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| ANSWER KEY | Chapter 18 Test Answer Key | BLM 18.5.1A |
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Answers to **Multiple Choice** Questions

1. a
2. c
3. d
4. c
5. b
6. d
7. c
8. c
9. b
10. a
11. d
12. a
13. c
14. b
15. a
16. c
17. b
18. d
19. a
20. d
21. b
22. b
23. c
24. a
25. d
26. b
27. c
28. d
29. a
30. b

Answers to **Numerical Response** Questions

1. 15, 35, 35, 15
2. 5, 2, 3, 1, 4
3. 3, 4, 1, 2
4. 4, 3, 2, 1

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Sample Answers to **Written Response** Questions

1. a) The vector is the Ti (tumour-inducing) plasmid of the plant bacterium *Agrobacterium tumefaciens*, (1 mark)
- b) The plants that are successfully infected by this vector are broadleaf plants such as tomato or soybean. (1 mark)
- c)
- DNA Cleavage: A restriction endonuclease is used to cleave the source DNA into fragments. A different set of fragments will be obtained by employing endonucleases that recognize different sequences.
 - Production of Recombinant DNA: The fragments of DNA are inserted into plasmids or viral vectors that have been cleaved with the same restriction endonuclease as the source DNA.
 - Cloning: The plasmids or viruses serve as vectors that can introduce the DNA fragments into cells (usually bacteria). As each cell reproduces, it forms a clone of cells that all contain the fragment-bearing vector.
 - Screening: The clones containing a specific DNA fragment of interest, often a fragment that includes a particular gene, are identified from the clone library. (4 marks)
- d) The following are possible answers: (6 marks)
- Herbicide resistance: This technology would be a benefit to farmers because a crop resistant to herbicides would never have to be weeded if the field were simply sprayed with the herbicide.
 - Nitrogen Fixation: Plants that produce their own nitrogen would reduce the cost of producing the crop because the farmer would not have to apply nitrogen fertilizers.
 - Insect Resistance: Plants that resist attacks by insect pests would increase the yield of food crops, making more food available, and would reduce the need for pesticides.
 - Frost Resistance: Plants that are modified to withstand frost will increase the growing season in some regions of the world and will protect crops if there is an early frost.
 - Nutritional Improvements: Increasing the source of nutrients (proteins, vitamins, minerals) in plants would improve the diets of people—especially in countries where chronic food shortages are common.

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- e) There are a number of potential risks, the following are examples of possible answers: (6 marks)

Environmental Threats:

- The use of herbicide-resistant plants could encourage farmers to use higher levels of herbicides. This, in turn, could lead to a build-up of herbicide chemicals in water supplies and neighbouring ecosystems.
- As well, there is evidence that engineered genes can be transferred to wild plants and other organisms, raising concerns about the emergence of “superweeds” and “superbugs.”
- The introduction of transgenic bacteria, plants, or animals could upset the ecological balance of these organisms, with unknown results.

Health Effects:

- Many consumer groups argue that not enough is known about the long-term effects of consuming transgenic products, including genetically modified foods and medicines.
- The complex processes of gene regulation are not well understood, so it is difficult to predict potential health risks.

Social and Economic Issues:

- Advocates of genetically modified foods argue that these foods will help to improve human health and alleviate world hunger. Their opponents argue that genetic research absorbs millions of dollars, which would be better spent directly helping people in need.
- Many people are concerned about the growing influence of private corporations over global food production. The treatment of plants as commodities to be manipulated and patented also raises questions about our relationships with—and responsibilities to—other living organisms.

2. The following are potential answers that are based on research that students might have completed during this chapter. Accept other reasonable answers: (10 marks)

Potential Benefits:

- The map of the human genome provides information that will allow scientists/doctors to diagnose, and eventually treat, many diseases.
- This map will also enable scientists to determine the genetic basis of numerous physical and psychological traits, which raises the possibility of altering those traits through genetic intervention.
- Germline interventions would be a more efficient method for treating disease, since a single intervention would render both the patient and his or her progeny disease-free, thus removing the need for repeated somatic cell treatments across future generations.

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- Knowing the human genome will make it easier to produce medicines that affect pathogens or cancer cells, but that do not damage healthy body cells. In addition, in the future it is hoped medicines could be tailor-made to suit each of us as individuals.
- It will be possible to produce a full DNA profile of every new-born baby, with the information stored on computer ready to be called up when needed. Such ideas have many potential benefits, including personally targeted medicines and lifestyle planning to avoid the risk of disease.

Social Issues:

- Some people feel that the huge amounts of money being spent on the project could be used to improve the human condition in more effective ways.
- Genetic information can be misused; for example, through genetic discrimination by employers or insurance companies.
- Some critics suggest that the ability to diagnose a genetic disorder before any treatment is available does more harm than good, because it creates anxiety and frustration.
- The ethical, legal, and social issues need to be considered urgently because the project is proceeding more rapidly than expected, and genetic information may be available before appropriate guidelines are in place.

Other questions that students might raise include:

- Does an employer have a right to genetic information about an employee?
- Does an individual have a right to terminate the life of a human embryo or fetus?
- Can people be tested for a particular genetic disorder without their knowledge or against their will?
- Does a person have an obligation not to pass on disease-causing genes to his or her child?
- Am I obliged to share genetic information about myself with others—for example, my spouse, colleagues, the local blood bank, judge, insurance agent?

The following is a scoring guide that you might want to use to assess student answers for question 2.

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| Score | Scoring Criteria |
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| | The student ... |
| 10 Excellent | <ul style="list-style-type: none"> • clearly identifies four benefits of the Human Genome Project • clearly discusses the benefits of each point made • clearly identifies two social issues • clearly describes the implications of the two social issues |
| 8 Proficient | <ul style="list-style-type: none"> • identifies four benefits of the Human Genome Project • discusses the benefits of each point made • identifies two social issues • describes the implications of the two social issues |
| 6 Satisfactory | <ul style="list-style-type: none"> • identifies three benefits of the Human Genome Project • discusses the benefits of each point made • identifies one social issue • describes the implications of the social issue |
| 4 Limited | <ul style="list-style-type: none"> • identifies one or two benefits of the Human Genome Project • discusses the benefits of each point made • identifies one social issue • does not describe the implications of the social issue |
| 1 Poor | <ul style="list-style-type: none"> • addresses one of the two scoring bullets at the 4 (limited) level |