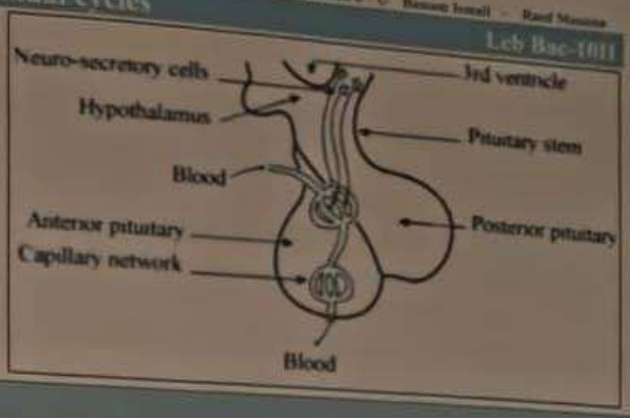
Question-2- Regulation of the sexual cycles

We aim to study the ovarian and uterine cycles by performing experiments on adult mammals.
Doc-1 illustrates the hypothalamo-pituitary complex implicated in the regulation of these cycles.



Experiment 1:
The ablation of the anterior pituitary is followed by the atrophy of both the ovaries and the uterus along with the disappearance of the cycles.

Experiment 2:
In animals submitted to the ablation of the pituitary gland and receiving regular injections of anterior pituitary extracts, we can observe a redevelopment of the ovaries and sometimes a reestablishment of the ovarian and uterine cycles. However, in an ovariectomized animal, injected by anterior pituitary extracts, we never observe a reestablishment of the uterine cycle.

Experiment 3:
Lesions of the posterior hypothalamus have the same effect as the ablation of the anterior pituitary.

1- Interpret the results of each of the three experiments.

Experiment 4:
Bilateral ovariectomy provokes a hypertrophy of the pituitary gland followed by an abnormal high production of gonadotropic hormones. This experiment allows us to admit the existence of a feedback mechanism exerted by the ovaries on the production of FSH and LH.

In order to determine the types of this feedback, an ovariectomized female monkey receives, for four periods of 15 days each, injections of ovarian hormones with different doses and composition. For each period the average level of FSH and LH production is measured (document 2).

Periods of 15 days	Characteristics of the injections		Plasmatic levels	
	Composition	Plasmatic levels	of FSH in ng/ml	of LH in ng/ml
1	Estrogen	0	> 15	> 50
	Progesterone	0		
2	Estrogen	70 pg/ml	Around 6	Around 4
	Progesterone	0		
3	Estrogen	300 pg/ml	Around 12	Around 40
	Progesterone	0		
4	Estrogen	300 pg/ml	< 4	< 3
	Progesterone	4 pg/ml		

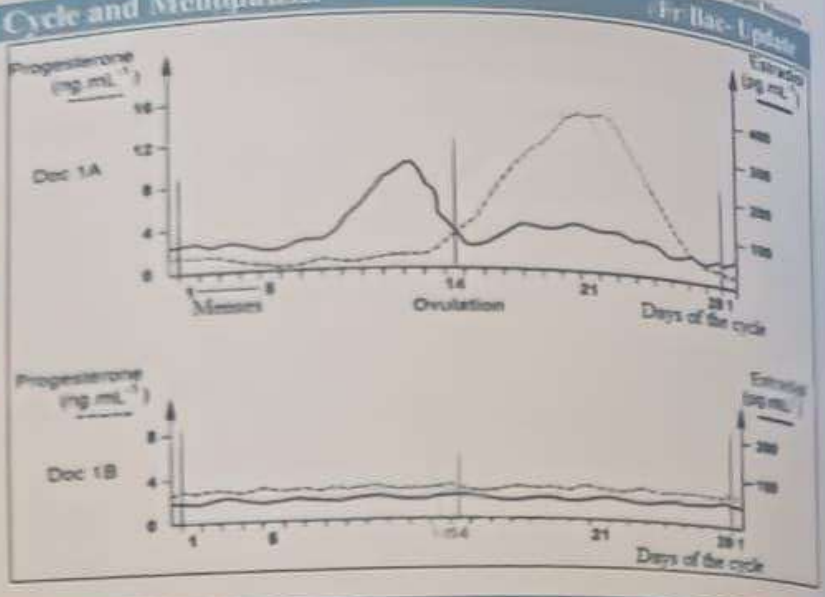
Document 2

2- Specify the types of the feedback revealed in document 2.

3- Establish, by referring to the four experiments, a functional diagram showing the relations between the different organs involved in the regulation of the sexual cycles.

Question -9- Sexual Cycle and Menopause.

Starting from puberty, Human females show periodic ovulations and menstruation. At menopause (around 50 years old), the cyclic activity stops. The following graphs show the variation of the ovarian hormones' levels over 28 days in a 25 years old young woman (doc-1A) and a 50 years old woman (doc-1B). **Document-1**



1- Compare the levels of estradiol & progesterone in both women.
2- Formulate two hypotheses to explain the results obtained for the 50 years old woman.

Aiming to know the cause(s) behind the stoppage of the sexual cycle in female at menopause, several experiments were done. The experiments and their results are given below:

First experiment:

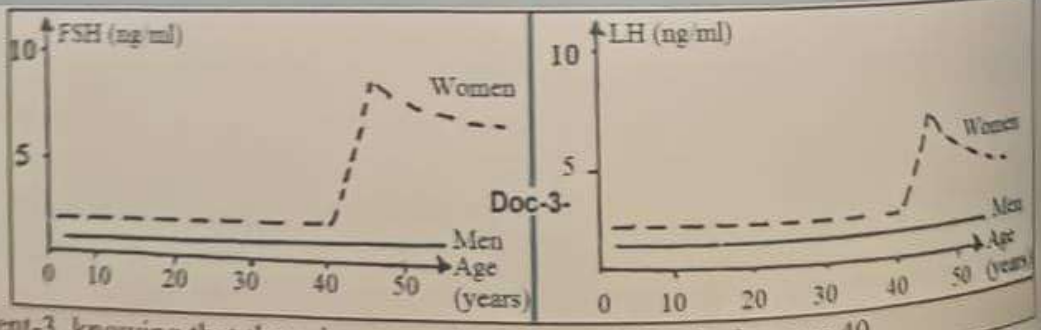
Male rats, whose pituitary gland was removed, were subjected to injections of urine taken from a 50 years old woman. The effects on the testicles of the rats whose pituitary gland are removed and on normal rats are given in the following table: *Note: hormones found in the body are excreted through the urine.*

Document-2 Experiment	State of the rats	Mass of the testicle (mg)
No injection of urine Of 50 years old woman	Normal rats	1270
No injection of urine of 50 years old woman	Rats subjected to the ablation of the pituitary gland	210
Injection of urine of 50 years old woman	Rats subjected to the ablation of the pituitary gland	760
Injection of FSH & LH in a specific manner	Rats subjected to the ablation of the pituitary gland	1060

Second experiment:

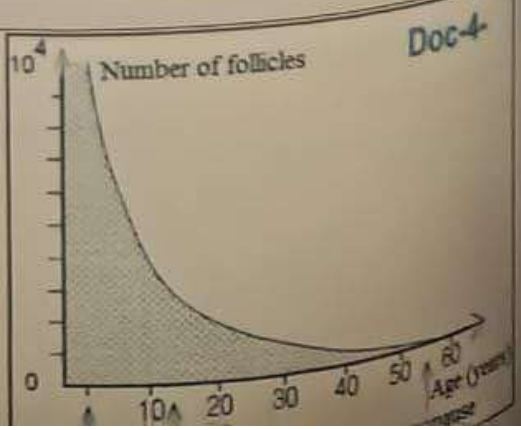
Concentrations of Gonadotropic hormones, secreted by the pituitary glands, are measured in men and women of different ages.

The obtained results are shown → in document-3, knowing that there is a normal cyclic variation before age 40.



Third Experiment: A study was done to trace the reserve of follicles during the life of a woman. The results are given in document-4→.

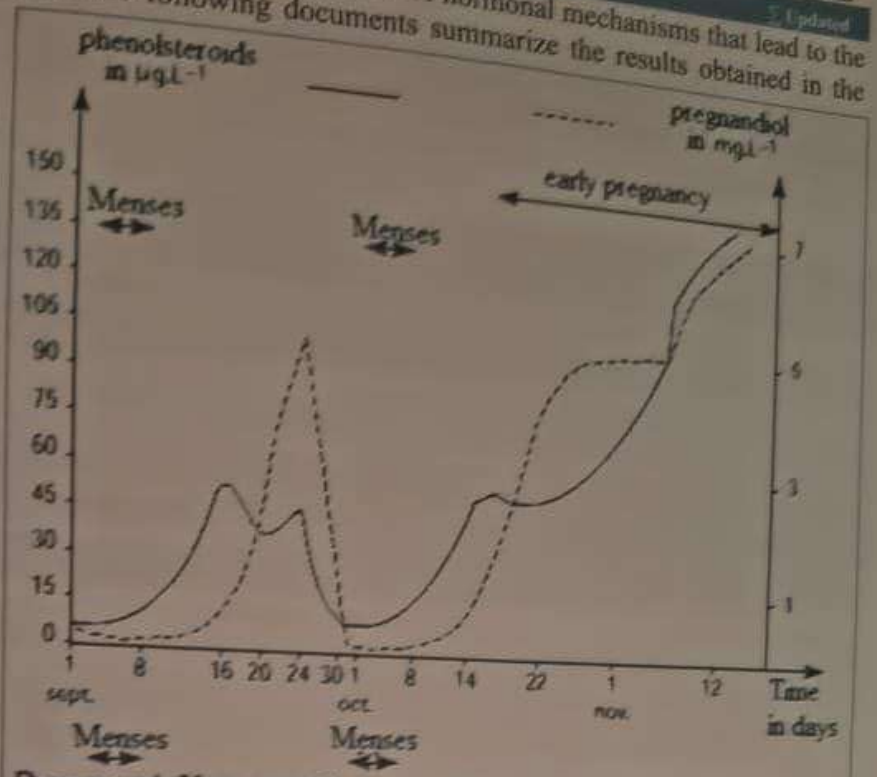
3- Interpret the results of the 1st exp (doc-2), derive a conclusion concerning the real cause of the stoppage of cyclic activity in the 50 years old woman at menopause.
4- Based on the results of doc-3 & referring to your knowledge, explain the increase in the synthesis of (FSH & LH) in a woman between 40 & 50 years.
5- Interpret the results revealed in document-4.
6- Show how, the results of the three experiments (documents 2, 3, and 4) are complementary to explain the results concerning the stoppage of the cyclic activity of the ovaries in the 50 years old woman.



Exercise -10- Pregnancy and the Absence of Menses

Several experiments are done in order to determine the sequence of hormonal mechanisms that lead to the absence of menses during pregnancy. The following documents summarize the results obtained in the experiments.

Document 1: Graph showing the variation of the level of phenolsteroids and pregnandiol in the urine of a female during 73 days



Document 1: Variation of the concentration of ovarian hormones in the urine of a female over 73 days

Notes:

1- Chemical substances found in the blood are eliminated in the urine when their level increases

2- Progesterone found in the blood is eliminated in the form of pregnandiol and estradiol in the form of phenolsteroids.

1- Specify the main features or characteristics of the studied substances (hormones) during both cases (document 1).

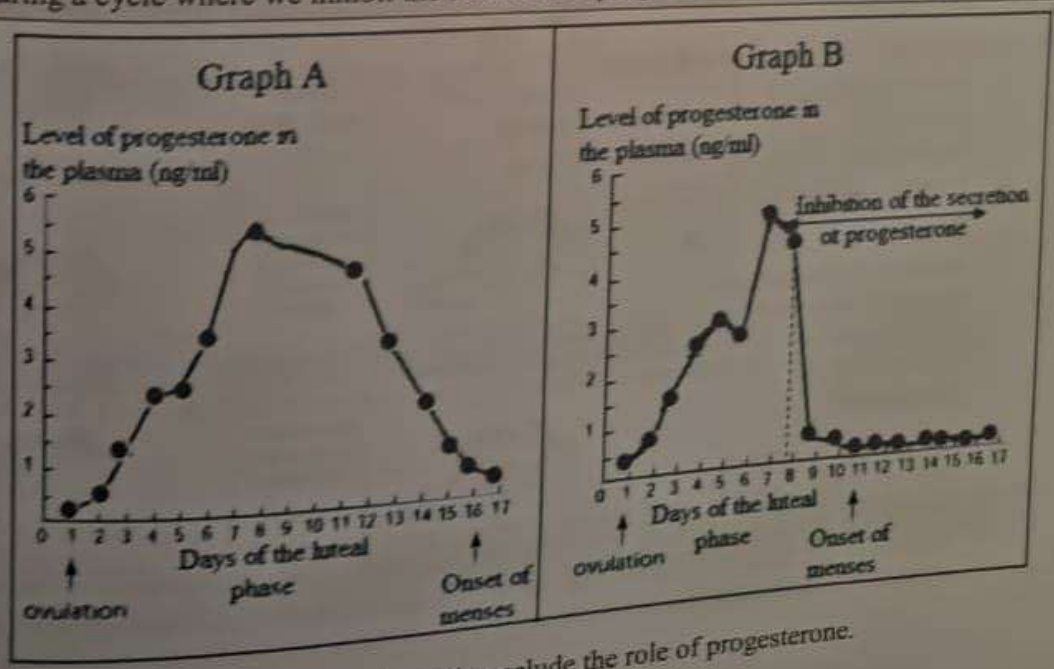
2- Formulate a hypothesis to explain the differences obtained.

Document 2: **Progesterone and menses**

In the plasma of female monkeys, we measure the level of progesterone during the luteal phase:

- Graph A: during a normal cycle
- Graph B: during a cycle where we inhibit the secretion of progesterone during the luteal phase.

The results are shown in the following graph:



3- Compare the results obtained in both graphs and conclude the role of progesterone.

Question-12- Effects of Estrogen on Pituitary Gland

Estrogen, a hormone secreted by ovaries in response to stimulation from hypothalamo-pituitary axis. In order to study the effects of this hormone on this system we carry on the following experiments.

Exp.1: In a lot of female monkeys, bilateral ovariectomy causes decrease in estrogen to null level & induce increase in LH which reaches a value of 25.1 ng/mℓ.

Exp.2: the above females receive different injections after which we record the variation in the level of LH over a period of 15 days for each injection or treatment. The obtained results are summarized in doc. 1.

Doc-1- Condition	Injections	Average level of LH 35.1 ng/mℓ
Bilateral ovariectomy	A dose of 70 pg/mℓ of estrogen	5.3
	A dose of 290 pg/mℓ of estrogen	35.2
Bilateral ovariectomy & lesion in the hypothalamus	-	null
	Discontinuous injection of GnRH	25.1
	A dose of 290 pg/mℓ of estrogen	3.7
	Discontinuous injection of GnRH & a dose of 290 pg/mℓ of estrogen	35.1

Exp.3: Clomiphen is an analogous structure to estrogen and can fix to its receptors on the hypothalamic cells.

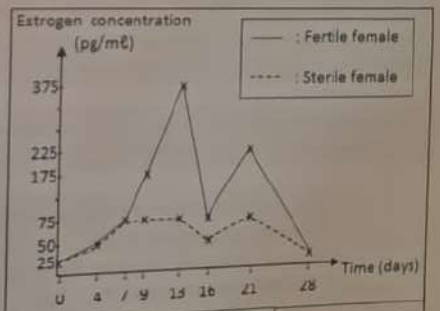
In presence of clomiphen, a dose of 290 pg/mℓ of estrogen doesn't practically modify the level of LH.

1- Interpret the above experiments and specify the effects of estrogen on LH.

2- Is it necessary to use females subjected to ovariectomy in exp.2? Justify.

Document 2 shows the variation in the estrogen during the sexual cycle of a human fertile female and that of a sterile female.

3- Compare the variation in the level of estrogen in both females and then propose a possible cause for this sterility.



Document 2

Tests performed on this sterile female shows that ovulation isn't taking place.

4- Explain based on your acquired knowledge and document 2 the situation that leads to sterility in this female.

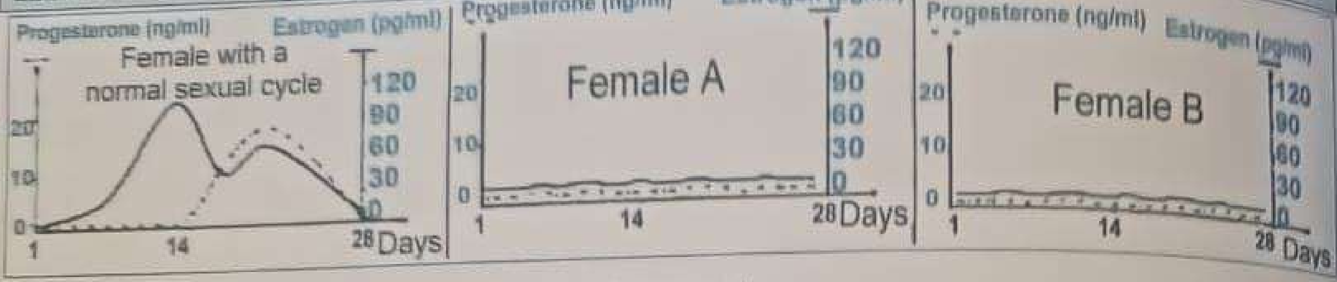
Consumption of clomiphen can solve the sterility of this female.

5- Formulate a hypothesis about its mode of action.

Question 13: Absence of Prolonged Menses

Aiming to determine the cause of absence of prolonged menstruation in certain females, clinical examinations were realized on two females A and B having such trouble.

First examination: The dosage of blood rates of the ovarian hormones in a female having normal cycle and in the two females A and B provides the results indicated in the following document 1.



1- From the results or data provided from document 1:

1-1. Compare the results of dosages of blood rates of the ovarian hormones for the three females.

1-2. Propose an explanation about the absence of menstruation in the two females A and B.

Second examination: The echography of the ovaries in the two females A and B show:
The ovaries of the female A contain neither follicles nor corpus luteum.
The ovaries of the female B contain only primordial follicles and primary follicles.

Third examination: The dosage of the hormones of the hypophysis (FSH and LH) during one month permits to determine the mean concentration of such hormones (table of document 2).

	Female Normal	Female A	Female B
Mean concentration of FSH (mU/ml)	32	92	12
Mean concentration of LH (mU/ml	30	60	10

2- Construct a histogram showing the mean concentration of hormones in the normal female as well as in the two females A and B.

3- Referring to the results of the second and third examination, determine the cause of absence of prolonged menstruation in each of the two females A and B.

4- Propose a treatment that permits to reestablish the normal sexual activity in the female B. Justify.

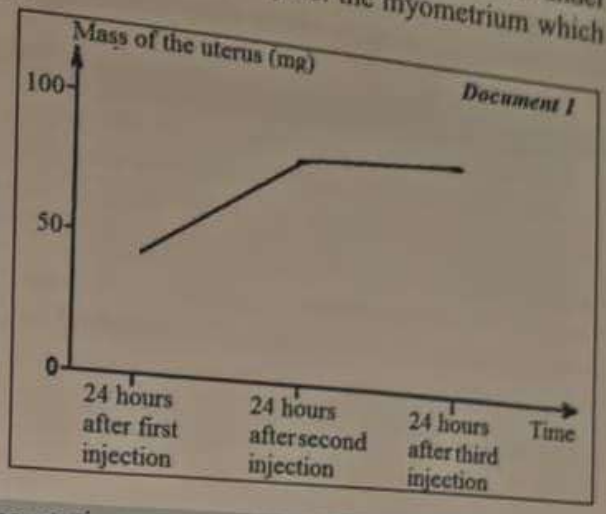
Question -14-

During female sexual cycle, the uterus is subjected to changes or variations in mass and appearance under the action of ovarian hormones. Keep in mind that the uterus contains two layers: the myometrium which is muscular layer and the inner lining or the endometrium.

In order to study the effect of ovarian hormones at the cellular level which causes changes in the mass of the uterus, the following experiments are applied on two batches (lots) of immature or ovarictomized rats:

-The first lot is injected with 0.1 ml of estradiol once a day for three days at most. Some animals of this lot are sacrificed; the uteri, whose original weight is 15 mg for each, are removed and weighed 24 hours after each injection.

The results are shown in the graph of **document 1**.



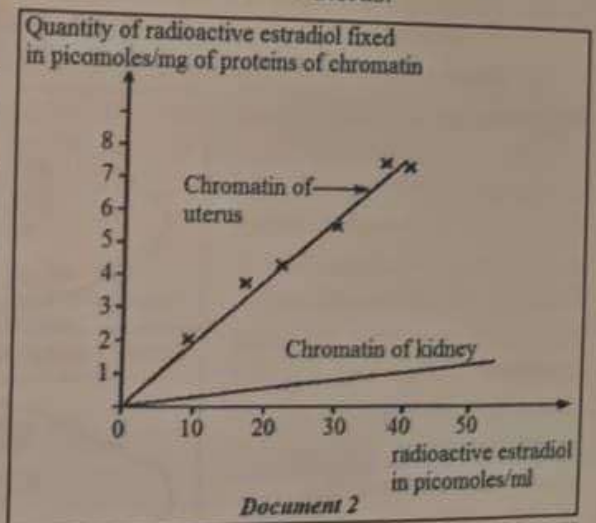
Document 1

- The control lot is injected with a physiological solution not containing estradiol once a day for three days at most. Some animals of this lot are sacrificed; the uteri are removed and weighed 24 hours after each injection. The weight of the uterus remains constant at 15. g.

1- Analyze the results obtained, draw out the effect of estradiol on the mass of the uterus.

• We isolate chromatin from cells of the uterus and cells of the kidney and culture them in a solution containing radioactive estradiol. Then, we measure the quantity of radioactive estradiol fixed to proteins of chromatin in these two types of cells.

We obtain the results shown in **document 2.**

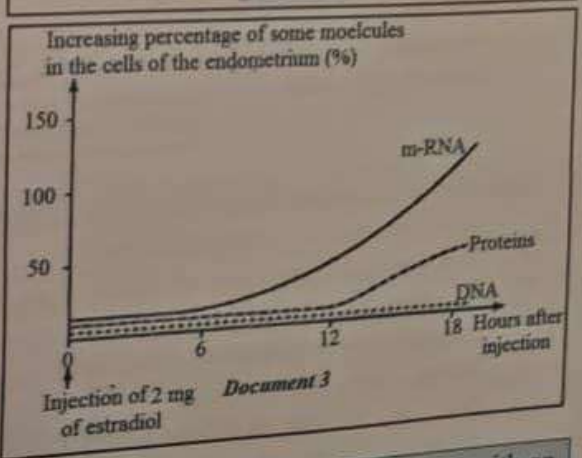


Document 2

2- Interpret the results shown in document 2.

• Estradiol is injected into castrated rats at time 0 hours, and then we measure the increase in the percentage of some cellular components of the endometrium.

The results are shown by the graph of **document 3.**



Document 3

3- Compare the variation of the three parameters shown in document 3.

- Few days later, we observe DNA synthesis and increased cell proliferation of the endometrium with an increase in the number of progesterone receptors.

4- Referring to the sequence of events that is shown by the above information and to the acquired knowledge, explain the cause of proliferation of the above endometrial cells.

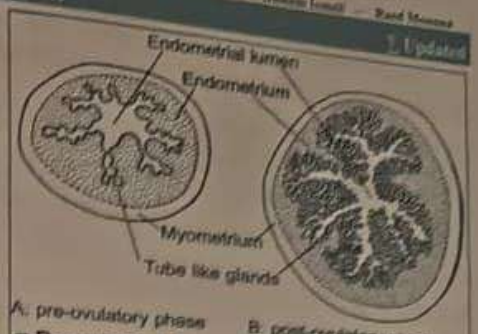
Question-20- Evolution of the Uterine Mucosa.

During the women sexual cycles, the uterus, composed of Myometrium or uterine muscle and endometrium or uterine mucosa, undergoes cyclic structural variations.

We suggest studying certain aspects that determine the cyclic modifications of the uterine mucosa.

Document-1 corresponds to uterus sections of a mammal female observed under an optical microscope.

1- Compare the two sections.



■ **Document 1: Section of a female rat observed under an optical microscope (x 18)**

Modifications at the level of the uterus depend on ovarian hormones. The ovaries, that evolve in a cyclic way and coordinate with the uterus, produce two types of hormones: estrogens, in which the principal hormone is the estradiol produced, during the whole cycle; and progesterone, released during the post-ovulatory phase.

In order to study the effect of ovarian hormones on the uterus:

The following two series of experiments done on three lots of female rats (doc-2).

1st series of experiments	1st lot	2nd lot	3rd lot
Experimental conditions	Injection of 0.1 mL of a solution without estrogens	Injection of 0.01 mL of a solution of estradiol (estrogen)	Injection of 0.1 mL of an estradiol solution
Results: mass of uterus 24 hours after the injection	15 mg	30 mg	60 mg

■ **Document 2: Variations in the mass of uterus as a function of estrogen concentration**

* For a female rat, the average mass of the uterus is 15 mg.
* Some animals of each lot are sacrificed, the uterus is removed and weighed, 24 hours after injection.

2- Analyze these experimental results. Then conclude the effect of estradiol on the uterus.

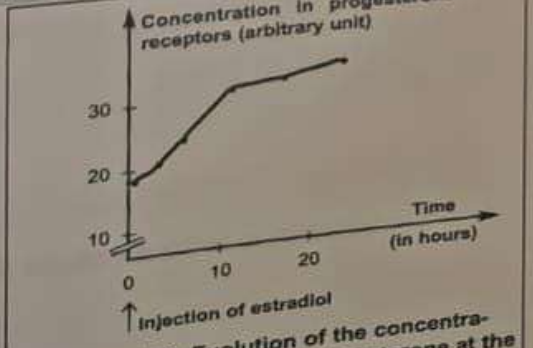
3- Identify referring to document 1 the part of the uterus that is studied in the variations of the measured mass in document 2.

2nd series of experiments:

E_1: The injection of progesterone alone, without previous injection of estradiol, into a female rat undergoing ovariectomy doesn't practically produce any modification in the mass of the uterus.

E_2: The injection of progesterone after an injection of estradiol on the same female rat undergoing ovariectomy leads to an increase in the mass of the uterus. This increase is more than that observed with the estradiol alone. The uterus appears as the one observed in document 1 B.

E_3: A solution of estradiol is injected into a female rat that has undergone ovariectomy then the concentration of receptors in the progesterone is measured at the level of the uterine mucosa, we obtain the results shown by doc-3:



■ **Document 3: Evolution of the concentration of receptors in the progesterone at the level of the uterine mucosa.**

4- Interpret the preceding experiments. What do you conclude regarding the functional relation between estradiol and progesterone?

Control of LH Secretion

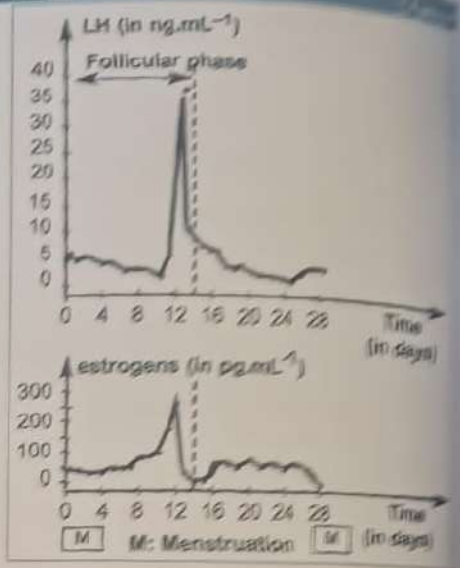
Question-21-

LH is a pituitary hormone in which the variation of concentration determines the stages of the sexual cycle in a female mammal.

In order to study the regulation in LH concentration, we insert into the macaque female monkey a dose of LH from plasma (pituitary hormone) and estrogens (ovarian hormones).

The results are shown in document-1.

1- Analyze the variation in LH and estrogen concentrations during the follicular phase.

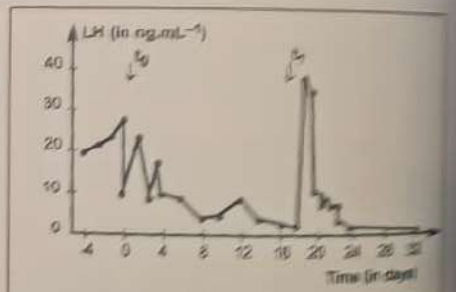


In order to study the effects of ovarian hormones on the pituitary secretion we do the following experiments:

An adult macaque female with ovariectomy at time t_0, the plasma level of estradiol is maintained low and constant of 60 pg/mL with the help of perfusion. At time t_1 a high dose of 600 pg/mL of estradiol alone is injected.

The results of the plasma doses of LH are recorded by document-2.

2- Interpret the results of these experiments.



■ Document 2: Effects of estradiol injections

3- Identify the types of feedback shown by these experiments & pick out from document-1 the intervals of time that correspond to each type of feedback.

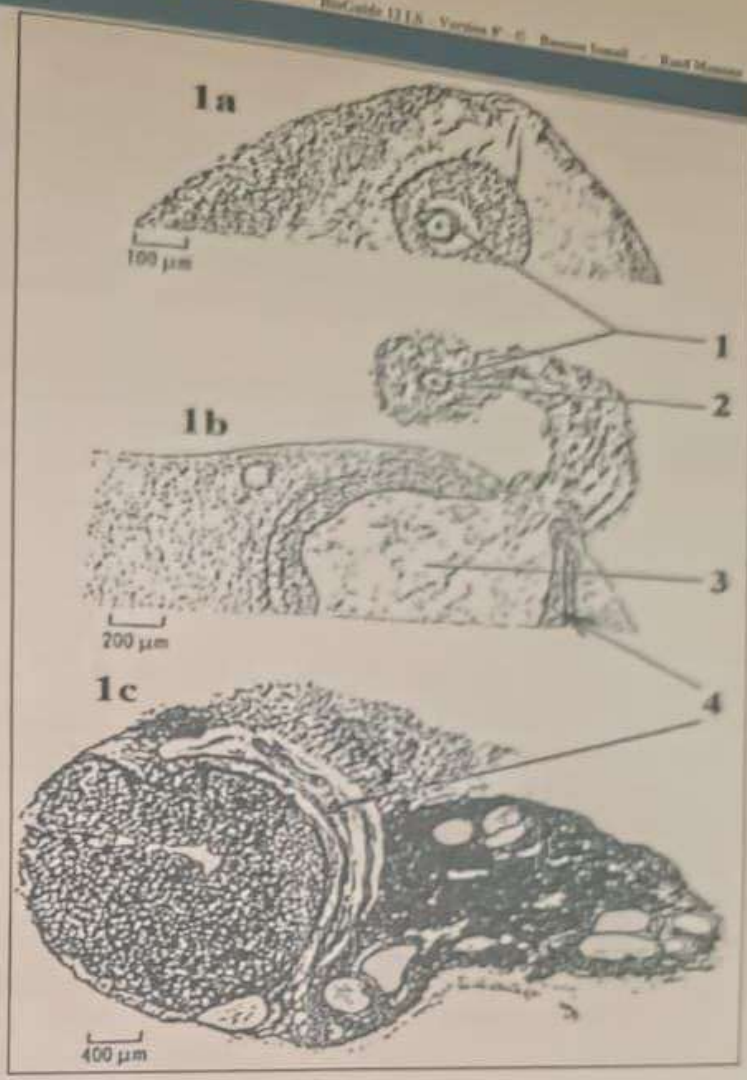
4- Draw a synthesis or functional schema that shows regulation of LH concentration.

Question -22-

The photographs of document 1 show partial sections of the ovary of a female monkey observed under a microscope at different moments of the sexual cycle.

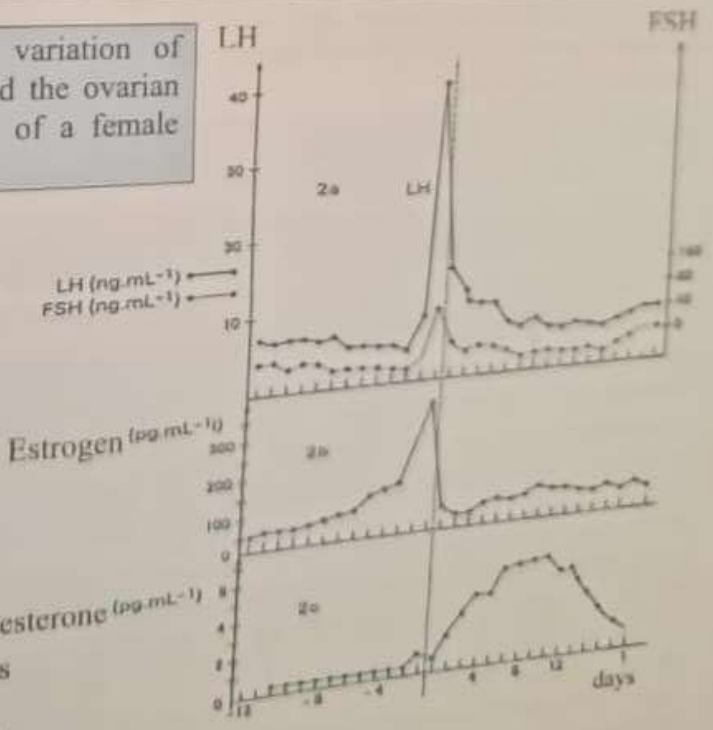
1- Label document.1.

2- Referring to your acquired knowledge, relate the photographs 1a, 1b, and 1c to different stages of the sexual cycle. Justify your answers.



The graphs of document 2 represent the variation of plasmatic concentration of the hypophysis and the ovarian hormones in the course of the sexual cycle of a female monkey.

3- What are the functional relations that exist between the structures figured in the photos 1a and 1c from one side and the concentration of hormones shown in the graphs 2b and 2c of figure 2 on the other side?

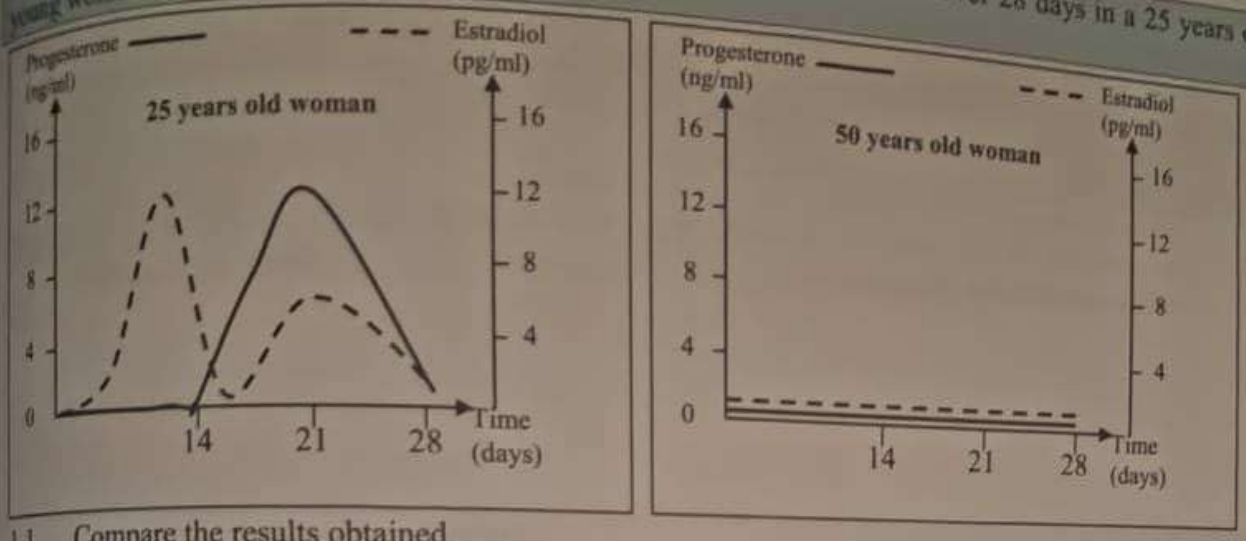


4- How does the concentration of hormones shown in the graphs of document 2 permit to explain the phenomenon observed in 1b?

Question -27-

Starting from puberty, Human females show periodic ovulations and menstruation. At menopause (around 50 years old), the cyclic activity stops.

The following graphs show the variation of the ovarian hormones' levels over 28 days in a 25 years old young woman and a 50 years old woman.



1-1. Compare the results obtained.

1-2. Formulate 2 hypotheses to explain the low level of ovarian hormones in the 50 years old woman.

• In order to find the real cause, we carry out the following experiments:

- Male rats, whose pituitary gland is removed, are subjected to injections of urine taken from a 50 years old woman. The effects on the testicles of the rats whose pituitary gland is removed and on normal rats are given in the following table:

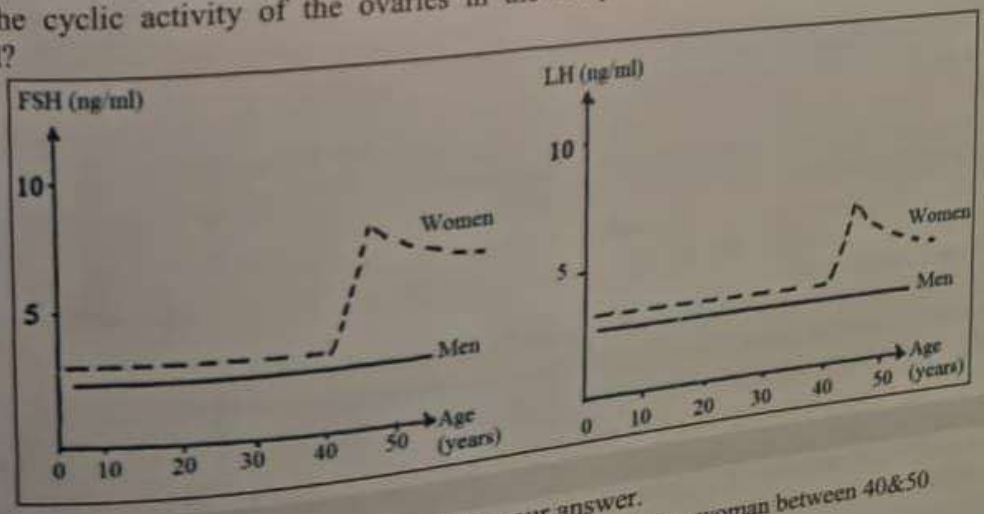
Experiment	State of the rats	Mass of the testicle (mg)
-	Normal rats	1270
-	Rats subjected to the ablation of the pituitary gland	210
Injection of urine of 50 years old woman	Rats subjected to the ablation of the pituitary gland	760
Injection of FSH and LH in a specific manner	Rats subjected to the ablation of the pituitary gland	1060

Note: hormones found in the body are excreted through the urine

2- Interpret the results shown by the table. What do you conclude concerning the real cause that led to the stoppage of the cyclic activity of the ovaries in the 50 years old woman? Which of your hypotheses is valid?

• Concentrations of Gonadotrpic hormones, secreted by the pituitary glands, are measured in men and women of different ages.

We notice that in women the measured concentrations are modified between the age of 40 and 50 years.



3- Do the results obtained confirm your hypothesis? Justify your answer.

4- How can you explain the increase in the synthesis of gonadotropic hormones in a woman between 40&50 years?

Question -29-: Control of LH-Secretion

In a female rat, experiments are carried out in order to find the factors that trigger the LH- surge.

A- In vivo experiment :

Each day of the cycle, we inject to female rats, the same dose of GnRH. We measure the plasmatic rate of LH, just before the injection and then 10 - minutes after the injection.

The obtained results are given in the following table:

Plasmtic rate of LH (ng /ml)	Before GNRH injection	10min after the GNRH injection
Day D -2	2.1	4.2
Day D -1	2	4.2
Day D	21.2	110.2
Day D +1	2	5.8

1- Interpret the obtained results. What does D- day correspond to? Justify your answer.

2- By referring to your acquired knowledge, explain the mechanism that is at the origin of LH-surge during D-day, specifying its importance.

B- In vitro experiment:

Cells secreting LH are collected from the pituitary gland of female rats at day (D- 1) and then cultured in different conditions. The incubation takes place in two successive steps:

- The cells are; first placed for 36- hours in a medium-A containing or not estradiol at a concentration of 30 pglmL.
- Then after the elimination of the first medium, the cells are incubated for 5- hours in a second medium- B containing or not GnRH at a concentration of 0.2 nglmL. The plasmatic rate of LH is measured at the end of the second incubation; the obtained results are given in the following table:

	Cells collected from the pituitary gland			
	+	+	+	+
1st incubation : 36hrs in medium A, Estradiol at a concentration 30pg/ml	-	-	+	+
2nd incubation: 5hrs in medium B , GnRH at a concentration of 0.2ng/ml	-	+	-	+
Plasmatic rate of LH at the end of the 2nd incubation in ug	< 0.2	0.7	< 0.2	3.3

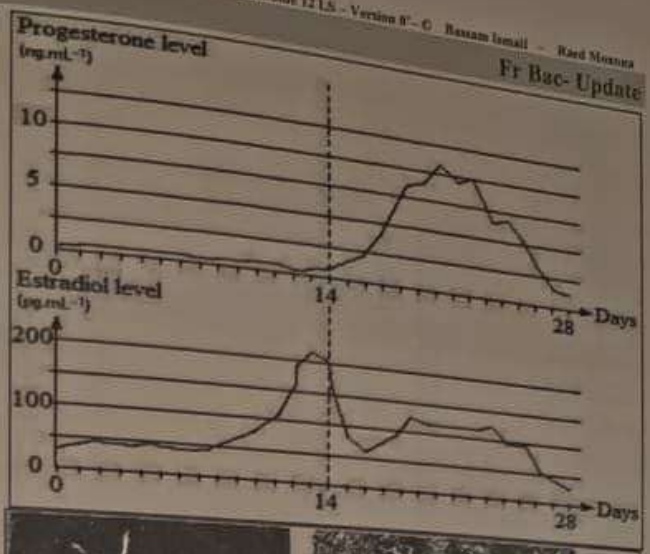
+: Presence -: absence

3- Interpret the obtained results. What can you conclude?

Question -37-

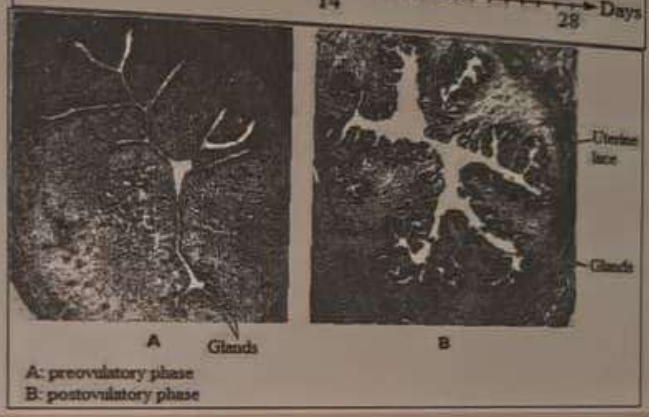
In female mammals, there are cyclic changes of the endometrium. Using the documents below, suggest an explanation for the observed structural cyclic variations of the endometrium.

Document-1: shows the levels of estrogen and progesterone were measured in the plasma of a female during a sexual cycle of 28 days.



1- Analyze the graph.

Document-2 shows a section of the uteri which are taken from rats during the pre-ovulatory & the postovulatory phase.



2- Compare the aspect of the endometrium during both phases.

3- Use the graph and document 1 to determine the cause of the formation of uterine lace.

Several experiments were done to find the relation between estradiol, progesterone & the changes in the endometrium.

1st series of experiments: Estradiol alone is injected to female rats that are previously subjected to ovariectomy. A slight thickening of the endometrium is observed.

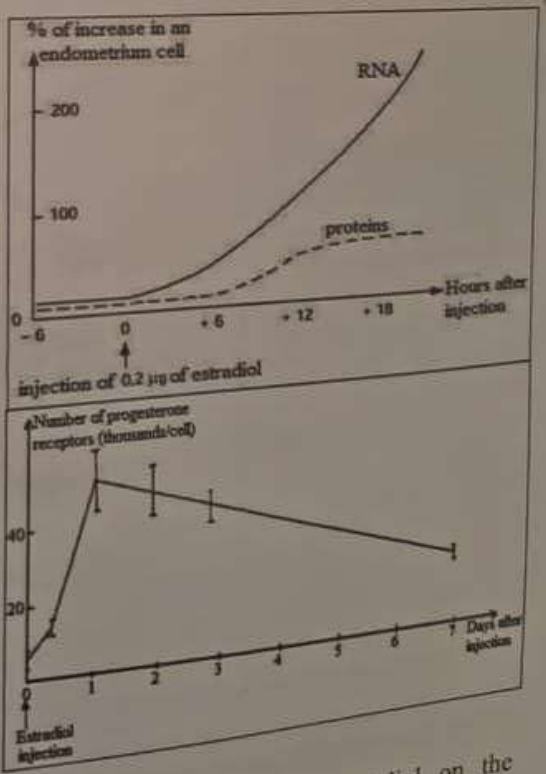
Progesterone alone is injected to female rats that are previously subjected to ovariectomy. No variation in the size of the endometrium is observed.

Progesterone is injected into female rats, subjected to ovariectomy, and previously injected with estradiol. A significant thickening of the endometrium is observed.

4- Interpret the 1st series of experiments.

2nd series of experiments:

Female rats are Subjected to ovariectomy & then injected with estradiol. The levels of some substances are measured in the cells of the endometrium after the injection. The results are shown in the graph below.



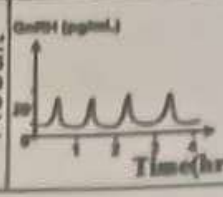
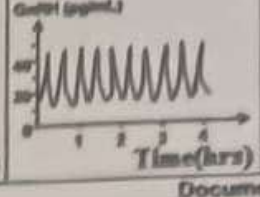
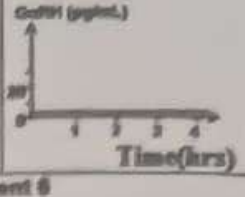
5- Interpret the results obtained.

Document 4 shows the variation of the level of progesterone receptors in endometrial cells after the injection of estradiol.

6- Interpret the results obtained in document 4.

7- Using all the results obtained, deduce the effect of progesterone and estradiol on the endometrium. Draw a concept map that summarizes this relation.

Document 6 represents the results of tests performed in the normal boy and boys X and Y.

Test	Test 3	Test 4	Test 5	Test 6
	Dosage of GnRH in the normal boy.	Dosage of GnRH in boy X.	Dosage of GnRH in boy Y.	Injections of GnRH in the boy Y followed by dosage of LH and FSH
Result				Correction of troubles in the secretion of FSH and LH

Document 6

3- 3.1- Compare the results of the concentration of GnRH among the normal boy (test 3) and in the boy X (test 4) and the data in the doc 3-b; explain the results of the concentration of GnRH obtained in the boy X (test 4).

3.2- According to the previous information; specify the cause of disturbances observed in the boy X.

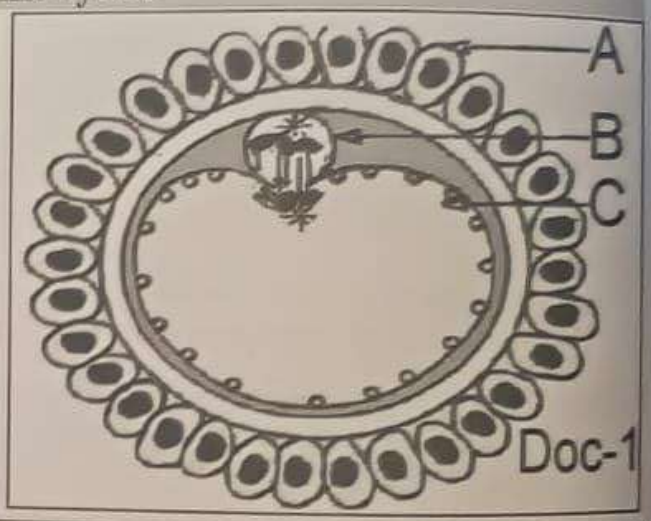
3.3- Analyze the result of test 5 in order to identify the cause observed in boy Y.

3.4- based on test 6, identify the functional relationship between hypothalamus &pituitary glands.

4- Refer to the previous answers & your knowledge, represents by a functional diagram the hormonal interactions responsible for the regulation of the normal functioning of the test is in a normal boy.

Question-36- Ovarian and Uterine cycles

The adjacent document illustrates a stage of oogenesis in human female (for simplification we consider the cell of 2n=4).



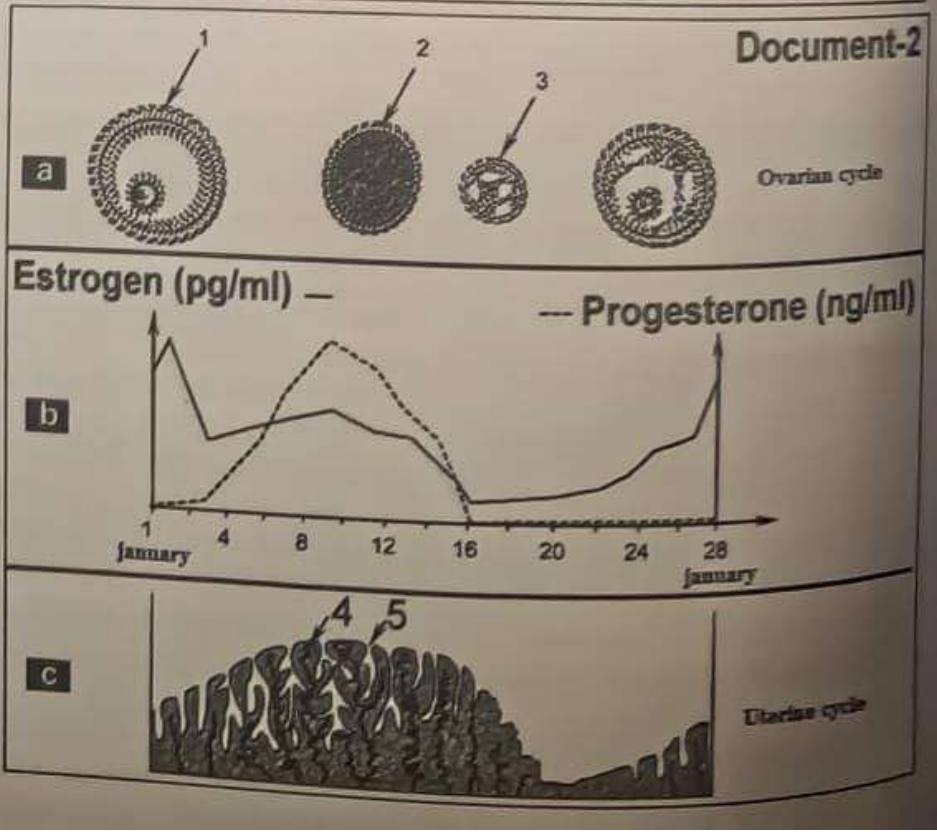
1- Identify the stage shown in the document.

2- Name the cells A, B and C.

3- Indicate the fate of each of the cells B and C.

The ovaries secrete progesterone and estrogen into the blood stream, these hormones act on the uterus and controls its cycle. The follicles show different developmental stages inside the ovary.

Document 2 shows the synchronization between the ovarian and the uterine cycles.



4- Explain the hormonal interaction that allows the transformation of structure 1 into structure 2.

5- Specify the duration of the luteal phase.

6- Determine from document 2, the effect of progesterone on the uterus.

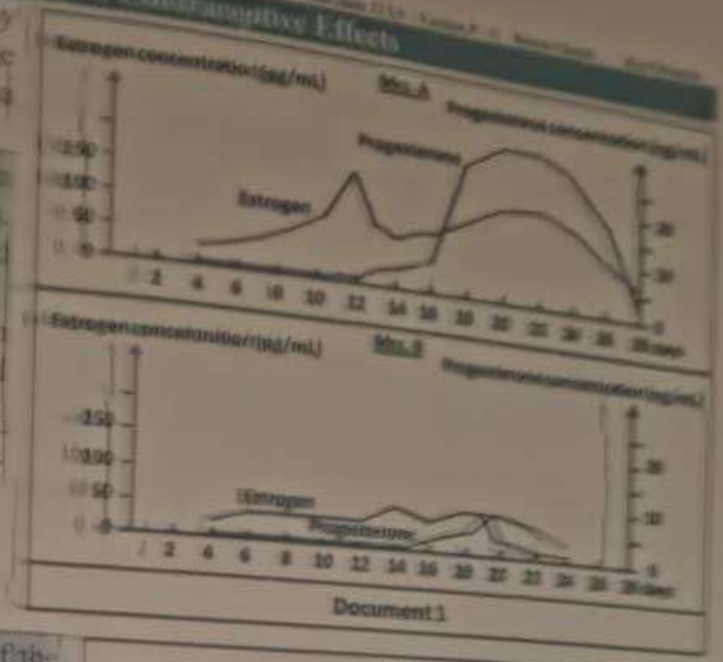
The Diversity of Contraceptive Effects

Contraceptive methods are ways adopted by couples in order to prevent pregnancy. We aim to identify the effects of 4 contraceptive pill: Norgestrienone.

Document 1 shows the variation of estrogen and progesterone levels in the blood of Mrs. A who does not use a contraceptive method and Mrs. B who uses Norgestrienone.

The increase of progesterone concentration to higher than 20 ng/mL during the luteal phase indicates that ovulation occurred.

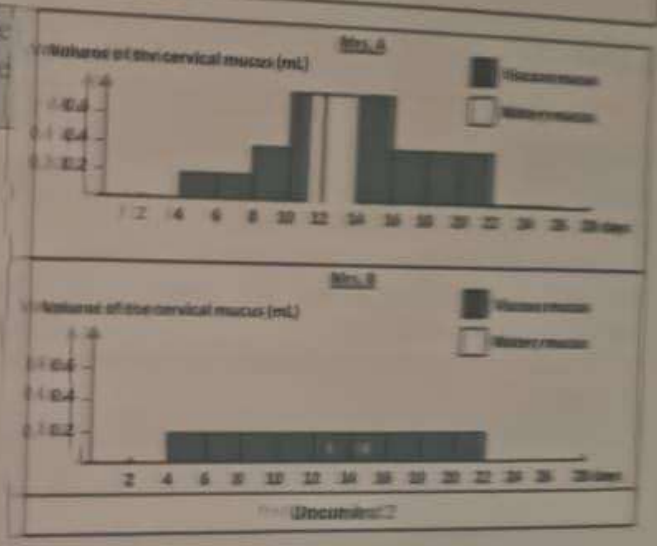
1- Interpret the results corresponding to Mrs. B in document 1.



Document 1

Document 2 shows the variation of volume of the cervical mucus as a function of days of the cycle in these 2 females.

2- Compare the results document 2.

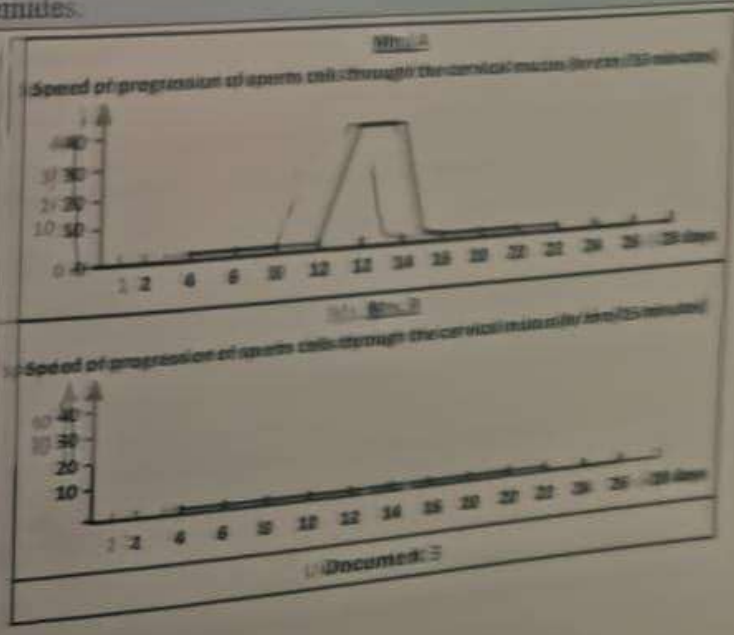


Document 2

Document 3 shows the variation of the speed of progression of sperm cells through the cervical mucus as a function of days of the cycle in these 2 females.

3- Analyze the results document 3.

4- Based on the given, specify the effects of Norgestrienone.

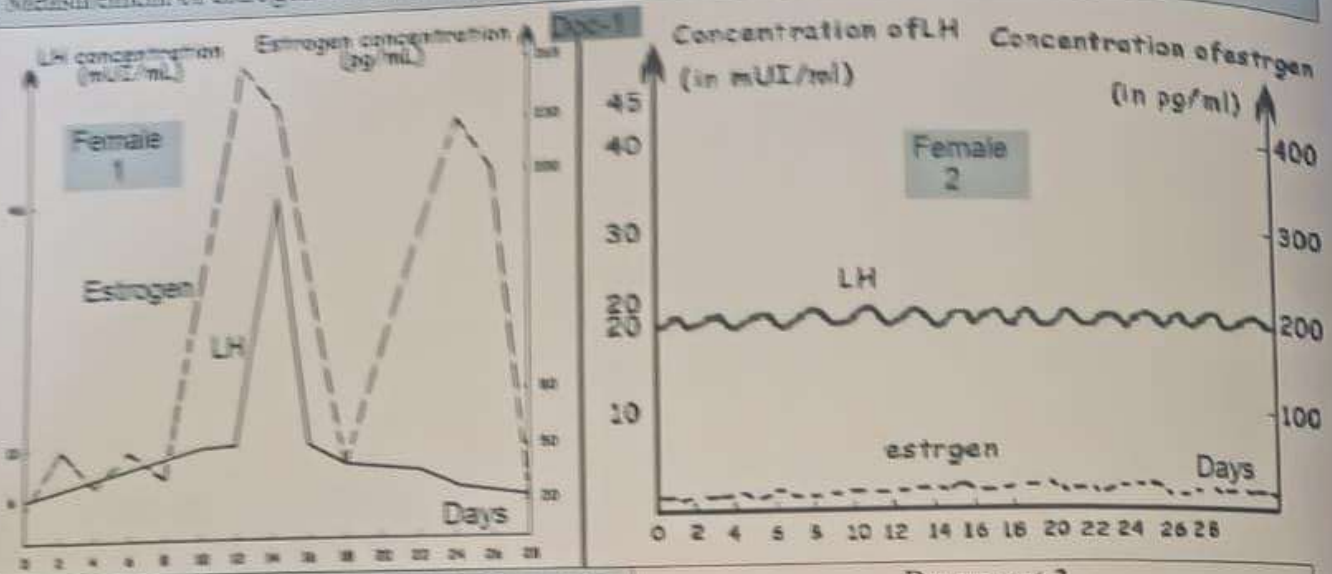


Document 3

Question-12-

In order to determine the cause of sterility in two 30 years old females, & to propose the adequate treatment of medically assisted procreation, a gynecologist prescribed the following tests for the 2 females:

Measurement of estrogen & LH hormones during one sexual cycle. The results are revealed in doc- 1



Observation of the structure of their uterine mucosa at the 21st day of the luteal phase.

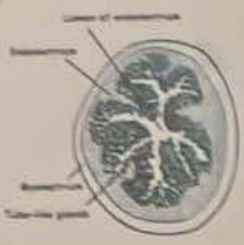
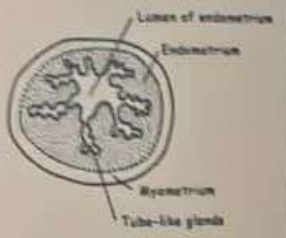
The results are revealed in document 2.

1- Analyse the results of female 1 in doc1. What can you conclude regarding the causes of sterility in this female?

2- Formulate a hypothesis to explain the sterility of female 1.

3- Determine the possible cause of sterility of the females 2.

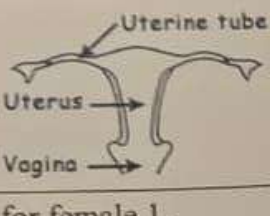
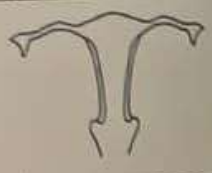
Document 2

Female	1	2
Uterine mucosa At day 21		

The previous tests did not permit the gynecologist neither to determine the problem of female 1 nor the exact cause of sterility in females 2 so he performed echography for the reproductive system of the two females.

The results are revealed in document 3.

Document 3

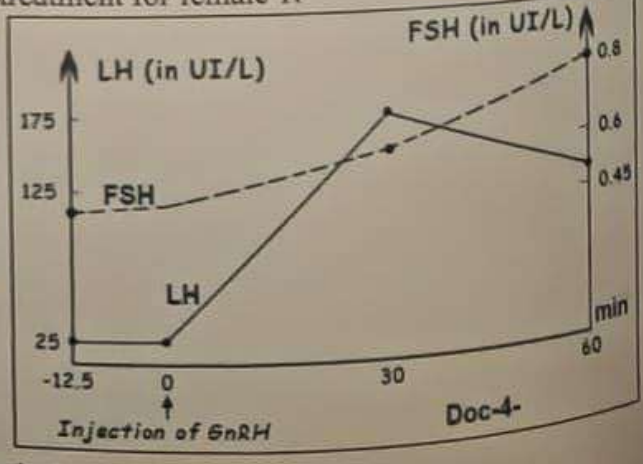
Female	1	2
Results of echography		

4- Explain the cause behind the sterility of female 1.

5- Propose the adequate medically assisted procreation treatment for female 1.

Aiming to find the real causes of sterility in female 2 and to determine the effective treatment, the gynecologist did the following: he injected 100 µg GnRH to female 2 and then measured the concentration of FSH and LH. The results are shown in document 4.

REMARK: The normal concentration of FSH secreted by the hypophysis in a control female without any trouble varies between 2 & 26 UI/L.



6- Tabulate the results of document 4.

7- Deduce the cause of sterility of female 2.

8- Propose a treatment that would solve sterility of female 2.

Question - 13-

A young woman visits the doctor for an absence of menstrual cycle. The doctor prescribes the measurement of the levels of hormones: LH, FSH, & estradiol during one month. The results are shown in the following table.

Document 1: Levels of LH, FSH, and estradiol during a month

Hormonal doses (functional hormones)		LH (UI/L)	FSH (UI/L)	Estrogen peak in pg/ml
Measured levels in a female having a normal cycle	Follicular phase	1.5 to 10	2 to 17	30 to 90
	Ovulation peak	18 to 90	9 to 26	90 to 400
	Luteal phase	1 to 16	2 to 8	50 to 200
Measured levels in the patient	Follicular phase Ovulation peak Luteal phase	21	< 0.5	25

1- Compare the results obtained for both females then formulate two hypotheses to explain the cause of absence of menstrual cycle in the patient.

Document 2: Results of hormonal treatment of the patient

Document 2a: Test of hormonal stimulation by the injection of GnRH

Hormonal doses (functional hormones) (UI/L)	Level before injection	Level 30 minutes after injection	Level 60 minutes after injection
LH	33	170	130
FSH	< 0.6	< 0.6	< 0.8

2- Interpret the results obtained in the table.

3- Formulate a hypothesis to explain the results obtained

Document 2b: Treatment with FSH resulted in a follicle growth and ovulation induction.

4- Verify if the results obtained in document 2b confirm your hypothesis formulated in part 3?

Document 3: The gene coding for FSH hormone is sequenced in a normal female and in the patient. The following document shows a part of the non-transcribed strand of the gene encoding the FSH in both females.

Sequence in a normal female	AGTGCCCGGCTGTGCT	
Nucleotide number	150	165
Sequence in the patient	AGTGCCCGGCCGTGCT	
Nucleotide number	150	165

5- Write the amino acid sequence of FSH hormone coded by the two DNA strands in a normal female and in the patient.

6- Compare the DNA and amino acid sequences in both females.

7- Deduce the real cause of absence of menstrual cycle in the patient.

First letter	Second letter U	Second letter C	Second letter A	Second letter G	Third letter
U	UUU Phe UUC Phe UUA Leu UUG Leu	UCU Ser UCC Ser UCA Ser UCG Ser	UAU Tyr UAC Tyr UAA Stop UAG Stop	UGU Cys UGC Cys UGA Stop UGG Trp	U C A G
C	CUU Leu CUC Leu CUA Leu CUG Leu	CCU Pro CCC Pro CCA Pro CCG Pro	CAU His CAC His CAA Gln CAG Gln	CGU Arg CGC Arg CGA Arg CGG Arg	U C A G
A	AUU Ile AUC Ile AUA Ile AUG Met	ACU Thr ACC Thr ACA Thr ACG Thr	AAU Asn AAC Asn AAA Lys AAG Lys	AGU Ser AGC Ser AGA Arg AGG Arg	U C A G
G	GUU Val GUC Val GUA Val GUG Val	GCU Ala GCC Ala GCA Ala GCG Ala	GAU Asp GAC Asp GAA Glu GAG Glu	GGU Gly GGC Gly GGA Gly GGG Gly	U C A G

Question -16-

The knowledge gained in the field of regulating the level of female sex hormones has made it possible to develop contragestive methods.

In 1980, EE Baulieu made an experiment to identify the role of mifepristone (RU 486). After having treated three batches (lots) of immature rabbits with an injection of estradiol (so that their uterus is sensitive to the action of progesterone), he continued the experiment according to the protocol indicated in the following table and obtained the following results:

Document 1:

	Lot number	1	2	3		
Protocol	Intravenous injection	estradiol	estradiol then progesterone	estradiol then progesterone		
	oral absorption of RU 486	no	no	yes		
				1 mg/kg	5 mg/kg	25 mg/kg
Results	transverse section of the uterus at the* end of treatment					

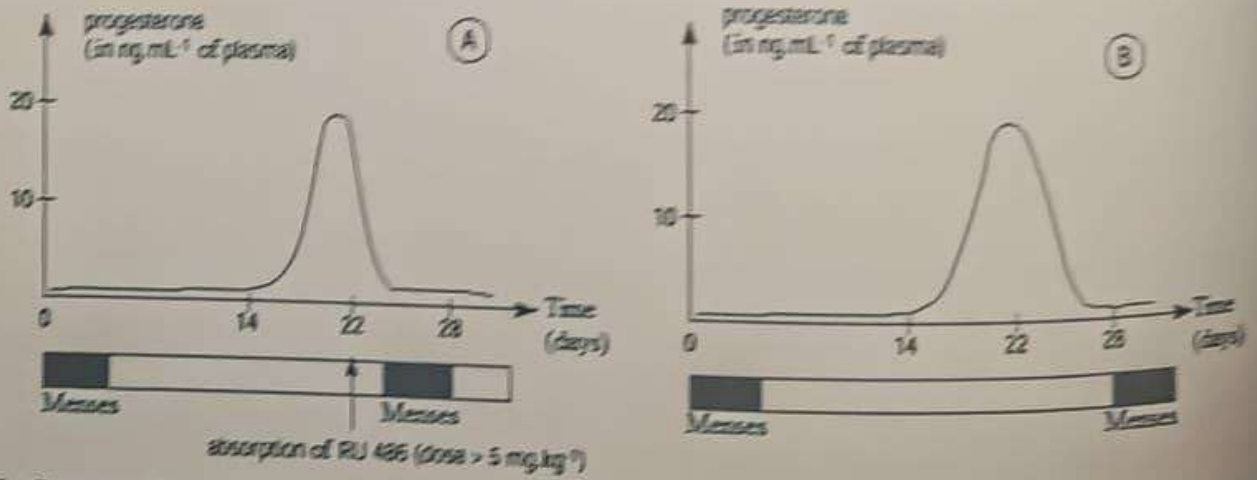
Note: The original size and aspect of the endometrium for all lots before realizing the experiment is smaller a little than that shown for rats of lot 1.

* all the schemes of the transverse sections have the same scale

a. Endometrium or uterine mucosa
b. Myometrium
c. blood vessels
d. lace

1- Interpret the results obtained in document 1. Give an adequate conclusion.

Document 2: Two groups of young females having normal cycles are taken. The first group of women (group A) absorbs RU486 whereas the other group of females (group B) doesn't. The level of progesterone is measured during 28 days. The results are shown in the following graph:



2- Compare the results obtained for both groups. Do the results obtained in the graph confirm your conclusion given in part 1?

Question -37- Stress and Hormonal Variations

During the period of the official exams, a period characterized strongly by stressful stimulants, a girl is submitted to several troubles.

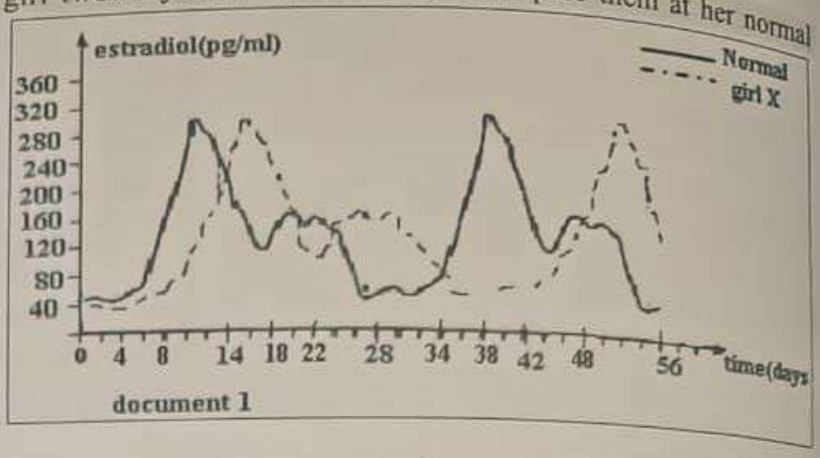
The doctor decides to practice at this girl two ways of measures and to compare them at her normal state outside of all agent of stress.

The first measure concerns the hormonal rates of estrogen.

The second concerning the rate of insulin in blood after one meal rich in carbohydrates.

The results of the measures done are represented here under in the documents.

Document 1 shows the estradiol in the normal & stressful cases for this girl



document 1

1. Compare the evolution of the secretion of the estradiol in the normal case and in case of stress for this girl.

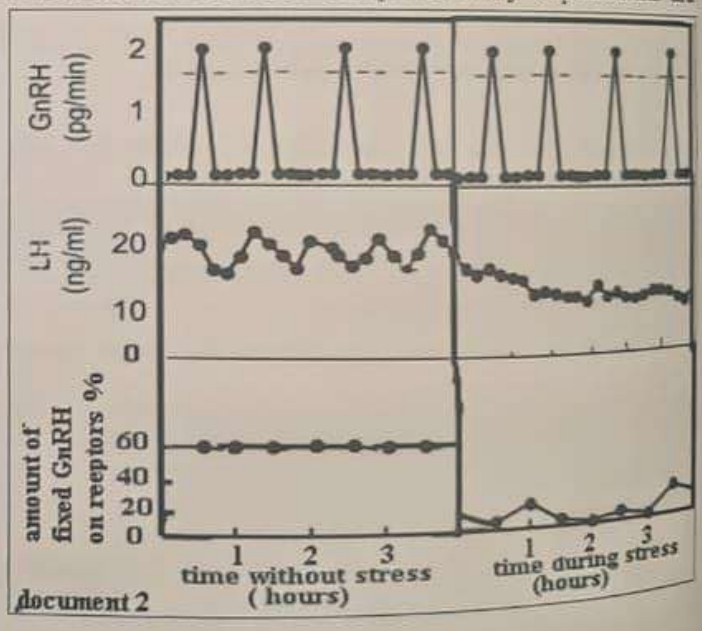
2. Determine the duration and the different phases of the sexual cycle of this girl in the two cases.

3. Deduce the effect of stress on the length of the sexual cycle.

-In order to show the effect of stress on the female sexual hormones complementary experiments are done:

Experiment 1: paradigm of psychosocial stress (sequential layering of isolation, blindfold, and predator cues) was developed in ovariectomized ewes leads to an increase of GnRH pulse amplitude from 1 to 2 pg/pulse and that of LH pulse amplitude decreases from 20 ng/pulse to become constant at 10 ng/pulse during stress.

Experiment 2: paradigm of psychosocial stress was developed followed by pulsatile injection of radioactive GnRH in ovariectomized ewes which are subjected to hypothalamus lesion the obtained results are shown in document 2:



document 2

4. 4-1-Analyze the obtained results of these 2 experiments.

4-2-What can you conclude concerning the effect of stress on the female hormones?

5. Explain, by referring to all what had precedes, the effect of stress on the menstrual cycle.

-Document 3 shows the results of the second measure done at this girl.

Knowing that, stress has an effect on the hypothalamus to modify the secretion of adrenaline by the adrenal gland.

Doc-3-	Normal Case	Stressful Case
Insulinimia	50 mU/l	60 mU/l

6. Explain the results of the table using your knowledge about the mode of action of adrenaline.

7. Make a diagram showing the action of stress on the parameters studied by this exercise, while limiting to the data and to the answers of the previous parts.

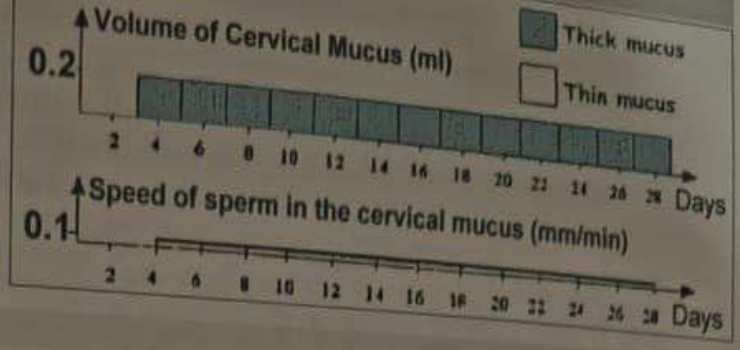
Question -38- Birth Control

Mrs. Hassoun has 6 children and is not interested in having more. So, she started to follow a special treatment (from July 4 till July 26) that helps her in birth control.

Different tests done to Mrs. Hassoun concerning the volume & the viscous state of her cervical mucus, & the velocity of sperm cells in her cervical mucus during the treatment.

The results are represented in document 1.

Document-1-



Different tests done to another woman who is not following any treatment showed the following results in the table of document 2.

Doc-2- Time (days of July)	4	8	10	11	12	14	15	16	24	26
Volume of the cervical mucus in ml	0.2	0.4	0.8	0.8	0.8	0.8	0.8	0.8	0.4	0.2
Velocity of the sperms in mm/15minutes	0.1	0.1	0.1	20	40	40	0.1	0.1	0.1	0.1

1- Draw, on 2 separate graphs, the variations of the state & volume of the cervical mucus(graph 1) as a function of time and the velocity of sperms in the cervical mucus (graph 2) as a function of time (during the month of July) in the control woman. Use the same scale to facilitate the comparison.

2- Specify on the graph the ovulation period, and describe the hormonal changes that would lead to such an event in a normal woman.

3- Compare the 2 curves. What do you conclude?

4- Based on documents 1 & 2, pick out how the treatment of Mrs. Hassoun helped her in birth control.

5- If in her treatment, Mrs. Hassoun was injected with moderate amounts of estrogen & progesterone all the period of her cycle, she will not be able to make ovulation. Explain how these injections can help in preventing ovulation.