Onset and Physiology of Labor

Reproductive Block

Please check out this link before viewing the file to know if there are any additions/changes or corrections
Physiology Edit File

- Important
- Further explanation

Mindmap

Physiology of labor

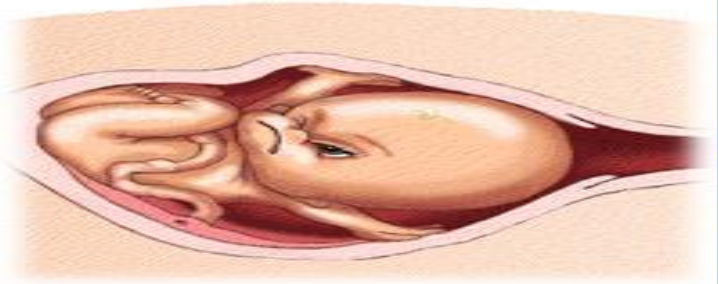
- Factors trigger the onset of labor
  - Mechanical changes
  - Hormonal changes
- Initiation of labor
- Phases of uterine activity
  - Phase 0
  - Phase 1
  - Phases 2
  - Phases 3
- Stages of labor
  - Stage 1
  - stage2
  - stage3

Parturition
(LABOR)

Definition:

- Uterine contractions that lead to expulsion of the fetus to extrauterine environment
- Towards the end of pregnancy the uterus become progressively more excitable and develops strong rhythmic contractions that lead to expulsion of the fetus
- Uterus is spontaneously active.
- Spontaneous depolarization of pacemaker cells.
- Gap junctions spread depolarization
- The exact cause of the increased activity of of the uterus in not known
- Factors that trigger the onset of labor

1. Hormonal changes
2. Mechanical changes



Hormonal Changes

Estrogen & Progesterone

- Progesterone inhibit uterine contractility
- Estrogen stimulate uterine contractility

From 7th month till term (third trimester):

- Progesterone secretion remains constant or decreases slightly
- Estrogen secretion increases continuously
- Increase estrogen/progesterone ratio

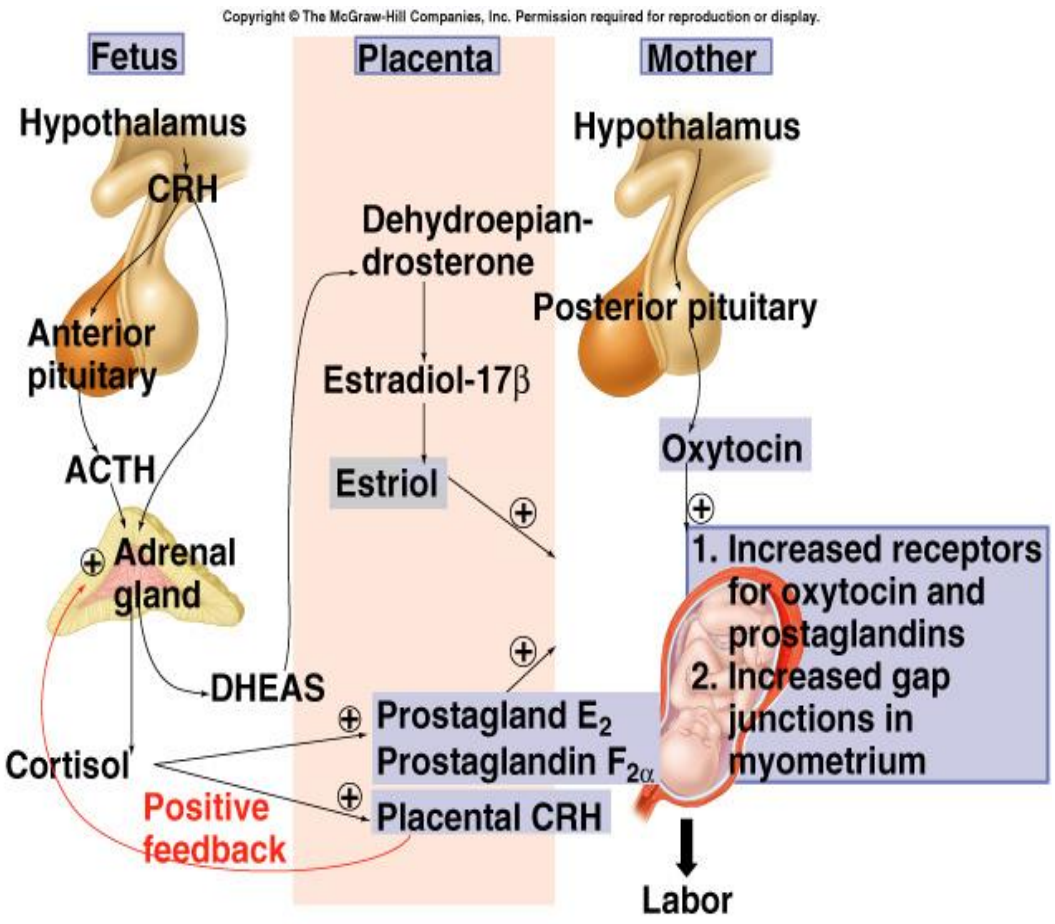
Progesterone	Estrogen
Decreases GAP junctions	Increases GAP junctions with onset of labour
Decreases Oxytocin receptor	Increases Oxytocin receptors
Decreases prostaglandins.	Increases Prostaglandins
Increases Resting mem. Potential(-45 _ -30) the more it decrease the more excitable it become	

Hormonal Changes

Oxytocin	Prostaglandins
At end of pregnancy, Dramatic Increases of oxytocin receptors (200 folds) leading to: Gradual transition from passive relaxed to active excitatory muscle (↑responsiveness).	❑Central role in initiation & progression of human labour ❑Locally produced (intrauterine)
❑ Increase in Oxytocin secretion at labor ❑Decreased level of oxytocin will lead to more prolonged labor	Oxytocin and cytokines stimulate its production
❑Oxytocin increase uterine contractions by 1. Directly on its receptors 2. Indirectly by stimulating prostaglandin production	❑Prostaglandin stimulate uterine contractions by: 1- Direct effect: ✓Through their own receptors ✓Upregulation of myometrial gap junctions. 2- Indirect effect: ✓Upregulation of oxytocin receptors (positive feedback between prostaglandins and oxytocin)

Parturition

- The hypothalamus of full term fetus will start to secrete CRH which will stimulate the AP gland to release ACTH which in turn act on the fetus adrenal gland leading to the production of cortisol and DHEAS.
- The Cortisol has a positive feed back on prostaglandins receptors and production of placental CRH.
- The DHEAS will be converted in the placenta into estrogen.



Mechanical Changes

Stretch of the uterine muscle

Simply stretching smooth muscle organs usually increases their contractility, as occurs repeatedly in the uterus because of fetal movements, can also elicit smooth muscle contraction.

Stretch of the cervix

stretching or irritating the uterine cervix is particularly important in eliciting uterine contractions.

the obstetrician frequently induces labor by rupturing the membranes so that the head of the baby stretches the cervix more than the usual.

The mechanism by which cervical irritation excites the body of the uterus is not known. It has been suggested that stretching or irritation of nerves in the cervix initiates reflexes to the body of the uterus

Mechanics of Parturition

Uterine contractions during labor begin mainly at the top of the uterine fundus and spread downward over the body of the uterus.

the intensity of contraction is great in the top and body of the uterus but weak in the lower segment of the uterus adjacent to the cervix.

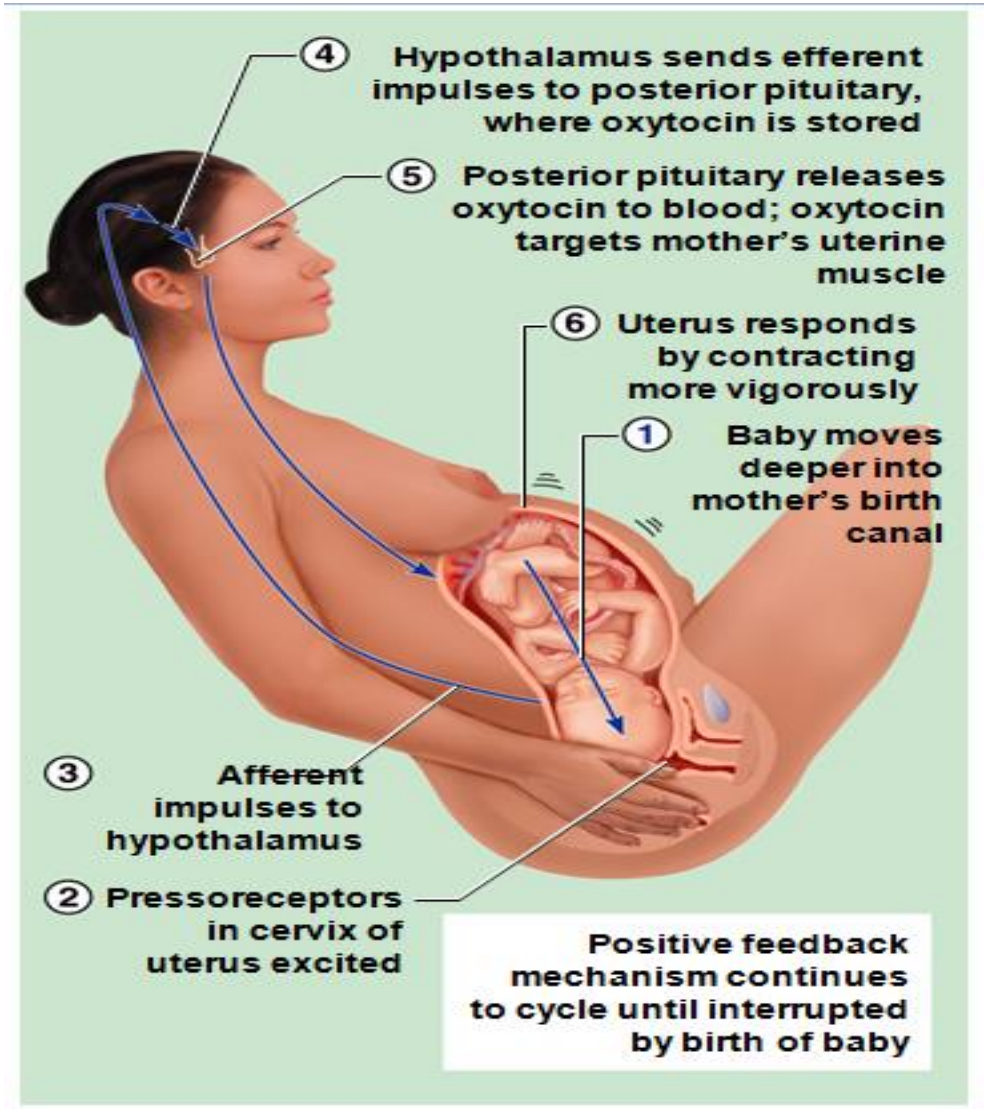
In the early part of labor, the contractions occur only once every 30 minutes. As labor progresses, the contractions finally appear as often as once every 1 to 3 minutes

The combined contractions of the uterine and abdominal musculature during delivery of the baby cause a downward force on the fetus of about 25 pounds

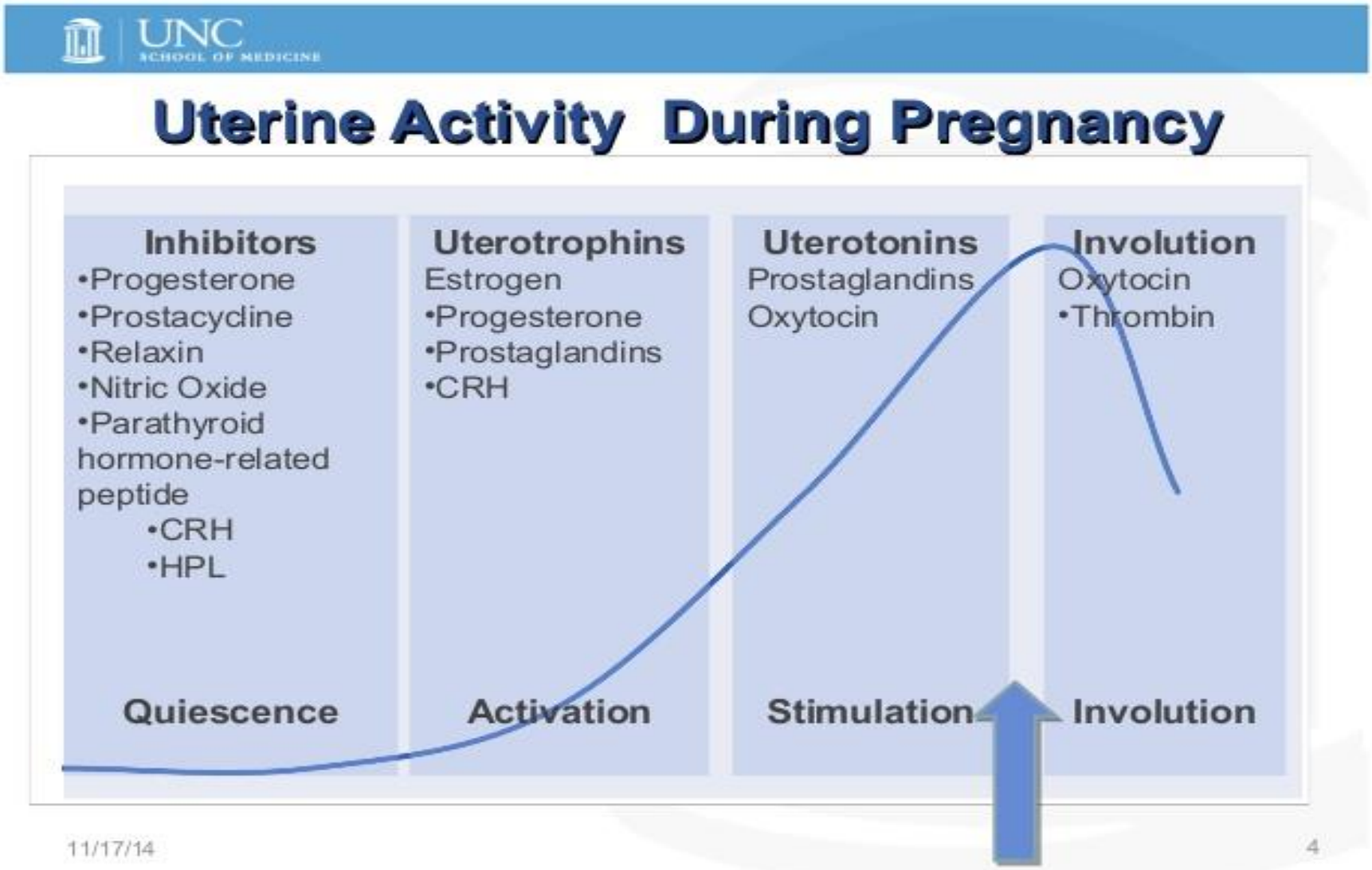
contractions of labor occur intermittently, because strong contractions impede or sometimes even stop blood flow through the placenta and would cause death of the fetus if the contractions were continuous.

Initiation of Labor

- The true labor contractions are rythmatic, continues and progressive contraction
- Other wise it is false labor pain " known as Braxton Hicks contraction" infrequent, irregular, and involve only mild cramping



Uterine Activity During Pregnancy



Phases of Parturition

Phase 0 (Quiescent)	Phase 1 (Activation)
❑Increase in cAMP level ❑Increase in production of : 1. Prostacyclin (PGI2) causes uterine relaxation 2. Nitric oxide (NO) causes uterine relaxation	❑Occurs in third trimester ❑Promote a switch from quiescent to active uterus ❑Increase excitability & responsiveness to stimulators by 1. Increase expression of gap junctions 2. Increase G protein-coupled receptors: • Oxytocin receptors • Increase PGF receptors

Phase 2 (stimulation)	Phases 3 (uterine involution)
❑Occurs in last 2-3 gestational weeks ❑Increase in synthesis of uterotonins 1. Cytokines 2. Prostaglandins 3. Oxytocin ❑ Includs 2 stages 1. Stage 1 2. Stage2	❑ Pulsatile release of oxytocin (to prevent postpartum hemorrhage) ❑ Delivery of the placenta ❑ Involution of the uterus (returen back to original size) ❑ Occurs in 4-5 weeks after delivery ❑ Lactation helps in complete involution

Onset of labor

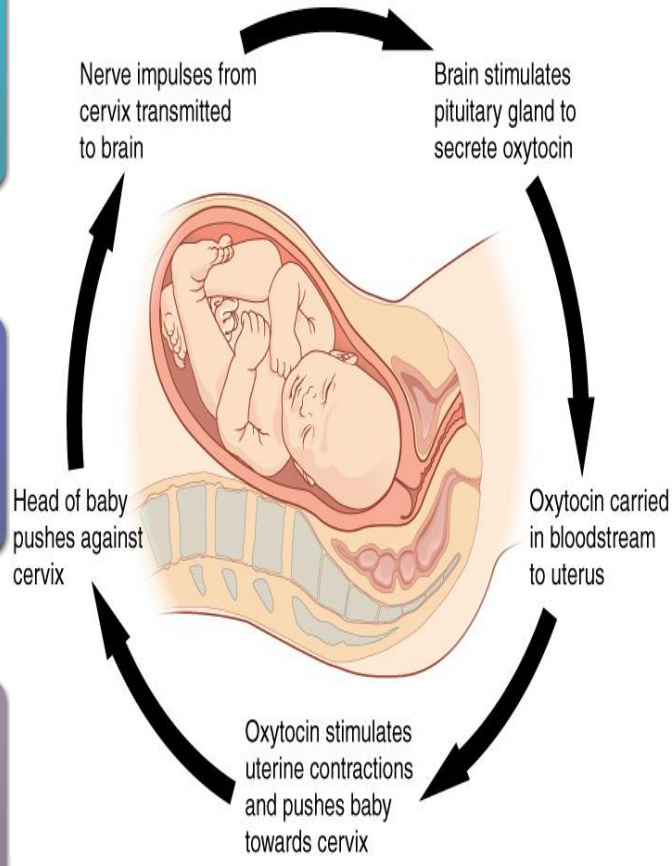
- Most of the months of pregnancy, the uterus undergoes periodic episodes of weak and slow rhythmical contractions called **Braxton Hicks contractions**
- Toward the end of pregnancy, These contractions become progressively stronger
- Then they change suddenly, within hours, to become exceptionally strong contractions that start stretching the cervix and later force the baby through the birth canal, thereby causing parturition. This process is called **labor.**
- The strong contractions that result in final parturition are called **labor contractions**.

Positive Feedback Mechanism

The positive feedback theory:
suggests that stretching of the cervix by the fetus's head becomes great enough to elicit a strong reflex increase in contractility of the uterine body.

This pushes the baby forward, which stretches the cervix more and initiates more positive feedback to the uterine body. the process repeats until the baby is expelled.

Two known types of positive feedback increase uterine contractions during labor:
(1) Stretching of the cervix causes the entire body of the uterus to contract
(2) Cervical stretching also causes the pituitary gland to secrete **oxytocin**



Stages of Labor

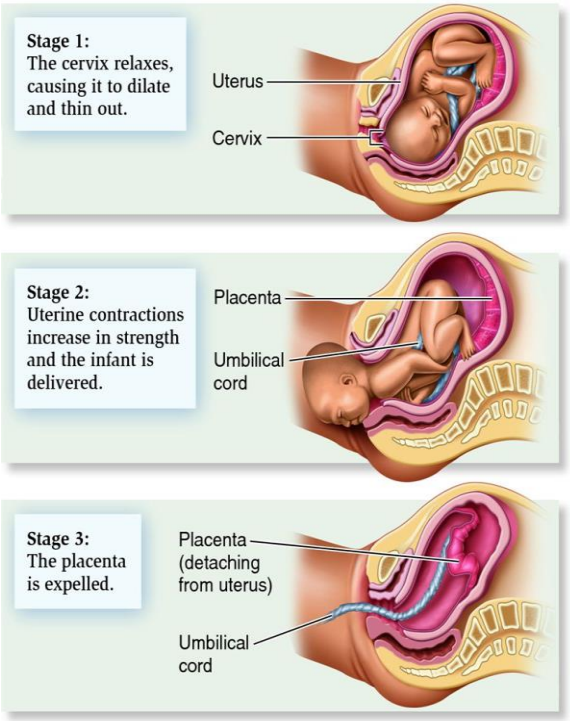
Stages of labor

First stage of labor (Dilation Stage) is a period of progressive cervical dilation, lasting until the cervical opening is as large as the head of the fetus. This stage usually lasts for 8 to 24 hours in the first pregnancy but often only a few minutes after many pregnancies.

The head is the first part of the baby to be expelled, but in some cases the buttocks are presented first. When the baby enters the birth canal with the buttocks or feet first, this is called a *breech* presentation

Second stage of labor (Expulsive Stage) Once the cervix has dilated fully, the fetal membranes usually rupture and the amniotic fluid is lost suddenly through the vagina. Then the fetus's head moves rapidly into the birth canal, and with additional force from above, it continues to wedge its way through the canal until delivery is effected, it may last from as little as 1 minute after many pregnancies to 30 minutes or more in the first pregnancy.

Separation and Delivery of the Placenta (Placental Stage) For 10 to 45 minutes after birth of the baby, the uterus continues to contract, causes a *shearing* effect between the walls of the uterus and the placenta and separating the placenta causes bleeding. The amount of bleeding is limited by smooth muscle fibers ,contraction of the uterus after delivery of the baby constricts the vessels that supplied placenta. it is believed that vasoconstrictor prostaglandins formed at the placental separation site cause additional blood vessel spasm.



Here we depend mainly on Guyton as source

MCQs

1- In which phase cAMP will be high :
A) phase0
B) Phase 1
C) Phase 2
D) phase 3

2- Contraction during labor start at :
A) Body of the uterus .
B) cervix
C) fundus.
D) vagina

3- At the third trimester, which one of these hormones will be increased:
A) Progesterone.
B) Estrogen.
C) Both Estrogen and progesterone

4- The first major obstruction to expulsion of the fetus is :
A-Uterine cervix
B-Uterine fundus
C-Uterine body
D-Abdominal muscle

5- Separation and Delivery of the Placenta lasts for :
A- 24 hours
B- 2 hours
C- 15 minuets
D- 2 minuets

Answers: 1-A 2-C 3-B 4-A 5-C

SAQs

Q1: weak and slow rhythmical contractions called ?

Ans: Braxton Hicks contractions

Q2: What is the different between labor and labor contraction ?

Ans: strong contractions that start stretching the cervix and later force the baby through the birth canal called **labor**

The strong contractions that result in final parturition are called **labor contractions**.

Q3: During phase 2 of parturition what are the hormones that will increase

Ans: 1-Cytokines 2- Prostaglandins 3- Oxytocin

Q4: What are the phases of parturition ?

Ans: 1- Phase 0 (Quiescent) 2- phase 1(Activation) 3- phase 2 (Stimulation) 4-phase 3 (uterine involution)

Q5: What are the hormonal changes ?

Ans: 1- Increased Ratio of Estrogens to Progesterone 2- Oxytocin Causes Contraction of the Uterus. 3- Oxytocin Causes Contraction of the Uterus.

Q6: What are the mechanical changes ?

Ans: 1- stretch uterine muscle 2- stretch cervix

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Thank you for checking our work

Best Wishes..