show your work in the blank space. Use complete sentences where asked.

1. Name the tool that does each job in making a recombinant plasmid.

Job	Tool
Cuts the plasmid and the gene at specific sequences	
Joins the cut pieces of DNA together	
Carries the gene into a bacterium	

Restriction enzyme. DNA ligase. Plasmid (a vector).

2. A plasmid vector is 2,700 bp. A gene of 900 bp is inserted.

(a) What is the size of the recombinant plasmid?

(b) After transformation, 120 colonies grow on a plate from 0.04 micrograms (ug) of DNA. How many colonies per microgram is this?

(a) 2,700 + 900 = **3,600 bp**.

(b) 120 colonies / 0.04 ug = **3,000 colonies per ug**.

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3. Sample data (made up for practice): a farmer compares two fields. In a field with a non-engineered crop, the farmer sprays 6 times per season and harvests 100 units. In a field with a Bt crop, the farmer sprays 2 times and harvests 108 units.

(a) How many fewer sprays does the Bt crop field need?

(b) Write a claim, evidence, reasoning statement about the Bt crop. Also state one thing these data do not show.

(a) 4 fewer sprays (6 - 2).

(b) Claim: in this sample, the Bt crop needed fewer sprays and gave a slightly larger harvest. **Evidence:** 2 sprays versus 6, and 108 units versus 100. **Reasoning:** the Bt protein protects the plants from some insect pests, so less spraying is needed. **Not shown:** effects on other organisms, whether pests will become resistant over time, or costs.

A correct answer includes: both numbers, a link between the Bt protein and the pests, and one limit of the data.

4. Decide whether each statement is evidence or a value judgment.

(a) "The sample data show 2 sprays on the Bt field and 6 on the other field."

(b) "Farmers ought to choose Bt crops."

(a) Evidence (a measurement that can be checked). **(b) Value judgment** (what people think ought to be done, which depends on how they weigh benefits, risks, and other values).

5. Choose one use of genetic engineering from the lesson (insulin, Bt corn, or gene therapy for sickle cell disease). Write a claim about whether its benefits outweigh its risks, with one benefit, one risk, and the view of one person or group affected. Different claims can be well supported.

A correct answer includes: a clear claim; one benefit and one risk that are accurate; one stakeholder view; and reasoning that explains how the benefit and risk led to the claim. Either side can earn full credit.

Sample A: Bt corn's benefits outweigh its risks if refuges are planted. It reduces spraying, and refuges slow resistance (sample data: 11% vs 81% resistant after 6 years). A farmer would value the lower costs.

Sample B: The risks of Bt corn are not yet outweighed by its benefits. Pests have evolved resistance in some places, and effects on other insects are still being studied. An environmental scientist would want more study first.

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