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^RC^R

1 mark

ii. C^WC^W

1 mark

iii. C^RC^W

1 mark

b.

	C^R	C^R
C^W	C^RC^W	C^RC^W
C^W	C^RC^W	C^RC^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.

	C^h	C^h
c	C^hc	C^hc
c	C^hc	C^hc

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