



BIOLOGY 2016

Unit 4

Key Topic Test 4 – Heredity

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:

In order to produce a population of whole purple plants, they must have the dominant purple allele present.

Question 2

Answer: B

Explanation:

The genotypes produced would be; PpSS, PpSs, Ppss.

Question 3

Answer: C

Explanation:

If only wrinkled kernels were obtained, they must both be homozygous recessive for kernel type. Wrinkled is a recessive trait as indicated in the numbers of offspring with that trait.

Question 4

Answer: B

Explanation:

A test cross is used to determine the genotype of a phenotypically dominant individual. If all offspring are of the dominant phenotype then it could be assumed that they the individual is homozygous dominant.

Question 5

Answer: B

Explanation:

Two affected parents can have a non-affected offspring. If the pedigree demonstrated a recessive mode of inheritance then individual IV1 would be affected.

Question 6

Answer: A

Explanation:

The unaffected mother would not be able to have an affected son if the trait was X linked.

Question 7

Answer: D

Explanation:

The crossing over in prophase I is unique to meiosis and allows the relocation of DNA from one chromosome to another. It does not occur in mitosis.

Question 8

Answer: A

Explanation:

Monogenic traits are traits determined by a single gene, as both of the individuals are heterozygotes for two traits, after a dihybrid cross was conducted 8 variations can be produced.

Question 9

Answer: D

Explanation:

The ratio 9:3:3:1 can be linked to two heterozygotes at both gene locus. The ratio 1:1:1:1 would be associated with two genes undergoing independent assortment involving a homozygous and heterozygous individual.

Question 10

Answer: B

Explanation:

When a male is affected with the X chromosome that has the trait present, they are known as hemizygous as they only have one copy of the allele that results in the overall expression.

SECTION B – Short-answer solutions

Question 1

- a. Mother is homozygous recessive non-affected (hh). 1 mark
- b. The father is heterozygous dominant affected (Hh). 1 mark
- c. The individual is heterozygous dominant affected (Hh). 1 mark
- d. A genotype is the particular alleles present for a particular trait based on genetic code 1 mark
 AND
 The phenotype is the physical expression of the genotype 1 mark
- e. 50% 1 mark
- f. The brothers genotype would be unknown. 1 mark
 AND
 If he did have the dominant gene present it would not be expressed due to the presence of the medication. 1 mark

g.

	H	h
h	Hh	hh
h	Hh	hh

1 mark

50% heterozygous dominant affected
 50% homozygous dominant unaffected

1 mark

1:1 affected: unaffected

1 mark

Total 11 marks

Question 2

Cross of F1 generation	Number of different kinds of gametes	Number of different kinds of genotypes in F2 generation	Number of different kinds of phenotypes in F2 generation
TT x Tt	2	2	1
TTbb x TtBb	5	4	2

1 mark per correct answer

Question 3

- a.**
- i.** $C^R C^R$ 1 mark
 - ii.** $C^W C^W$ 1 mark
 - iii.** $C^R C^W$ 1 mark

b.

	C^R	C^R
C^W	$C^R C^W$	$C^R C^W$
C^W	$C^R C^W$	$C^R C^W$

100% red splash flower produced.

1 mark

- c.** Co-dominance 1 mark
- d.** They could be linked genes 1 mark
- e.** It would depend on if the colour gene for leaf curl was dominant or recessive. 1 mark

Total 7 marks

Question 4

- a.** C^+ 1 mark
- b.** c 1 mark
- c.** 1 mark

	C^h	C^h
c	$C^h c$	$C^h c$
c	$C^h c$	$C^h c$

1 mark

1:0 White with black extremities fur : albino

1 mark

d.

	C^h	c
C^h	C^hC^h	C^hc
c	C^hc	cc

1 mark

There would be a 25% chance of producing albino rabbits from this cross.

1 mark

e. polygenic inheritance

1 mark