TSSM
Creating VCE Success

BIOLOGY 2020

Unit 2
Key Topic Test 4 – Genotypes and phenotypes

Recommended writing time*: 45 minutes
Total number of marks available: 45 marks

SOLUTIONS

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

Question 1

Answer: A

Explanation: Observations and early research on genetic "factors" was carried out by Gregor Mendel, option A. Darwin's work was more to do with evolution, Crick and Watson with the structure of DNA and Ian Fraser with the development of the vaccine against cervical cancer.

Question 2

Answer: B

Explanation: Options A and C could possibly be correct but Andrew cannot necessarily know this. He can only confidently comment on their phenotype, option B. Option D is the incorrect use of the word genome.

Question 3

Answer: D

Explanation: Only option D is not a correct statement and so is the correct solution. A homozygous recessive genotype will not have the dominant allele present.

Question 4

Answer: C

Explanation: Only option C is not a correct statement and so is the correct solution. Recessive alleles will not show in the phenotype unless it is homozygous recessive.

Question 5

Answer: B

Explanation: An organism with two different alleles for a gene is termed heterozygous, option B. Options A and D are essentially the same and describe the two alleles being the same. Option C refers to twins developing from one fertilised egg.

Question 6

Answer: D

Explanation: Option D is the classic dominant/recessive situation, the dominant characteristic masks the recessive characteristic. Option A is not valid, option B is not necessarily so and option C is not the case, as it depends on which parent supplied the dominant allele.

Question 7

Answer: D

Explanation: Option A would result in all children being tongue non-rollers. Option B would result in the children being able to tongue roll but the mother could also be heterozygous, option C. There is not enough information to decide between options B and C without knowing if the trait is dominant or recessive, and so the correct solution is option D.

Question 8

Answer: A

Explanation: Option A shows the typical result of graphing a continuous variation caused by several genes, polygenic. Option B is an S shaped growth curve, option C shows a direct relationship and option D is a bar graph that does not show the typical normal distribution shape.

Question 9

Answer: C

Explanation: Option C describes a typical continuous variation. This type of distribution is caused by many genes, polygenic.

Question 10

Answer: D

Explanation: Options A, B and C all contribute to an individual's phenotype and so option D is the correct solution.

SECTION B: Short-answer questions

Question 1

a. Straight hair is dominant
Curly haired is recessive

1 mark

b. Straight hair is dominant, S
Curly haired is recessive, s
The recessive must be the lower case of the dominant

1 mark

c.

	S	S
s	Ss	Ss
s	Ss	Ss

Herbert

Curly

Award one mark for correct genotypes of parents and one mark for correct genotypes of offspring

2 marks

d. Ss

1 mark

e.

	S	s
s	Ss	ss
s	Ss	ss

Harry

Curly

Award one mark for correct genotypes of parents and one mark for correct genotypes of offspring

2 marks

f. Curly is homozygous recessive

1 mark

g. Herbert is homozygous dominant

1 mark

h. Harry is heterozygous

1 mark

Total 10 marks

Question 2

a. Tongue roller is dominant
Tongue non-roller is recessive

1 mark

b. Tongue roller is dominant, T or maybe R
Tongue non-roller is recessive, t or maybe r
The recessive must be the lower case of the dominant

1 mark

c.

Individual	**Phenotype**	**Genotype**
A	**Tongue roller**	**Tt**
B	**Tongue roller**	**Tt**
C	**Cannot tongue roll**	**tt**
D	**Tongue roller**	**Tt**
F	**Cannot tongue roll**	**tt**
H	**Cannot tongue roll**	**tt**

6 marks

d. Tongue roller

1 mark

e. May be either TT* or Tt*

2 marks

Total 11 marks

Question 3

a. Let C^w represent white allele for colour and C^r represent the red allele for colour*.

	C^w	C^r	Pink
C^w	C^wC^w	C^wC^r	
C^r	$C^r C^w$	$C^r C^r$	

Pink

C^wC^w would be white

$C^r C^w$ would be pink

$C^r C^r$ would be red

Award one mark for correct parent genotypes and one mark for correct offspring genotypes.

3 marks

b. One red: two pink: one white

1 mark

c. Incomplete dominance

1 mark

Total 5 marks

Question 4

a. The kittens are emerging from the warm uterus* at birth and so the enzyme is not effectively producing pigment* and the kittens are white.

2 marks

b. The extremities of the body (ears, tip of tail and feet) are likely to be cooler* than the trunk of the body and so the enzyme is more effective at producing pigment in these tissues* and they appear darker.

2 marks

c. Placing a cold pack on part of the cat should after a time generate a darker patch or it could be suggested to put the cat in a fridge (not ethical and not recommended but it would be a theoretical solution).

1 mark

Total 5 marks

Question 5

a. The study of changes in organisms caused by modification of gene expression rather than alteration of the genetic code itself.

1 mark

b. Epigenetics thought to act by the environment causing methylation (the addition of a CH3 group)* to the cytosine in DNA which will effect some gene expression*, turning on or off.
OR
Epigenetics thought to act by the environment causing modification of histones (the protein wrapping up DNA)* resulting in changes to chromatin structure which will effect some gene expression*, turning on or off.

2 marks

c. One of diet, obesity, physical activity, tobacco smoking, alcohol consumption, environmental pollutants, psychological stress, and working on night shifts.

1 mark

Total 4 marks