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|  | P:\Logos\Perkins logos\Harry Perkins logos all formats\Logos jpeg\PI_L_COL.pngP:\Logos\BioDiscovery\BioDiscovery Logo Col Pos.jpg**Validation Test: Techniques in Biotechnology** | | |
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**Name:**

**Part A: /6**

**Part B: /44**

**Total: /50**

### Time allowed for this paper

Working time for paper: 40 minutes

Structure of Paper

Part A: Practical component

Part B: Validation test including questions from excursion to the Harry Perkins Institute of Medical Research

### Material required/recommended for this paper

# To be provided by the supervisor

Question/answer booklet

# To be provided by the candidate

Standard items: Pens, pencils, eraser or correction fluid, ruler, highlighter

Special items: Scientific calculator

# *Important note to candidates*

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorized notes or other items of a non-personal nature in the examination room. If you have any unauthorized material with you, hand it to the supervisor **before** reading any further.

**PART B: (44 Marks)**

This section has nine (9) questions. Answer all questions. Write your answers in the spaces provided in this Question/Answer Booklet. Use a blue or black pen for this section.

Suggested working time: 40 minutes.

**Question 1**

What is the function of each of the following in gel electrophoresis of DNA?

a) Agarose gel: (1 mark)

b) Electric current: (1 mark)

c) "Wells" in the gel: (1 mark)

**Question 2**

a) Toward which pole (positive or negative) does DNA migrate when electric current is run through the gel? (1 mark)

b) Why do the DNA molecules move toward this pole? (1 mark)

**Question 3**

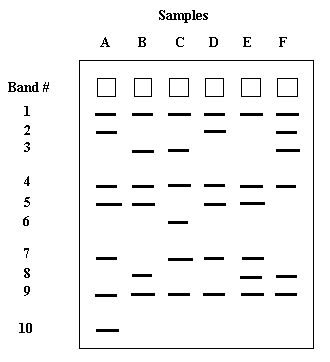
What would happen to the DNA fragments if you forgot to turn the current off? (1 mark)

**Question 4**

Describe how the different sized DNA fragments are separated by the gel matrix. (1 mark)

**Question 5**

Examine the diagram of an agarose gel below and answer the following questions.



a) What do the bands in the drawing of the agarose gel represent? (1 mark)

b) Which band(s) travelled slowest? (1 mark)

c) Which band(s) travelled fastest? (1 mark)

d) On the above drawing, label the positive and negative ends of the gel. (2 marks)

e) How many bands are shared in common by all of the individuals? (1 mark)

f) Are there any bands that are unique to only one individual? If so, which one/s? (2 marks)

**Question 6**



Orangutans are an endangered species of ape that live in Southeast Asia. Their numbers have dwindled due to habitat loss and poaching, but there are currently efforts to save the orangutans.

DNA fingerprinting has been used by Dr. Benoit Goossens at Cardiff University to better understand mating and genetic variation in orangutans.

Use DNA fingerprinting (see below) to determine which male orangutan is the father of a baby orangutan. You will have DNA from the baby orangutan and several possible father orangutans. It is your job to determine which is the father .

In the BIO-RAD DNA Fingerprinting scenario which follows, each DNA sample stands for a different suspect, here (orangutan parentage scenario) each DNA sample stands for an individual orangutan. The picture below shows the results you would expect from the DNA Fingerprinting practical outlined here.

Mother baby Male 1 Male 2



a) Who is the father of the baby orangutan? (1mark)

b) Explain how you reached this conclusion (2 marks)

**Question 7**

**a)** Explain what is meant by DNA profiling/fingerprinting. (2 marks)

b) List 2 fields that would use PCR in their work on a regular basis (other than medical). (2 marks)

**Question 8**

a) What is PCR? What role does electrophoresis play in this process? (3 marks)

b) What is a primer? (2 marks)

c) What is Taq polymerase and what does it do? (2 marks)

d) List the three stages in PCR and describe what occurs at each stage. (6 marks)

e) Why did you place a water sample in the thermocycler? (1 mark)

f) Name four of the reagents in the Master Mix (2 marks)

g) What is a DNA ladder, and why is it used? (2 marks)

**Question 9**

a) What is BRAF and what does it do? (2 marks)

b) What effect does the mutated BRAF gene have in melanoma, and what is the significance of this gene in melanoma? (2 mark)

END OF TEST