



BIOLOGY 2017

Unit 4

Key Topic Test 6 – Biological knowledge and society

Recommended writing time*: 45 minutes

Total number of marks available: 45 marks

SOLUTIONS

SECTION A: Multiple-choice questions (1 mark each)

Question 1

Answer: B

Explanation:

Genetic screening or genetic testing may be performed in order to determine whether an individual has inherited a genetic condition or not. However, genetic screening is performed on an entire population or a large section of a population. Genetic testing is performed on individuals who have already been determined to be at high risk of developing the condition.

Question 2

Answer: B

Explanation:

Legal issues concern the protection that laws and regulations provide. Ethical issues concern what is moral or right. Social issues concern how society and individuals will be affected.

Question 3

Answer: B

Explanation:

A is incorrect because there is no point in designing a drug if it does not have a therapeutic effect. C is incorrect as a drug cannot be designed if the shape of the target is now known. D is incorrect as if binding between the target and the drug is not possible then the drug will not be effective. B is correct as there is no intention for the drug to transform the drug structure. The purpose of the drug is to bind to and neutralise the effect of the target structure.

Question 4

Answer: C

Explanation:

Antibiotics specifically target the cell wall of bacterial cells.

Question 5

Answer: A

Explanation:

Transformed bacteria are those which have taken up a recombinant plasmid, which is the vector for foreign DNA. Bacteria reproduce by binary fission, so each of the offspring of a bacterium will contain copies of the recombinant plasmid, therefore bacteria are used to clone copies of inserted genes.

Question 6

Answer: B

Explanation:

As the child does not have the trait and it is recessive the child may be homozygous dominant or heterozygous, and therefore carrier testing would be performed in order to determine if they possess a copy of the allele. If the child possesses the allele then that child could pass it on to any children they have in the future.

Question 7

Answer: C

Explanation:

A is wrong as predators do not eat crop plants. B and D are social issues rather than biological issues. C is a biological issue as pollen from a transgenic plant is fertilising another plant potentially leading to the creation of superweeds.

Question 8

Answer: B

Explanation:

Options A, C and D would all have an impact on society. Option A brings up the question who should have access to this information. Option B impacts on the rights of individuals to have genetic privacy. Option D brings up ethical issues, such as it is right to charge a person extra for a product because of their family's genetic history. Option B would only affect that individual and their family.

Question 9

Answer: D

Explanation:

Newborn children should only undergo genetic testing if they are at a high risk of developing a harmful genetic condition that would have a rapid effect. Therefore, it would be in their best interest to have such a condition diagnosed as soon as possible in order to arrange appropriate treatment as soon as possible.

SECTION B - Short-answer questions**Question 1 (8 marks)**

The table should contain the following information.

CONDITION AND CAUSE	TYPE OF TEST	EXPLANATION
DiGeorge syndrome: caused by a microdeletion on the 22 nd chromosome.	Fluorescent in situ hybridization.	A microdeletion is a small abnormality in a chromosome.
Klinefelter syndrome: males have an extra X chromosome.	Karyotype	Karyotypes are used to show mutations that affect the number of chromosomes or a substantial change to the size of a chromosome. The extra X chromosome would be easily seen in a karyotype.
Tyrosinemia: caused by an absence of the enzyme fumarylacetoacetate hydrolase (FAH) which is essential in the metabolism of tyrosine	Biochemical test	The FAH enzyme is not being produced. Biochemical tests can be used to detect the absence of the FAH protein.
Huntington's disease: the allele that causes Huntington's disease has a large number of repeat sequences.	Molecular testing	The presence of additional repeats in the allele can be tested for by using molecular testing techniques, such as gel electrophoresis.

1 mark for each cell correctly completed to a maximum of 8 marks
Total 8 marks

Question 2 (5 marks)

- a. The man identified as dad 3 is the father of the child.

1 mark

AND

A child inherits half of their genetic information from each parent. Half of the bands shown in the child's result match to the mother and half match to Dad 3.

1 mark

- b. Actual fingerprints are unique to the individual as are genetic fingerprints (except in the case of identical twins, or very rarely identical triplets).

1 mark

- c. Identifying the source of DNA from a crime scene.

1 mark

AND

Gel electrophoresis can be used to make genetic fingerprints that are unique to the individual. This can be used to prove that the DNA came from the victim of a crime or that a suspect was present at a crime scene.

OR

Any other reasonable suggestion and reason.

1 mark

Total 5 marks

Question 3 (8 marks)

- a. Transgenic and genetically modified.

1 mark

AND

The glofish have been transformed by having genetic material from another species inserted into the genome.

1 mark

- b. Genetically modified.

1 mark

AND

There has not been any additional genetic information inserted into the genome of these chickens, genetic engineers have merely activated a gene that was already present, but no longer normally expressed.

1 mark

- c. Neither.

1 mark

AND

This is an example of artificial selection. Although the phenotype of the roses has altered over a long period of time, breeding programmes are carried out by natural processes and do not involve artificial manipulation of genetic material.

1 mark

- d. Genetically modified.

1 mark

AND

The genome of the organism has been altered by the removal of a gene, however, genetic information from another species has not been inserted.

1 mark

Total 8 marks

Question 4 (8 marks)

- a. Incorporating the BT toxin gene into the genome of the corn would increase the crop yield.

1 mark

AND

Corn borer moths would die after consuming some of the corn, so their numbers would reduce so there would be less insect pests to eat the corn.

1 mark

- b. Farmers would not have to use pesticides as much, so less chemicals would be getting into the environment, particularly into soil and water.

1 mark

- c. Other organisms depend on the corn borer as a source of food, so by killing off the corn borers these organisms lose a food source, which could affect the whole food web.

1 mark

- d. There are still a significant number of people who do not wish to consume any food that contains products from transgenic or genetically modified organisms. A farmer who grows this crop may find that they cannot sell it.

1 mark

- e. If the farmer growing the organic produce cannot prevent cross-contamination then they cannot certify that their produce is completely organic and they will not be able to sell it as such

OR

In order to ensure that their produce will not be contaminated they will have to buy materials to isolate their crop plants.

1 mark

- f. The advantage of the traditional method is that it enables costs to be lower as money is not expended on having to purchase seeds.

1 mark

If a farmer were saving seeds from a GM crop and planting them in the following year then it could not be predicted exactly what, if anything could grow as these plants tend to be hybrids and do not breed true.

OR

This method enables quality control to be maintained as the source of the seeds that generate a crop can be identified to any purchaser.

OR

If an unforeseen problem occurs with the crop then a farmer can turn to the supplier for assistance.

OR

Any other reasonable answer.

1 mark

Total 8 marks

Question 5 (7 marks)

- a. An emerging disease is either a disease that has not been seen before OR a new strain of an existing disease.

1 mark

AND

Sources of emerging diseases include:

Mutations of existing pathogens.

Zoonosis (pathogens crossing the species barrier from animals to humans)

The production of superbugs by the overuse of antibiotics.

1 mark

- b. Pandemic.

1 mark

AND

According to the information provided the disease spread across a large percentage of the world.

1 mark

- c. It is much easier to travel internationally today than it was one hundred years ago. It is also faster to travel as well. More people are travelling greater distances very quickly than ever before, therefore it is also faster and easier for pathogens to spread as infected people travel.

1 mark

- d. There are many strategies. Some of these include:

- Improve monitoring techniques.
- Devise methods of testing for/identifying new pathogens.
- Have communication systems in readiness so that details can be rapidly provided to those who need them.
- Establish an appropriate treatment.
- Have an existing health network that can respond effectively to a potential pandemic.
- Have sufficient trained health professionals to be able to respond to a potential pandemic.

1 mark for each appropriate response to a total of 2 marks

Total 7 marks