# Chapter 10: Inheritance – Answers

1.gene – section of DNA that codes for a protein

allele–alternative forms of a gene

dominant allele – one copy of an allele is needed to have an effect

recessive allele – two copies of an allele are needed to have an effect

heterozygous – having two different alleles for a gene

homozygous – having two copies of the same allele

phenotype– the physical expression of the genotype

genotype – the alleles present for a certain feature

pedigree diagram – a branching diagram that shows inheritance patterns

2. (a) Marks awarded for:

* linear scale using at least half of grid
* axes labelled
* correct bar heights
* bars touching
* bars drawn with straight lines/uses ruler

(b) A prediction based on scientific theory and evidence

(c) Both hypotheses are supported to some extent; there are two clear phenotypes (discontinuous variation); in an approximate ratio of three to one; which supports the genetic control hypothesis; there are more than two phenotypes (continuous variation); supporting the effect of the environment

3. (a) (i) Purple; the homozygous purple parent must have passed on a purple allele and the white flower a white allele; because all the heterozygous offspring were purple, the purple allele must be dominant.

(ii) Parent genotypes: QQ and qq; F1 genotypes: Qq

(iii) Parent genotypes: QQ and qq; Gametes Q or Q and q or q

Offspring are all Qq

(iv) To prevent self-pollination

(b) (i) A cross that has parental genotypes of Qq; gametes as Q or q; offspring as QQ, Qq and qq

(ii) 3 purple : 1 white flowers

(iii) Fertilisation is random and so there is always the effect of chance; the sample size is also small

4. (a) (i) Dominant allele: only one copy is needed to affect the phenotype

(ii) 100% horned

(b) (i) Cross the bull with cows with horns; if some of the offspring have horns, the bull is Hh; if none of the offspring have horns, the bull may be HH but there is a chance that it could be Hh

(ii) Heterozygous: having two different alleles of a gene; homozygous: have two of the same alleles of a gene

5. (a) (i) Ram genotype: Bb

(ii) Ewe genotype: Bb

(iii) Black lamb genotype: bb

(iv) White lamb genotype: BB or Bb

(b) (i) Bb

(ii) No; the ewes could be Bb or BB; if the ewes were Bb, there is still a chance that all their lambs would be white

6. (a) (i) Gametes: X or X; X or Y

Offspring: XX, XX, XY, XY

Probability of having a baby boy: 50%

(ii) The probability will stay the same as it is a 50% chance every time

(b) (i) As females do not have a Y chromosome and so would not survive

(ii) Males only have one X chromosome and so would have a condition if they inherited only one copy of a recessive allele

7. (a) (i) 7

(ii) PTC tasting is dominant as I and J both taste and have children who cannot. They must be carriers (heterozygous).

(iii) 75% probability. They are both Tt and so they could produce children in the ratio of TT, Tt, Tt, tt. (3 : 1)

(iv) E must be Tt as her father must be tt. The cross with E and her partner is Tt and tt. This would give a 50% chance of having a child that can taste PTC.

8. (a) Lamarck stated that the environment changed the organisms and the changes were inherited. Darwin stated that all organisms show variation and that the environment ‘selects’ those with suitable genes to survive.

(b) (i) The giraffes’ necks increased in size to reach food that was high; the offspring were then born with longer necks

(ii) Mutation generated giraffes with different sizes of neck; food that was low down disappeared; only giraffes with long necks survived; they bred and passed on the alleles for long necks

9. (a) (i) Light form: bb Melanic form: BB or Bb

(ii) Genetic diagram that shows parents as Bb; gametes as B or b and offspring as BB, Bb and bb.

(b) (i) Trees are covered with soot and no lichen; lighter moths are not camouflaged, melanic moths are; fewer melanic moths are eaten; melanic moths breed and pass on genes to offspring

(ii) Wind blows pollution to easterly areas

(c) (i) Marks awarded for:

* linear scales that use over half grid
* axes labelled
* year on horizontal axis
* correct plots
* plots joined with straight lines

(ii) 48

(iii) Little change in peppered moth types until 1990; lichen takes time to recover and grow on trees; as lichens increase, melanic forms are less camouflaged; melanic forms are eaten more; less melanic alleles passed on to offspring

10. (a) Hyracotherium – low height; five digits; foot spread out

Mesohippus – low height; fifth digit reduced; bones elongating and foot less spread out

Merychippus – height has increased; fifth digit not present, third digit elongated; second and fourth are fused into digit three

Pliohippus – increase in height; second and fourth digits lost, third digit has become elongated with hoof

Modern horse – increase in height; elongated middle digit and larger hoof

(b) Only a few organisms became fossils; many fossils are incomplete; only hard parts fossilised

(c) Early horse feet are spread out; to reduce pressure on marshy land; so the organisms did not sink; they escape predators by wading into marshes; as land dries out it is better to run fast on single digits and be taller/have longer legs; these individuals survived as they were not eaten by predators; passed on genes to next generation