Biology Leaving Certificate Higher Level

Past Exam Questions on:

Genetics

Q11 2013

(b) (i) Human males and females differ in one of their twenty three pairs of chromosomes. What name is given to this pair of chromosomes?

(ii) Draw this pair of chromosomes for a human male **and** for a human female and label them appropriately.

(iii) Using the chromosomes referred to in part (b) (ii), show, using a Punnett square or otherwise, that a child stands an equal chance of being male or female.

(iv) 1. What is meant in genetics by the term *sex linkage*?

2. Name **two** common sex-linked traits.

Q6 2012

6. (a) In genetics, what is meant by the term *variation*?

_____

(b) Variation can result from mutation. Name **one** other cause of variation.

_____

(c) Name **two** types of mutation.

(i) _____ (ii) _____

(d) Name **two** agents responsible for increased rates of mutation.

(i) _____ (ii) _____

(e) Briefly explain the significance of mutation in relation to natural selection.

_____

_____

Q10(b) 2012

(b) In the sweet pea plant the texture and colour of the testa (seed coat) are governed by two pairs of alleles, which are not linked. The allele for smooth (S) is dominant to the allele for wrinkled (s) and the allele for yellow (Y) is dominant to the allele for green (y).

(i) State the Law of Segregation **and** the Law of Independent Assortment.

(ii) Using the above symbols, and taking particular care to differentiate between upper case and lower case letters:

1. give the genotype of a pea plant that is homozygous in respect of seed texture and heterozygous in respect of seed colour.
2. state the phenotype that will result from the genotype referred to in 1.

(iii) What phenotype will be produced by the genotype SsYy?
Give another genotype that will produce the same phenotype. Do not use a genotype that you have already given in response to part (ii) 1.

(iv) If the allele for smooth were linked to the allele for green and the allele for wrinkled were linked to the allele for yellow, give the genotypes of the **two** gametes that parent SsYy would produce **in the greatest numbers**.

(27)

Q 13(B & C) 2011

(b) In the antirrhinum (snapdragon) there is no dominance between the allele for red flower and the allele for white flower. Heterozygous individuals have pink flowers.
The allele for tall stem is dominant to the allele for short stem.
These pairs of alleles are located on different chromosome pairs.

(i) What is the significance of the fact that the two allele pairs are located on different chromosome pairs?

(ii) A plant which had pink flowers and was heterozygous in respect of stem height was crossed with one which had white flowers and a short stem.

1. Using suitable symbols determine the genotypes of all the possible offspring of this cross.
2. For each of your answers, state the phenotype that would result. **(27)**

(c) Distinguish between the members of each of the following pairs of terms, by writing a sentence about **each** member of each pair.

(i) Gene and allele.

(ii) Homozygous and heterozygous.

(iii) Genotype and phenotype.

(iv) Linkage and sex linkage. **(24)**

Q 2 2010

2. In each of the following cases read the information provided and then, **from the list below**, choose the correct percentage chance of obtaining the indicated offspring in each case.

0% 10% 25% 50% 75% 100%

(a) In the fruit fly *Drosophila* the allele for full wing is dominant to the allele for vestigial wing. One parent was homozygous in respect of full wing and the other parent was heterozygous.
What is the % chance of obtaining offspring with **full** wing?
% = ☐

(b) In roses there is incomplete dominance between the allele governing red petals and the allele governing white petals. Heterozygous individuals have pink petals. A plant with pink petals was crossed with a plant with white petals.
What is the % chance of obtaining offspring with **white** petals? **% =** ☐

(c) In Dalmatian dogs the allele for brown spots is recessive to the allele for black spots. The two parents were heterozygous in respect of spot colour.
What is the % chance of obtaining offspring with **black** spots? **% =** ☐

(d) Red hair in humans is recessive to all other hair colours. A red-haired woman and a black-haired man, whose own father was red-haired, started a family.
What is the % chance of obtaining offspring with **red** hair? **% =** ☐

Q 10 (b) 2009

(b) In guinea pigs the allele for black hair (B) is dominant to the allele for brown hair (b) and the allele for short hair (S) is dominant to the allele for long hair (s). The alleles governing hair colour are located on a different chromosome pair to those governing hair length.

(i) Explain the terms *alleles* and *dominant*.

(ii) What term is used to describe alleles that lie on the same chromosome?

(iii) Why is it significant that the two pairs of alleles, mentioned above in relation to guinea pigs, are located on different chromosome pairs?

(iv) Determine all the possible genotypes and phenotypes of the offspring of a cross between the following guinea pigs:

Brown hair, heterozygous short hair X Heterozygous black hair, long hair

(27)

(c) (i) Explain the term *species*.

(ii) Within a species a considerable degree of variation is usually seen.

1. What is meant by *variation*?
2. State **two** causes of variation.

(iii) What is the significance of inherited variation in the evolution of species?

(iv) State **two** types of evidence used to support the theory of evolution. **(24)**

Q11 2008

11.(a) Explain the following terms which are used in genetics: homozygous, recessive, phenotype. **(9)**

(b) In the fruit fly, *Drosophila*, the allele for grey body (**G**) is dominant to the allele for ebony body (**g**) and the allele for long wings (**L**) is dominant to the allele for vestigial wings (**l**). These two pairs of alleles are located on different chromosome pairs.

(i) Determine all the possible genotypes and phenotypes of the progeny of the following cross: grey body, long wings (heterozygous for both) X ebony body, vestigial wings.

(ii) What is the significance of the fact that the two allele pairs are located on different chromosome pairs? **(27)**

(C) Haemophilia in humans is governed by a sex-linked allele. The allele for normal blood clotting (**N**) is dominant to the allele for haemophilia (**n**).

(i) What is meant by sex-linked?

(ii) Determine the possible genotypes and phenotypes of the progeny of the following cross:

haemophilic male X heterozygous normal female. **(24)**

Q5 2007

5. (a) In genetics, what is meant by sex linkage? .....

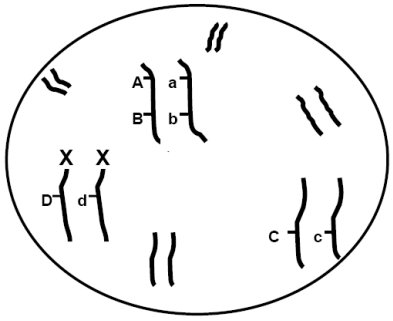
(b) In humans a sex-linked recessive allele **c** is responsible for red-green colour blindness. Complete the blank spaces above the lines in the following cross.

			X X	
Parents	**c** ⊣ | |	X	**c** ⊣ | **C** ⊣	
Gametes		X	_____	_____
F1	**c** ⊣ | **c** ⊣ |	**c** ⊣ | **C** ⊣		
			_____	_____
Phenotypes:				
Sex	_____	_____	_____	_____
Vision	_____	_____	_____	_____

Q12(a & b) 2006

12. (a) (i) Explain the following terms as used in genetics: species, variation.
(ii) Give **one** cause of genetic variation. **(9)**

(b) The diagram shows some of the chromosomes in the nucleus of a cell taken from a small mammal.



(i) What is the sex of this individual?
(ii) How many loci are marked in the diagram?
(iii) "A is linked to B but not to C". Is this statement correct? Explain your answer.
(iv) Is D linked to d? Explain your answer.
(v) What term is used to describe the allele pair Dd?
(vi) Draw a diagram, similar to the one above, but in which A, B, and C are homozygous and the cell is taken from an individual of the opposite sex. **(27)**

Q10(B & C) 2005

(B) Cystic fibrosis is a serious condition that affects the lungs and digestive system. The condition

results from the inheritance of a single pair of recessive alleles.

(i) Explain each of the underlined terms.

(ii) Suggest why a person with an heterozygous allele pair does not suffer from the condition.

(iii) If both parents are heterozygous what is ~~the p~~ercentage chance that one of their children may inherit the condition? Explain how you obtained your answer.

(iv) What is meant by genetic screening?

(v) Parents who are suspected of being carriers of disease-causing alleles may be advised to consider a genetic test. Suggest a role for such a test after *in-vitro* fertilisation.

(27)

(c) (i) Define the following terms as used in genetics; linkage, sex linkage.

(ii) Explain why linked genes do not assort independently.

(iii) Red-green colour blindness is a sex (X)-linked condition. Normal red-green vision results from the possession of a dominant allele (**C**). In each of the following cases give the genotypes of the mother and of the father.

1. A family in which one daughter is red-green colour blind and one daughter has normal colour vision.
2. A family in which all the sons are red-green colour blind and all the daughters are carriers (heterozygous).

(24)