

ORGANIZATION OF OBSTETRIC CARE. PHYSIOLOGY OF PREGNANCY

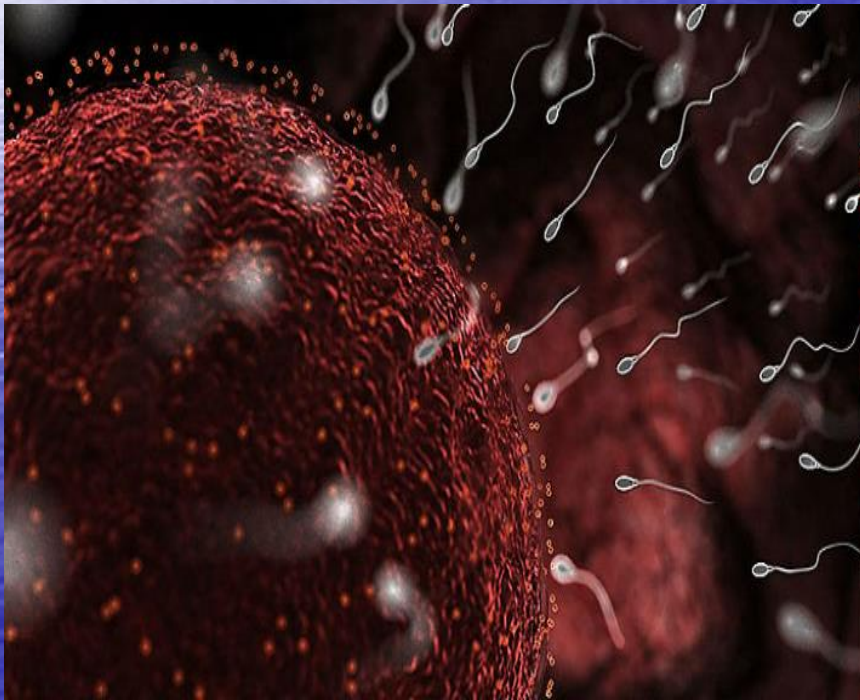
Department of Obstetrics
and Gynecology, number 1
KhNMU

Pregnancy (latin graviditas) -

- physiological condition of the woman when embryo or fetus is developing in her reproductive organs



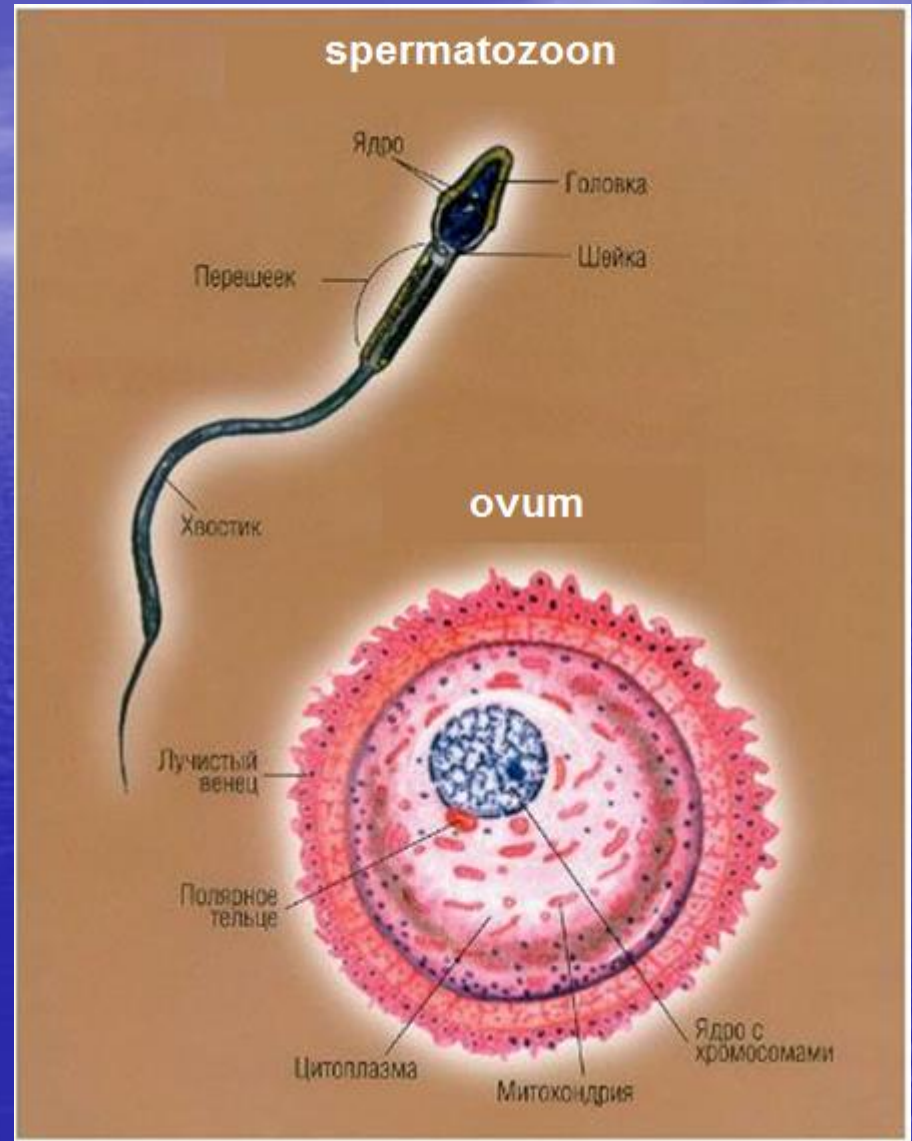
- PREGNANCY starts from the moment of fertilization, which occurs in the ampullar department of fallopian tube.



- Fertilization - is the fusion of the male sex cell (sperm) with the female sex cell (ovum), thus forming a fertilized egg - a zygote.



- Gametogenesis - the process of development of germ cells. Sex cells are formed and ripens in the gonads: sperm - in the testes, ova - in the ovaries.
- Gametogenesis in both men and women have a number of general steps:
- 1) forming a primary germ cells;
- 2) Reproduction of germ cells in the gonads;
- 3) the growth of germ cells;
- 4) meiosis;
- 5) maturation.

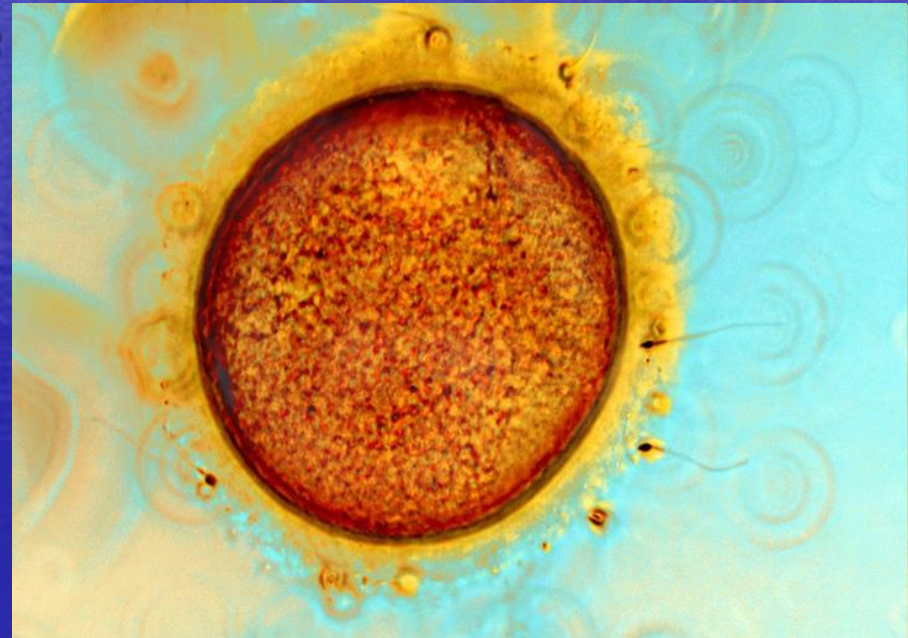


- Spermatogenesis - the development of male germ cells - sperm. Of the millions of sperm only a few reach their goal and fertilize the egg.
- The mature human sperm up to 50-60 μ m. It consists of a head, neck and tail. The head is oval, flattened, has a sealed haploid nucleus, acrosome (secretory vesicle containing hydrolytic enzymes that allow the sperm to penetrate the egg shell).



- sperm development occurs in several stages;
- spermatogenesis starts at puberty and is continuously on testicular seminiferous tubules;
- speed of movement is 3 mm / min. In the vagina they retain their mobility within 1-2 h, in cervical mucus - 38-48 h.

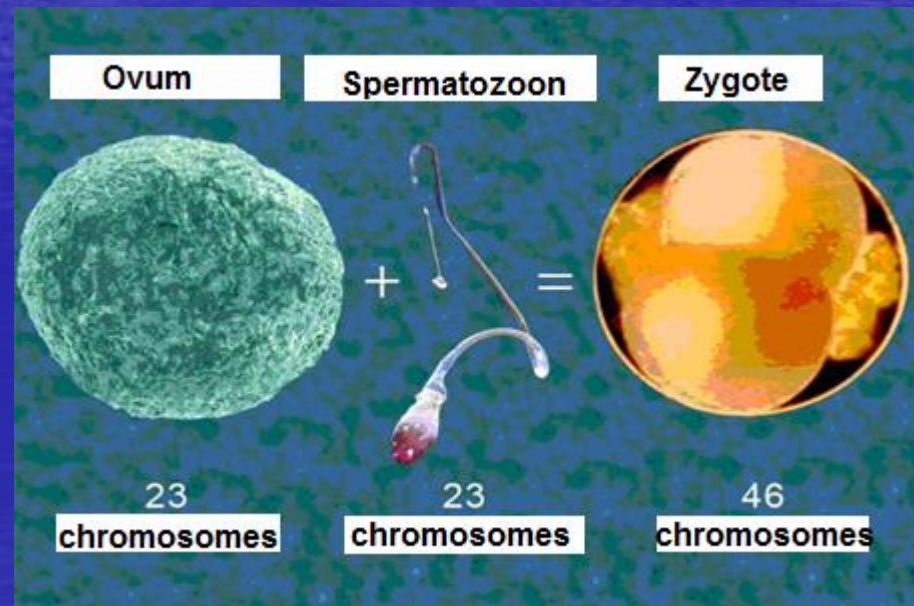
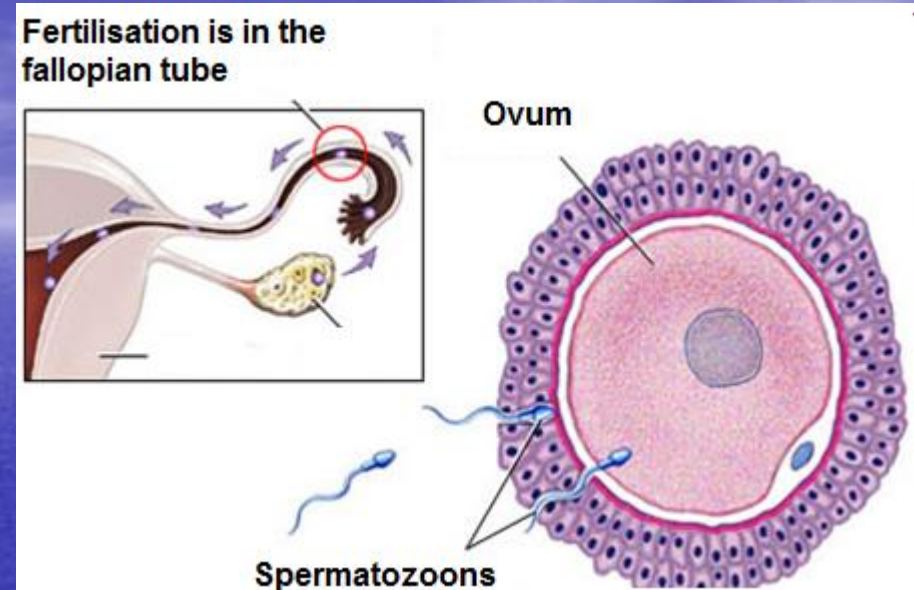
- The ovum- female sexual gamete diameter of about 100 microns and a specific structure. Radiant crown - a collection of follicular cells surrounding the egg. The cells which located diffusely called oviparous tubercle;
- Shiny shell adjacent to the plasma membrane and consists of two glycoproteins which are receptors for sperm. The plasma membrane is adapted to fertilize. Cortex of the cytoplasm has quite orderly structure and includes microfilaments required for crushing.

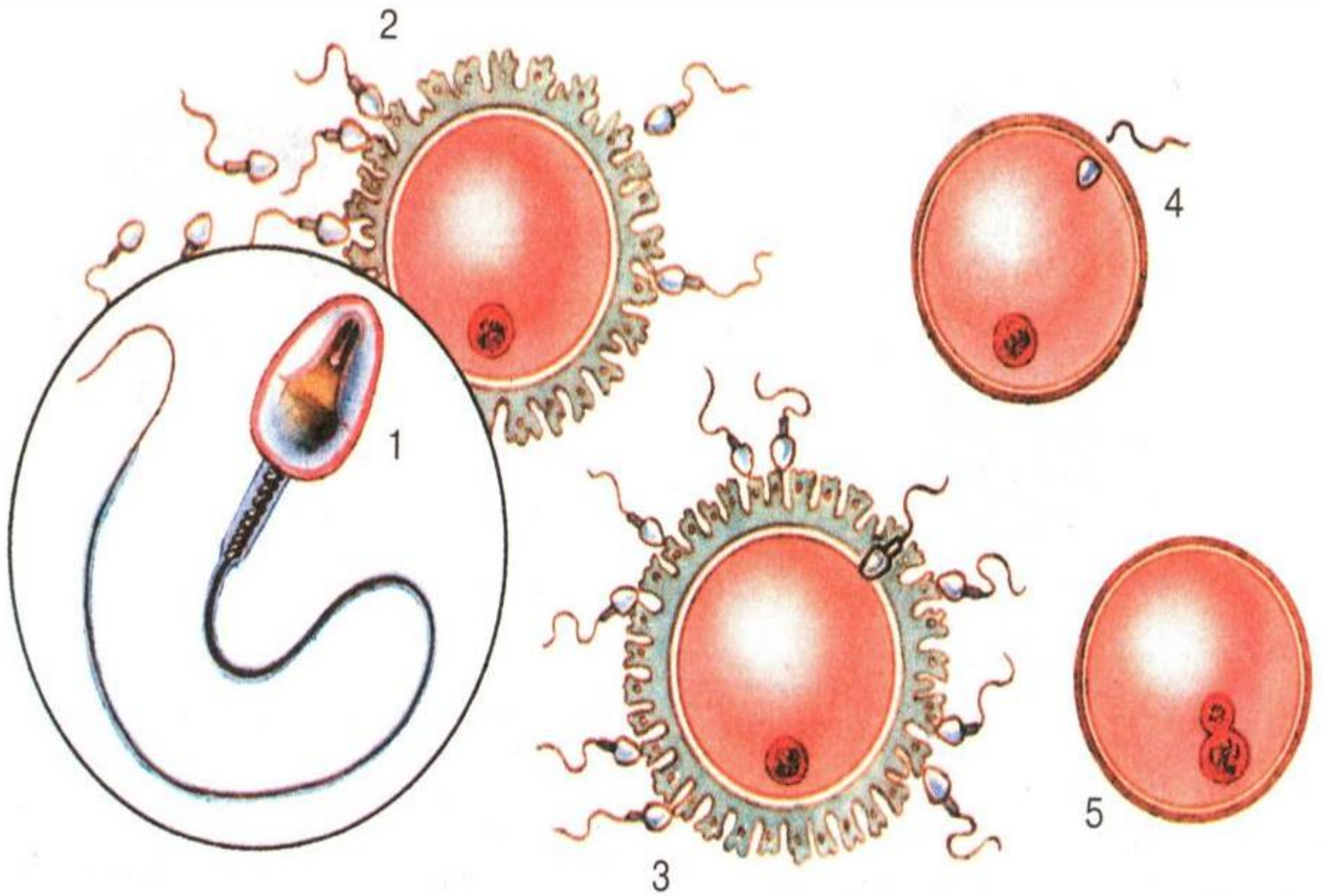


- Oogenesis occurs in several stages , the main part of which extends in the ovary (the first half of the menstrual cycle) . Developing ovum is called an oocyte .
- Primary germ cells migrate to the gonads and form oogonia that divide mitotically , differentiate into oocytes I order.
- Oocytes of I order enter in the first meiotic prophase on 3- 8th month of fetal development . The division in this phase is terminated prior to the onset of puberty.
- Oocyte of the II order and the first polar body formed after the completion of the first phase of meiosis . This phase of development called maturation and covers 15-25 follicles simultaneously , only one of which " survive " to its termination.
- At this stage, the oocyte go out of the ruptured ovarian follicle (ovulation) , corpus luteum is formed on this place.

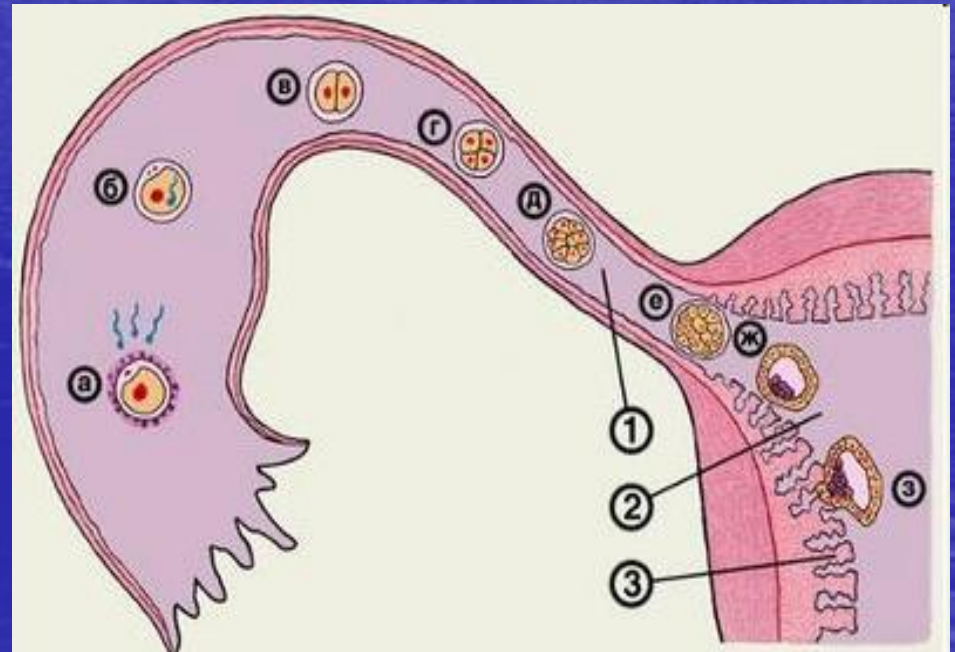
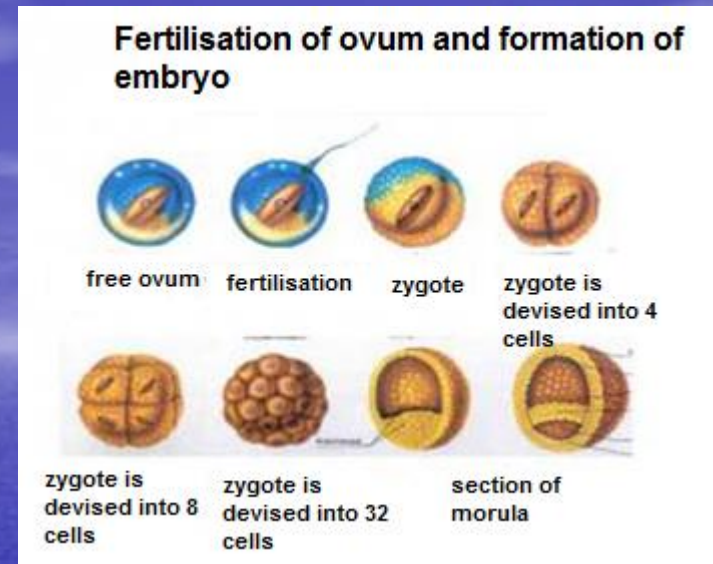
Fertilization

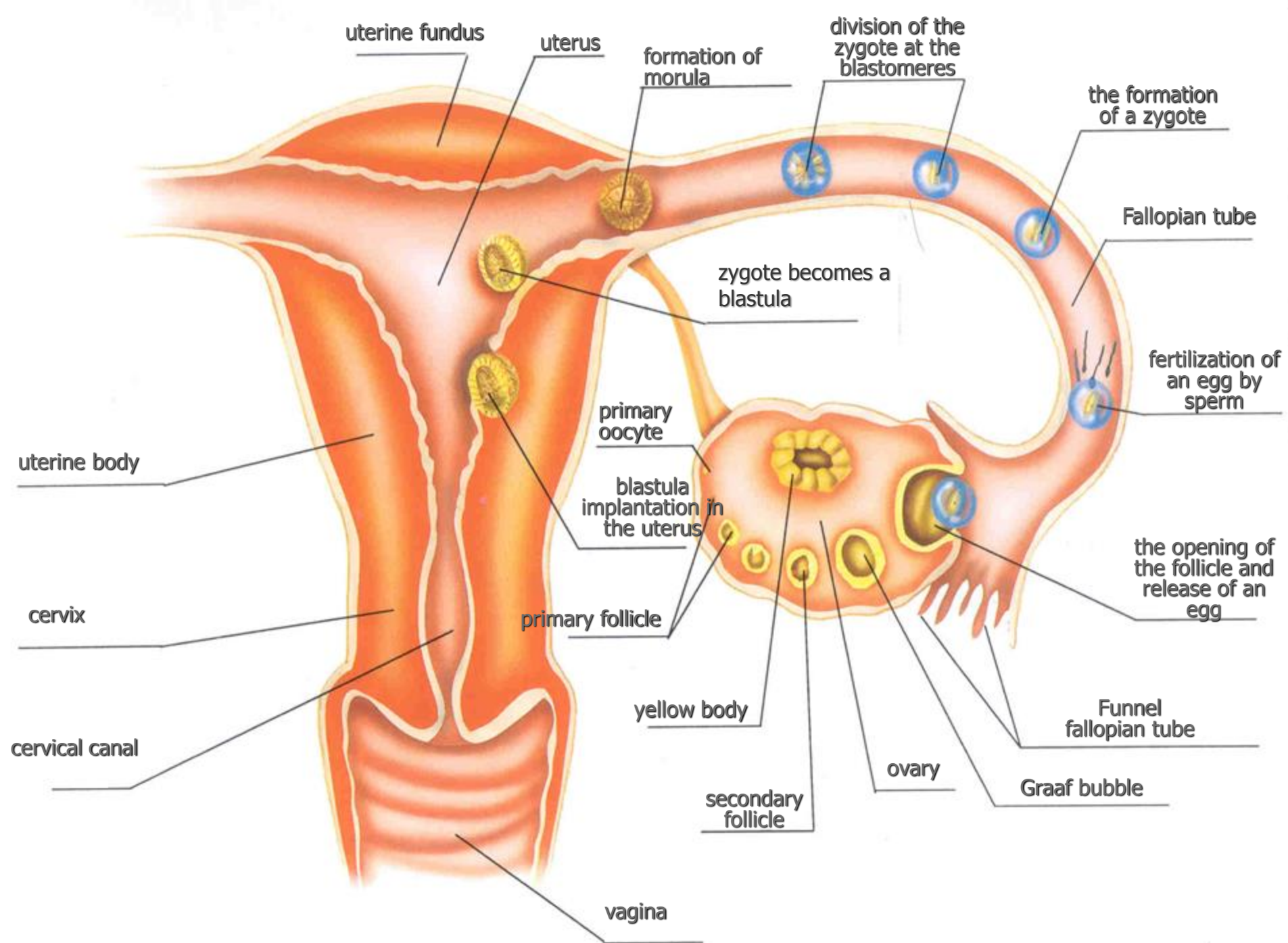
- Fertilization occurs in the ampullar department of fallopian tube.
- There are the following stages of fertilization:
 - Penetration of the sperm into the ovum (penetration);
 - Nuclear fusion of two gametes (copulation).
- The important role plays an acrosome reaction with the penetration of the sperm through the shiny shell of the ovum. There is merge of the plasma and acrosome membrane after the "meeting" of sperm and ovum.





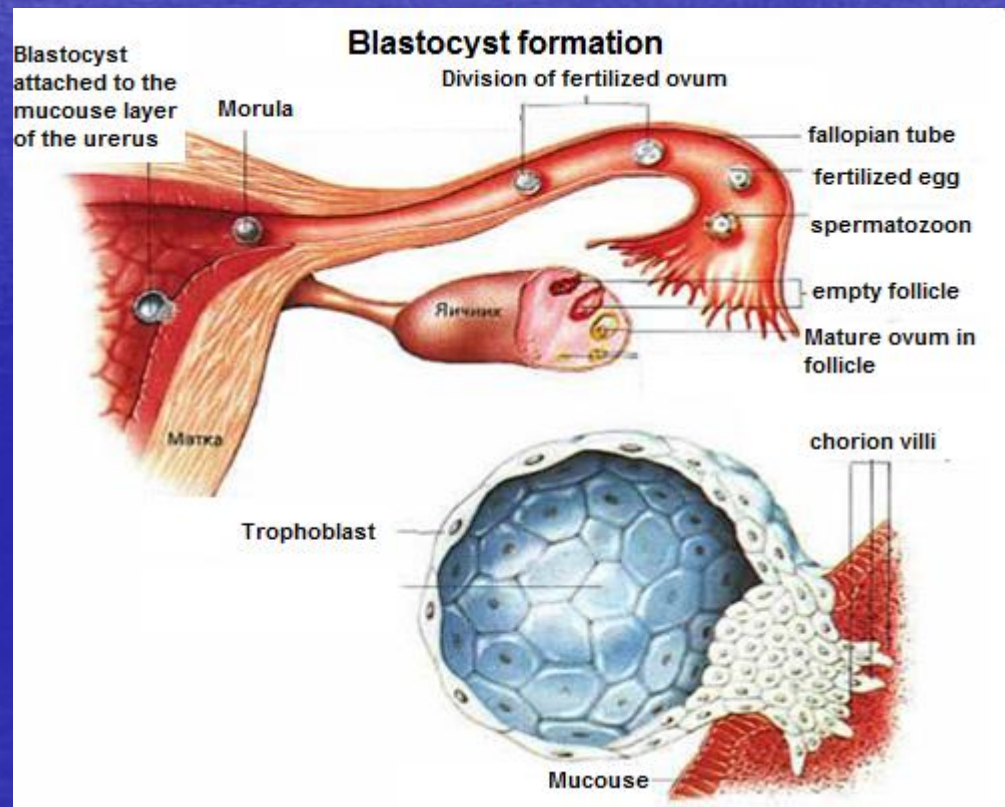
- the fertilized egg (zygote) begins to break up and move through the fallopian tube to the uterus is mainly due to peristaltic movements of the tube and the ciliated epithelium of the villi;
- as a result of fragmentation of the zygote is formed complex of blastomeres, the outer layer which is called the trophoblast;
- these cells melted endometrial mucosa with using enzymes resulting with implantation in 7-8 days

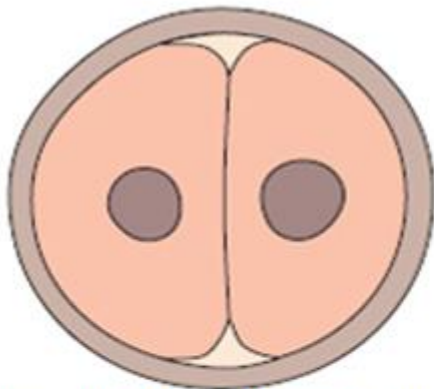




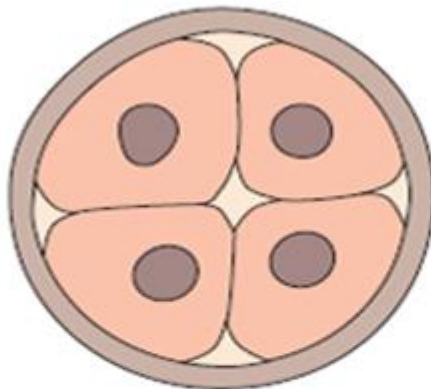
Blastogenesis

- Blastogenesis is the stage of development of the embryo after fertilization. This stage combines the processes from fertilization to the formation of the main primary organs of the embryo, the so-called germ layers. Among them during embryonic and fetal life (during organogenesis) formed individual organs and systems.
- Periods:
 1. Formation of morula
 2. Blastulation (blastocyst and blastoderm formation)
 3. Gastrulation (formation of the ectoderm and endoderm)
 4. Formation of the third germ layer - the mesoderm

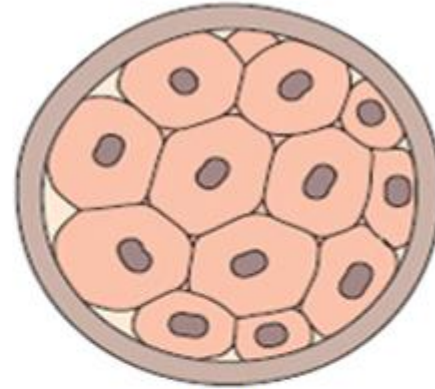




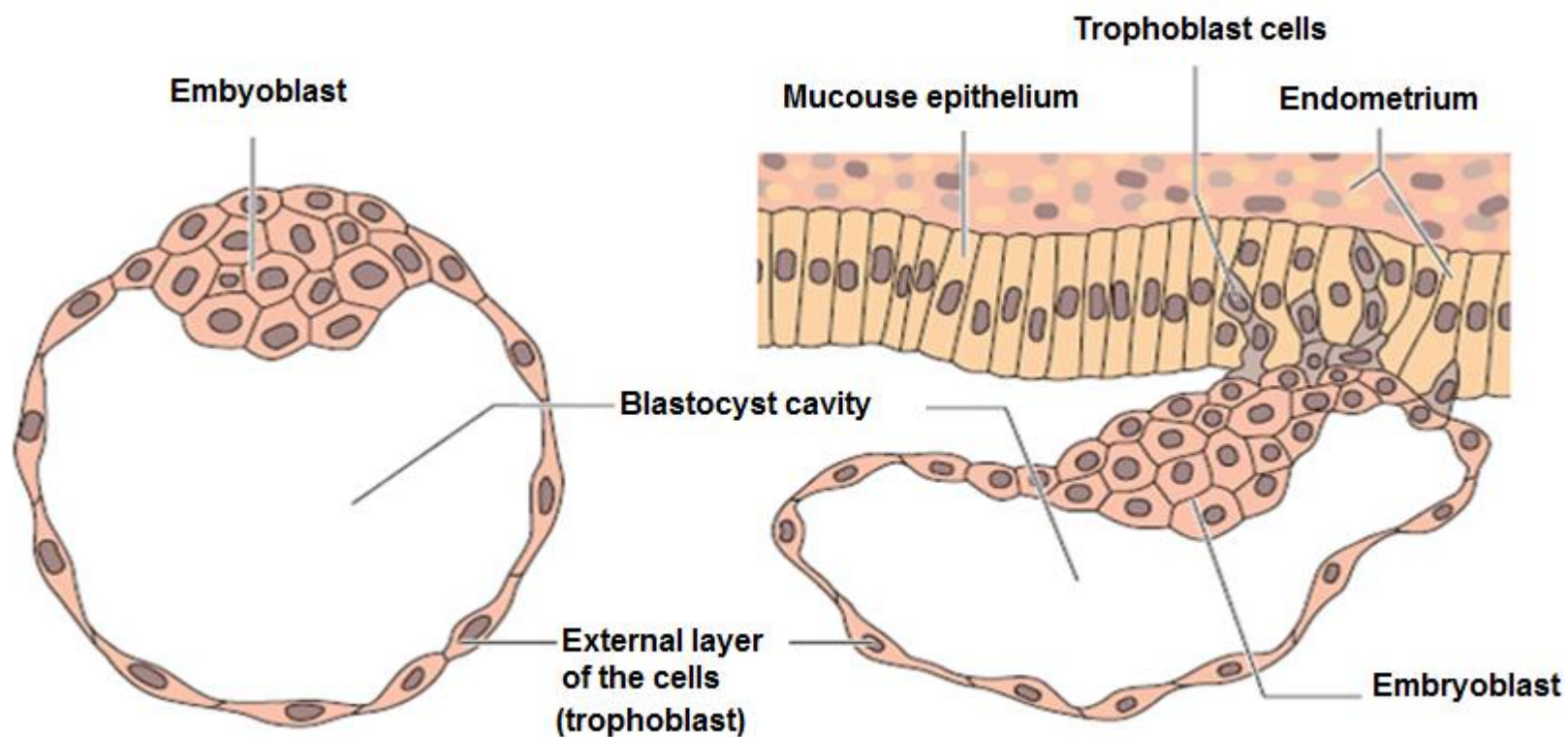
Two cells stage (blastomeres)



Four cells stage



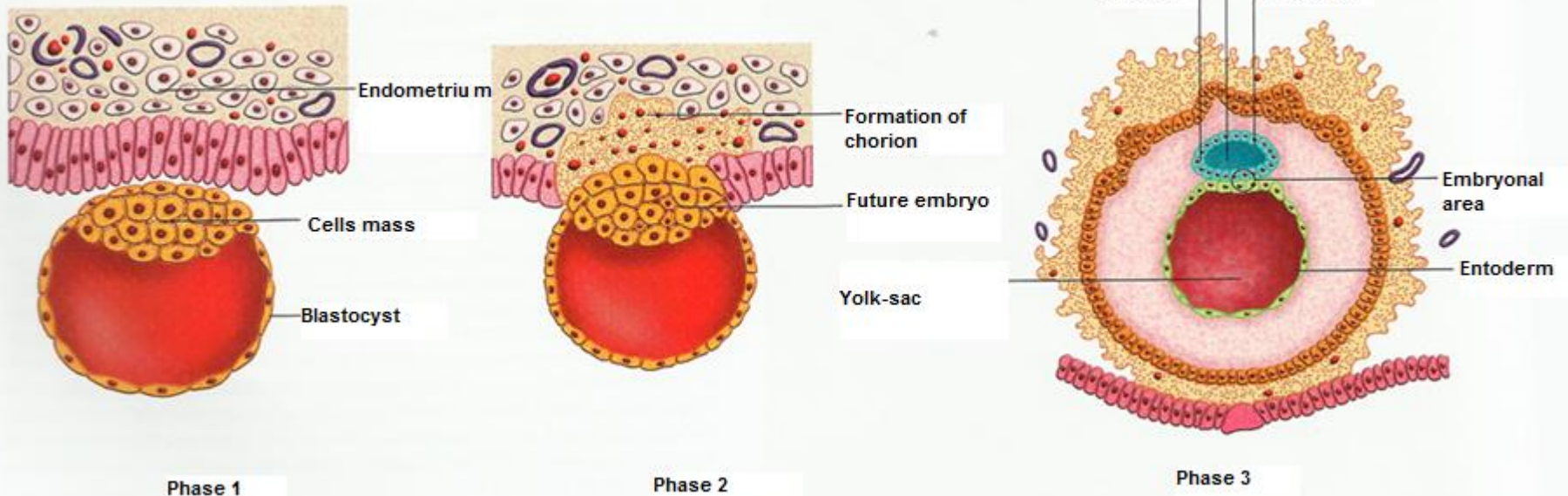
Morula



Implantation

- **Implantation** - immersion of the embryo at the blastocyst stage in the lining of the uterus. Trophoblast releases proteolytic enzymes melted endometrium, thereby making it possible to penetrate deep into the the mucous membrane of the uterus and its nutrition.
- Implantation begins on the 7th-8th day after fertilization.
- The fetus is fully immersed in the lining of the uterus before the 12th day after fertilization, and with the help of trophoblast receives nutrients from the mucosa and secret of the uterine glands.

Embryo implantation



Embryogenesis

- At the same time with the trophoblast develops embryoblast.

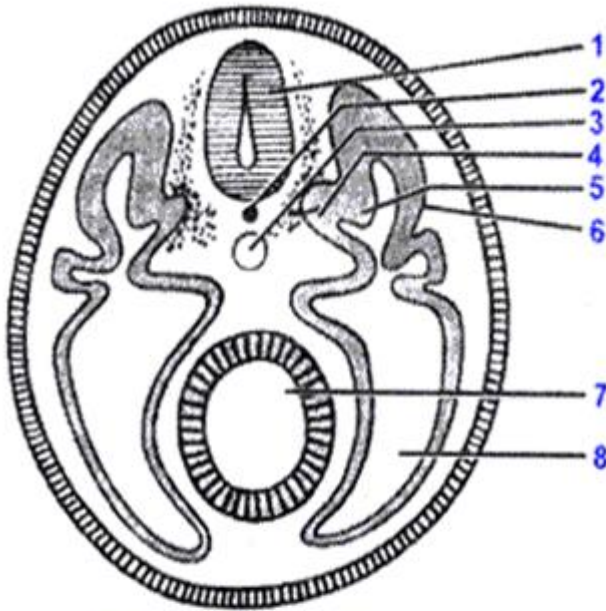
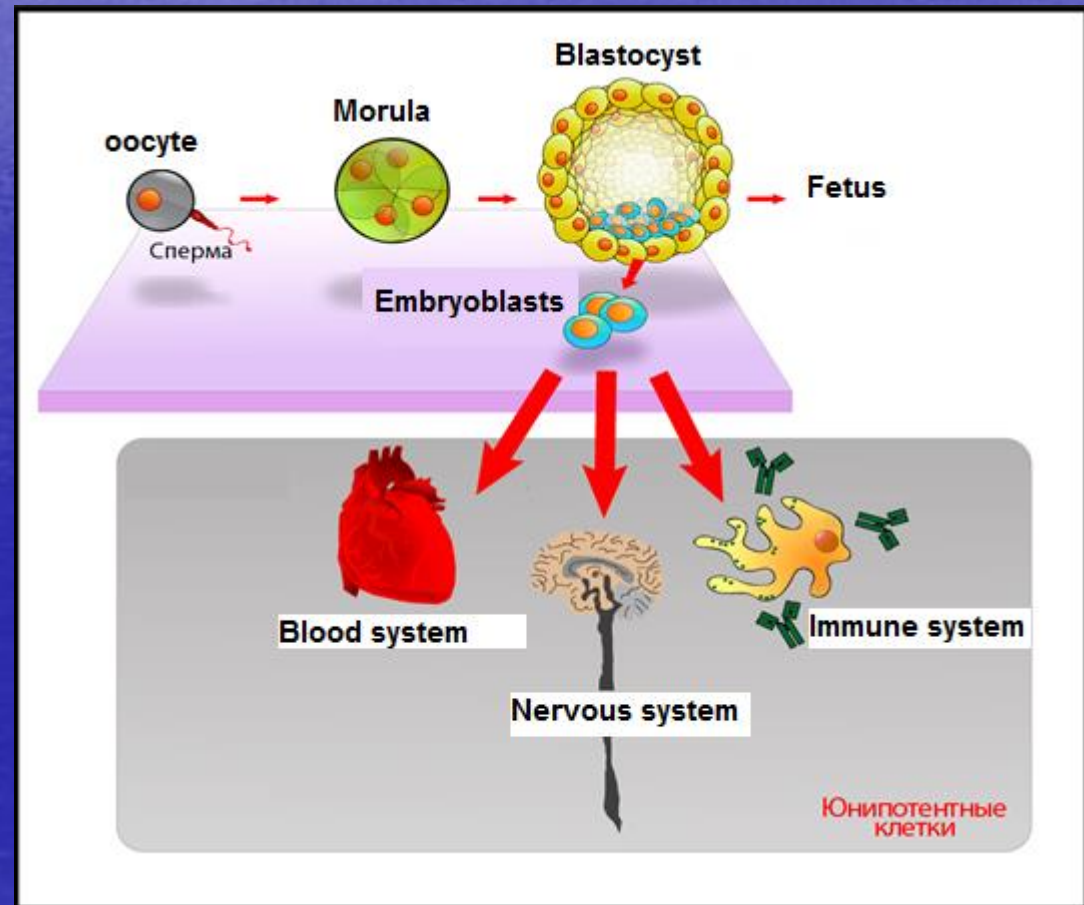
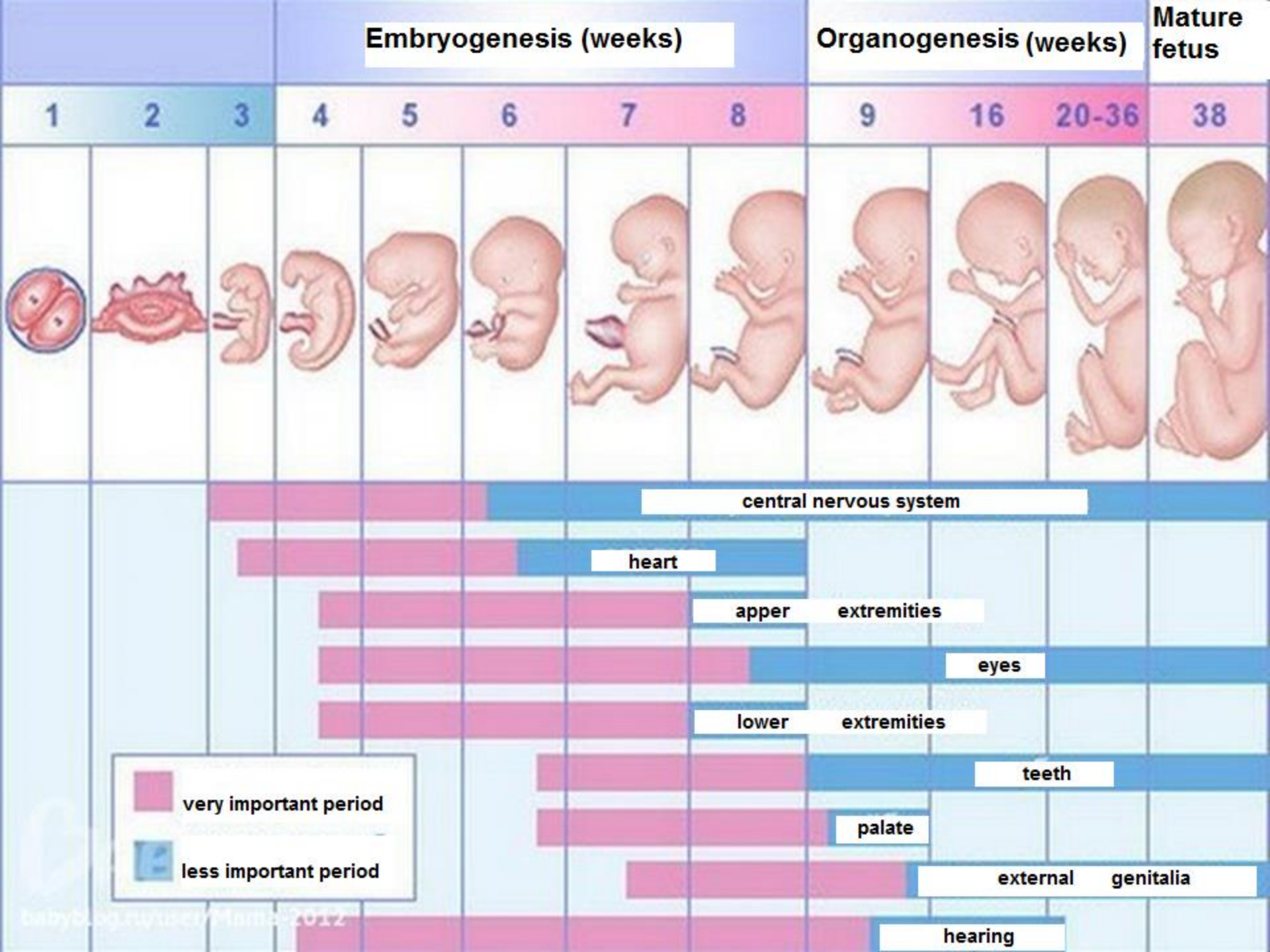


Рис. 134. Embryo body
в поперечном разрезе:

1 – нервная трубка; 2 – хорда; 3 – аорта;
4 – склеротом; 5 – миотом; 6 – дерматом;
7 – первичная кишка; 8 – вторичная полость
тела (целом)





The dynamics of development of the fetus

Week	Heigh, cm	Weight, gr		Week	Heigh, cm	Weight, gr
11	6-8	10-15		26	33,5-35,5	850-1000
12	8-10	15-20		27	35,5-37	1000-1200
13	10-12	20-30		28	37-38,5	1200-1350
14	12-14	30-50		29	38,5-40	1350-1500
15	14-16	50-75		30	40-41	1500-1650
16	16-18	75-115		31	41-42,5	1650-1800
17	18-20	115-160		32	42,5-43,5	1800-1950
18	20-22	160-215		33	43,5-44,5	1950-2100
19	22-24	215-270		34	44,5-45,5	2100-2250
20	24-26	270-350		35	45,5-46,5	2250-2500
21	26-27,5	350-410		36	46,5-48	2500-2600
22	27,5-29,5	410-500		37	48-49	2600-2800
23	29,5-31	500-600		38	49-50	2800-3000
24	31-32	600-750		39	50-51	3000-3200
25	32-33,5	750-850		40	51-54	3200-3500



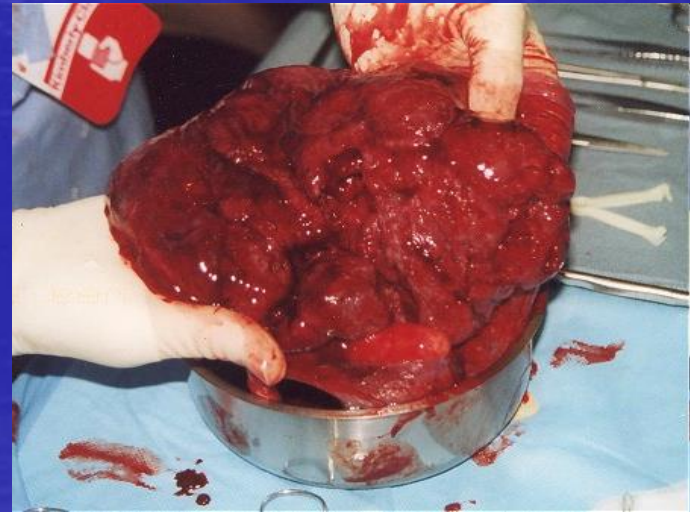
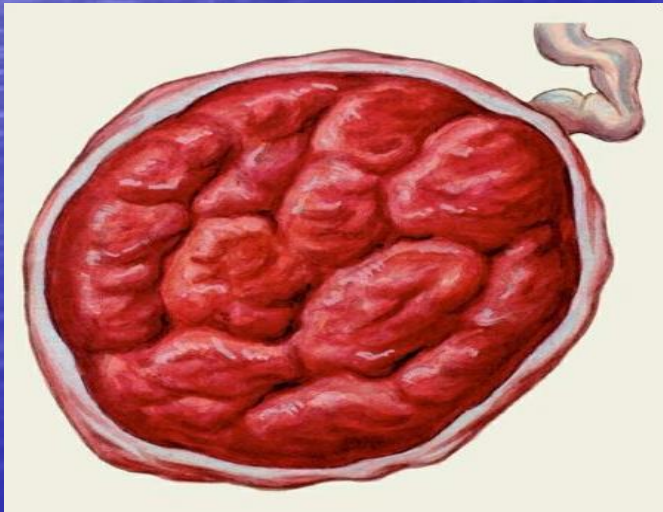
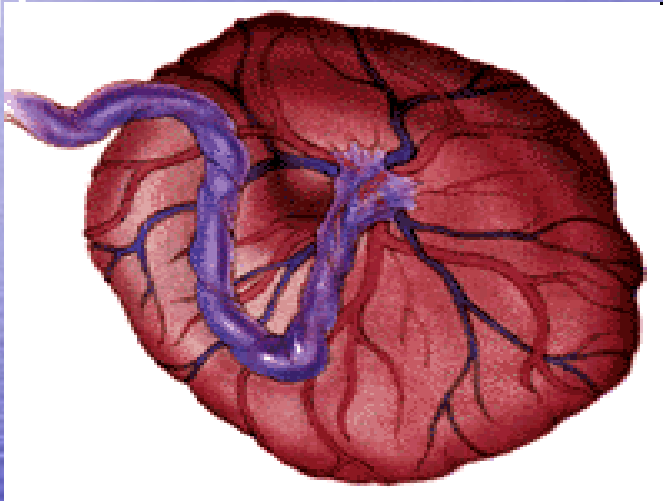
Physiological changes in a woman's body during pregnancy:

- CNS : the fertilized egg interoreceptors irritates the uterus , leading to the formation of a permanent source of sensory input . Reflex responses resulting from complex interactions of the mother and fetus are an important part of the pregnancy.
- In the I trimester there is a decrease in excitability of the cerebral cortex , which leads to increased reflex excitability of the subcortical centers of the brain and spinal cord ;
- In the II trimester excitability cortex and subcortical centers are practically at the same level;
- In the III trimester of cortical excitability increases and remains at that level until the 39th week of pregnancy ; 1-1.5 weeks before the birth , it drops again .

- The endocrine system. The endocrine glands play important role for advance and duration of normal pregnancy.
- **The pituitary gland.** The front part (anterior pituitary) during pregnancy increases by 2-3 times increased gonadotropin-releasing hormone production , contributing to the development of the corpus luteum , estrogen and progesterone influence the changes in the mammary glands . Enhanced synthesis of TSH, ACTH, growth hormone .
- At the rear (neurohypophysis) accumulate oxytocin and vasopressin . Pituitary hormone secretion is influenced by the hypothalamus and cortex.

- **The ovaries** . In early pregnancy in the ovary develops new gland- the corpus luteum , which secretes the hormone progesterone , which reduces the excitability and contractility of the uterus, which creates favorable conditions for the implantation of the fertilized egg and the development of the pregnancy.
- **The corpus luteum** is actively functioning in the first 10-12 weeks, then gradually regresses , and 16 weeks of pregnancy hormonal function has been taken over fetoplacental complex . Throughout the pregnancy, the follicles do not mature in the ovaries and ovulation does not occur, but the production of estrogens that stimulate the growth of uterus and breasts continues.

- **Placenta** - a special body providing communication with the mother of the fetus. In placenta occurs intensive process of synthesis ,secretion and transformation of hormones like steroid and protein origin



- **The thyroid gland.** In 35-40 % of pregnant thyroid gland increases . In the I half of pregnancy observed its hyperfunction, in II - hypothyroidism. The concentration of thyroid hormones in the blood plasma does not significantly change.
- **Parathyroid gland.** During pregnancy, there is a tendency to hypofunction of parathyroid glands, which can cause disorders of the calcium metabolism.
- **The adrenal glands.** If pregnancy, occurs adrenal cortex hyperplasia, increased glucocorticoid and mineralocorticoid formation. In the cortex, increased synthesis of cortisol, estrogen, progesterone and androgens. Under the influence of the adrenals in the blood increases cholesterol and other lipids, increased skin pigmentation .

- The immune system. During pregnancy, there is a physiological state of immunosuppression. Immune responses of the female body decreased on the background of antigenic immaturity of the fetus. The placenta, fetal membranes and amniotic fluid performs the function of the immunological barrier that prevents the rejection of the ovum.
- Metabolism and oxygen consumption increases. Protein metabolism during pregnancy is reduced. Carbohydrate metabolism is increased, the blood glucose level remains within the physiological limits, hyperglycemia noted sometimes during childbirth. The content of total lipids, triglyceride and cholesterol in blood serum increases. In the body of a pregnant accumulation of inorganic substances that affect the water exchange, with a disposition to water retention in the body. During pregnancy dramatically increases the need for vitamins (vit. C, A, gr. B, D, E).

- The cardiovascular system. Physiological hypervolemia is developing during pregnancy, there are physiological hypertrophy of myocardial fibers and the strengthening of its contractile function. There is also a physiological tachycardia, and in some cases, there is the inferior vena cava syndrome, the cause of the collapse of a pregnant.
- Hemoplasty. levels of red blood cells and hemoglobin increased from the first months of pregnancy, however, arises in the future due to hemodilution , in II trimester, there is a decrease in hematocrit and hemoglobin levels. In the III trimester (at 34 weeks) has the lowest rate of hemoglobin - 110 g / l. During pregnancy in the peripheral blood is a progressive increase in the number of white blood cells, the growth of ESR. Pregnancy is characterized by a hypercoagulable state , the constant increase in fibrinogen and factor VII-X blood clotting.

- The respiratory system. During pregnancy increases the oxygen consumption of mother and fetus. Lungs are functioning in the mode of hyperventilation , chest expands , expands infrasternal angle, diaphragm cupula rises to 4 cm, respiratory volume increases toward the end of pregnancy by 30-40 %.
- The digestive system. In the early stages of pregnancy observed violations of varying severity in the form of nausea , vomiting, increased salivation , changes in taste sensations, as a result of the weakening of intestinal motility may experience constipation.
- The urinary system. Greatly enhanced the renal pelvis and ureter (mostly right) , there is an excess of the ureter in the upper third of its transition to the middle . Dilatation of the urinary tract begins with a 6 -week , reaching a maximum at 32 weeks of pregnancy and is reduced at childbirth.

- The musculoskeletal system . During pregnancy, under the influence of relaxin , which is produced in the placenta, is serous impregnation and loosening of ligaments, cartilage and fibrous of pubic symphysis and sacroiliac joints, there is a discrepancy in the pubic symphysis bone to 0.5 cm, in the result of uterine increase, changes posture of pregnant - shoulders and head lean back , increasing the lumbar spine lordosis (" prance ").
- Skin. The white line of the abdomen , on the nipple and areola can be expressed as a dark brown pigmentation . Brown spots can be localized on the forehead, nose, upper lip (chloasma gravidarum). With increasing gestational gradually stretched anterior abdominal wall , in some pregnant on the skin , breast , thighs formed pinkish red stripes arcuate shape - scars of pregnancy (striae gravidarum). There is increased function of the sweat and sebaceous glands, sometimes there is hypertrichosis .

✓ pigmentation of the face



✓ pigmentation of the white line of the abdomen

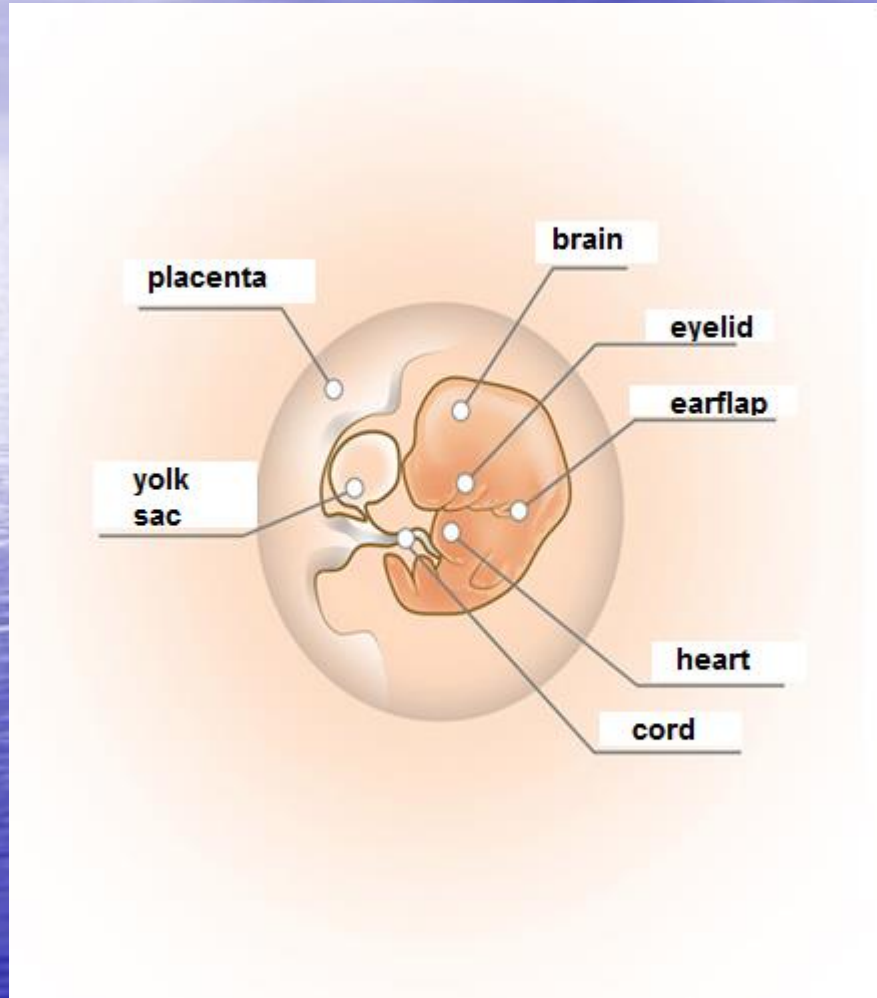


✓ band of pregnancy

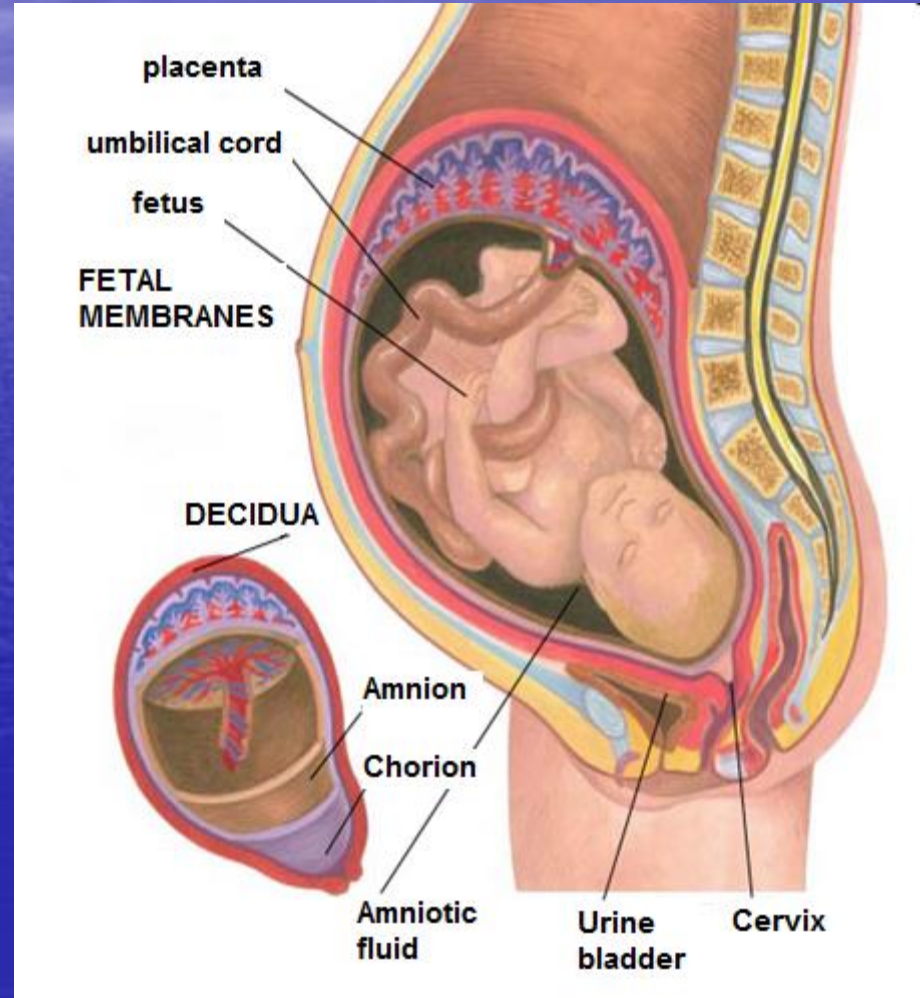


- Mammary glands , from 6 weeks of gestation increases, there is preparation for the secretion of milk - increases the amount of glandular lobules , increasing blood flow , increasing the nipples, the formation of colostrum.
- Genitals. Change the size , shape, position , consistency and responsiveness of the uterus. Size increases during pregnancy due to hypertrophy and hyperplasia of muscle fibers and the growth of the newly formed muscle cells. Transformed uterine vasculature - arteries , veins and lymphatic vessels widen and elongate to form new blood vessels. Lengthen and thicken the uterine ligaments holding the uterus in the correct position during pregnancy and during labor. Fallopian tubes thicken ; ovaries slightly increased in size , cyclic changes in them cease. During pregnancy there is increased blood flow to the vagina, it is extended , expanded , the folds of mucous are pronounced, and become cyanotic hue. The mucous membrane of the vulva loosened , the vestibule is cyanotic .

- The fertilized egg in the early stages of pregnancy.



- The fertilized egg at the end of pregnancy.



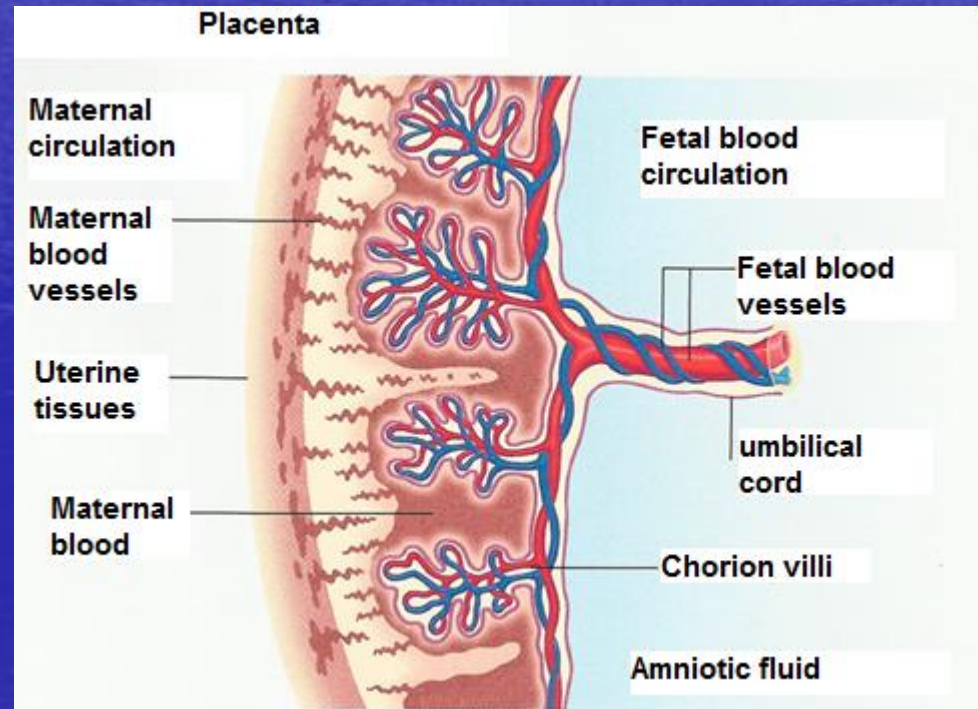
Amniotic fluid

- Amniotic fluid secreted by the amnion epithelium (0.5-1.5 liters).
- Amniotic fluid are of great physiological significance:
 - 1) create the conditions for the free development of the fetus and its movements;
 - 2) protect the fetus from adverse environmental impacts;
 - 3) are involved in the metabolism of the fetus;
 - 4) prevent compression of the umbilical cord;
 - 5) contribute to the normal flow of labor.



Placenta

- Placenta - provisional organ formed during pregnancy and allows communication with the mother and the fetus.
- there are three periods in the formation of the chorion and then placenta :
 - 1) previlli (7-8th day of development);
 - 2) during the creation of the villi (up to 50 days);
 - 3) during the creation of cotyledons (50-90th day).
- The placenta provides for the exchange of substances between organisms of pregnant woman and fetus, performs: trophic, endocrine, excretory, protective function, and the function of gas exchange, antigenic and immunogenic properties.
- The placenta is not only unite, but also shares the genetically heterogeneous organism of mother and fetus, preventing immunological conflict.



Umbilical cord

- The umbilical cord is formed from the allantois, which involves the blood vessels from the embryo to the chorion. The structure of umbilical cord remnants of the yolk sac.
- Umbilical cord - it is lace-like formation, in which lie two arteries and one vein, which carry blood from the fetus to the placenta and vice versa.



Critical periods of ontogeny

- The critical period is called the period of development , which is characterized by increased sensitivity of the embryo to the damaging effect of different factors - the mechanical, physical, chemical, etc.
- There are three major critical periods:
 - I - 1 - 2 nd week of gestation (the period of implantation). The effect is most damaging factor is realized death of the fetus. Detrimental factors have embryotoxicity.
 - II - 6 - 8th week of gestation (the period of organogenesis). Detrimental factors have teratogenic effects.
 - III - 11 - 13th week of pregnancy, when the fetoplacental complex is formed (the period of placentation).
- By the critical periods of fetal development also includes 15 - 20th week of pregnancy (rapid increase of the brain) , and 20 - Week 24 (the formation of basic functional systems of the body).

The objectives of obstetric examination:

- establish a pregnancy;
- determine the period of pregnancy;
- determine the overall condition of the pregnant woman, and in the case of detection of the disease - to find out its effect on pregnancy and childbirth;
- establish the presence of obstacles in the birth canal (narrow pelvis, tumors), which may worsen the prognosis of labor;
- determine the amount, location and condition of the fetus.

The order of history-taking:

- passport data;
- the complaint;
- working and living conditions;
- Family history (heredity: the presence of close relatives in such diseases as diabetes, hypertension, cancer, ovarian cancer, breast cancer, alcoholism, drug addiction);
- previously deferred disease (rickets, tuberculosis, syphilis, childhood infectious diseases), transferred gynecological diseases;
- allergic history;
- the state of menstruation (the onset of menarche, menstrual pattern, the exact date of the last menstrual period);
- secretory function (nature of the discharge from the genitals);
- the nature of sexual behavior (time of onset of sexual activity, the number of marriages, their duration, sex life during pregnancy);
- the reproductive function, or obstetrical history (information about previous pregnancies, their number and outcome);
- Duration of pregnancy (in which term pregnant applied to the women's clinic, when at first felt fetal movements, etc.)

Objective obstetric examination:

- General survey:
 - ✓ definition of height, body mass;
 - ✓ measurement of blood pressure, t of the body;
 - ✓ examination of the skin, sclera;
 - ✓ examination of organs and systems;
 - ✓ conducting laboratory tests of blood, urine, RW, etc.
- Special obstetric care:
 - ✓ diagnosis of early pregnancy;
 - ✓ diagnosis of pregnancy in the later stages;
 - ✓ Modern methods of assessment of fetal development.

Diagnosis of pregnancy:

- CONJECTURAL SIGNS - a subjective feeling of the pregnant woman and the changes in her body , not deals with the internal sex organs:
 - Salivation, morning nausea and vomiting, change in appetite, aversion to certain foods , addicted to spicy and acidic foods, the distortion of taste (the desire to eat chalk, clay, etc.), dyspeptic symptoms , feelings of heaviness in the epigastric region, and constipation;
 - Functional changes in the nervous system irritability, heightened sense of smell, hearing, tearfulness, isolation;
 - Changes in metabolism: abdominal distension associated with the deposition of fat in the subcutaneous adipose tissue , pigmentation of the nipples and areola, the white line of the abdomen, the appearance of age spots on the face;
 - Scars of pregnancy.

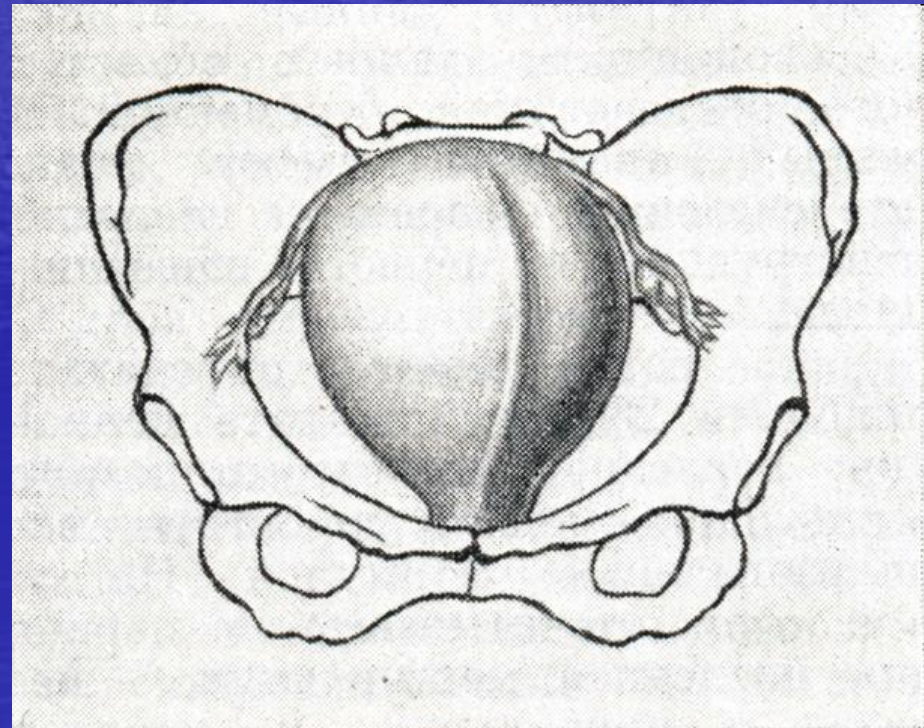
- Likely SIGNS - objective changes in the genitals and breasts. These signs are mostly indicate the occurrence of pregnancy, but can serve sometimes as a manifestation of some gynecological diseases.
- Cessation of menstruation;
- Changes in the vagina, uterus and mammary glands;
- Laboratory reactions.



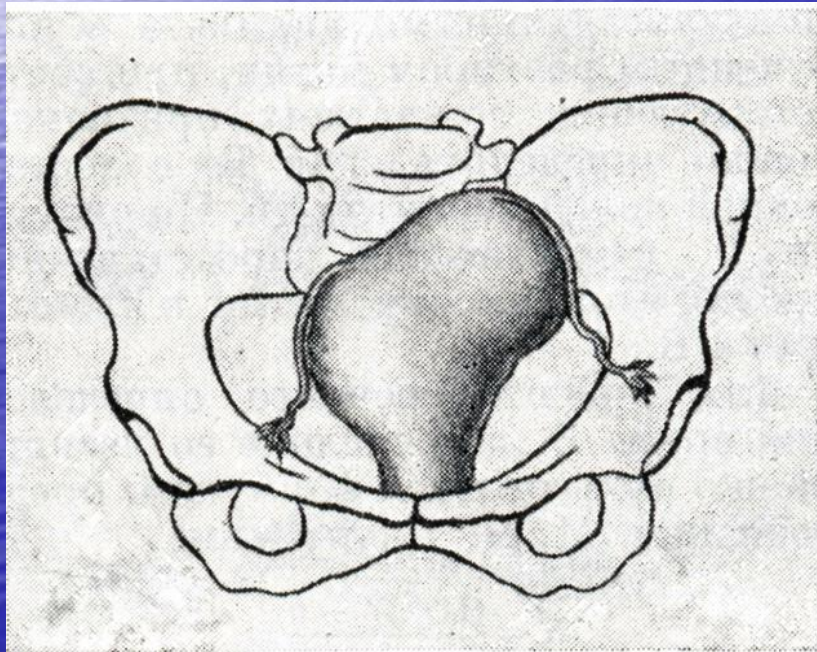
- Horwitz –Gegar sign - lies in the fact that as a result of the softening of the isthmus the fingertips of both hands during bimanual examination is easy to converge.



- Günter sign - on the front wall of the uterus is palpable longitudinally arranged comb-shaped protrusion, not passing on the bottom or on the cervix or on the back of its surface.



- Piskachek's Sign - the appearance of the dome-shaped bulge in one of the corners of the uterus, which corresponds to the implantation of the ovum.



- Snegiryov's Sign – contraction of the soft pregnant uterus during its palpation.
- Gause's Sign - excessive displacement of the cervix in all directions, which is not transmitted to the body of the uterus.

- RELIABLE SIGNS - signs undoubtedly testifying in favor of pregnancy, these include:
 - Palpation of the fetus or the parts of his body;
 - Fetal heart tones;
 - The motor activity of the fetus.

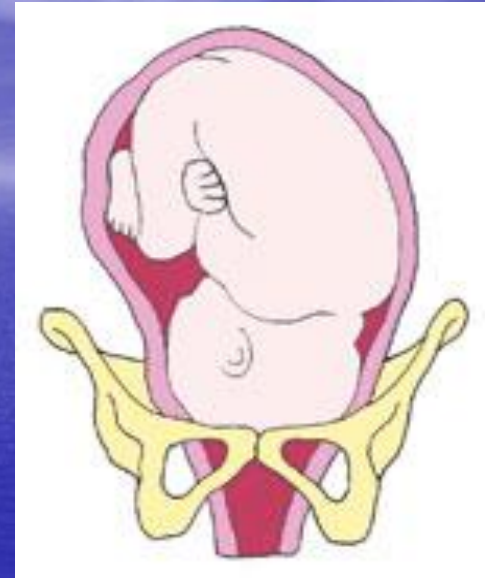


Determination of date of birth:

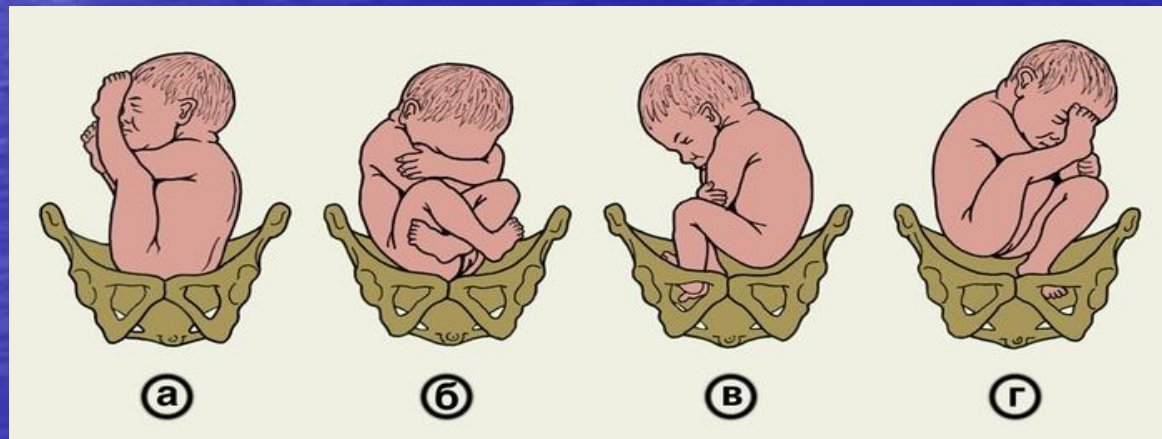
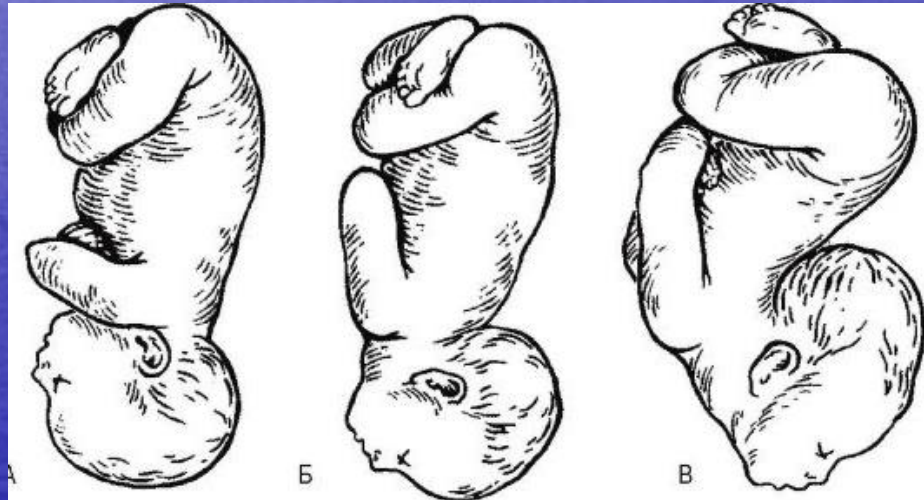
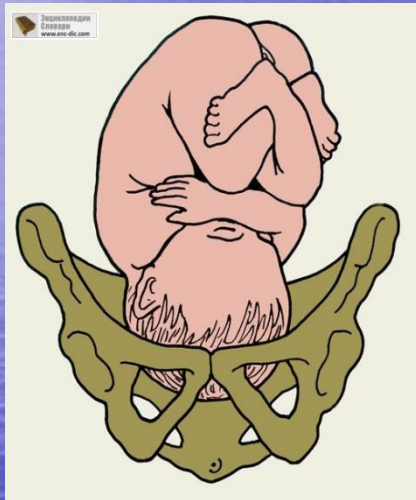
- by date of last menstrual period : the first day of the last menstrual period added 280 days and get the approximate date of birth , formula Negele: from the first day of the last menstrual period take 3 months and add 7 days;
- on the date of the first fetal movements : the date of the first stirring in nulliparous add 20 weeks, multiparous - 18 weeks;
- by gestational age , diagnosed at the first prenatal visit , the error will be minimal, if a woman went to the doctor in the first 12 weeks of pregnancy;
- by ultrasound (fetobiometry);
- Date of issue of prenatal leave (30 weeks) - to this date add 10 weeks.

Obstetric terminology:

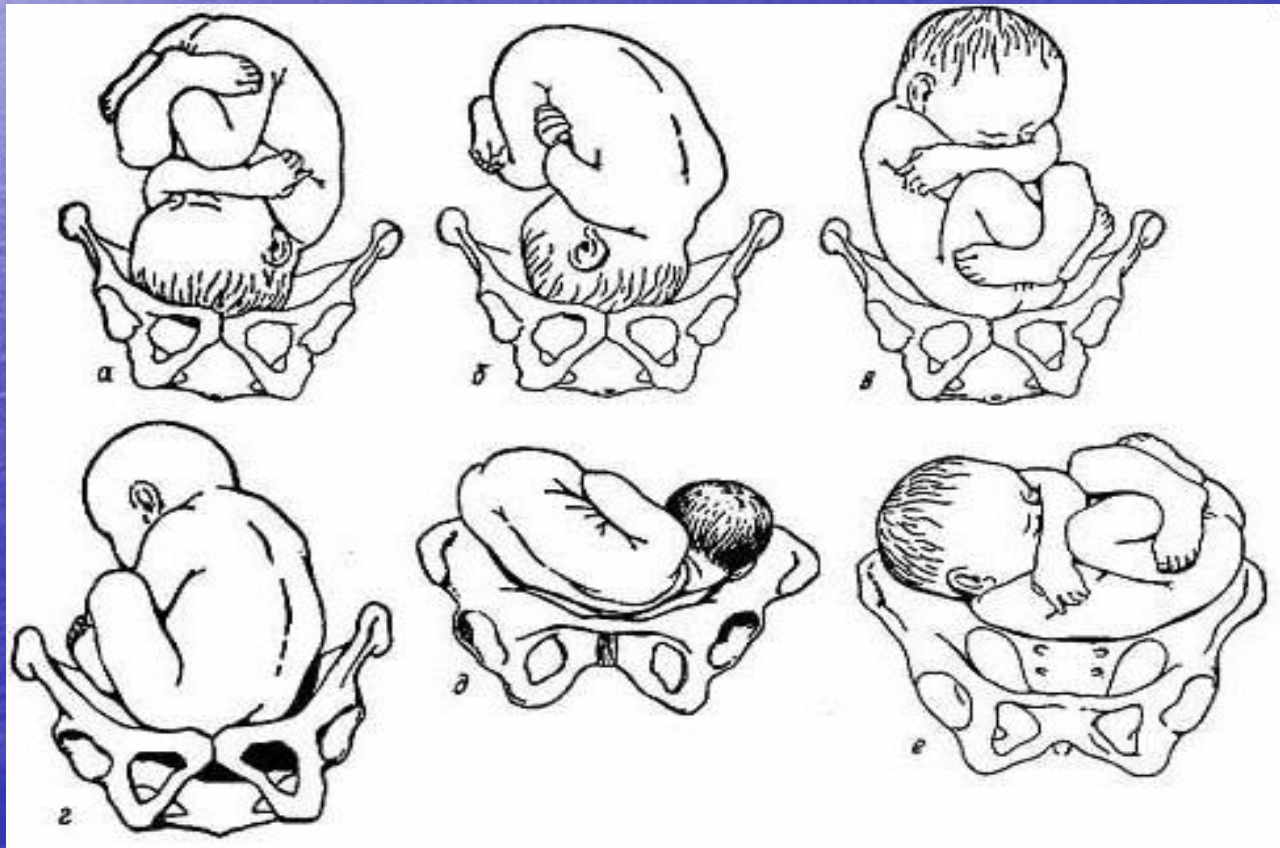
- **Fetal location** - the ratio of the axis of the fetus to the axis of the uterus. If the axes are the same - called the longitudinal position of the fetus, if the axis of the fetus crosses the axis of the uterus at the right angle - cross at an acute angle - an oblique.



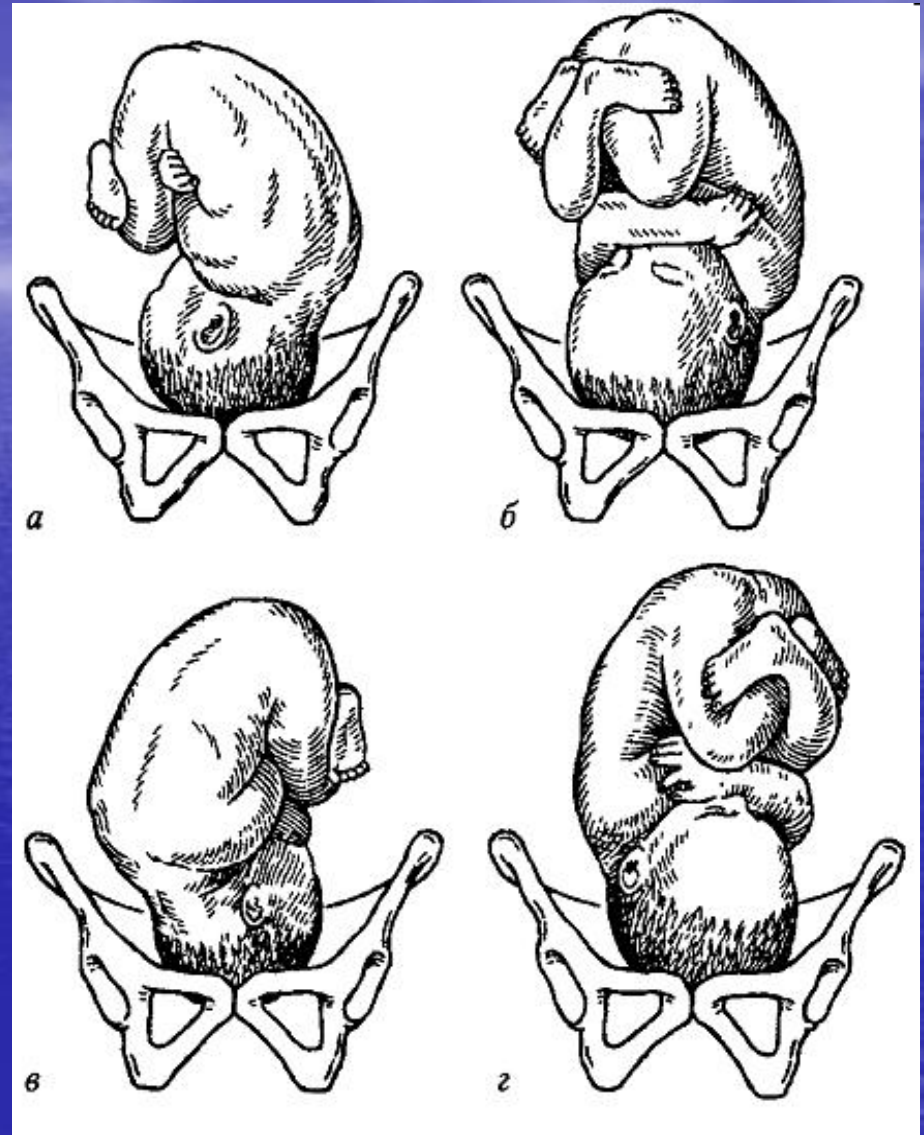
- **Fetal presentation** - the ratio of a major fetal parts (head, pelvic end) to the plane of the pelvic inlet.



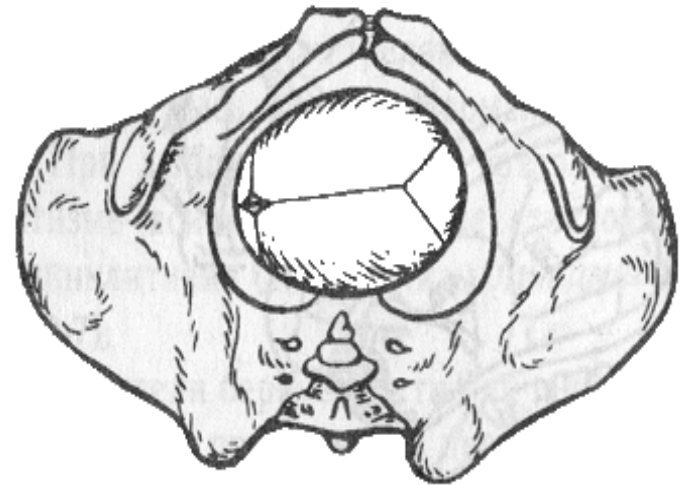
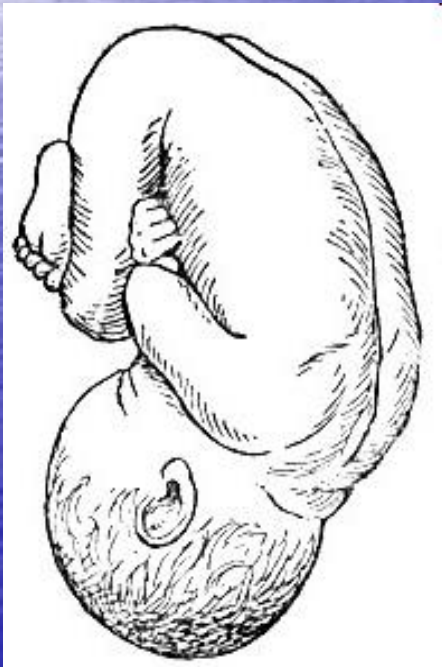
- **The position of the fetus** - the ratio of the back of the fetus to the side walls of the uterus: fetal back toward the left side of the - I position to the right - II position. In transverse and oblique positions fetal position is determined by the placement of the head: the head is on the left - I position, on the right - II position.



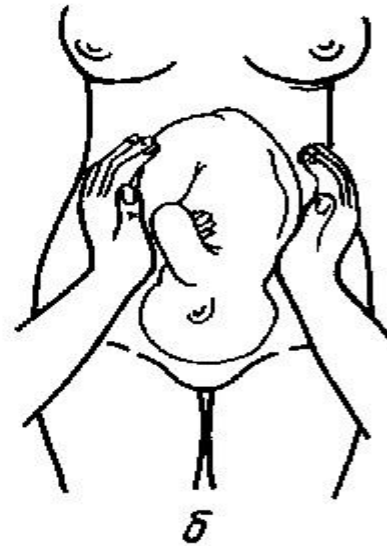
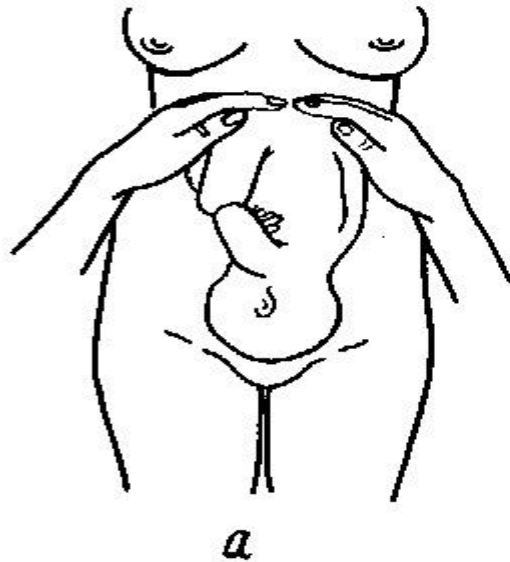
- **View of the fetus** – ratio of fetus back to the anterior or posterior wall of the uterus. The back faces to the anterior wall of the uterus - the anterior view, the posterior- the posterior view.



- **The location of the body parts of the fetus**
- the ratio of the limbs and the fetal head to his torso. Normally, the head is bent and clamped to the body, hands bent at the elbows, crossed and pinned to the torso, legs bent at the knee and hip joints are crossed and pressed against abdomen.



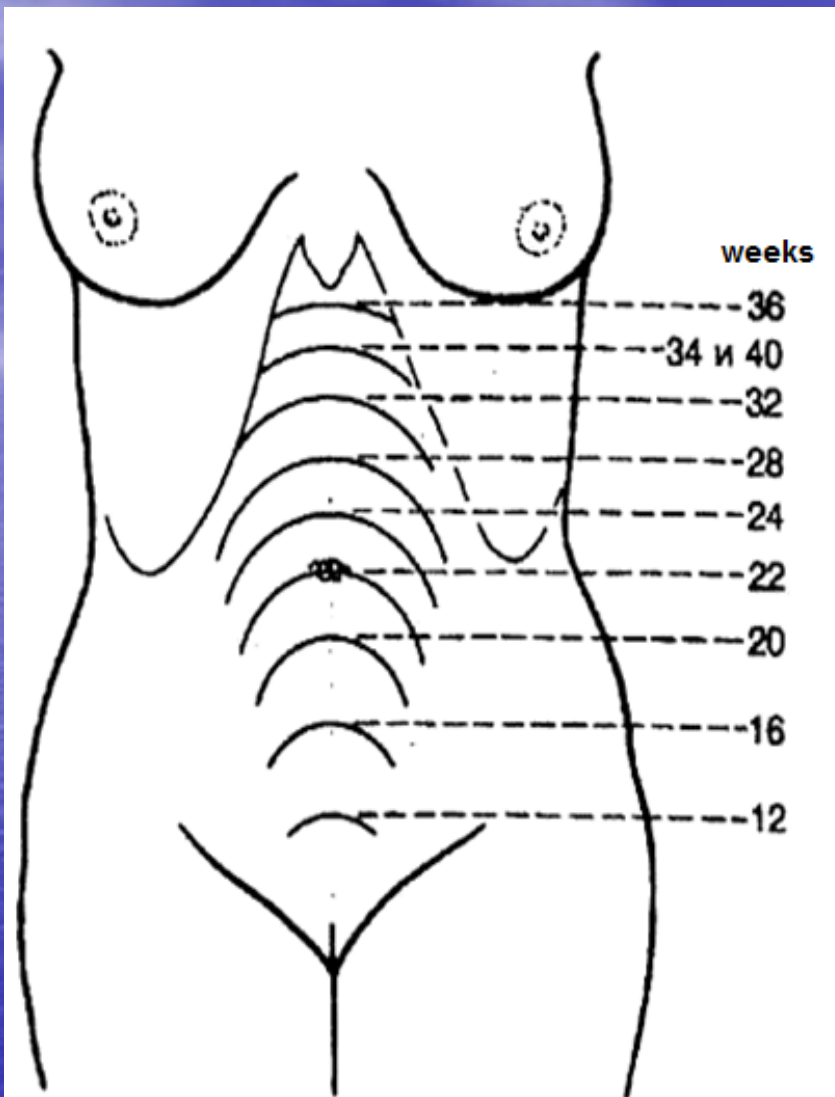
External obstetric study (methods of Leopold)



Measurement of abdominal circumference and height of the bottom

- abdominometry
made measuring tape at the level of the navel, with a full-term pregnancy is 90-100 cm;
- measuring bottom height - the distance from the pubic symphysis to the fundus of the uterus, in the last 2-3 weeks of pregnancy is 35 cm





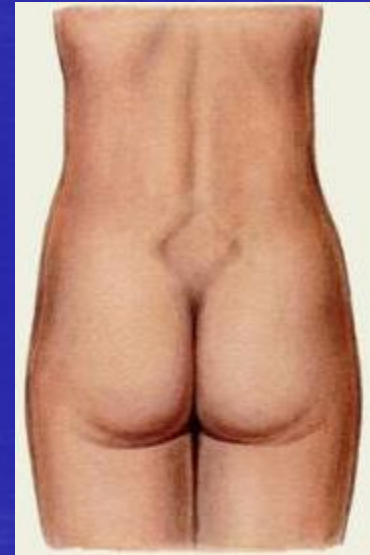
Level of uterine bottom in different ages of pregnancy

Measuring the size of the pelvis

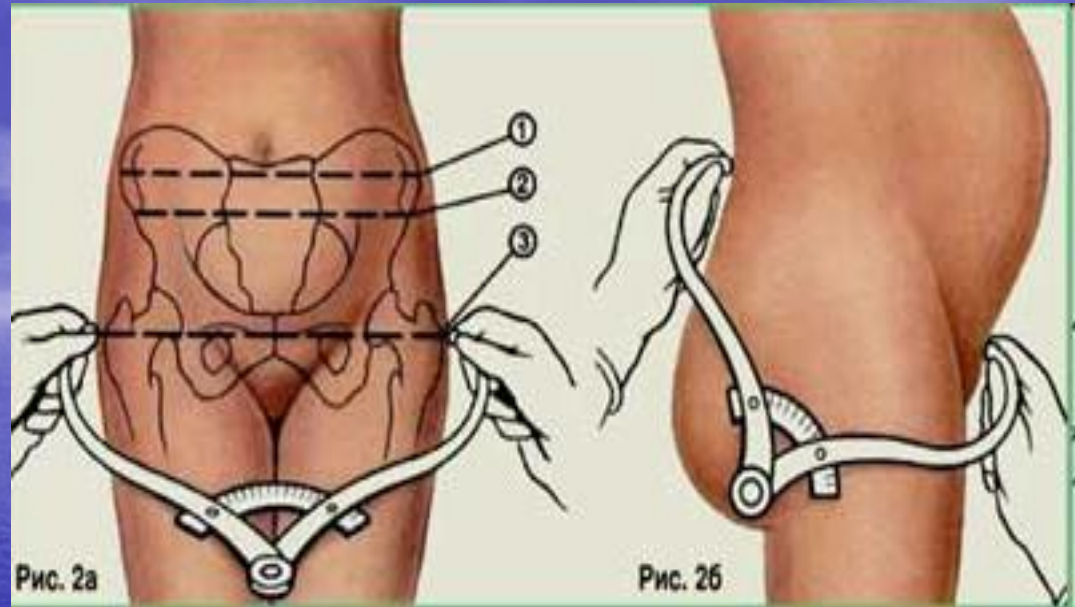
- external dimensions of the pelvis

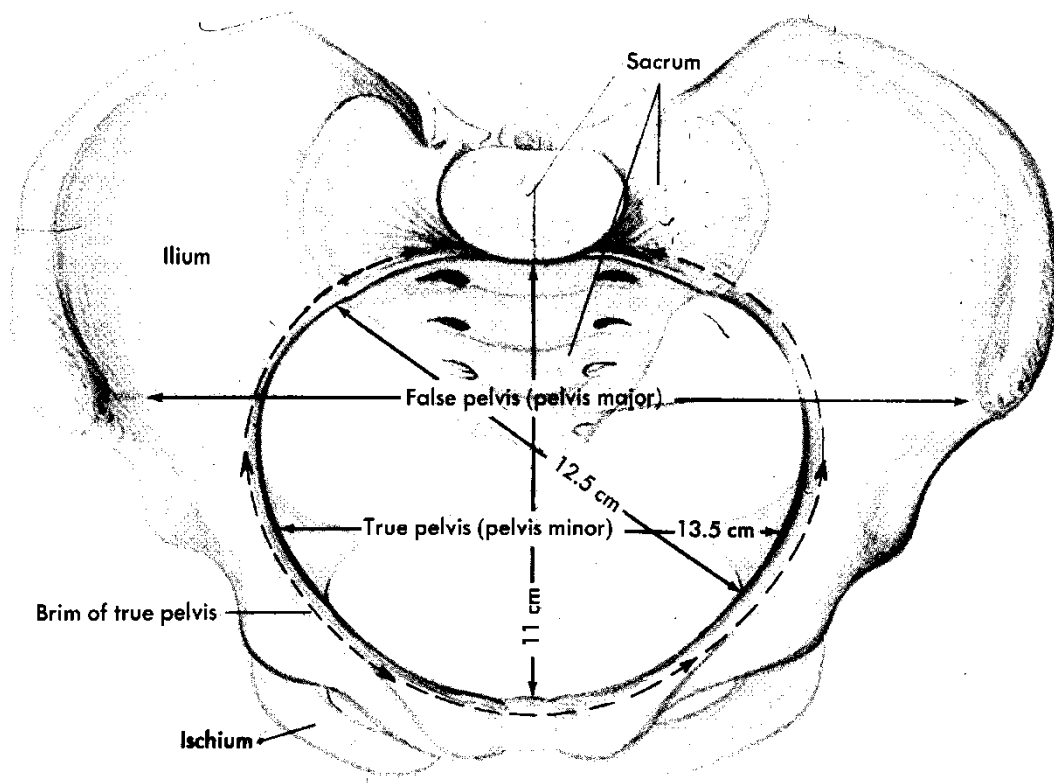


- Michaelis rhombus

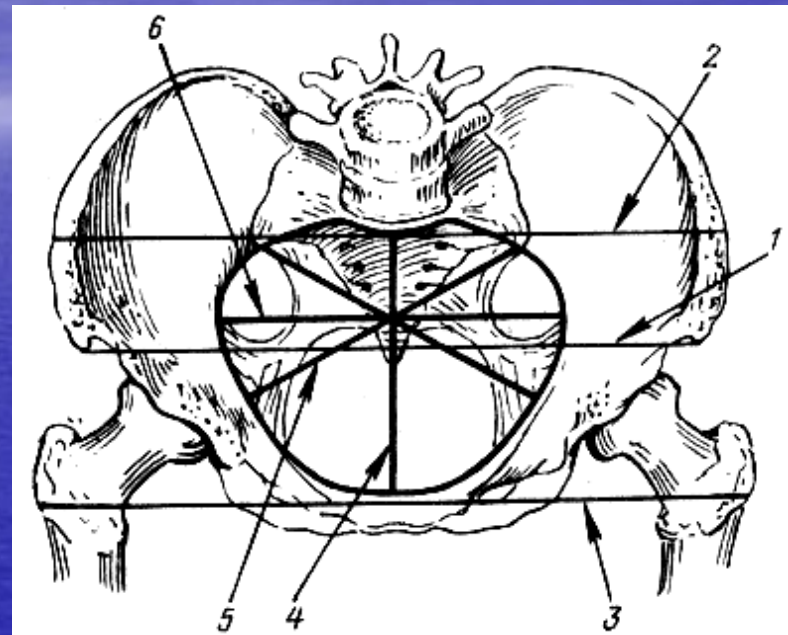


- Interostium distance (*distantio spinarum*) - the distance between the anterior superior awns pelvic bones, is 25-26 cm;
- Intercristal distance (*distantio cristarum*) - the distance between the most distant points of the iliac crest, is 28-29 cm;
- intertrochanteric distance (*distantio trochanterica*) - the distance between the most distant points of the greater trochanter of the hip bone is 30-31 cm;
- External conjugate (*conjugata externa*) – upper external distance from the edge of the pubic symphysis to the fossa between the spinal processes of L5 and S1; is 20-21 cm





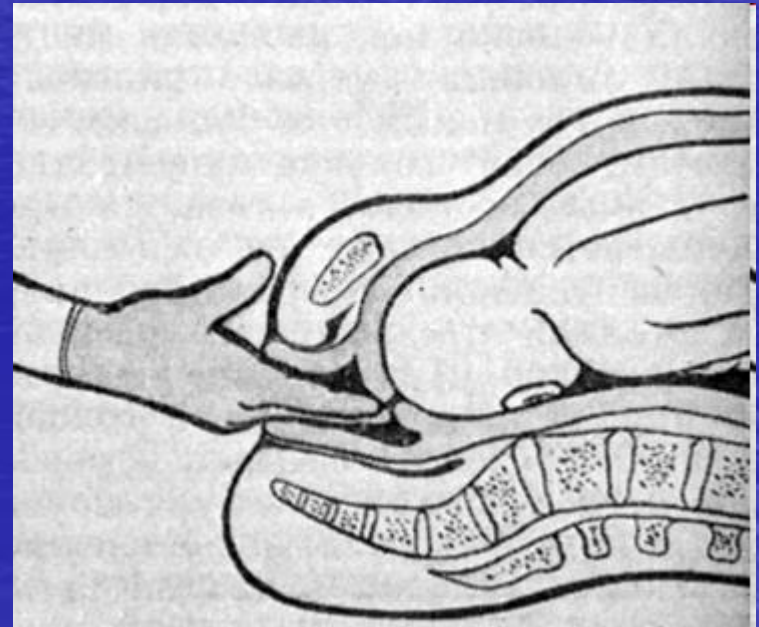
The female pelvis viewed from above. Note the brim of the true pelvis (dotted line) that marks the boundary between the false pelvis (pelvis major) above and the true pelvis (pelvis minor) below it.



Pelvic planes	Diameters		
	Antero-posterior	Transverse	Oblique
Pelvic inlet	11	13-13,5	12-12,5
Wide part of pelvic cavity	12,5	12,5	13 (conditionally)
Narrow part of pelvic cavity	11-11,5	10,5	—
Pelvic outlet	9,5-11,5	11	—

Vaginal examination

- to evaluate:
 - ✓ condition of the vaginal part of the cervix (the texture, length, location relative to the wire axis of the pelvis, patency of the cervical canal;
 - ✓ presenting part;
 - ✓ high standing of the presenting part;
 - ✓ state of the soft birth canal;
 - ✓ presence or absence of deformation and pelvic contractions.



Methods of fetal assessment

- Non-invasive:

- ✓ biochemical screening
(the definition of PAPP-A,
hCG, AFP)
- ✓ ultrasound;
- ✓ fetal biophysical profile;
- ✓ Doppler study FPC;
- ✓ CTG.

- invasive:

- ✓ amnioscopy;
- ✓ amniocentesis;
- ✓ chorionic villus sampling;
- ✓ cordocentesis.

Ultrasound examination



Biophysical Profile Scoring

Techniques and Interpretation

A score of 2 is assigned to each normal finding and 0 to each abnormal one for a maximum score of 10.

Normal findings (score = 2)

Breathing movements: ≥ 1 episode of ≥ 20 seconds in 30 minutes.

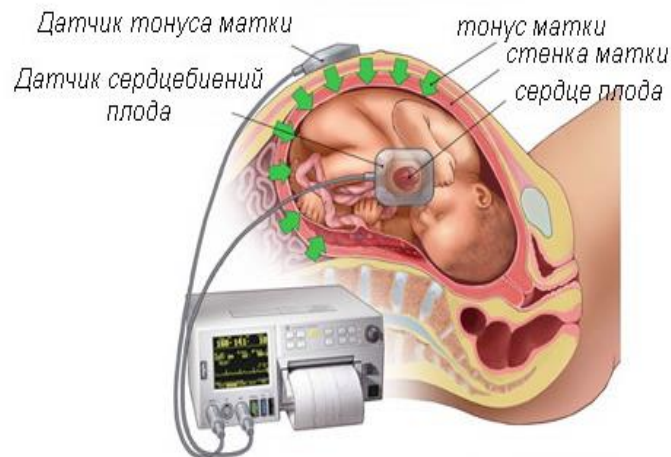
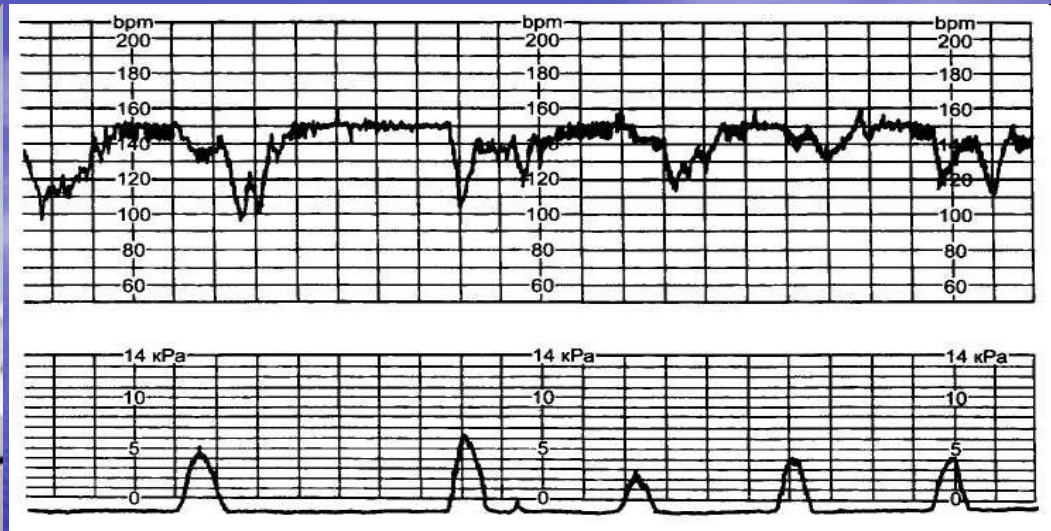
Body movements: ≥ 2 discrete body/limb movements in 30 minutes (episodes of active continuous movement is considered as a single movement).

Tone: ≥ 1 episode of active extension with return to flexion of limb(s) or trunk (opening and closing of the hand is considered normal tone).

Amniotic fluid volume: ≥ 1 pocket of fluid measuring ≥ 2 cm in 2 perpendicular planes.

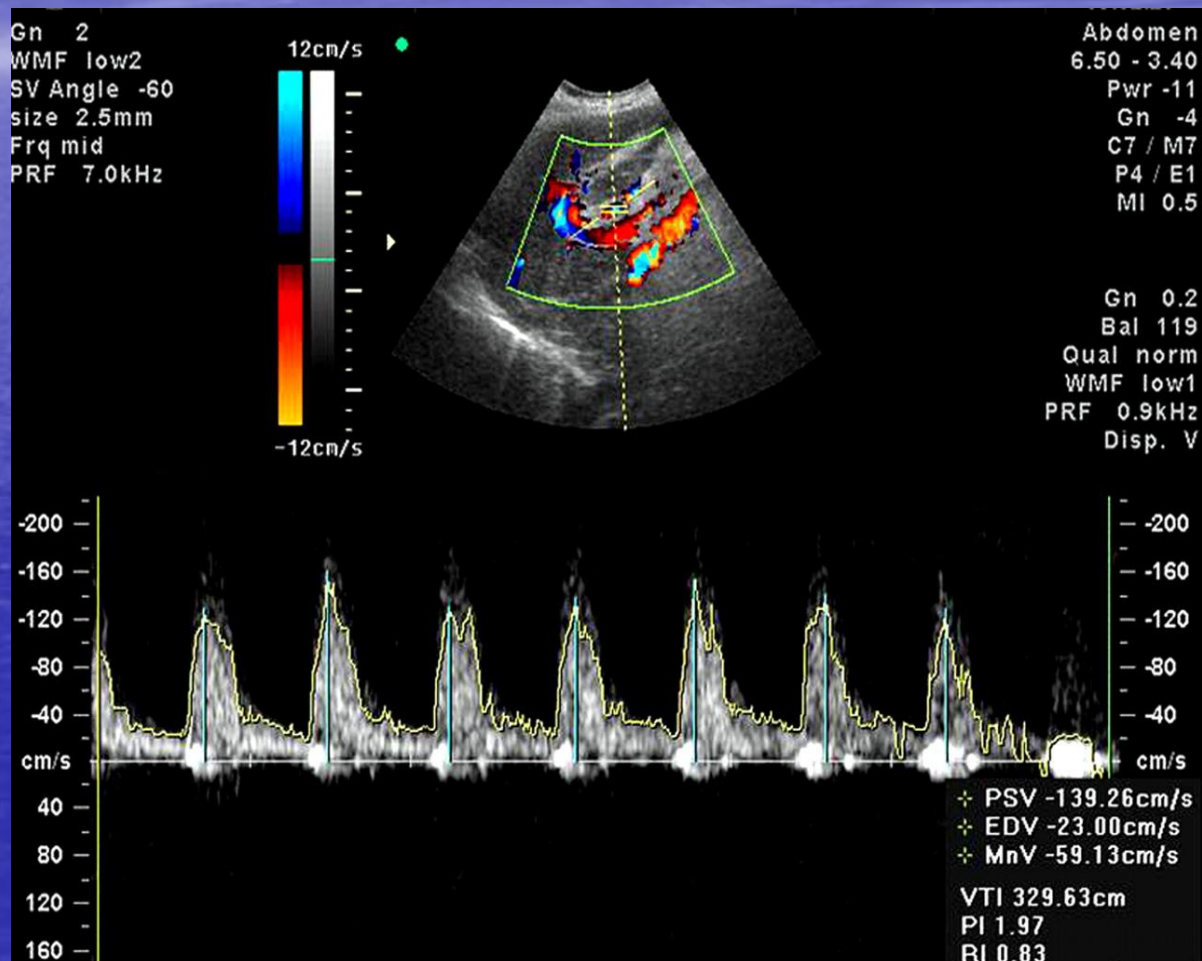
FHR reactivity: ≥ 2 episodes of acceleration of ≥ 15 bpm and of > 15 seconds associated with fetal movement in 20 minutes.

CTG

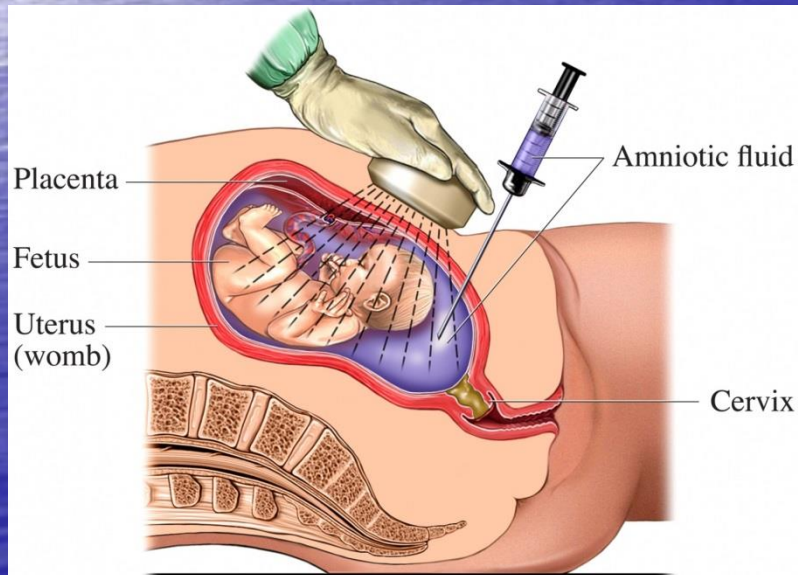
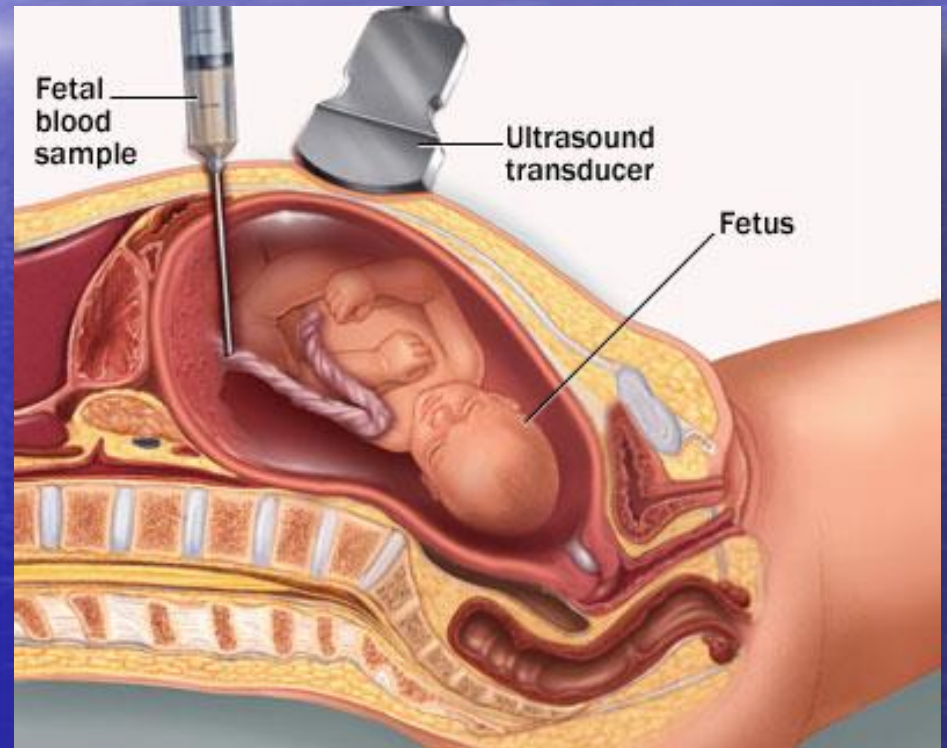
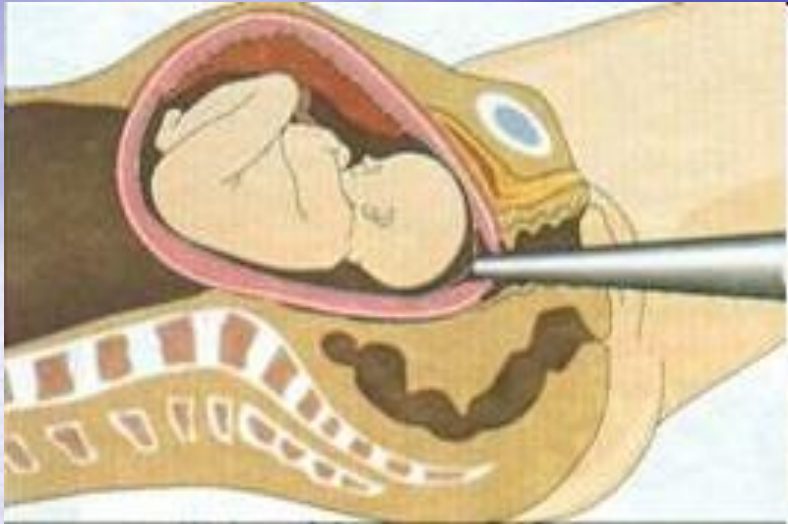


CTG parameters	Points		
	0	1	2
Basal rhythm	<100 >180	100-119 161-180	120-160
Variability: -amplitude, beats -frequency per min	<3 <3	3-6; >25 3-6	>6-25 >6
Accelerations in 30 min	0	Periodical, 1-4 sporadic	5 and more sporadic
Decelerations in 30 min	Dip II, severe dip III	Dip II, Moderate Dip II, mild	0 Dip I Dip 0

Doppler



Invasive methods of investigation



Fetoscopy

