THE SCHOOL FOR EXCELLENCE
UNIT 4 BIOLOGY 2010
COMPLIMENTARY WRITTEN EXAMINATION 2 – SOLUTIONS

ERRORS AND UPDATES

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SECTION A – MULTIPLE CHOICE QUESTIONS

QUESTION 1 Answer is A
QUESTION 2 Answer is D
QUESTION 3 Answer is B
QUESTION 4 Answer is D
QUESTION 5 Answer is B
QUESTION 6 Answer is A
QUESTION 7 Answer is A
QUESTION 8 Answer is A
QUESTION 9 Answer is A
QUESTION 10 Answer is C
QUESTION 11 Answer is D
QUESTION 12 Answer is C
QUESTION 13 Answer is C
QUESTION 14 Answer is A
QUESTION 15 Answer is D
QUESTION 16 Answer is C
QUESTION 17 Answer is A
QUESTION 18 Answer is B
QUESTION 19 Answer is D
QUESTION 20 Answer is A
QUESTION 21 Answer is D
QUESTION 22 Answer is A
QUESTION 23 Answer is C
QUESTION 24 Answer is A
QUESTION 25 Answer is C

SECTION B – EXTENDED RESPONSE SOLUTIONS

QUESTION 1

(a) Autosomal recessive. 1 mark

(b) The inheritance of white fur is recessive because two unaffected parents (I-1 and I-2) have an unaffected son (II-2). (1) It is autosomal because the father of II-3 is unaffected. If it was sex-linked then the father of II-3 would be affected. (1)

2 marks

(c) I-1:Bb II-1:BB/Bb II-5: Bb III-4: bb

(½ mark each) 2 marks

(d) Parents: Bb x Bb

	B	b
B	BB	Bb
b	Bb	bb

Where B=black, b=white

Offspring are 75% (3/4) black.

25% (1/4) white.

(1 mark working out, 1 mark frequencies of phenotypes)

2 marks

Total 7 marks

QUESTION 2

(a) mRNA

1 mark

(b) Any two of: addition of a methyl cap,
addition of a poly A tail, or
introns removed.

2 marks

(c) i. Reverse transcriptase creates a DNA copy of mRNA. (1)

ii. The advantage of using this enzyme is that the DNA copy made does not contain introns and so is smaller. (1)

2 marks

(d) The purpose of microarrays is to determine which genes are being expressed in an individual.

1 mark

(e) Any two of:

- It is more economic for a cell to only express genes which are required by that cell. (1)
- Cells are specialised and thus only particular proteins are produced which are needed by that cell. (1)
- Many genes are switched on during different stages of development and so are not expressed in all cells at all times. (1)

2 marks

Total 8 marks

QUESTION 3

(a) By chance some bacteria were resistant to antibiotic Z. (1) These bacteria survived and reproduced, passing on this resistance to their offspring.(1) Over time the majority of bacteria causing the eye infections were resistant and so the antibiotic is no longer effective against the bacterial strain. (1)

1+1+1 = 3 marks

(b) Hypothesis: That Z23 will kill the bacteria that causes the eye infections. (1)

Experiment: Using bacterial plates, make some plates with Z23 on/in them and some control plates without the antibiotic. (1)

Using a swab take a colony of bacteria and smear across the control plate. Repeat with the antibiotic plate. (1)

The results that would support the hypothesis would be if the bacteria grew on the control plate but not the plate with the antibiotic in it. (1)

The experiment should be repeated a number of times to increase the reliability of the results. All conditions should be kept constant such as the temperature of incubation, time incubated, amount of bacteria inoculated. The only variable between the two plates is the presence of antibiotic. (1)

1+1+1+1+1 = 5 marks

The above example is possibly the easiest experiment that could be designed.
Other reasonable alternatives accepted.

Total 8 marks

QUESTION 4

(a) The polymerase chain reaction.

1 mark

(b) Any four of: DNA sample,
primers,
buffer,
DNA polymerase/*Taq* polymerase
nucleotides. (½ mark each)

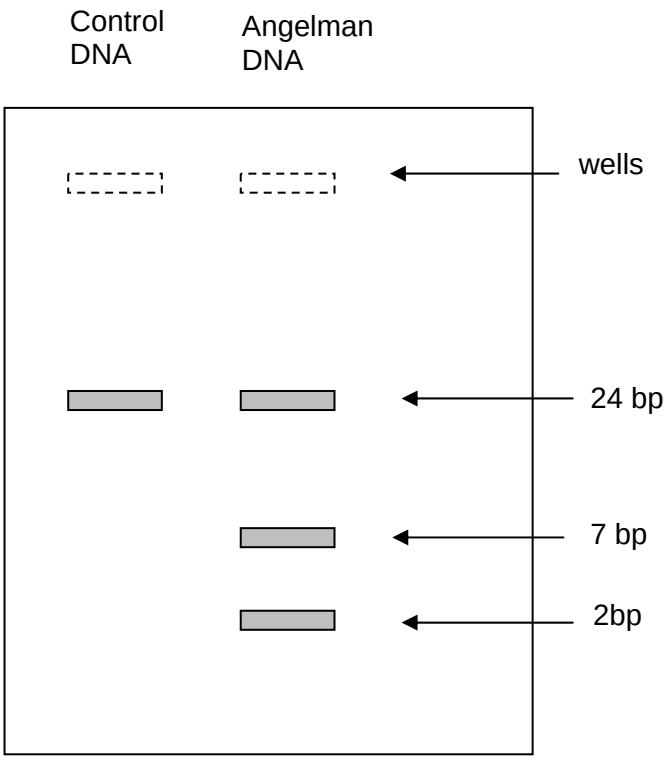
2 marks

(c) Deletion. 1 mark

(d) Attacker's chromsome 15: …ATGTAAGCT…

1 mark

(e)



1 mark for correct bands on gel.

1 mark for correct labelling of samples, wells and sizes.

2 marks

(f) DNA migrates towards the positive terminal/cathode (1) as the DNA molecule is slightly negatively charged. (1)

2 marks

Total 9 marks

QUESTION 5

(a) Gene flow refers to the movement of genes into or out of populations due to migration.

1 mark

(b) Gene flow affects allelic frequency because immigrants may add new alleles to the population, and emigrants may completely remove some alleles or significantly change the frequency of others.

1 mark

(c) A bottleneck could be caused by either intense natural selection or a disaster.
eg. exposure to a virus, flood, earthquake etc.

1 mark

Total 3 marks

QUESTION 6

(a) 1st box = monotreme

2nd, 3rd box = placental/marsupial

4th box = reptile (½ mark each box)

2 marks

(b) Divergent evolution.

1 mark

(c) The presence of homologous structures.

1 mark

(d) Mammals were believed to have evolved from reptiles. A platypus is a 'missing link' because it has characteristics of both mammals and reptiles eg. egg-laying (reptile feature) and mammary glands (mammalian feature).

1 mark

(e) Samples of both platypus and echidna DNA are cut with restriction enzymes to create smaller fragments. These DNA samples are then heated to separate them into single-stranded DNA. (1) The two samples are mixed and allowed to cool to form double-stranded DNA. These newly bonded strands are then heated to separate, the higher the temperature needed, the greater the similarity between the two species.(1)

2 marks

Total 7 marks

QUESTION 7

(a)

Feature	Adaptive advantage
Opposable thumb	Hands able to grasp
Large eyes at the front of the head	Three-dimensional vision
Nails	Increased sensitivity in fingertips
Variation in tooth size/shape	Omnivorous diet
Upright locomotion	Frees hands for other activity or enables better vision etc.

4 marks

(b) That the oldest fossils of modern humans have thus far only been found in Africa.

1 mark

(c) Radiocarbon dating.

1 mark

(d) Sharing of ideas through language rather than visual imitation. (1)
Development of culture eg. songs, stories etc. (1)
Any other reasonable answer.

2 marks

Total 9 marks