Neap:

BIOLOGY VCE UNITS 3&4
DIAGNOSTIC TOPIC TESTS 2017

TEST 9: DNA MANIPULATION AND BIOLOGICAL KNOWLEDGE AND SOCIETY

TOTAL 40 MARKS (45 MINUTES)

Student's Name: _____ Teacher's Name: _____

Directions to students

Write your name and your teacher's name in the spaces provided above.
Answer all questions in the spaces provided.

SECTION A– MULTIPLE-CHOICE QUESTIONS

Instructions for Section A

Choose the response that is **correct** or that **best answers** the question.
A correct answer scores 1; an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.
Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Question 1

EcoR1 is a tool used in the 'cutting' manipulation of DNA.

EcoR1 is a

A. polymerase enzyme from a bacterium.
B. ligase enzyme from a bacterium.
C. restriction enzyme from a bacterium.
D. reverse transcriptase enzyme from a bacterium.

Question 2

When carrying out polymerase chain reactions (PCR), DNA engineers do not use human enzymes. Instead they use a bacterial enzyme derived from a hot spring-dwelling microorganism.

Why is this?

A. To assist in the transfer of insect resistant genes to plants.
B. The production of insulin requires huge vats of microorganisms.
C. The PCR requires very hot temperatures.
D. The electrophoresis gel is very harsh.

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Question 3

What is normally present in one of the lanes of every DNA electrophoresis gel?

A. restriction enzymes

B. standards of known base pair sizes of DNA

C. vectors

D. gene probes

Question 4

A plasmid is used

A. to multiply one fragment of DNA into many.

B. to bind one DNA fragment to another.

C. in the identification of the DNA fragment after gel electrophoresis.

D. in the transfer of DNA fragments into another cell.

Question 5

Lack of knowledge and understanding has led to transgenic crop species not being widely grown even when the benefits are so high. Such is the case with Golden Rice. Golden Rice contains genes to produce vitamin A. Vitamin A deficiency leads to blindness. The World Health Organization (WHO) estimate 250 million preschool children and 7 million pregnant women are vitamin A deficient. Most of these people have rice as their staple food. If these people had access to Golden Rice they would not be deficient in vitamin A and would not become blind. Greenpeace and other GMO critics are preventing Golden Rice being distributed and grown.

This issue has

A. social implications.

B. no ethical implications.

C. no social implications.

D. no implications.

Question 6

Cloning using somatic cell nuclear transfer techniques involves first

A. enucleation, nuclear transfer then embryogenesis.

B. nuclear transfer, enucleation then embryogenesis.

C. embryogenesis nuclear transfer then enucleation.

D. nuclear transfer, embryogenesis then enucleation.

Question 7

Rational drug design was behind the development of the antiviral drug Relenza.

Rational drug design is based around designing drugs based on

A. chemical properties.

B. physiological properties.

C. the non-complementary shape and fit of the drug to the target molecule.

D. the complementary shape and fit of the drug to the target molecule.

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Question 8

Any organisms that possess a 'foreign' gene or segment of 'foreign' DNA in their genome as a result of human experimentation are termed

A. genetically modified organisms.

B. transgenic organisms.

C. cloned organisms.

D. enhanced organisms.

Question 9

Which of the following outlines how the gene transfer of glyphosate (a herbicide) resistance increases the productivity of the crop canola?

A. Natural herbicides produced by soil bacteria will not harm the canola.

B. When they spray the canola crop with 'Roundup' (a herbicide), the weeds die.

C. The gene transferred switches on a growth gene in the canola.

D. all of the above

Question 10

Which of the following explains why the glyphosate resistant gene is an issue?

A. herbicide-resistant gene could be transferred into wild plants that are close relatives of cultivated plants and create so-called 'superweeds'

B. owners of these herbicides would control the herbicide market

C. possible long-term human health affects by consuming this canola

D. all of the above

Question 11

An antiviral drug is effective against

A. all pathogens.

B. all bacteria.

C. all viruses.

D. a specific virus.

Question 12

New diseases are emerging all the time in our globally connected world. Diseases are categorised by their spread.

Localised diseases are called _____, whereas diseases that spread globally are called _____.

A. epidemic; pandemic

B. pandemic; epidemic

C. contagious; infectious

D. contagious; pathogenic

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Question 13

Many antibiotics are produced by fungi.

Which of the following outlines the role do the antibiotics serve in fungi?

A. protection and reduction of competition from viruses

B. protection and reduction of competition from bacteria

C. protection and reduction of competition from parasites

D. all of the above

Use the following information to answer Questions 14 and 15.

Question 14

The name of the molecule that caries out the process illustrated in the diagram above is a

A. ligase enzyme producing sticky ends.

B. ligase enzyme producing blunt ends.

C. restriction enzyme producing sticky ends.

D. restriction enzyme producing blunt ends.

Question 15

If PSTI (the molecule that was used in the example in the diagram above to carry out the process) was used for another sample and three fragments were formed, a total of

A. six recognition sites were recognised.

B. one recognition site was recognised.

C. three recognition sites were recognised.

D. two recognition sites were recognised.

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SECTION B – SHORT-ANSWER QUESTIONS

Instructions for Section B

Answer **all** questions in the spaces provided. Write using blue or black pen.
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Question 1 (2 marks)

a. Why is prenatal testing controversial in some people's view? 1 mark

_____

_____

b. What is pre-symptomatic testing? 1 mark

_____

_____

Question 2 (1 mark)

How can knowing the molecular structure of a protein assist in drug design?

_____

_____

Question 3 (2 marks)

a. What is gene therapy? 1 mark

_____

_____

b. Describe **one** method of inserting a gene into a cell. 1 mark

_____

_____

_____

_____

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Question 4 (3 marks)

Describe the technique of gel electrophoresis and give a use of this technique.

Question 5 (2 marks)

Explain what gene probes are and how they work.

Question 6 (7 marks)

Insulin is a protein which regulates the body's blood sugar levels by aiding the conversion of glucose to glycogen. Diabetes is a disease resulting from insufficient insulin production by the pancreas and so insulin must be obtained by other means. Recombinant DNA technology enables the production of insulin that is suitable for humans in other organisms such as yeasts. During this process, the human insulin gene is synthesised and introduced into the yeast cell by being attached to a plasmid where the insulin is made.

a. Explain why the plasmid in the yeast is regarded as a vector. 1 mark

_____

_____

b. Explain why the following types of enzymes are used in the production of genetically engineered insulin.

i. restriction endonucleases 1 mark

_____

_____

_____

ii. ligases 1 mark

_____

_____

_____

c. During the process of producing insulin, certain parts of the plasmid form 'sticky ends'.

Consider the following sequence of the sticky ends.

```
1.
...G           G A T C C...
...C C T A G             G...
                         2.
```

What sequence will join with the sticky ends 1. and 2.? 2 marks

_____

_____

d. Briefly explain why it is possible to exchange DNA molecules between different species. 2 marks

_____

_____

_____

_____

Question 7 (5 marks)

An article written recently concluded with the statement 'It's time to use our knowledge of evolution and its well-worn paths to cultivate a new garden as we plan our future, one seeded with species that benefit rather than harm us.'

Source: Rob Dunn. (2012). The Garden of Our Neglect. Accessed 22/11/2016.
https://www.scientificamerican.com/article/how-humans-shape-evolution-other-species/

a. The use of genetically modified organisms (GMOs) are continually present in the media and particularly within the cultivation of crops.

Outline **one** advantage and **one** disadvantage of using GMOs.

i. advantage 1 mark

_____

_____

ii. disadvantage 1 mark

_____

_____

b. Humans have been changing the path of evolution for centuries through selective breeding techniques.

i. Outline **one** different type of selective breeding technique. You may use an example to assist your response if needed. 1 mark

_____

_____

ii. Outline an advantage of selective breeding. 1 mark

_____

_____

iii. Outline a disadvantage of selective breeding. 1 mark

_____

_____

Question 8 (2 marks)

Distinguish between the terms genetically modified organisms and transgenic organisms.

_____

_____

_____

_____

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Question 9 (1 mark)

New diseases are emerging all of the time and the use of drugs against diseases is widespread.

How is the action of antibiotics different from antiviral drugs?

_____

_____