

BIO/DNA TECHNOLOGY REVIEW

1. In making recombinant DNA, what is the role of:

Molecule	What does it do?
Plasmid	
Restriction Enzyme	
Sticky Ends	
DNA ligase	

2. Using the vocabulary above, be able to describe HOW recombinant DNA is made.

3. Explain how the universality of genetic code is central to the gene transfer process.

4. Give examples of 3 Genetically Modified Organisms (GMOs) and list the advantages/concerns about them.

	Advantages	Concerns
Golden Rice		
Bt Corn or other pest resistant plants		
Salt Tolerance in Tomato plants		

Sheep with Blood Clotting Factors		
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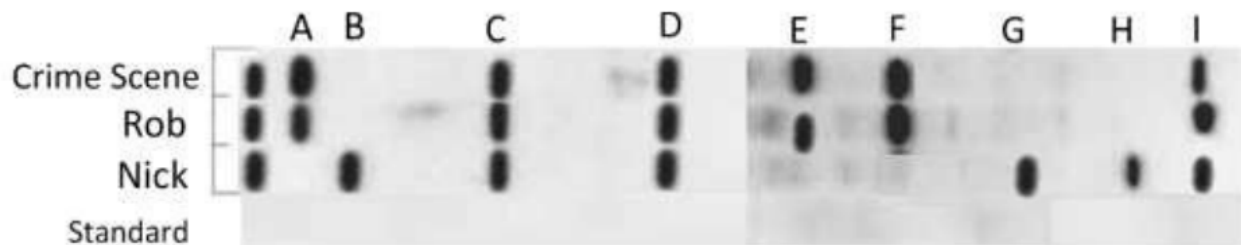
5. State the roles of of following parts of Gel Electrophoresis.

Restriction Enzymes	
Electrical Current	

6. How does the SIZE of DNA fragments affect their positioning when separated by gel electrophoresis?

7. State 2 reasons for DNA Profiling.

8. Using the profile below, answer the following questions. In this case, a DNA sample was taken from cigarette found at a crime scene (smoking in a non-smoking zone).



- State the process to amplify the small amounts of DNA collected at the crime scene to an amount big enough to be used in a DNA profile.
- Deduce which criminal, Rob or Nick, left their dribbly cigarette-end at the crime scene. Explain how you arrived at this.
- Explain why one might say that Rob and Nick are related.

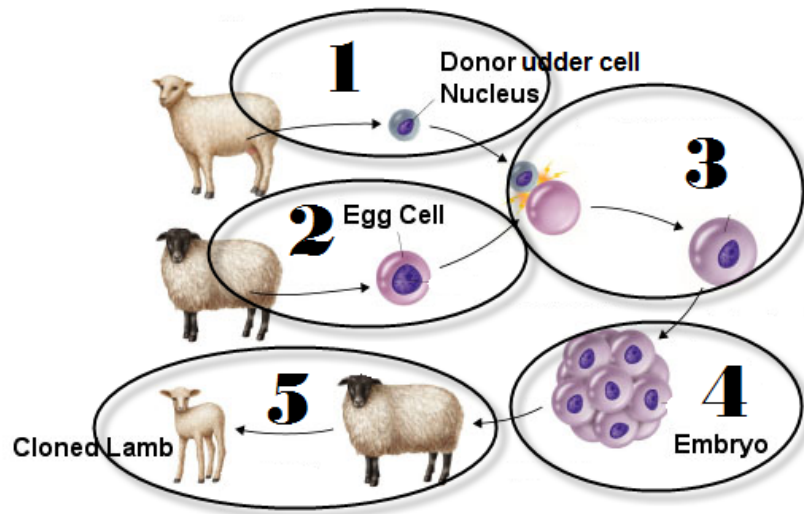
9. What was the GOAL of the Human Genome Project (HGP)?

10. What are some good things that came out of the human genome project?

11. Define clone/cloning.

12. Dolly the Sheep was the first main-stream clone of another animal, using differentiated nucleus.

a. Use the numbers in the diagram below to outline the method used to clone Dolly.



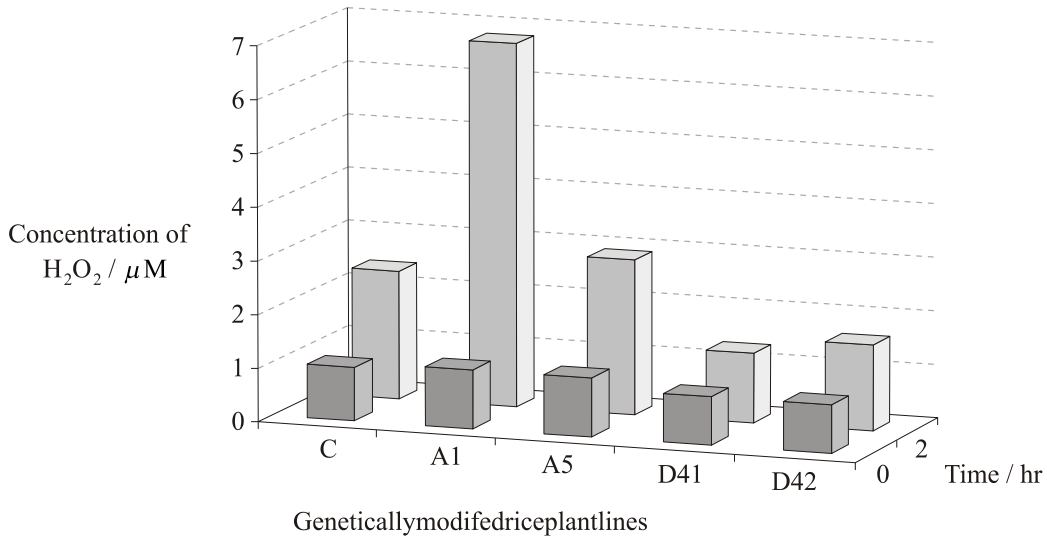
13. Define Therapeutic cloning.

14. Discuss the ethical concerns of therapeutic cloning OR cloning a WHOLE human.

Advantages	
Disadvantages	

15. Plants have developed defence mechanisms against pathogens such as bacteria, fungi, and viruses. Chemicals released by these pathogens can trigger a defence response in infected plant cells. For example, the production of hydrogen peroxide (H_2O_2) which reacts with pathogen membranes and cellular chemicals, eventually kills both the cell and the pathogen.

The OSRac1 gene was isolated and introduced into a number of rice plant (*Oryza spp.*) lines to study its role in disease resistance of plants to Blast fungus. Experiments were carried out to see if the OSRac1 gene was part of the signalling pathway for hydrogen peroxide production. A control and four other genetically modified rice plant lines were exposed to chemicals known to initiate a defence response and the production of hydrogen peroxide. The results are shown in the graph below.



Key: C: control

A1 and A5: rice plants with the OSRac1 gene always turned on

D41 and D42: rice plants with the OSRac1 gene suppressed

- (a) Identify the concentration of H_2O_2 at time 0 for the control plants.

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(1)

- (b) Compare the change in H_2O_2 production in the control and genetically modified plants two hours after the chemical was applied.

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(3)

- (c) Evaluate whether the data supports the hypothesis that OSRac1 gene is involved in disease resistance.

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(1)

(d) Suggest **one** possible concern about the use of transgenic plants with the disease resistant gene.

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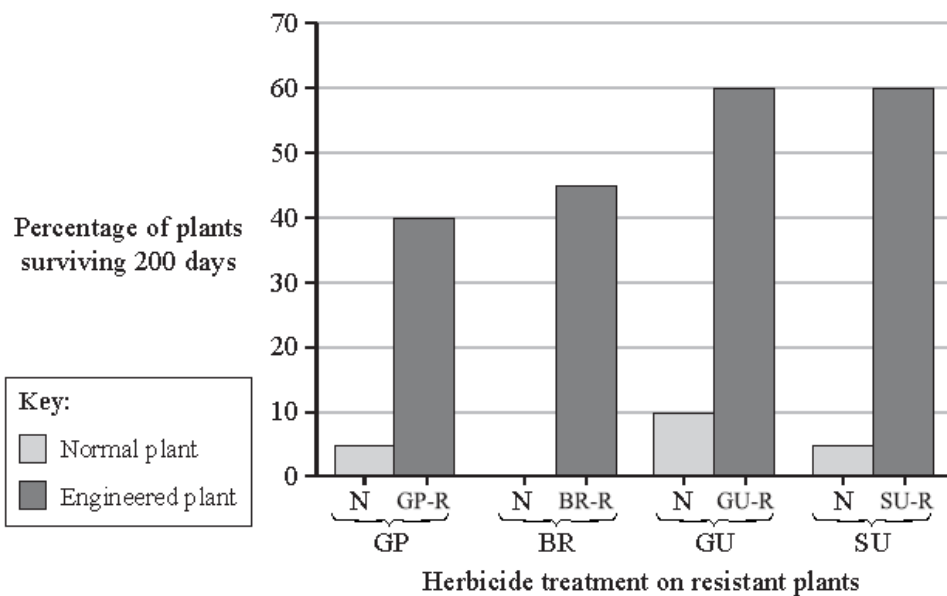
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(1)
(Total 6 marks)

16. Weeds growing with crop plants can reduce yields because they compete for nutrients, water and sunlight. Synthetic chemical herbicides are often used to control these weeds. Herbicides are classified by the kinds of plants they kill and their mechanism of action. Broad-spectrum herbicides kill many different kinds of plants, but often kill the crop plant as well. Genetic engineering can create resistance to specific broad-spectrum herbicides which may solve the problem in crop plants.

Different genes from bacterial sources known to protect against the effects of individual herbicides were engineered into corn plants (*Zea mays*). The resistance of normal and genetically engineered corn plants was measured and compared by calculating the percentage of plants that survived for 200 days with regular herbicide treatments.

Graph 1 Exposure of Normal and Resistant Plants to Different Herbicides



	<i>Herbicide</i>	<i>Resistant Genes</i>
GP	Glyphosate	GP-R
BR	Bromozymil	BR-R
GU	Glufosinate	GU-R
SU	Sulfonylurea	SU-R

(a) (i) Calculate the difference between the survival of engineered plants and normal plants treated with Glyphosate (GP).

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(1)

(ii) Identify the engineered plant which shows the greatest difference in resistance to herbicide treatment.

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(1)

(iii) Suggest a reason for the difference in survival of the normal plants treated with Glyphosate (GP) and Bromozymil (BR).

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(1)

(b) (i) Define the term *genetically modified crop*.

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(1)

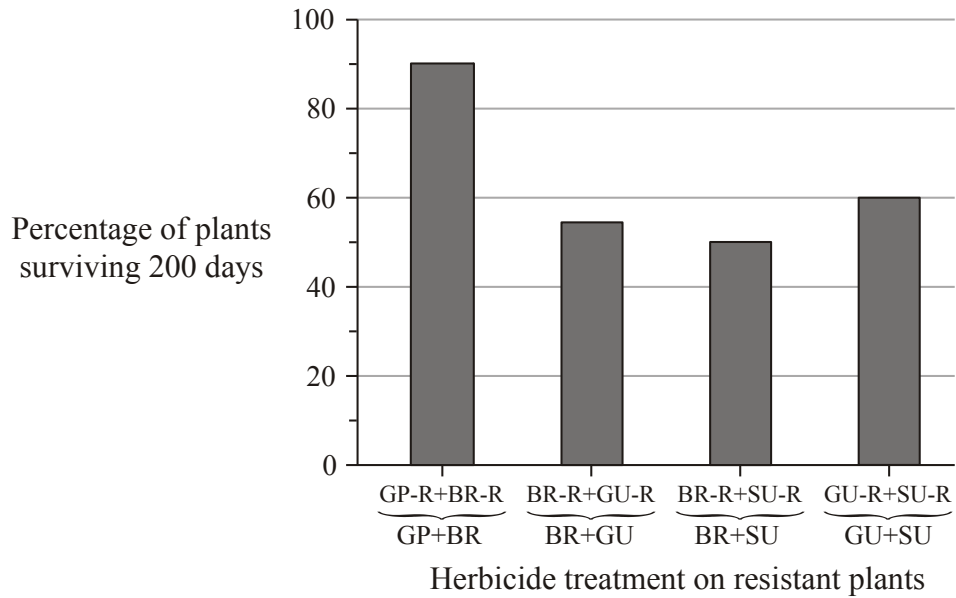
(ii) State an example of a genetically modified plant other than corn.

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(1)

The graph below represents data from experiments in which plants were genetically engineered with more than one resistance gene.

Graph 2 Exposure of resistant plants to combinations of herbicides



(c) (i) Using **both** graphs, compare the data for BR-R with the data for SU-R, and for BR-R + SU-R in the same plant.

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(2)

(ii) Suggest a possible reason for these results.

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(1)

(d) Evaluate the effects on survival when combining two herbicide resistance genes in the same plant.

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(3)
(Total 11 marks)