

MONYETLA BURSARY PROJECT – PAST PAPER QUESTIONS – 20 APRIL 2024

1 GENETICS

5.1 The size and colour of unripe fruit in a plant species is genetically controlled. The allele for small fruit (**b**) is recessive to the allele for big fruit (**B**). The allele for yellow fruit colour (**g**) is recessive to the allele for green fruit (**G**).

5.1.1 State:

(a) The phenotype of the plant with the genotype **BbGg** (2)

(b) ALL possible genotypes of the gametes produced by the plant mentioned in QUESTION 5.1.1(a) (2)

5.1.2 In a cross between two plants with genotypes **BBGG** and **bbgg** what percentage of the offspring will be homozygous for both characteristics? (2)
(6)

5.3. In rice plants the allele for high yield (H) is dominant over the allele for low yield (h). The allele for a tall stem (T) is dominant over the allele for a short stem (t).

There are two varieties of rice plants, A and B.
The genotype of variety A is HHtt.
The genotype of variety B is hhTT.

A plant breeder wants to produce a rice plant variety with a high yield and a short stem.

5.3.1 Give the phenotype of variety A. (2)

5.3.2 Give ALL the possible genotypes of the gametes of variety B. (1)

5.3.3 Give the genotype(s) of the variety the plant breeder wants to produce. (2)

5.3.4 Explain why the plant breeder would want to produce a rice plant with a short stem. (1)

5.3.5 Describe how the plant breeder would be able to produce rice plants with a high yield and short stems only. (2)
(8)

ANSWERS

GENETICS

5.1	5.1.1	(a) Big✓ and green✓ fruit	(2)
		(b) BG, Bg, bG, bg✓✓	(2)
	5.1.2	0✓ %✓	(2)
			(6)

5.3	5.3.1	High yield✓ Short stem✓	(2)
	5.3.2	hT✓ <i>(Mark first ONE only)</i>	(1)
	5.3.3	HHtt✓, Hhtt✓ <i>(Mark first TWO only)</i>	(2)
	5.3.4	Does not break easily in windy conditions✓/to carry a bigger yield/ easier to harvest	Any (1)
	5.3.5	The plant breeder must cross✓ plants of variety A (HHtt) with plants of variety A✓(HHtt)	(2)
			(8)

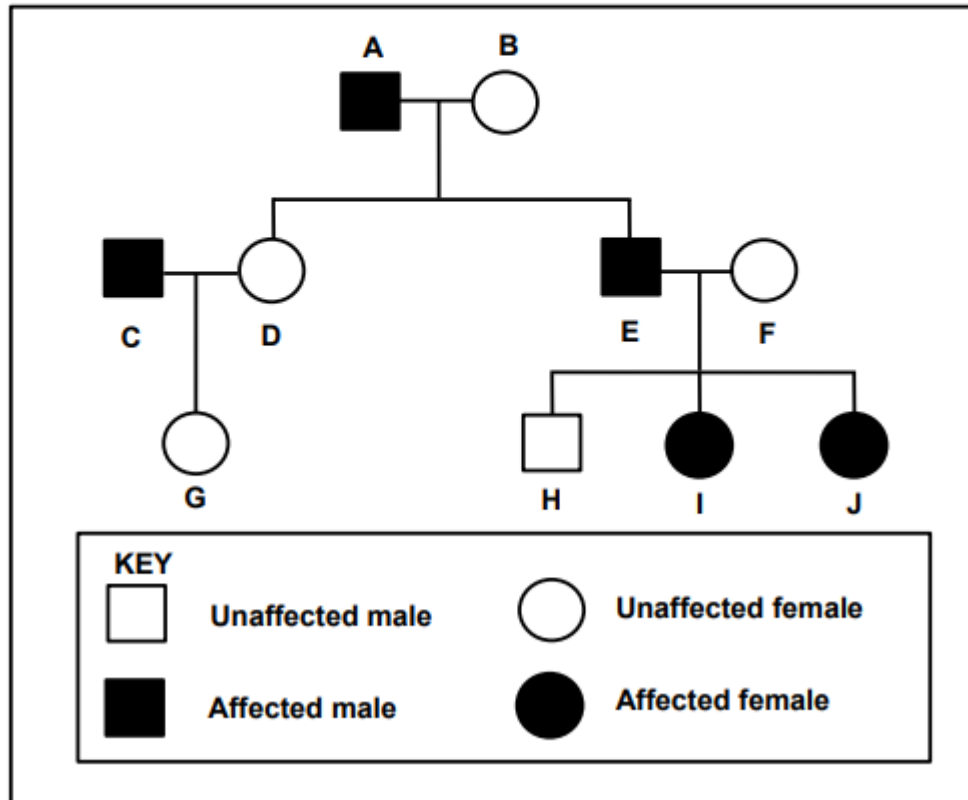
ANSWERS

NOVEMBER 2022 – NSC PAPER 2

1.4	1.4.1	3✓/Three	(1)
	1.4.2	(a) H✓	(1)
		(b) Rr✓	(1)
		(c) C✓and F✓	(2)
			(5)

- 1.4 Moyamoya is a disorder caused by a dominant allele (**R**). This disorder damages the arteries supplying blood to the brain.

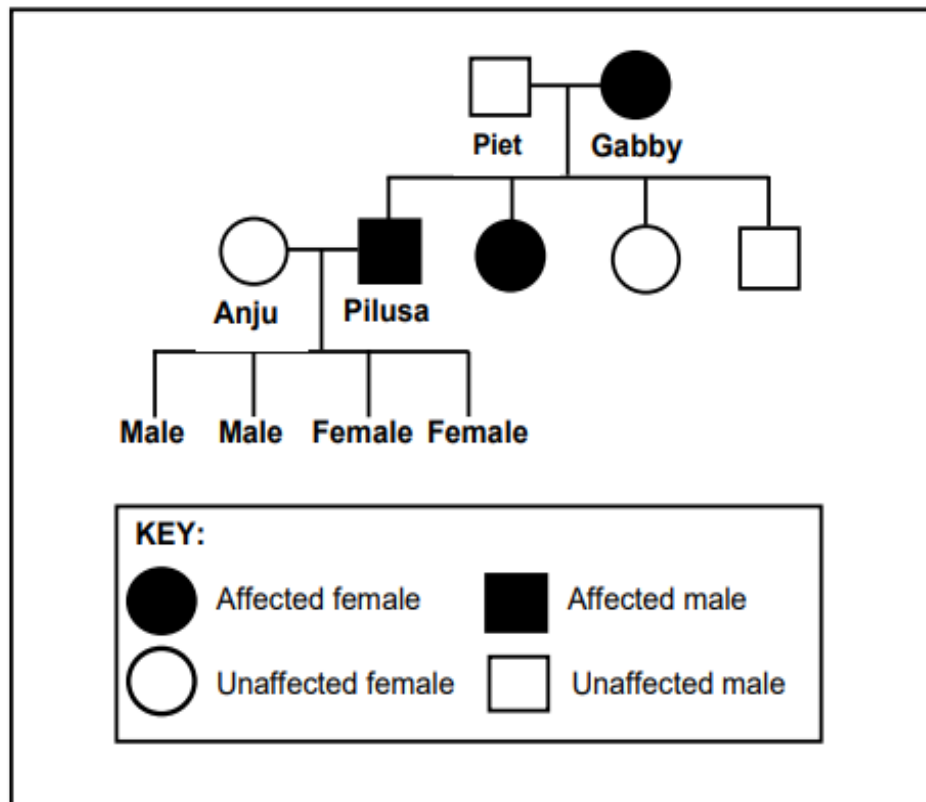
The pedigree diagram below shows the inheritance of Moyamoya in a family.



- 1.4.1 How many generations are represented in the diagram? (1)
- 1.4.2 Give the:
- (a) LETTER(S) of unaffected males (1)
- (b) Genotype of individual **A** (1)
- (c) LETTER(S) of individuals not biologically related to **A** and **B** (2)
- (5)**

- 2.5 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.



- 2.5.1 Name the type of diagram shown. (1)
- 2.5.2 How many:
- (a) Females are in this family (1)
- (b) Males in the F_1 -generation have Goltz syndrome (1)
- 2.5.3 Give Gabby's genotype. (2)
- 2.5.4 Anju and Pilusa have four children. Give the phenotype of their sons. (2)
- 2.5.5 Explain your answer to QUESTION 2.5.4. (4)
- (11)**

ANSWERS

- 2.5.1 Pedigree✓ diagram (1)
- 2.5.2 (a) 6✓ (1)
- (b) 1✓ (1)
- 2.5.3 $X^G X^g$ ✓✓ (2)
- 2.5.4 Unaffected✓✓/without Goltz syndrome (2)
- 2.5.5
- Pilusa is affected✓/ $X^G Y$
 - Anju is unaffected✓/ $X^g X^g$
 - Males inherit the Y chromosome from Pilusa✓
 - and inherit X^g from Anju✓
- (4)
- (11)**
-

1.1.6 Colour-blindness is a disorder caused by a recessive allele on the X chromosome. Which ONE of the following is the genotype of a colour-blind person?

- A $X^D X^D$
- B $X^D Y$
- C $X^D X^d$
- D $X^d Y$

ANSWER

1.1.6 D