

Craigie High School

National 5 Biology

Unit 2

Multicellular Organisms

Ink Exercise Four

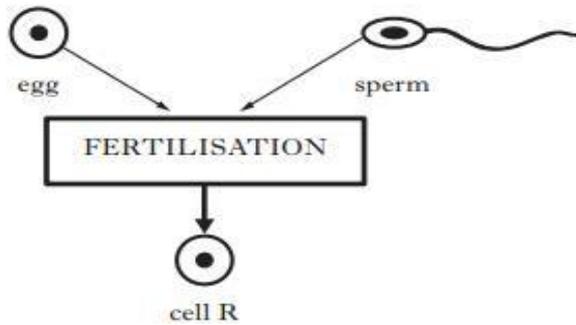
**Reproduction, Variation and
Inheritance.**

Name: _____

Class: _____

Question 1

The diagram below shows the process of fertilisation.

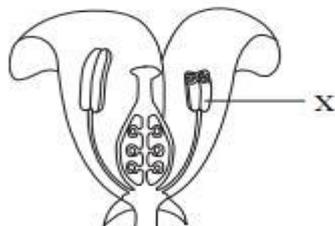


Cell R is

- A a zygote
- B a gamete
- C an ovule
- D an embryo.

Question 2

The diagram below shows the main parts of a flower.



Which line in the table identifies X and the type of gamete it produces?

	<i>Name of X</i>	<i>Type of gamete produced</i>
A	ovary	male
B	ovary	female
C	anther	female
D	anther	male

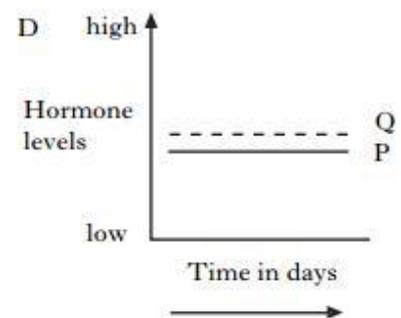
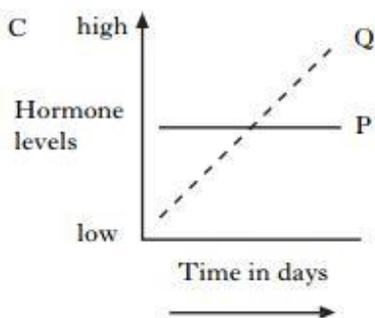
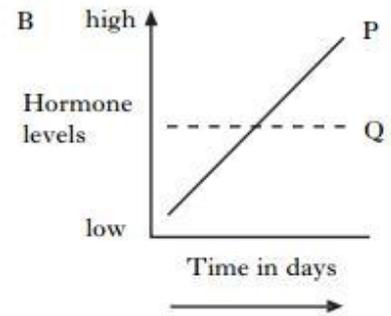
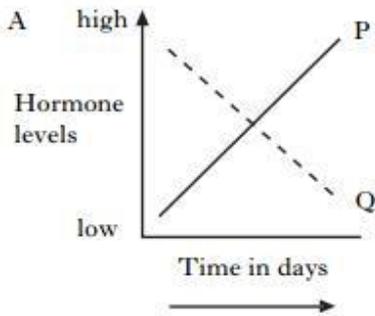
Question 3

Sperm production in humans is controlled by two hormones, P and Q.

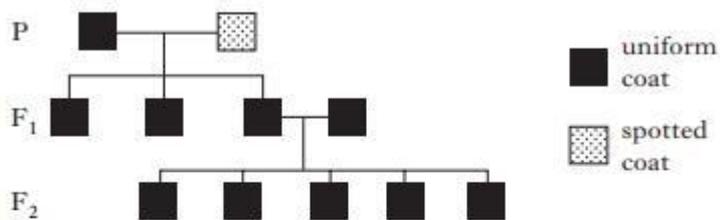
As levels of P rise, sperm production increases.

As levels of Q rise, sperm production decreases.

Which of the graphs below shows the changes in hormone levels of a man whose sperm production is decreasing?



Question 4



From the family tree above, in which generation(s) are all the dogs heterozygous for coat colour?

- A P only
- B F₁ only
- C F₂ only
- D P and F₁

Question 5

A hairy stemmed pea plant is crossed with a smooth stemmed pea plant. All the F₁ plants had hairy stems.

The genotype of the F₁ plants was

- A heterozygous
- B homozygous
- C dominant
- D recessive.

Question 6

Distichiasis is a dominant characteristic in humans which causes the person to have two rows of eyelashes.

A woman who is homozygous for the condition and a man who is unaffected have children.

What proportion of their children would be expected to have *Distichiasis*?

- A 0%
- B 25%
- C 50%
- D 100%

Question 7

A hairy stemmed pea plant was crossed with a smooth stemmed pea plant and all of the F₁ had hairy stems.

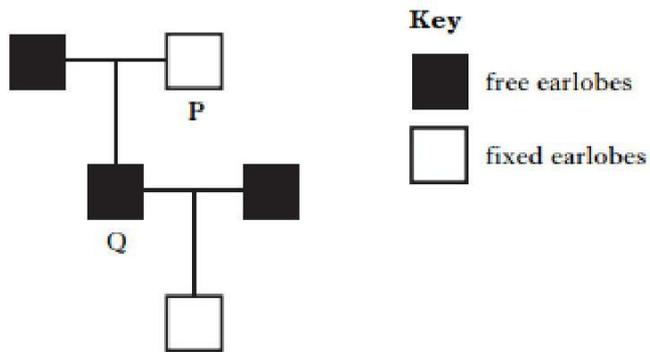
The genotype of the hairy stemmed parent plant is

- A heterozygous dominant
 - B heterozygous recessive
 - C homozygous recessive
 - D homozygous dominant.
-

Question 8

In humans, the allele for free earlobes (E) is dominant to the allele for fixed earlobes (e).

The diagram below shows the inheritance of this characteristic.



Which line in the table identifies correctly the genotypes of persons P and Q?

	<i>Genotype</i>	
	<i>P</i>	<i>Q</i>
A	ee	EE
B	ee	Ee
C	EE	Ee
D	Ee	Ee

Question 9

In gerbils, agouti coat colour is dominant to white.

Some heterozygous gerbils were allowed to interbreed and 56 offspring were produced. What would be the expected number of agouti gerbils?

- A 14
- B 28
- C 42
- D 56

Question 10

In the fruit fly *Drosophila*, the allele for normal wings is dominant to the allele for short wings.

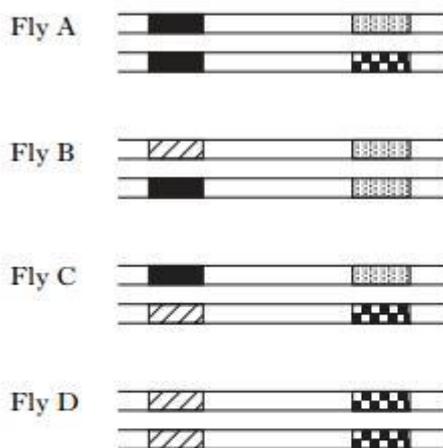
A normal winged fly was crossed with a short winged fly and all the F₁ offspring had normal wings.

If these F₁ offspring were to mate with each other, what percentage of the F₂ offspring would be expected to have normal wings?

- A 25%
- B 50%
- C 75%
- D 100%

Question 11

The diagram below shows the same sections of matching chromosomes found in four fruit flies, A, B, C and D.



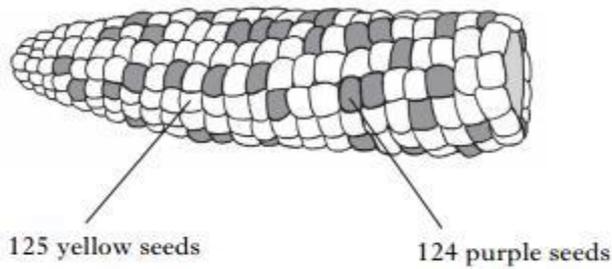
The genes shown on the chromosomes can be identified using the following key.

- Key**
-  gene for striped body
 -  gene for unstriped body
 -  gene for normal antennae
 -  gene for abnormal antennae

Which fly is homozygous for both genes?

Question 12

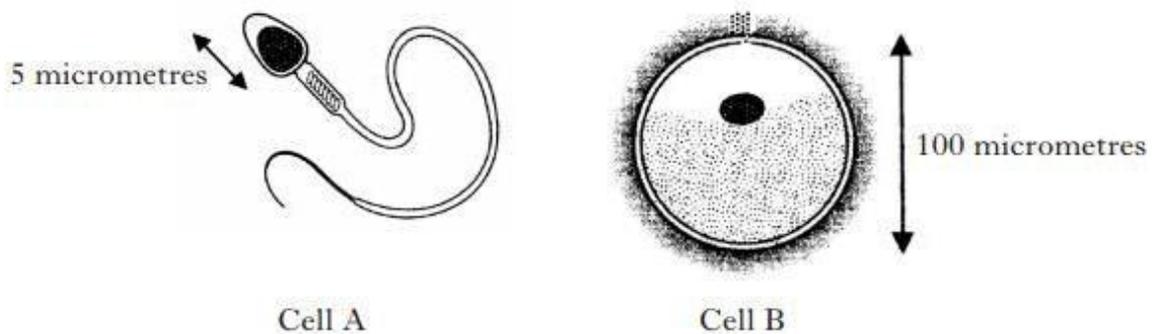
In corn on the cob, yellow seed (G) is dominant to purple seed (g). The cob shown below shows some yellow and some purple seeds. The seeds have been counted.



The genotypes of the parents that produced this cob were

- A $GG \times gg$
- B $Gg \times gg$
- C $gg \times gg$
- D $Gg \times Gg$

Question 13



(i) Name cells A and B.

Cell A _____ Cell B _____

(ii) Give **one** feature of cell A which makes it different from cell B.

(iii) Name the organ which produces cell A.

Question 14

The following table shows four blood groups and their frequency in a population.

Blood Group	Frequency in population (%)
O	44
A	42
B	10
AB	4

- (a) Calculate the simplest whole number ratio of the frequency of blood groups O to AB.

Space for calculation

Blood group $\frac{\quad}{\quad}$: $\frac{\quad}{\quad}$
 O AB

- (b) Name the type of variation shown by these blood groups.

Question 15

The difference between blue and green feather colour in budgerigars (budgies) is determined by a single gene. The allele for green (G) is dominant and the allele for blue (g) is recessive.

True-breeding blue males were allowed to breed with true-breeding green females. The offspring were allowed to interbreed to produce a second generation.



- (a) Explain what is meant by the term “true-breeding”, in terms of the alleles present.

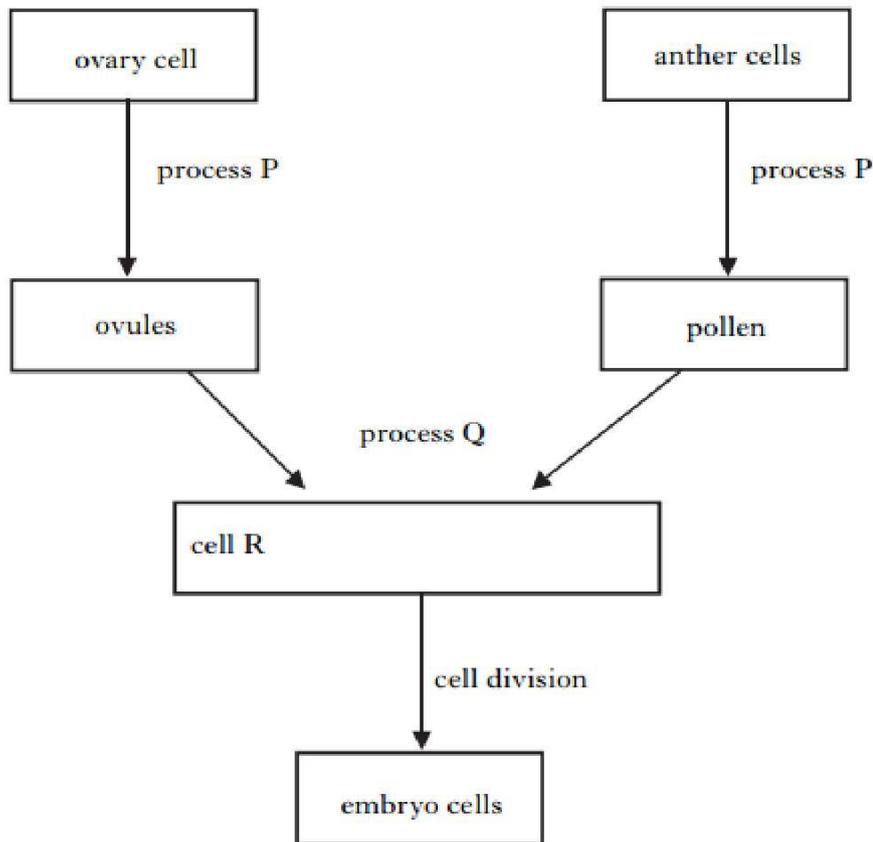
- (b) Give the genotype(s) and phenotype(s) of the F₁ generation.

genotype(s) _____

phenotype(s) _____

Question 16

(a) The diagram below shows a summary of events that occur during reproduction in a flowering plant.



- (i) **Complete the diagram** by entering the name of cell type R.
- (ii) Which process in the diagram represents fertilisation?

(iii) Complete the following table by inserting a tick (✓) in the correct boxes to show which of the cells in the diagram have a double or single set of chromosomes.

<i>Cell</i>	<i>Double set of chromosomes</i>	<i>Single set of chromosomes</i>
anther		
ovule		
R		
embryo		

Question 16

Sorghum is an important food crop in some parts of the world. The colour of the seed husk (coat) is controlled by a single gene. Purple husk colour (H) is dominant to tan husk colour (h).



(a) A true breeding purple husk plant is crossed with a true breeding tan husk

(i) What other term is used in genetics to indicate true breeding?

(ii) Complete the genotypes of the parental (P) generation below:

P purple X tan

P genotypes _____ _____

(iii) State the phenotype(s) of the F₁ plants.

F₁ phenotype(s) _____

(b) An individual from the F₁ generation is crossed with a true breeding tan husk plant.

(i) Complete the Punnett square to show the expected results of this cross.

	Genotypes of gametes from F ₁ plant	
Genotype of gametes from tan husk plant		

(ii) State the expected phenotype ratio for the offspring of this cross.

_____ : _____
purple tan

Question 17

Hair appearance in mice is controlled by a single gene.

Wavy hair (H) is dominant to straight hair (h).

Two homozygous mice were crossed, one had wavy hair and one had straight hair.

- (i) Complete the genotypes of the parental generation (P).

Wavy haired × **Straight haired**

P genotypes _____ × _____

- (ii) State the phenotype of the F₁ mice.

F₁ phenotype _____

- (iii) An F₁ mouse was crossed with a straight haired mouse.

State the genotype of the wavy haired offspring.

Space for working

Genotype _____

Question 18

Candytuft is a plant with white or pink flowers. The two forms of the gene responsible for the flower colour are:

P = pink flowers and **p** = white flowers.

(a) A plant breeder crossed two pink flowered plants as shown below.

Parents **Pp** × **Pp**

(i) What is the expected ratio of pink to white flowered plants in the offspring?

_____ : _____
pink : white

(ii) If 48 offspring had been produced, how many white flowered plants would have been expected?

Space for calculation

_____ white flowered plants

(iii) The offspring actually consisted of 24 pink flowered and 16 white flowered plants.

What is the simplest whole number ratio of pink to white flowered plants in the offspring?

Space for calculation

_____ : _____
pink : white

(iv) Suggest a reason for the difference between the expected ratio and the observed ratio.

Question 19

- (a) The photograph shows a child with dimples. Dimples are small indentations in the cheeks. Their presence is controlled by a single gene which has two forms. The dominant form (**D**) gives dimples. The recessive form (**d**) gives no dimples.



- (i) What name is given to different forms of the same gene?
-

- (ii) The parents of the child are known to have the following genotypes.

DD × dd

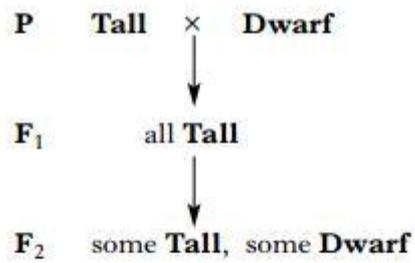
Underline one option in each bracket to make the following sentence correct.

The parents have $\left\{ \begin{array}{l} \text{the same} \\ \text{different} \end{array} \right\}$ phenotypes and
 $\left\{ \begin{array}{l} \text{the same} \\ \text{different} \end{array} \right\}$ genotypes.

- (iii) What is the genotype of this child?
-

Question 20

The diagram shows a cross between tall and dwarf pea plants.



- (i) What would be the predicted ratio of **Tall** to **Dwarf** plants in the **F₂** generation?

_____ : _____
Tall **Dwarf**

- (ii) The observed ratio of **Tall** : **Dwarf** plants was different from the expected ratio.

Give an explanation for this difference.

- (iii) Identify the true-breeding plants from the above cross.

Tick (✓) the box(es) of the correct plant(s).

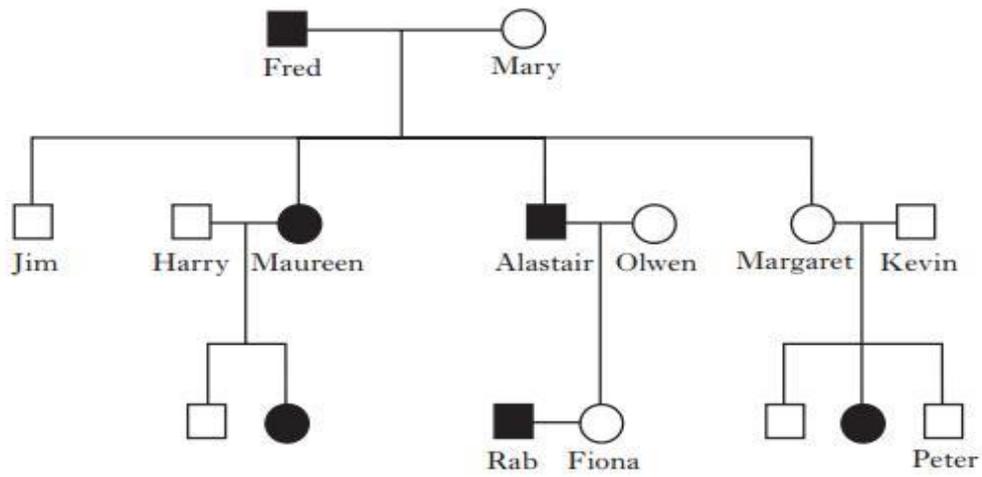
Tall P

Dwarf P

Tall F₁

Question 21

Tongue-rolling is an inherited characteristic. The diagram below shows the pattern of its inheritance in one family.



(i) Using **R** for the dominant form of the gene and **r** for the recessive form, state the genotypes of:

1 Maureen _____

2 Jim _____

3 Kevin _____

(ii) If Rab and Fiona have a child, what are the chances of the child being able to roll its tongue?

Space for working

(iii) Which of the original parents could be described as true-breeding?

Tick (✓) the correct box.

Fred Mary

Both Neither

(iv) Name a tongue-roller from the F₁ generation.

(b) Explain why the proportions of the offspring phenotypes from genetic crosses are not always exactly as predicted.

(c) What term is used for the different forms of the same gene?

Question 22

Feather colour in parrots is controlled by a single gene. Blue feather colour (B) is dominant to yellow feather colour (b).



(a) A homozygous blue parrot is crossed with a homozygous yellow parrot.

(i) Complete the genotypes of the P generation.

P phenotype blue X yellow
 P genotype _____ _____

(ii) State the genotype of the F₁ parrots.

F₁ genotype _____

(iii) State the phenotype of the F₁ parrots.

F₁ phenotype _____

(b) An F₁ individual is crossed with a true breeding yellow parrot.

Complete the punnet square to show the expected results of this cross.

	Genotype of gametes from F ₁ parent	
Genotype of gametes from yellow parent		