Class: 3 rd. Secondary (L. S.) | **First Unified Exam** | **Points:** 20 pts.
Subject: Biology | **Duration:** 150 min.

Exercise I: (8 pts) Semen analysis

In a fertility clinic 4 males performed semen analysis the results are shown in the documents below:

Male (A) is normal, he performed routine semen analysis, the results are summarized in document (1):

Number of sperm cells	Morphology of sperm cells	Percentage of Motility	Forward Progression towards oocyte	Fertility
> 40 milions/ml	> 30% Normal	> 50%	Present	> 60%

Document 1

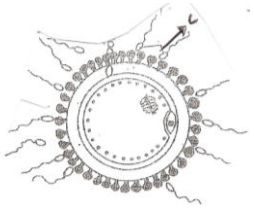
Male (B) is infertile, document (2) shows the semen analysis as recorded in the clinic:

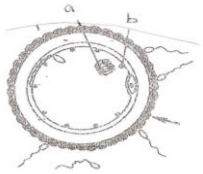
Number of sperm cells	Morphology of sperm cells	Percentage of Motility	Forward Progression towards oocyte	Fertility
Between 10 to 12 million/ml	Between 20 to 65% Normal	< 30%	Not present	< 30%

Document 2

1- Compare the semen of male (A) and male (B).

2- A medical team in this clinic had done in vitro experiments to study the medical case of male (B).They brought healthy oocytes blocked at metaphase 2 of meiosis and place them with the semen of(A) and with the semen of B as in Fig(a) and Fig(b) respectively:





Fig(a) : oocyte With semen A Fig(b): oocyte with semen B

The results of observation of the two experiments are recorded in the following document 3 as seen below:

Figure (a)	Figure (b)
Efficiency of movement and fertilization is 70%	Efficiency of movement and fertilization is null.
Forward progression towards the oocyte is 70%	Forward progression towards the oocyte is null.
Hyperactive sperms	Hypoactive sperms
Presence of protein called catsperm in the flagellum	Absence of this protein in the flagellum.

Document 3

3- After analyzing Fig. (a) and Fig. (b) deduce the cause of infertility of male (B) & the role of protein catsprem.

4- By referring to your acquired knowledge, indicate the changes that follow Fig(a) at the level of the oocyte and the spermatozoon.

5- Label a,b, and c (of Fig. a and b).

Male (C) is infertile the following document represents the results of semen analysis.

Number of sperm cells	Morphology of sperm cells	Percentage of Motility	Forward Progression towards oocyte	Fertility
Between 12 to 13 million/ml	< 30% normal sperms Presence of sperms with two heads	< 30% moves normally	Slightly found	< 30%

Document 4

6- What hypothesis you can formulate concerning the cause of infertility of male(C).

7- Explain, by referring to spermatogenesis, how would the abnormal sperm cells (with 2 heads) of male (C) be formed.

Male(D) is exposed to vasectomy, the vas deferns on each side is sectioned and the cut ends are tied thus preventing the release of spermatozoa from testes.
The results of the semen test are recorded in document 5.

Number of sperm cells in the semen	Morphology of sperm cells	Percentage of Motility	Forward Progression towards oocyte	Fertility
0	0	0	0	0

Document 5

8- Explain why there is no sperm in the semen (document 5) knowing that the semen is ejected.

<u>QUESTION II</u>: (5pts) The inheritance of two genes

A number of experiments are done on 3 pea plants A,B,&C having the same phenotypes: long stem and red flower ..The 3 plants are crossed with a plant (D) having medial stem and white flower.The following results are recorded.

1) Cross A &D GIVES100% plants having long stem and red flower.
2) CrossB&D GIVES :50% plants with medial stem and red flower,50%plants with long stem and red flower.
3) Cross C&D gives :25%long red plants ,25%medial red,25% medial white,25% long white..

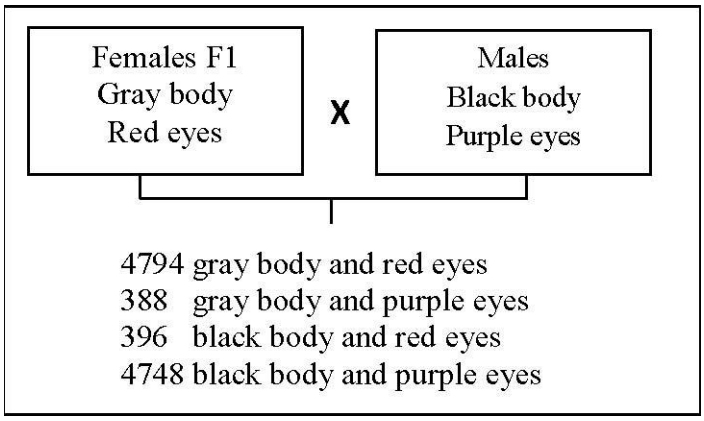
1- What are the dominant and the recessive phenotypes. Justify your answer.

2- Determine the genotypes of the A, B&C plants and justify your answer

QUESTION III: (7pts)

In an attempt to study the autosomal heredity in drosophilae, we cross a drosophila of pure race ,, having grey body and red eyes and well formed wings with another drosophila of pure race having black body ,purple eyes and deformed wings. We obtaind in $F_1$100% drosophilae having gray body red eyes and well formed wings.

First Cross



1- Indicate the dominant allele and recessive allele for each of the studied genes.

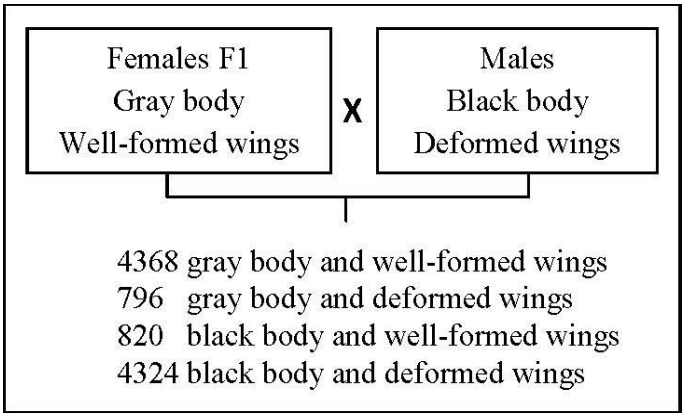
We perform, in drosophilae, two other experimental crosses 1 and 2, represented in the adjacent figures.

2- Name the type of the performed crosses.

3- Explain the results obtained in the first cross.

Second Cross

The results of the two crosses put in evidence the existence of a certain type of genetic recombination during meiosis in female drosophilae F1.



4- Name this type of genetic recombination and illustrate by explanatory schematic drawings the behavior of the corresponding chromosomes of the second cross.

5- Determine, by referring to the first and second crosses, whether the genes responsible for eye color and form of wings are linked or independent.

6- Calculate the percentage of recombination between the studied genes in each of the two crosses.

7- Knowing that the percentage of recombination between the genes of eye color and form of wings is 8%, establish a factorial map which reveals the location of the three studied genes on a chromosome.

Good Work