39-3 The Reproductive System

Sexual Development

→produces, stores, and releases specialized sex cells known as gametes.

→the fusion of sperm and egg form a zygote, the single cell from which all cells of the human body develop.

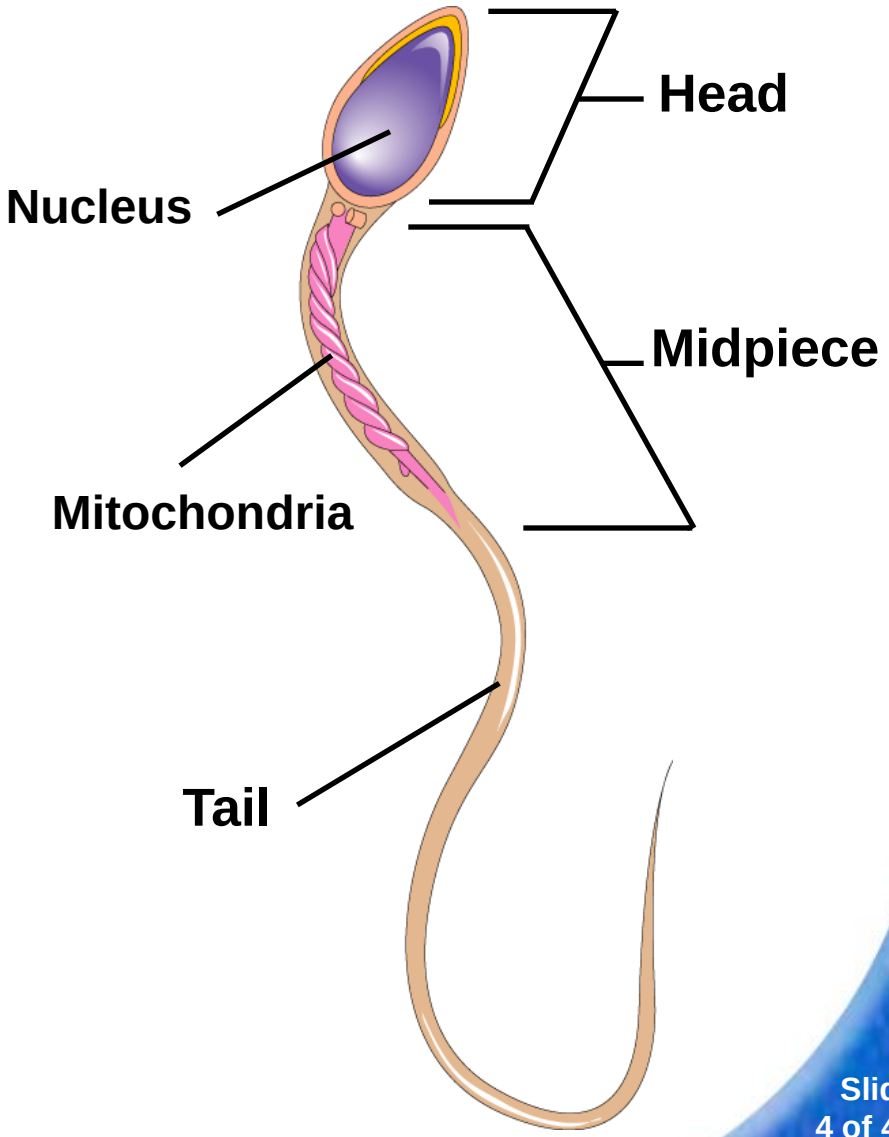
The Male Reproductive System

Release of Follicle Stimulating Hormone (FSH) and (Lutenizing Hormone) LH stimulates cells in the testes to produce testosterone.

FSH and testosterone stimulate the development of sperm.

A sperm cell consists of:

- a head, which contains the nucleus
- a midpiece, which contains energy-releasing mitochondria
- a tail, which propels the cell forward



The Female Reproductive System

→reproductive organs in the female are the ovaries.

→located in the abdominal cavity.

Puberty in females starts when the hypothalamus signals the pituitary gland to release FSH and LH.

FSH stimulates cells within the ovaries to produce estrogen.

The Menstrual Cycle

→controlled by internal feedback mechanisms between the reproductive system and the endocrine system.

→average of 28 days.

→egg develops and is released.

→uterus is prepared to receive a fertilized egg.

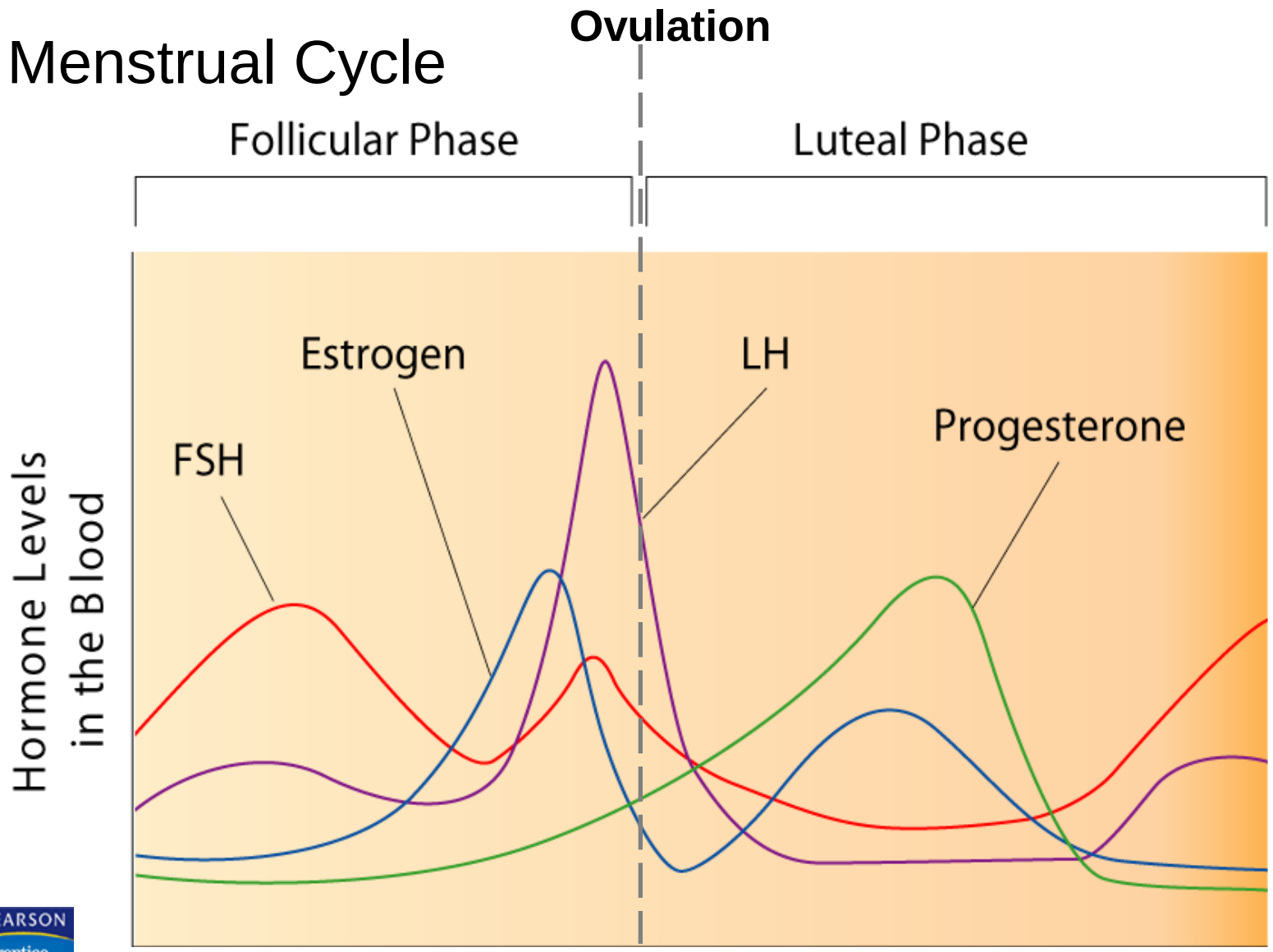
→If fertilized, it is implanted in the uterus and embryonic development begins.

→If not fertilized, it is discharged.

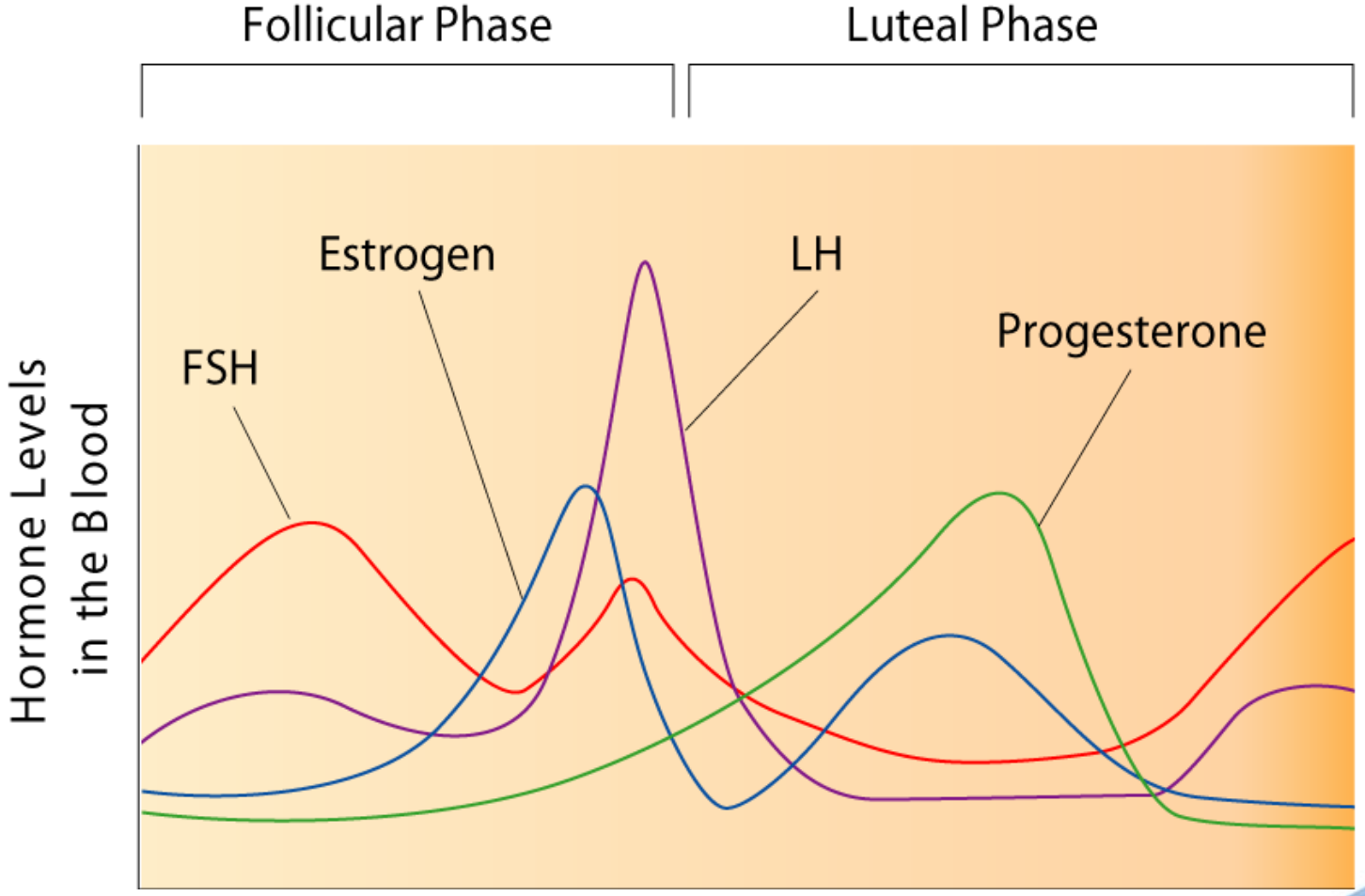
The menstrual cycle has four phases:

- follicular phase
- ovulation
- luteal phase
- menstruation

Menstrual Cycle



The follicular phase begins when estrogen levels in the blood are low.



→anterior pituitary secretes FSH and LH, which cause a follicle to develop to maturity.

→cells surrounding the egg enlarge and produce more estrogen.

→causes the lining of the uterus to thicken.

Ovulation

→occurs midway through the cycle

→lasts 3–4 days.

→The pituitary gland produces more FSH and LH.

→causes the follicle to rupture, and a mature egg is released into one of the Fallopian tubes.

Luteal Phase

→begins after the egg is released.

→moves in the Fallopian tube, the follicle turns yellow and is called the **corpus luteum**.

→continues to release estrogen but also begins to release progesterone.

→Progesterone stimulates growth and development of the blood supply and surrounding tissue.

→Within a few days of implantation, the uterus and the growing embryo will release hormones that keep the corpus luteum functioning for several weeks.

→allows the lining of the uterus to nourish and protect the developing embryo.

Menstruation

→If fertilization does not occur, the corpus luteum will begin to disintegrate.

→breaks down and releases less hormones, which makes the uterine lining detach.

→tissue, blood, and the unfertilized egg are discharged.

→lasts 3–7 days.

39-3 Section QUIZ

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Section QUIZ

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39-3 Section QUIZ

1 Human male and female embryos are identical until they begin to differentiate at about

a. 7 hours of development.

b. 7 days of development.

A c. 7 weeks of development.

d. 7 months of development.

2 The process in which a mature egg is released from the follicle of an ovary is known as

a. fertilization.

A b. ovulation.

c. menstruation.

d. meiosis.

3 An egg passes from a Fallopian tube into the cavity of the

a. ovary.

b. vagina.

A c. uterus.

d. cervix.

4 Which statement best describes male sperm cells?

a. They are motile, produced in small numbers, and larger than most body cells.

A b. They are motile, produced in large numbers, and smaller than most body cells.

c. They are nonmotile, produced in small numbers, and larger than most body cells.

d. They are nonmotile, produced in large numbers, and smaller than most body cells.

5 The menstrual cycle is regulated by hormones that are controlled by

a. positive feedback mechanisms.

b. ovulation.

A c. negative feedback mechanisms.

d. fertilization.

END OF SECTION

39–4 Fertilization and Development

39–4 Fertilizatior Development

→egg is fertilized, human development begins.

→a single cell undergoes a series of cell divisions that results in the formation of a new human being.

39–4 Fertilization and Development

→egg is surrounded by a protective layer that contains binding sites to which sperm can attach.

→a sperm attaches to a binding site and releases enzymes that break down the protective layer

→nucleus enters the egg, and chromosomes from the sperm and egg are brought together.

→After the two haploid (N) nuclei fuse, a single diploid (2N) nucleus is formed.

→called a **zygote**.

Early Development

→still in the Fallopian tube, begins mitosis.

→Four days after fertilization, solid ball called a morula.

The stages of early development include implantation, gastrulation, and neurulation.

Implantation

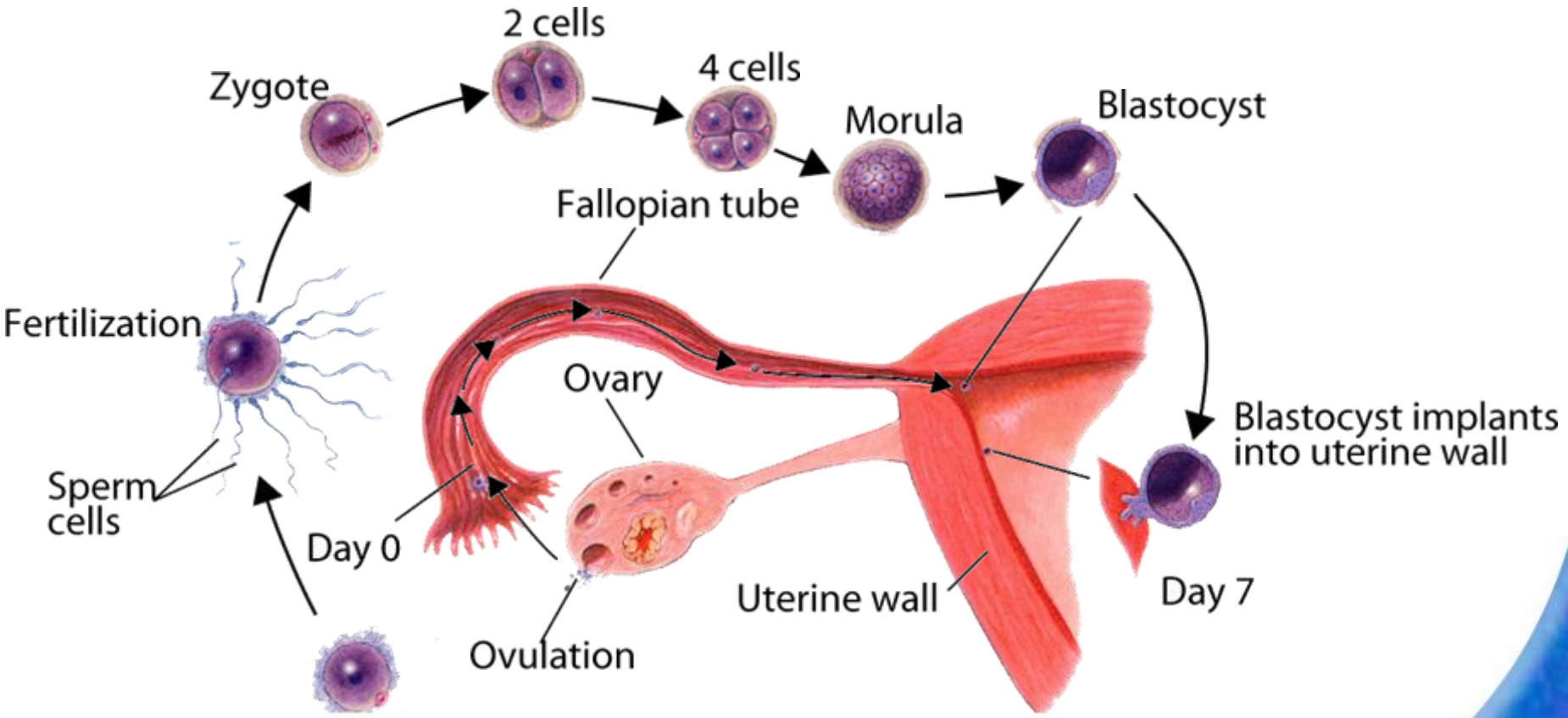
→morula grows, & it becomes a hollow structure called a blastocyst.

→6–7 days the blastocyst attaches to the uterine wall.

→secretes enzymes that digest a path into it.

→known as **implantation**.

Fertilization and Implantation



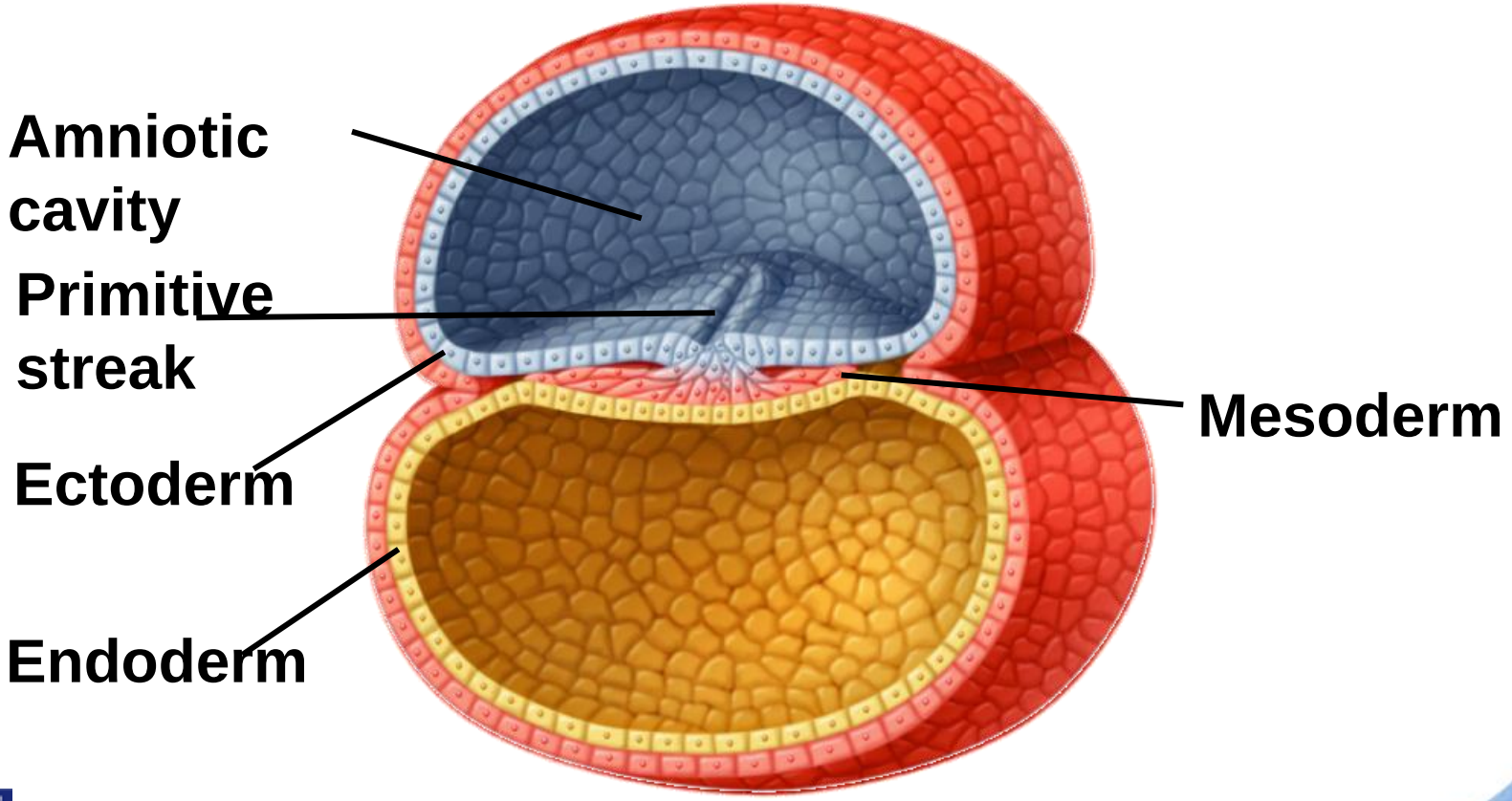
→cells specialize due to the activation of genes.

→called **differentiation**,

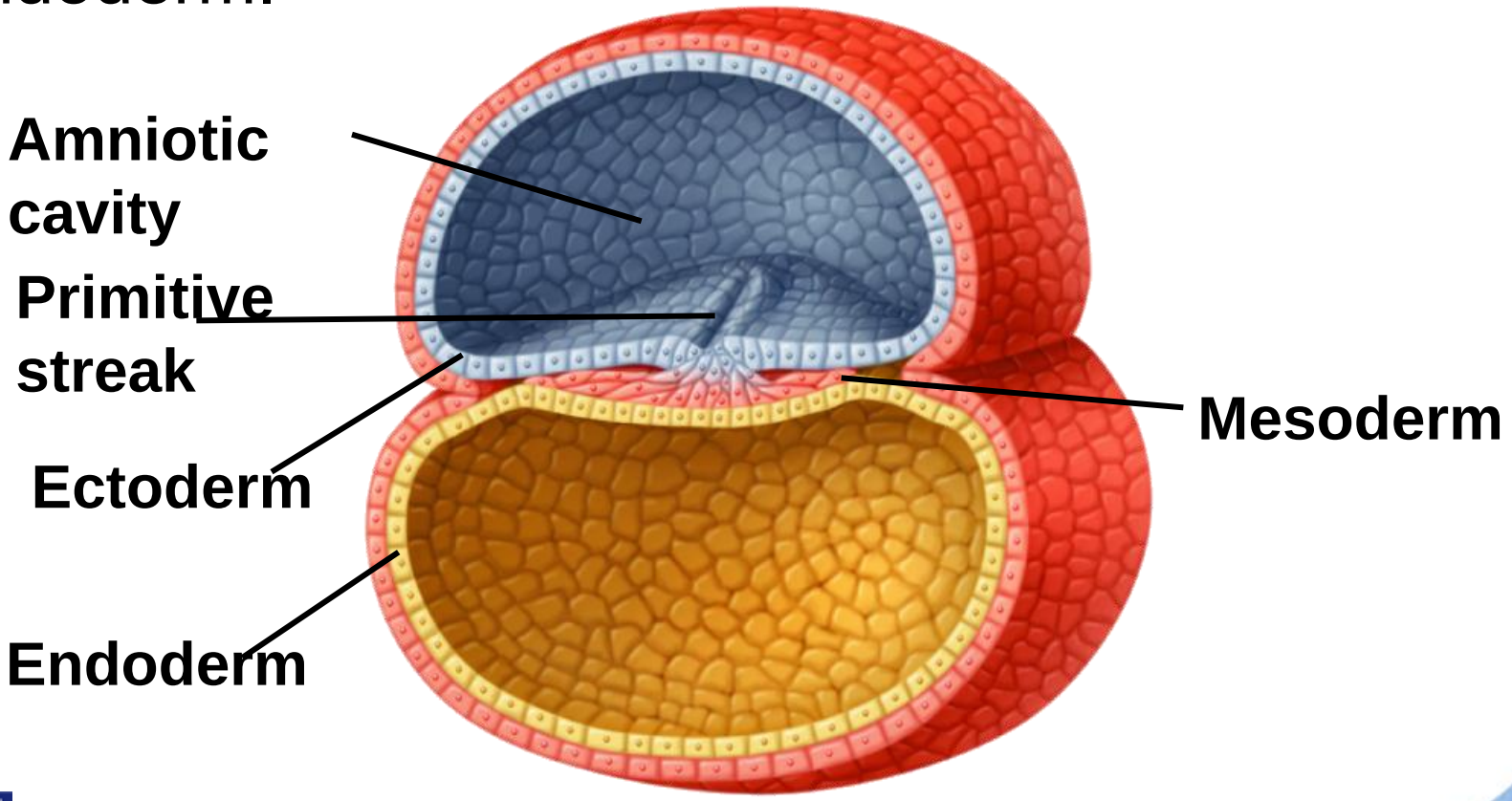
Gastrulation

→The inner cell mass sorts itself into two layers, which then give rise to a third layer.

The third layer is produced by a process of cell migration known as gastrulation.



The result of gastrulation is the formation of three cell layers—the ectoderm, the mesoderm, and the endoderm.



→ectoderm - skin and nervous system.

→endoderm - digestive lining and organs.

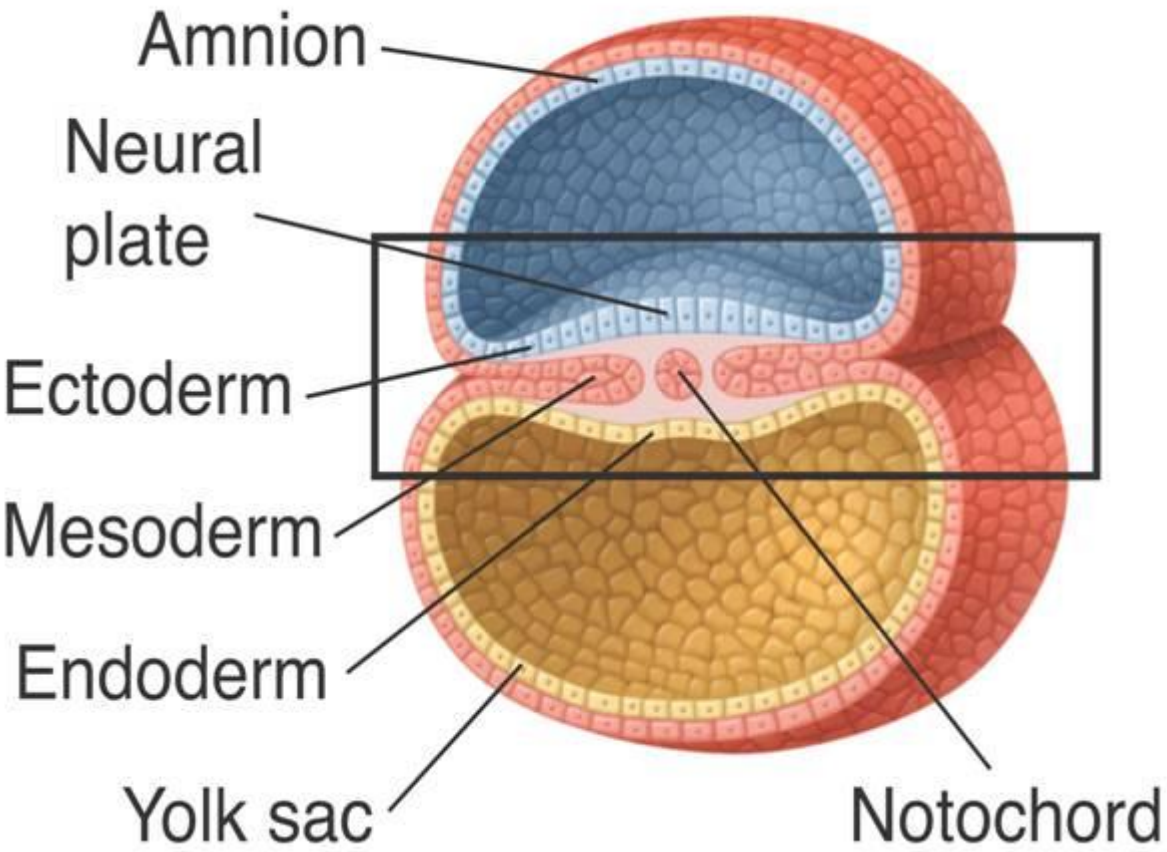
→mesoderm - internal tissues and organs.

Neurulation

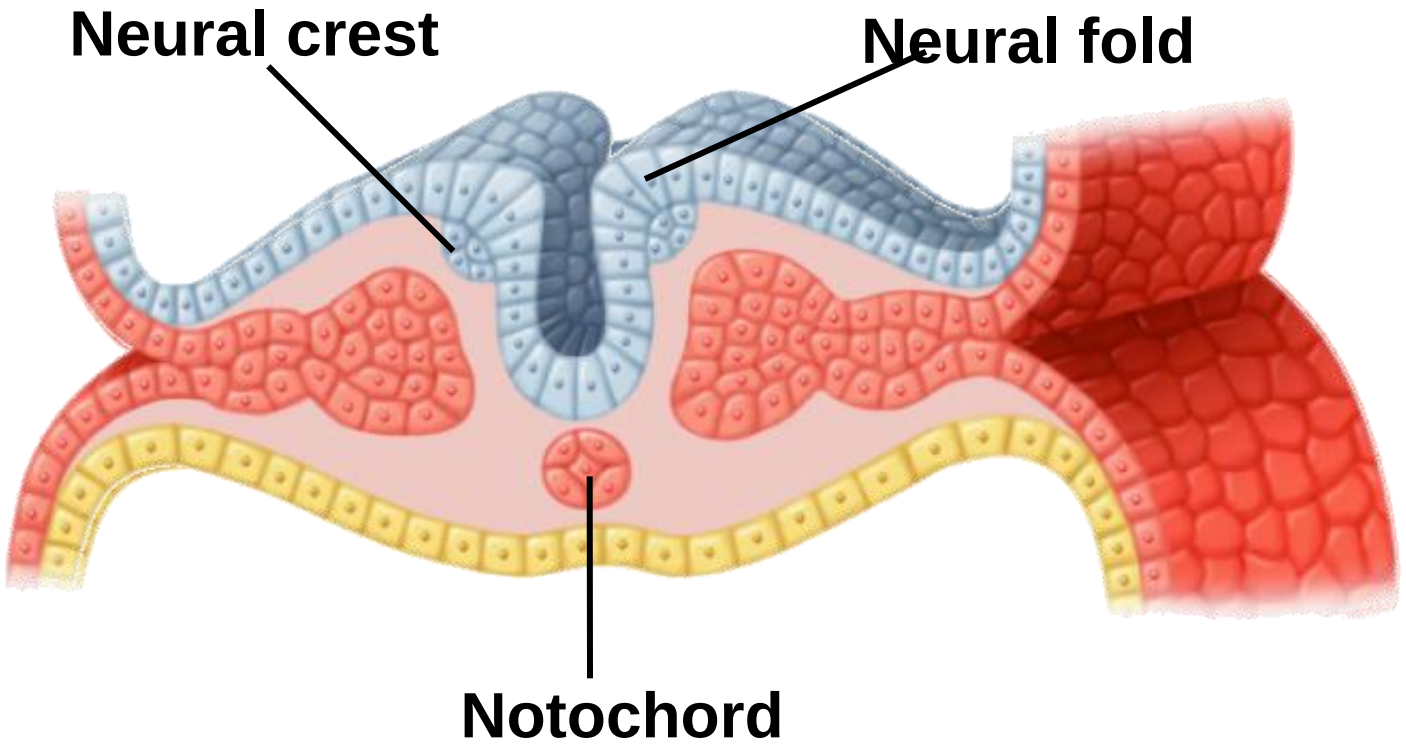
→Gastrulation is followed by neurulation.

→development of the nervous system.

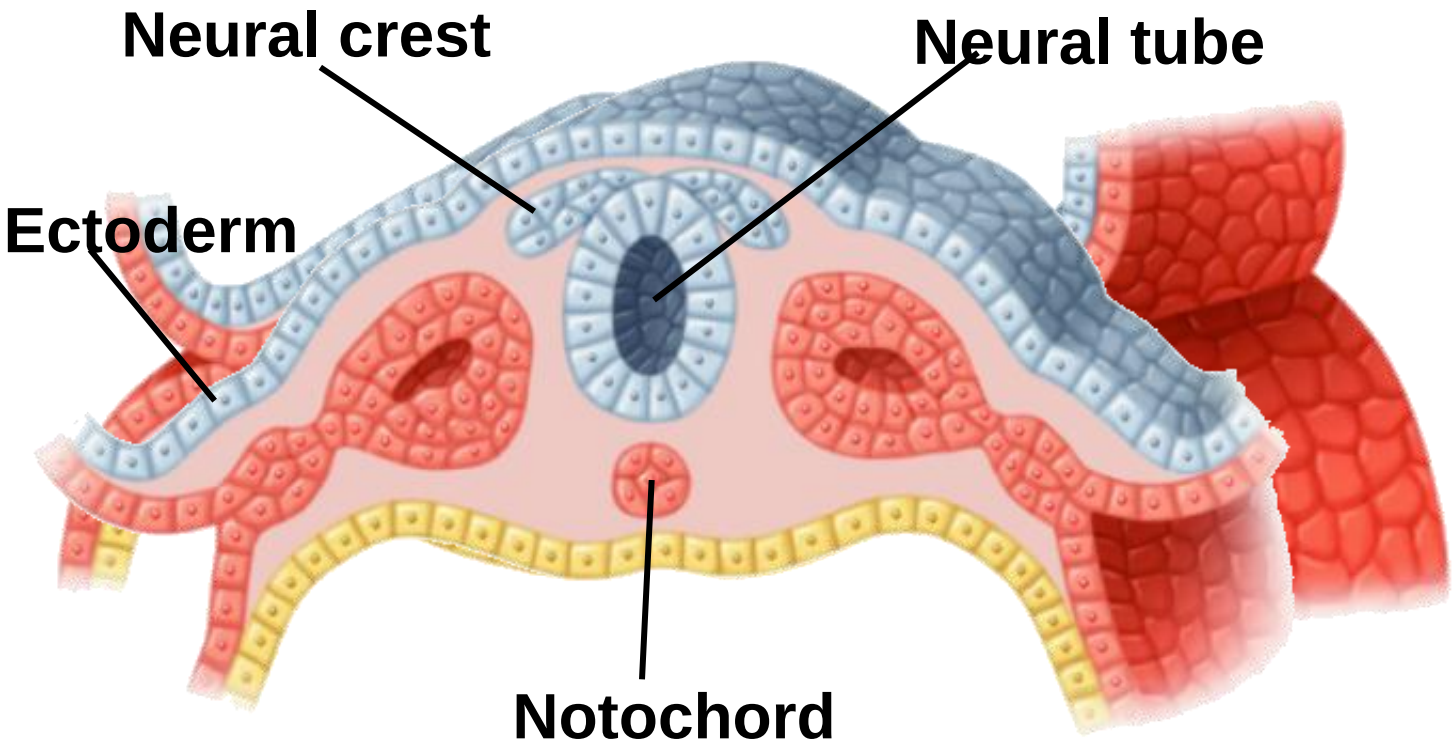
A block of mesodermal tissue begins to differentiate into the notochord.



As the notochord develops, the neural groove changes shape, producing neural folds.



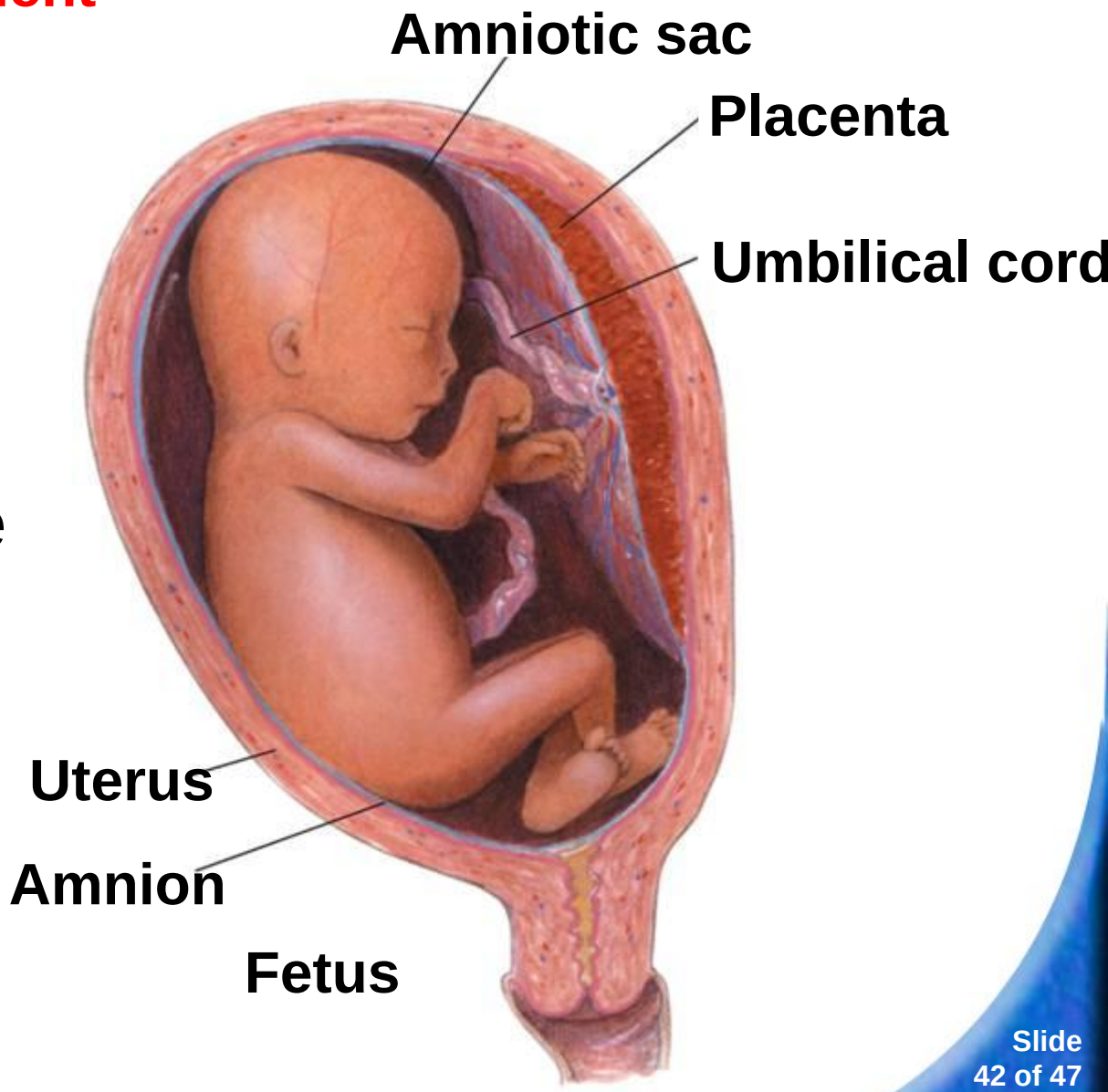
Gradually, these folds move together to create a neural tube from which the spinal cord and the nervous system develop.



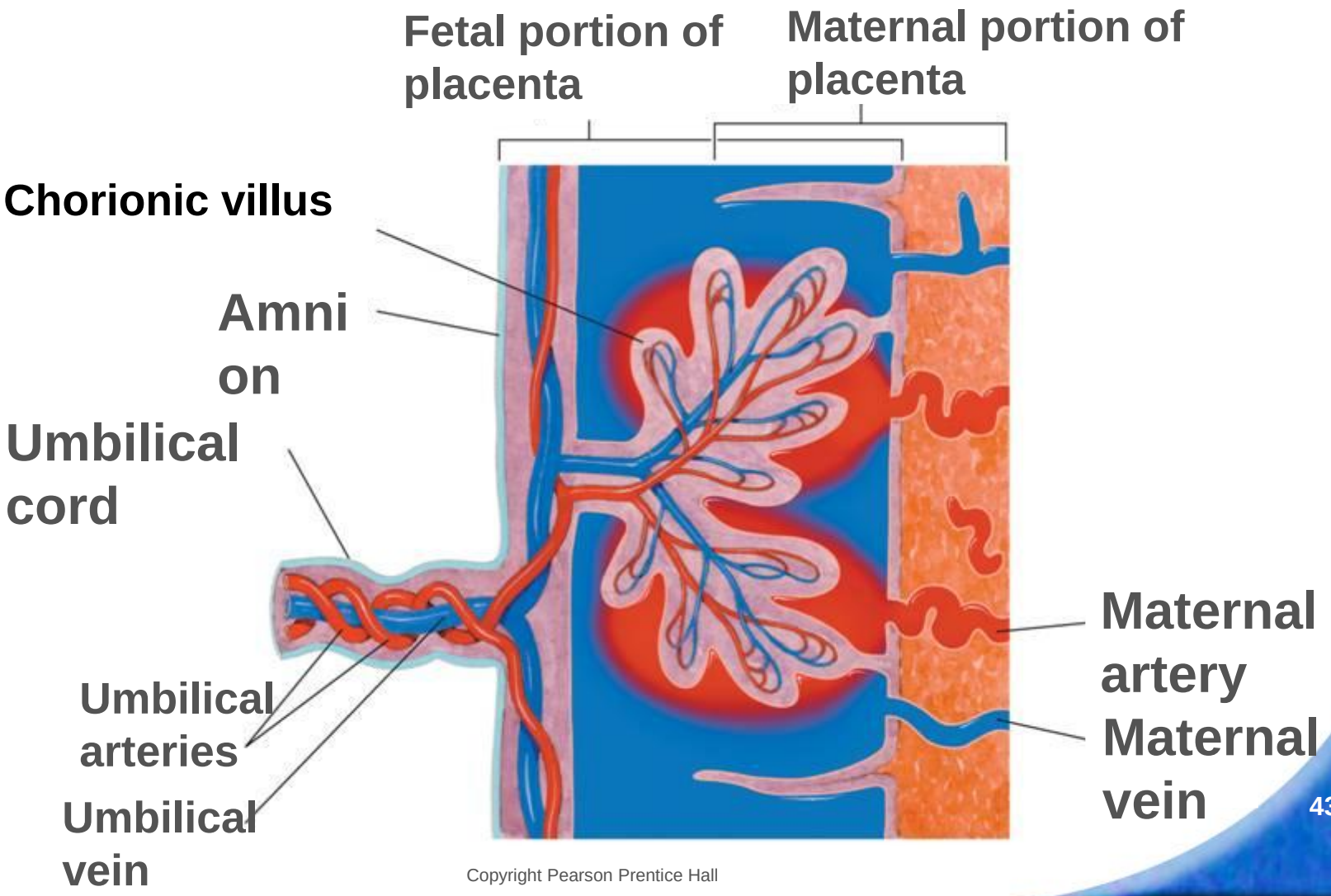
Extraembryonic Membranes

→As the embryo develops, the amnion and the chorion form to protect and nourish the embryo.

The amnion develops into a fluid-filled amniotic sac, which cushions and protects the developing embryo.



→chorionic villi form on the outer surface of the chorion and extend into the uterine lining.



The placenta is the embryo's organ of respiration, nourishment, and excretion.

→placenta acts as a barrier to some harmful or disease-causing agents.

→some however, such as German measles and HIV can cross the placenta.

→Some drugs, including alcohol and medications also can penetrate the placenta and affect development.

→eight weeks, the embryo is called a **fetus**.

→After three months, most major organs and tissues are formed.

→the umbilical cord also forms.

→connects the fetus to the placenta.

Control of Development

→The fates of many cells in the early embryo are not fixed.

→The inner cell mass contains embryonic stem cells,

→Researchers are still learning the mechanisms that control stem cell differentiation.

Later Development

4–6 months after fertilization:

- The heart can be heard with a stethoscope.
- Bone replaces cartilage that forms the early skeleton.
- A layer of soft hair grows over the fetus's skin.
- The fetus grows and the mother can feel it moving.

During the last three months, the organ systems mature.

- The fetus doubles in mass.
- It can now regulate its body temperature.
- The central nervous system and lungs completely develop.

Childbirth

About nine months after fertilization, the fetus is ready for birth.

A complex set of factors affects the onset of childbirth.

→the posterior pituitary gland releases oxytocin, which affects involuntary muscles in the uterine wall.

→begin rhythmic contractions known as labor.

→become more frequent and more powerful.

→opening of the cervix expands until it is large enough for the head of the baby to pass through it.

→the amniotic sac breaks,

→Contractions force the baby out.

39–4 Section QUIZ

Continue to:

Section QUIZ

- or -

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39–4 Section QUIZ

1 Fertilization takes place in the

a. ovary.

A b. Fallopian tube.

c. cavity of the uterus.

d. cervix.

2 The process in which a blastocyst attaches to the wall of the uterus is called

a. fertilization.

A b. implantation.

c. gastrulation.

d. neurulation.

3 The central nervous system develops during which phase of early development?

a. gastrulation

A b. neurulation

c. implantation

d. fertilization

4 The placenta is a structure that

a. belongs entirely to the mother.

b. belongs entirely to the fetus.

A c. brings blood from the mother and fetus close together.

d. provides an impermeable barrier between the mother and the fetus.

5 Which of the following is NOT a primary germ layer?

A a. neural tube

b. endoderm

c. ectoderm

d. mesoderm

END OF SECTION