THE SCHOOL FOR EXCELLENCE
UNIT 4 BIOLOGY 2008
COMPLIMENTARY WRITTEN EXAMINATION 2 - SOLUTIONS

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SECTION A – MULTIPLE CHOICE QUESTIONS

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

SECTION B: EXTENDED RESPONSE QUESTIONS

QUESTION 1

a. Nucleus contains DNA which in turn carries the genetic instructions for the synthesis of haemoglobin.

b. mRNA is translated at the ribosomes in the cytoplasm not in the nucleus. So translation of any residual mRNA could occur after the nucleus was removed

c. Gene Regulation -

- Cells are specialised in structure and function even though they contain the same genetic information.
- This is a result of the 'switching on' or 'switching off' of different genes in different cells by **Regulator Genes**.

d. i. TGA GGG CTT CTT TTT

ii. If CAA

DNA TGA GGG CAA CTT CTT

OR

If CAG
DNA TGA GGG CAG CTT CTT

OR

If CAU
DNA TGA GGG CAT CTT CTT

OR

IF CAC
TGA GGG CAC CTT CTT

iii. Mutation-single base substitution – alters the coded information so instead of glutamic acid, valine is coded for. This in turn alters the actual protein synthesised.

QUESTION 2

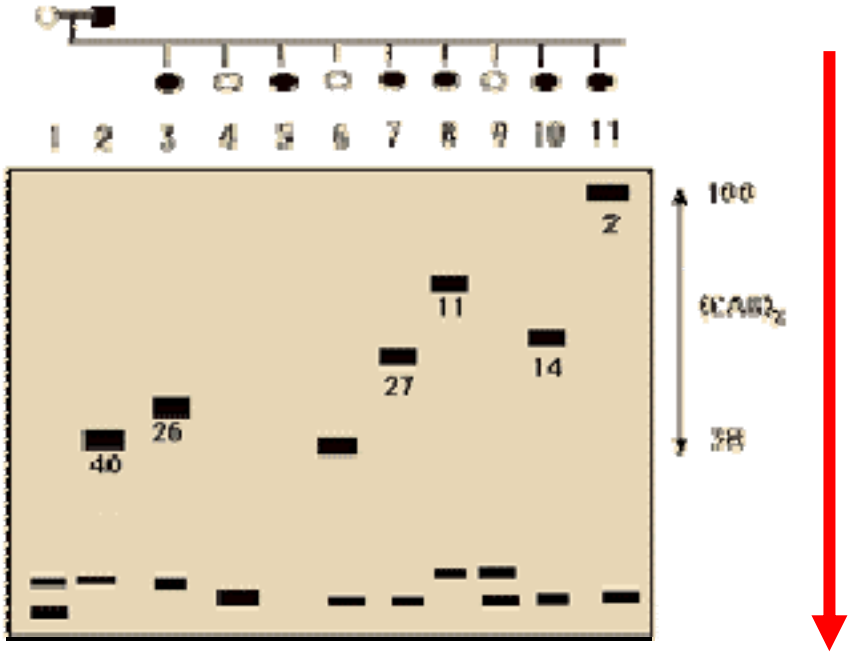


Figure 1

a. On diagram

b. i. Recognition Site: CAG CAG

ii.

AATGGGTAC CAGCAG TTAAGGCCTTATGGTAGGG CAGCAG CCCCGGG GT

ATATGTCGA CAGCAG TTAGGTCACACCC CAGCAG AATGGGTACCAG

iii. Number of Fragments: 5

c. Amplified sequence similar to diseased father so will get HD around 40 years.

d. Normal individuals can have up to 30 copies of CAG sequence but individuals with HD have between 37 and 100. If this person has 56 repeats then they would have HD. According to gel 56 CAG repeats corresponds to age of onset between 26 and 27 years.

e. Late age of onset-after reproduction may have occurred.

QUESTION 3

a. The ABO gene has three different alleles I^A, I^B and i. When a person has both I^A and I^B alleles they are blood group AB, ie one allele is not dominant over the other allele and both are expressed in the heterozygote.

b.

	I^A	I^B
i	I^A i	I^B i
i	I^A i	I^B i

Genotype 50% I^A i Phenotype 50% Blood group A
Genotype 50% I^B i Phenotype 50% Blood group B

c. I^A i or I^B i or ii

Therefore Blood Type A, Blood Type B or Blood Type O

d. I^A I^B A a x ii Aa

	I^AA	**I^Aa**	**I^BA**	**I^Ba**
iA	**I^A i AA**	**I^A i Aa**	**I^B i AA**	**I^B i Aa**
ia	**I^A i Aa**	**I^A i aa**	**I^B i Aa**	**I^B i aa**
iA	**I^A i AA**	**I^A i Aa**	**I^B i AA**	**I^B i Aa**
ia	**I^A i Aa**	**I^A i aa**	**I^B i Aa**	**I^B i aa**

Zero chance.

QUESTION 4

a. Describes Eukaryotic cells to which foreign DNA has been added.

b. To enable the bacteria that have taken up the plasmid to be identified.

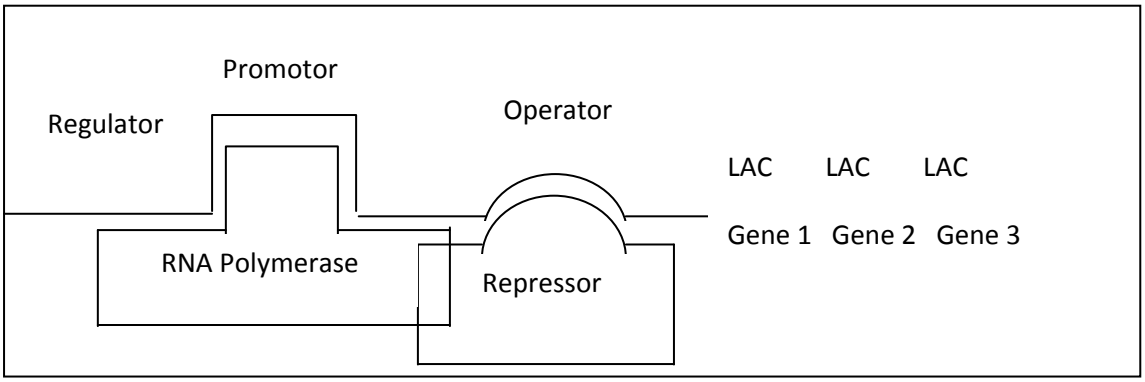
c. Various answers:

For Example:

1. To distinguish between the cells that have taken up the recombinant plasmid from those that did not, place the cells onto a plated medium containing an antibiotic that is normally toxic to the bacteria from which the plasmid was taken.

2. Observe growth on the plate. Only those cells that have been transformed to the antibiotic resistance by the recombinant plasmid will survive to form a colony on the medium. The red fluorescent protein will enable easy identification.

QUESTION 5



a. i. Regulator Gene
To produce the repressor molecule by protein synthesis

ii. Promotor
The binding site on DNA for RNA polymerase

b. On diagram.

c. When humans first began to domesticate wild cattle and use their milk, natural selection would have favoured individuals who were lactose tolerant because they could make use of this new, nutritious food source.

QUESTION 6

a.

- For the subskeleton-Carbon-14 as these are organic remains up to about 50 000 years old.
- Can also be used to date wooden handles of tools of same age.
- If they were stone tools Uranium-235 could be used to date from 1, 000 to 1, 000,000 years.
- Possible to also date the sediments in which the fossils were found.

b. i. The ability to interbreed and produce fertile offspring.

ii. Impossible to interbreed fossils to see if they produce fertile offspring.

c. i. Circular DNA molecule present in mitochondrion. Genes located on the DNA of mitochondria are transmitted from the maternal line.

ii.

- Isolate mtDNA from bone fragment of fossil.
- Amplify using PCR.
- Identify overlapping sequences between the fossil and a modern human and identify differences in base sequences.

iii. It is unlikely that useful DNA specimens exist in the available sample, as DNA degrades rapidly in warm tropical environments, sometimes in as little as a few dozen years. Also, contamination from the surrounding environment seems highly possible given the moist environment in which the specimens were found.

QUESTION 7

a. Various answers such as reduced number of parasites such as body lice, more surface area for vitamin D absorption, cooler for warmer tropical climates, sweat glands (evaporative cooling) more effective.

b. Variation would have existed in phenotypes between lots of body hair and those with reduced body hair.

There would have been a 'struggle for survival' and those with less body hair would have been selected for as they were more likely to survive.

They would have survived to reproduction age because of this advantage, have offspring who were more likely to inherit this characteristic.

Over time the population would have changed so that more humans would have reduced body hair.

c.

- Various answers eg the reduced body hair may have been more advantageous during the day for hunting and gathering and absorbing vitamin D but at night it would have been a disadvantage because of the dramatic drop in temperature.

- Continue to wear clothes today because of cultural evolution and the cultural conventions that go with this.

d. Various answers, eg. climate change and global warming, resistance to antibiotics, disease, super bugs etc.