



Agricultural Science Past Exam Questions

Genetics

Higher Level

2013 – Question 7

(a) Explain **each** of the following terms: Allele; Tetraploid; Metaphase.

(b) In broiler hens, white plumage (W) is dominant to red (w). Comb length on the head is controlled by two alleles: long comb (L) and short comb (S). An intermediate condition, medium comb, occurs when a pure breeding long-comb bird is crossed with a short-comb bird.

Answer the following questions using the letters given above.

(i) State the genotype of a red and medium-comb chick.

(ii) State the genotype of a red and short-comb chick.

(iii) If a red and long-comb cock is crossed with a purebred white and short-comb hen, state the expected genotype **and** phenotype in the F1 generation.

(iv) If two F1 siblings are then mated, what is the probability that an F2 chick will have:

1. white plumage and medium comb?
2. red plumage and medium comb?
3. red plumage and short comb?

(c) Explain the advantages of sexed semen as sold by AI companies.

(48 marks)

2012 – Question 1 – Part (h)

(h) In each of the following cases, name the type of cell division

- (i) that produces four daughter cells from one mother cell,
- (ii) that always produces haploid daughter cells,
- (iii) during which crossing over occurs.

2012 – Question 7

(a) Explain any **three** of the following terms:

- (i) Sex linkage.
- (ii) Continuous variation.
- (iii) Genetically modified (GM) crops.

(iv) Binary fission.

(b) In cereal trials for oats, the pure-breeding variety Barra, with a straw length of approximately 500 mm, was crossed with the pure-breeding variety Evita, with a straw length of approximately 800 mm. The resulting hybrid had an approximate straw length of 650 mm.

(i) Using B to represent the '500 mm' gene and E to represent the '800 mm' gene, show how this result arose.

(ii) Using a Punnett square or other suitable method, show the genotypes and **matching** phenotypes resulting from a cross between two of the new hybrids.

(c) Describe **one** natural method of vegetative reproduction in plants.

(d) Identify **two** reasons why male animals are castrated on farms.

(48 marks)

2011 – Question 7

(a) Explain **each** of the following terms:

(i) Interphase

(ii) Haploid

(iii) Inbreeding.

(b) A maize plant, heterozygous for the recessive alleles hairless tassel (h) and short anther (l), is self-fertilised and the seeds are collected. The genes for tassel type and anther length are not linked. Use a cross to illustrate what proportion of the offspring you would expect to show

(i) hairy tassel

(ii) short anther

(iii) hairy tassel **and** short anther.

(c) Roan coat colour in Shorthorn cattle occurs as a result of incomplete dominance.

Use a cross to show how roan coat colour arises from homozygous parents.

(48 marks)

2010 – Question 7

(a) Explain **three** of the following terms:

- (i) freemartin condition
- (ii) hermaphrodite
- (iii) artificial selection
- (iv) pedigree animal.

(b) In guinea pigs the allele for black coat (B) is dominant over the allele for brown coat (b). A pair of guinea pigs produces a litter of eight piglets; four of the litter are black and four are brown.

- (i) Give the phenotypes and genotypes of the parents.
- (ii) Using a Punnett square and labelling all genotypes and phenotypes, illustrate this cross.
- (iii) What name is given to this type of cross?

(c) (i) Explain how polyploidy arises in plants.

- (ii) Name **and** give an example of **one** type of polyploidy.

(d) Account for the importance attached to index of calving difficulty in A.I. sire catalogues.

(48 marks)

2009 – Question 1 – Part (b)

(b) (i) Explain the term hybrid vigour.

- (ii) Mention two plant or animal examples that show hybrid vigour.

2009 – Question 7

(a) Explain any **two** of the following terms:

Lethal gene

Recessive gene

Sex-linked gene.

(b) Suggest reasons why the fruit fly (*Drosophila*) is a suitable subject for genetics experiments.

(c) In maize G represents green and g represents albino. 55 maize seeds are sown and the

results show 42 green plants and 13 albino plants. Show by means of suitable crosses how this result might occur starting with homozygous parents.

(d) Briefly outline the principal stages of embryo transfer in cows.

(48 marks)

2008 – Question 7

(a) Explain **four** of the following terms, as used in genetics;
mutation, sex linkage, diploid, multiple alleles, back-crossing.

(b) The gender of offspring is determined by the male parent in mammals.

Illustrate this statement in terms of chromosomes.

(c) A broad-leaved red-flowered snapdragon was crossed with a narrow-leaved white flowered snapdragon and all the offspring were broad-leaved with pink flowers.

(i) Suggest why all the offspring were broad-leaved.

(ii) Suggest why all the offspring had pink flowers.

(iii) List the phenotypes that may result from a cross between two plants heterozygous for both traits.

(48 marks)

2007 – Question 7

(a) Distinguish between each of the following:

(i) inbreeding and crossbreeding,

(ii) performance testing and progeny testing.

(b) In peas, the allele for round seed (R) is dominant over the allele for wrinkled seed (r). Outline the cross between a heterozygous round-seeded plant and a wrinkled-seeded plant. In your answer show the gametes produced and the genotypes and phenotypes of the offspring.

(c) Write brief notes on **three** of the following:

(i) F1 hybrids,

(ii) polyploidy,

(iii) embryo transplantation,

(iv) genetic modification.

(48 marks)

2006 – Question 7

(a) Explain each of the following:

(i) The appearance of roan coat colour in Shorthorn cattle.

(ii) Lack of variation in plants that are propagated by cloning.

(iii) Continuous variation in many characters associated with higher organisms.

(iv) Why some defective phenotypes are more common in males than in females.

(b) In certain species of plants, the allele for straight stamen (S) is dominant to the allele for incurved stamen (s) and the allele for plain petal (P) is dominant to the allele for striped petal (p). If pollen from a homozygous straight stamen plain petal flower pollinates a flower with incurved stamens and striped petals:

(i) State the genotype of the seeds formed.

(ii) Describe the phenotypes of flowers produced when the seeds germinate and grow.

(iii) What ratio of offspring phenotypes could result from a cross between the F1 hybrid plant in

(ii) and a plant that is recessive for both traits?

(c) Outline the significance of meiosis in reproduction.

(48 marks)