

## Gr 12 LIFE SCIENCES REVISION TERM 2 TYPICAL EXAM QUESTIONS

<b>Topic 5:</b>	<b>Genetics and Inheritance</b>
<b>Date:</b>	<b>19 July 2021 – 35 minutes</b>
<b>Content:</b>	<b>Concepts of inheritance, Monohybrid crosses, Sex determination, Sex-linked inheritance</b>

### **QUESTION 1** (*Questions taken from various sources*)

Various options are provided as possible answers to the following questions.

Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.4) in your ANSWER BOOK, for example 1.5 D.

- 1.1 When a red horse (**RR**) is crossed with a white horse (**WW**), the offspring are all roan (**RW** = red and white hairs together). This type of inheritance is known as ...
- A codominance.
  - B polygenic inheritance.
  - C multiple alleles.
  - D incomplete dominance.
- 1.2 In mice brown fur coat is dominant to white fur coat. If a heterozygous brown mouse is mated with a white mouse and 8 offspring are produced, how many would be expected to be white?
- A 4
  - B 8
  - C 0
  - D 2
- 1.3 Which of the following is usually NOT possible for red-green colour blindness?
- A A carrier mother passes the allele on to her daughter.
  - B A colour-blind father passes the allele on to his daughter.
  - C A colour-blind father passes the allele on to his son.
  - D A carrier mother passes the allele on to her son.
- 1.4 An extra finger in humans is rare but is due to a dominant gene. When one parent is normal and the other parent has

an extra finger but is homozygous for the trait, what is the chance that their children will be normal?

- A 0%
- B 25%
- C 50%
- D 75%

(8)

**QUESTION 2.** (Questions taken from various sources)

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.3) in your ANSWER BOOK

2.1 Organisms that have two identical alleles for a particular characteristic

2.2 The physical / functional expression of an organism's genes

2.3 Allele that is only expressed in the homozygous state

(3)

**QUESTION 3** (Questions taken from various sources)

Indicate whether each of the statements in COLUMN I applies to **A ONLY, B ONLY, BOTH A AND B or NONE** of the items in COLUMN II.

Write **A only, B only, both A and B, or none** next to the question number (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II	
3.1	Sex chromosomes	A B	Autosomes Gonosomes
3.2	Heterozygous condition expresses both alleles in gene pair	A B	Co-dominance Incomplete dominance
3.3	All the genes in all the chromosomes of a species	A B	Genome Genotype

(3x 2) (6)

**QUESTION 4** (GDE, SCE 2018, Paper 2)

Lindiwe has two sons and she is now pregnant for the third time.

Use a genetic cross to show the percentage chance that this child could be a boy

**(6)**

**QUESTION 5** (KZN, Sept. 2018, Paper 2)

A female who is not colour blind but who has one allele for colour blindness marries a male who is not colour blind.

Use a genetic cross to show all possible genotypes and phenotypes of their children. Use the alleles **N** for normal and **n** for colour-blindness.

**(6)**

**QUESTION 6** (EC, Sept. 2019, Paper 2)

Read the following extract.

Duchenne's muscular dystrophy is a genetic disorder in which the skeletal muscles progressively weaken. It is a sex-linked disorder. The recessive mutated gene codes for a weak form of protein which cause the muscle fibres to weaken and break down. Duchenne's muscular dystrophy mostly affects boys and causes their muscles to weaken from the age of about 3. By the time they are teenagers they will be using a wheelchair and eventually their heart and respiratory muscles will also be affected.

6.1 Define a sex-linked disorder. (1)

6.2 According to the extract, when will parents first notice the changes in the muscles of their child? (1)

6.3 Explain why it is more common for boys to suffer from Duchenne's muscular dystrophy than girls? (4)

**(6)**

<b>Topic 5:</b>	<b>Genetics and Inheritance</b>
<b>Date:</b>	<b>20 July 2021 – 40 minutes</b>
<b>Content:</b>	<b>Blood grouping and Dihybrid crosses</b>

**QUESTION 1** (*Questions taken from various sources*)

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.4) in your ANSWER BOOK, for example 1.5 D.

- 1.1 If the mother has blood group AB and the father blood group O the possible blood groups of the offspring will be ...
- A A or B only.
  - B AB only.
  - C O only.
  - D A, B, AB or O.

**QUESTIONS 1.2 TO 1.4 ARE BASED ON THE TABLE BELOW:**

In a certain plant species, the gene for stem colour assort independently to the gene for plant height. The symbols for the alleles of the two genes are shown below.

<b>STEM COLOUR</b>	<b>PLANT HEIGHT</b>
B: black	T: tall
b: red	t: dwarf

Plant 1 is tall and has a black stem. Plant 1 has a parent that is a dwarf plant with a red stem.

- 1.2 Which of the following represents the phenotype of a plant with a genotype BBtt?
- A Tall plant with a black stem
  - B Dwarf plant with a black stem
  - C Tall plant with a red stem
  - D Dwarf plant with a red stem

1.3 Which of the following is the genotype of plant 1?

- A BBTT
- B bbtt
- C BbTt
- D BBTt

1.4 What are the possible gametes of a plant with a genotype of BbTt?

- A BT; BT; bt; bt
- B B; b; T; t
- C BT; Bt; bT; bt
- D B; B; T; T

(8)

**QUESTION 2.** (Questions taken from various sources)

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.3) in your ANSWER BOOK

2.1 A genetic cross involving two characteristics

2.2 The blood type with the genotype ii

2.3 Both alleles of a gene are equally dominant whereby both alleles express themselves in the phenotype in the heterozygous condition

(3)

**QUESTION 3** (Questions taken from various sources)

Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II	
3.1	Blood types	A	Incomplete dominance
		B	Multiple alleles
3.2	Number of alleles controlling blood groups	A	Two
		B	Three
3.3	Law of Mendel that states: alleles of a gene for one characteristic segregate independently of the alleles of a gene for another characteristic	A	Law of segregation
		B	Law of independent assortment

(3x 2)

(6)

**QUESTION 4** (EC, Sept. 2019, Paper 2)

In sheep, the allele for black wool (**B**) is dominant over the allele for white wool (**b**). Similarly, the allele for horns (**H**) is dominant over the allele for being hornless (**h**). A horned sheep with black wool was crossed with a pure breeding hornless sheep with white wool.

The punnett diagram below shows the result of this cross.

<b>SHEEP 1</b> →	<b>BH</b>	<b>Bh</b>	<b>bH</b>	<b>bh</b>
<b>SHEEP 2</b> ↓				
<b>bh</b>	<b>Y</b>			
<b>bh</b>		<b>X</b>		
<b>bh</b>				
<b>bh</b>				

- 4.1 State why the example above represents a dihybrid cross. (1)
- 4.2 Give the genotype for the horned sheep with black wool used in this cross. (1)
- 4.3 Give the:
- (a) Genotype of offspring **X** (1)
- (b) Phenotype of offspring **Y** (1)
- 4.4 If 32 offspring are produced, how many offspring are expected to have horns and white wool. (2)
- (6)**

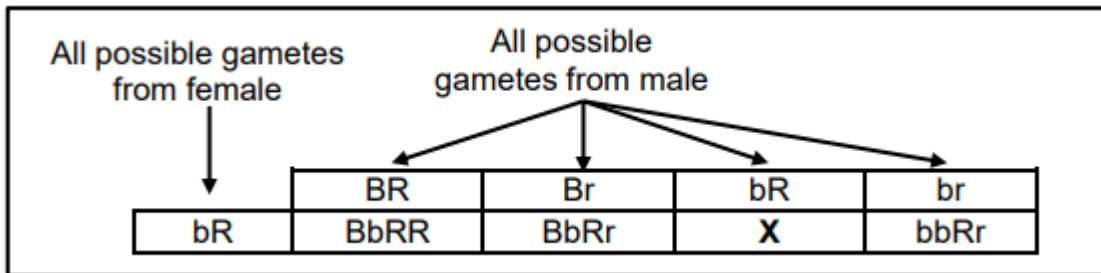
**QUESTION 5** (DBE, Nov. 2020, Paper 2)

There is variation in the characteristics of fur colour and fur texture in cats.

The table below shows the alleles that control these two characteristics.

CHARACTERISTIC	ALLELE	PHENOTYPE
Fur colour	<b>B</b>	Black
	<b>b</b>	White
Fur texture	<b>R</b>	Rough
	<b>r</b>	Smooth

The Punnett square below shows the inheritance of these alleles in a genetic cross.



- 5.1 Name the:
- (a) Dominant phenotype for fur colour (1)
  - (b) Recessive phenotype for fur texture (1)
- 5.2 Give the:
- (a) Genotype of offspring **X** (1)
  - (b) Phenotype of the female parent (2)
  - (c) Genotype of the male parent (1)
- 5.3 State the phenotype that ALL the offspring of this genetic cross have in common. (1)
- (7)**

**QUESTION 6** (DBE, Nov. 2020, Paper 2)

A man with blood group AB and a woman who is heterozygous for blood group B plan to have children.

6.1 How many alleles control the inheritance of blood groups? (1)

6.2 Describe the type of dominance that occurs in the inheritance of blood group **B** in the woman. (3)

6.3 Use a genetic cross to show all the possible genotypes and phenotypes of their children. (6)

**(10)**



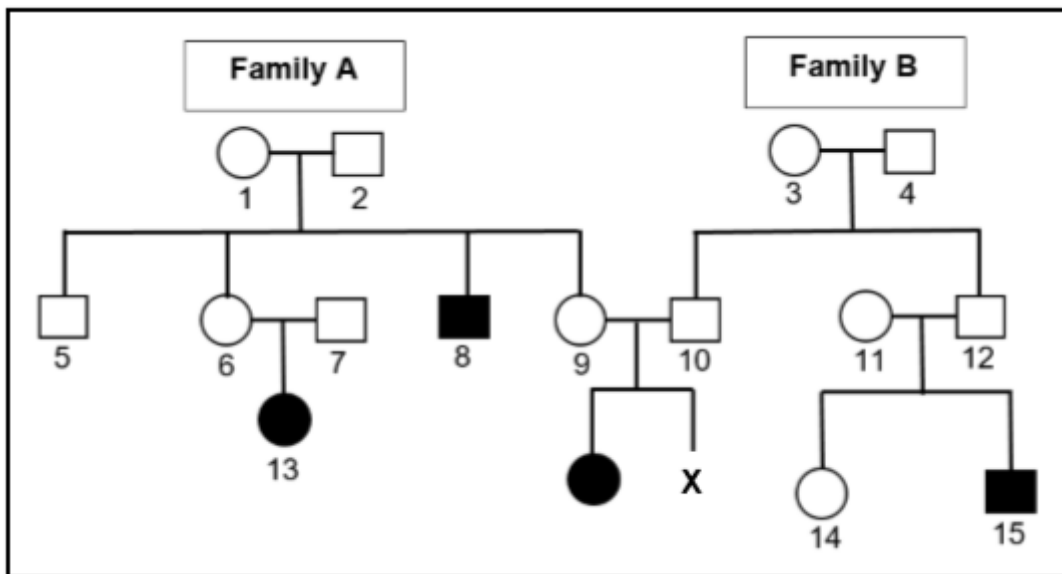
<b>Topic 5:</b>	<b>Genetics and Inheritance</b>
<b>Date:</b>	<b>21 July 2021 – 29 minutes</b>
<b>Content:</b>	<b>Genetic lineages/pedigree diagrams and Mutations</b>

**QUESTION 1** (EC, Sept. 2019, Paper 2)

Cystic fibrosis is a genetic condition that causes a build-up of thick sticky mucus in the lungs, pancreas, liver and intestines.

Study the diagram below of two families that carry the cystic fibrosis gene.

The letters **N** and **n** are used to represent the two alleles.

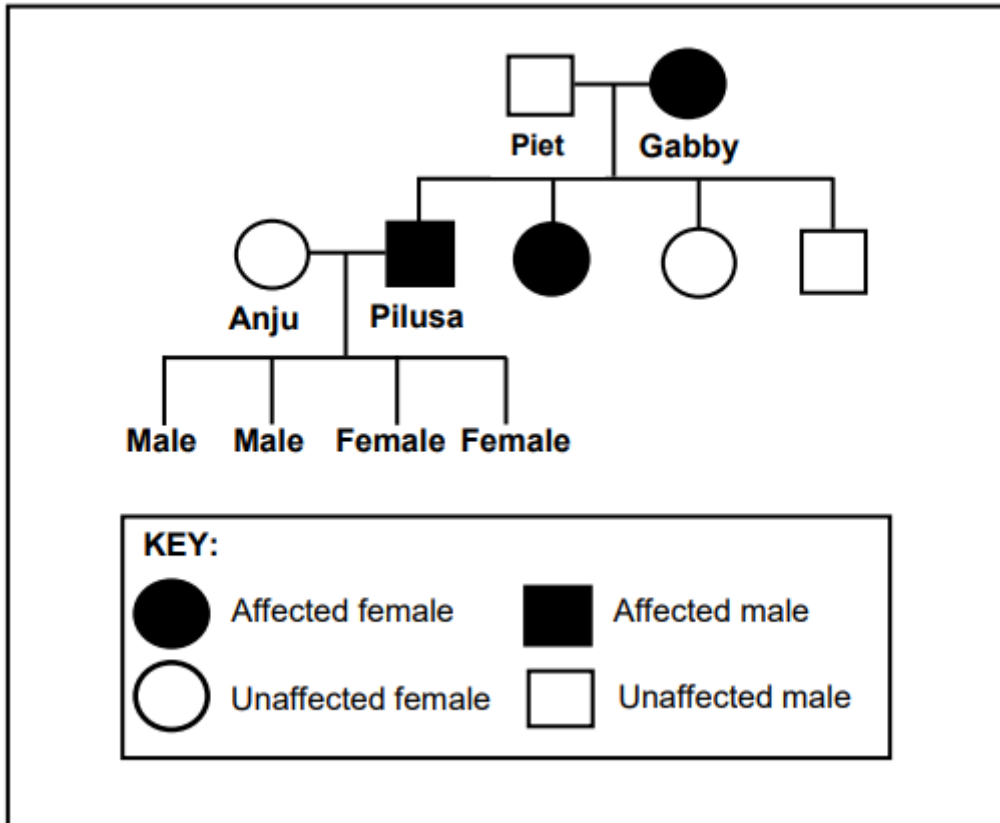


- 1.1 Define a *gene mutation*. (1)
- 1.2 Name the type of diagram shown above. (1)
- 1.3 How many generations are shown in the diagram? (1)
- 1.4 Using evidence from the diagram, explain why the gene for cystic fibrosis is a recessive allele. (3)
- 1.5 Individual **9** and individual **10** are expecting their second child **X**. (6)  
Use a genetic cross to show the percentage chance of them having a child with cystic fibrosis (12)

**QUESTION 2** (DBE, Nov. 2020, Paper 2)

Goltz syndrome is a sex-linked genetic disorder. It is caused by a dominant allele  $X^G$ .

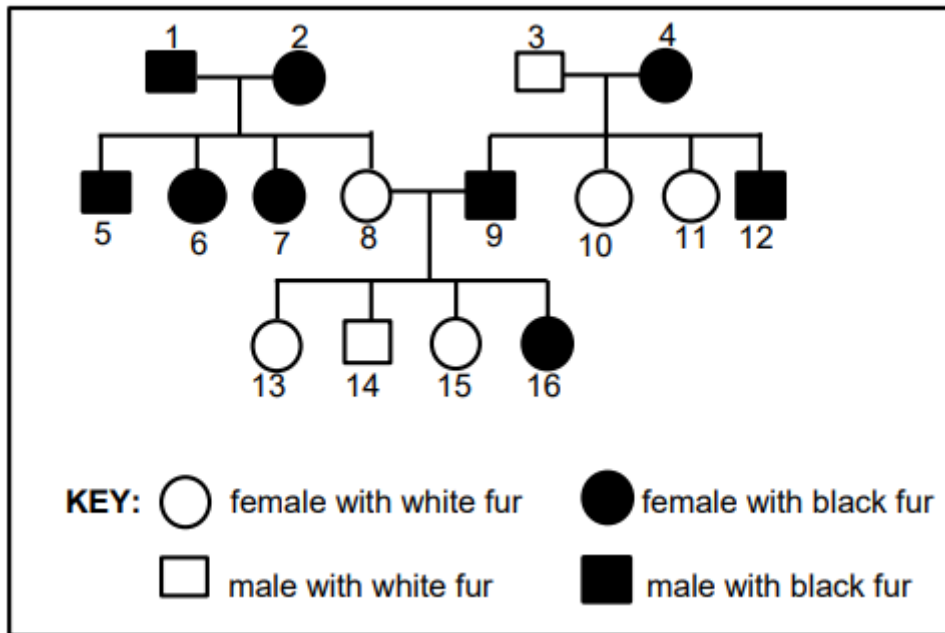
The diagram below shows the inheritance of Goltz syndrome in a family.



- 2.1 Name the type of diagram shown. (1)
- 2.2 How many:
- (a) Females are in this family (1)
  - (b) Males in the  $F_1$ -generation have Goltz syndrome (1)
- 2.3 Give Gabby's genotype. (2)
- 2.4 Anju and Pilusa have four children. Give the phenotype of their sons. (2)
- 2.5 Explain your answer to QUESTION 2.4. (4)
- (11)**

**QUESTION 3** (EC, Sept. 2017, Paper 2)

Mice may have white fur or black fur. The diagram shows the inheritance of fur colour in mice



- 3.1 What is this diagram called? (1)
  - 3.2 How many sets of parents are represented in this diagram? (1)
  - 3.3 Give the phenotype:
    - (a) Which is dominant (1)
    - (b) Of individual **9** (1)
  - 3.4 Use the letter **A** for the dominant allele and **a** for the recessive allele to give the genotype of:
    - (a) **8** (1)
    - (b) **16** (1)
- (6)**

<b>Topic 5:</b>	<b>Genetics and Inheritance</b>
<b>Date:</b>	<b>22 July 2021 – 39 minutes</b>
<b>Content:</b>	<b>Genetic engineering, Paternity testing, and Genetic links</b>

**QUESTION 1** (*Questions taken from various sources*)

Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1 to 1.4) in your ANSWER BOOK, for example 1.5 D.

1.1 Stem cells can be harvested in ...

- A very young embryos (one to three days old).
- B the centre of older embryos (five to fourteen days old).
- C certain foetal tissue (e.g. the umbilical cord).
- D all the above.

1.2 Study the list below.

1. Endangered species could be preserved.
2. Use of herbicides is reduced.
3. Crop yields are improved.
4. Health impacts on human health is known/or not known.

Which ONE of the following combinations represents support for genetic modification?

- A 1, 2, 3 and 4
- B 1, 2 and 4 only
- C 1, 2 and 3 only
- D 1, 3 and 4 only

1.3 During cloning, a nucleus is taken from a somatic cell and introduced into ...

- A a sperm cell.
- B an ovum.
- C a zygote.
- D another somatic cell.

1.4 Steps in the process of cloning an organism are provided below:

- (i) The embryo is implanted into the uterus of organism A
- (ii) An ovum is removed from organism A
- (iii) The nucleus of a donor cell from organism B is inserted into the  
ovum
- (iv) The cell is stimulated to divide

Which ONE of the following represents the correct order of steps?

- A (i), (ii), (iii), (iv)
- B (i), (iii), (ii), (iv)
- C (ii), (iv), (i), (iii)
- D (ii), (iii), (iv), (i) (8)

**QUESTION 2.** (*Questions taken from various sources*)

Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (2.1 to 2.3) in your ANSWER BOOK

2.1 Undifferentiated animal cells that can give rise to specialised cell

2.2 types

The process of producing similar populations of genetically

2.3 identical individuals

The manipulation of biological processes to satisfy human needs (3)

**QUESTION 3** (Questions taken from various sources)

Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, or **none** next to the question number (3.1 to 3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II	
3.1	Inheritance of mitochondrial DNA	A B	Mother Father
3.2	Genetic engineering	A B	Cloning GMOs
3.3	Paternity testing	A B	DNA profiling Blood grouping

(3x 2) **(6)**

**QUESTION 4** (GDE, Nov. 2020, Paper 2)

A farmer decided to have his best meat-producing bull cloned. The following steps were used in the process:

- A muscle cell was taken from the bull and the nucleus was removed.
- An ovum was taken from a cow and the nucleus was removed and discarded.
- The nucleus from the muscle cell was placed in the empty ovum.
- The ovum was given an electric shock to stimulate normal cell division to produce an embryo.
- The embryo was placed in the uterus of a surrogate cow where it developed into the clone.

4.1 What is *cloning*? (1)

4.2 Explain why the nucleus of a muscle cell was used and not the nucleus of a sperm cell. (2)

4.3 Explain why the nucleus of the ovum was removed. (2)

4.4 State ONE benefit of cloning. (1)

**(6)**

### QUESTION 5 (EC, Sept. 2017, Paper 2)

The European Corn Borer (ECB) worm is a pest which reduces crop yield of corn on farms. The soil bacterium *Bacillus thuringiensis* (Bt) contains a gene which causes the production of a poison which kills the ECB worm. In an effort to control the ECB worm, scientists incorporated the Bt poison gene into a corn plant resulting in corn plants that produce the same poison. They wanted to investigate if using the Bt corn would increase crop yields. The scientists conducted the investigation as follows:

- They planted Bt corn in one field and non Bt corn in another field (the environmental conditions for the two fields were exactly the same)
- The European Corn Borer was introduced into the fields
- The plants were grown and harvested after a period of five months
- The average yield of plants was recorded
- The experiment was repeated four times and an average was calculated

The results are shown in the table below.

**TABLE SHOWING THE AVERAGE YIELD OF DIFFERENT VARIETIES OF CORN PLANTS**

	<b>Average crop yield (bushels per acre)</b>
<b>Corn variety</b>	<b>With ECB</b>
non Bt	146
Bt corn	158

- 5.1 Name the process by which the Bt gene is inserted into corn to make Bt corn. (1)
- 5.2 State the hypothesis of this investigation. (2)
- 5.3 State the:  
(a) Independent variable (1)  
(b) Dependent variable (1)
- 5.4 Describe ONE way in which the reliability was ensured in this investigation. (1)

- 5.5 State the conclusion for this investigation. (2)
- 5.6 Explain ONE benefit to a farmer of using Bt corn. (2)
- 5.7 On the same set of axes, draw a bar graph to show the average crop yield of the two varieties of corn plants. (6)
- (16)**