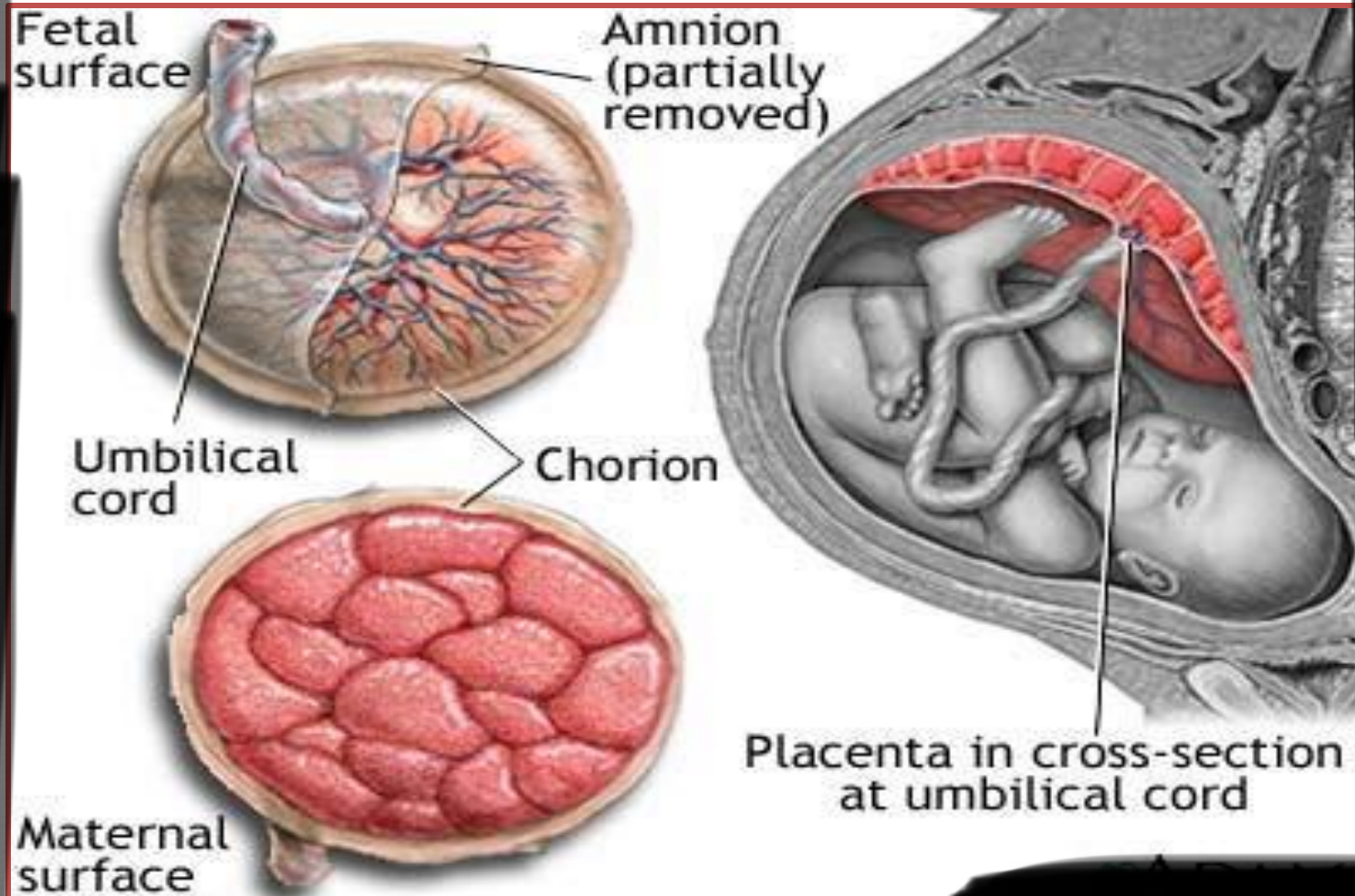


PLACENTATION : STRUCTURE , TYPE AND PHYSIOLOGY OF PLACENTA



- Placentation is a *Greek* word and it means a “**flat cake**”
- Name is received from the human placenta which is a flat ,round mass ,shaped more or less like a pan cake
- The term placenta in its broadest sense refers to any region in a viviparous organism where **maternal** and **embryonic tissues** of any kind are closely apposed and which serves as a site for **physiological exchange** b/w parent and embryo or
- A **temporary** organ which is formed jointly by the EEM of the fetus and maternal tissues by which fetus obtains nourishment (**Eutherian**).
- Placenta serves as a provisional **lung, intestine, kidney** and **endocrine glands** for the embryo
- It allows the maternal and fetal blood to come in proximity for exchange of substances
- Actions are highly selective –permits entry of **food , vitamins, O₂, hormones** and **antibodies** and the exit of **CO₂** and **nitrogenous metabolic Waste**
- The mode of formation and fusion of the placenta to the uterine wall is called **Placentation**

IMPLANTATION : ATTACHMENT AND ESTABLISHMENT

Before substantial growth can occur , the blastocyst must attach to the uterus and establish the nutritional supply of the embryo-**Implantation**

- Blastocyst held closely against the uterine endometrium- Decidua= “ ” to shed “
- The uterine capillaries and uterine wall in the immediate vicinity of the embryo becomes more permeable and causes local stroma oedema
- Soon the endometrium around the embryo shows the first sign of a Decidual Cell Reaction(DCR) :
 - the epithelium become disrupted
 - loosely packed fibroblast- like cells of the stroma are transformed into large rounded glycogen-filled cells
 - the no. of cells and vascularity of the area increases
 - the decidual cells thus form an “ Implantation Chamber ” around the embryo and probably have a nutritive role before the establishment of functional placenta
- Trophoblast – Primary fetal membrane; when mesoderm lines its cavity it become **Chorion** – fetal portion of placenta
- Trophoblast penetrate the endometrium & may destroy the uterine epithelium and phagocytose the decidual cells to obtain nutrition for the fetus
- Trophoblast invasion is particularly apparent in the area overlying the ICM

PATTERN OF IMPLANTATION MAY VARY IN DIFFERENT SPECIES

- **Superficial or Central-** Blastocyst remain unembedded in the uterine lumen eg. most Ungulates(Pig), Carnivores(Dog) & Monkey
- **Interstitial-** Blastocyst completely embedded in the endometrium eg. Hedgehog,Guinea pig ,Bat,Ape & Man
- **Eccentric-** Blastocyst lies for a time in a fold or pocket which looses off from the main cavity ;secondarily it become interstitial eg. Beaver ,rat ,squirrel & other rodents

PREGNANT ENDOMETRIUM-"DECIDUA"

Divided into different regions, depending on their relationship to the implantation site:

- **Decidua basalis** - Refers to that part of endometrium that is directly underlying the embryo , contribute to placenta
- **Decidua capsularis** – Refers to thin portion of endometrium on the lumen side of the uterus that covers the implantation site
- **Decidua paritalis** - Refers to the endometrium lining of the uterus other than at the implantation site

STRUCTURE OF PLACENTA

Structurally ,placenta have two different parts lying in close proximity :

1. Maternal component – Uterine endometrium

- i. Uterine epithelium (mucosa)
- ii. Uterine connective tissue
- iii. Maternal blood capillaries

2. Fetal component - Chorion

- i. Fetal blood capillaries
- ii. Fetal connective tissue
- iii. Fetal chorionic epithelium

TYPES OF PLACENTA BASED ON THE SOURCE OF VASCULAR SUPPLY

- From the **Vitelline circulation of the yolk sac** or **Allantoic circulation provided by the allantois** :
 1. **Chorio-vitelline/ Yolk-sac placenta** – Highly vascular yolk sac fuses with the chorion eg. Metatherian mammals – Marsupials , Didelphis and Macropus
 2. **Chorio-allantoic placenta-** Allantois with its blood vessels fuses with the chorion eg. Some Marsupials and all Eutherian mammals

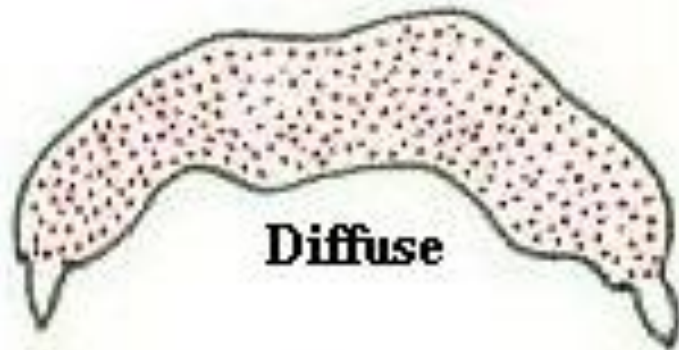
BASED ON THE DEGREE OF ASSOCIATION BETWEEN FETAL AND MATERNAL TISSUE (EUTHERIAN MAMMALS)

1. **Non-deciduate (non-deciduos) placenta** – Implantation superficial; foetal chorionic epithelium lies in contact with the uterine epithelium and at the time of birth the fetal villi are drawn out completely without tearing or causing injury to the uterine wall and no bleeding occurs eg. Pigs, Cattles, Horse & other Ruminats
2. **Deciduate (Deciduos) placenta** – Implantation is more intimate; the wall of the uterus become eroded so that the fetal chorionic epithelium may come to lie either in the connective tissue or into the maternal blood and at the time of parturation when fetal part separate from the uterine part of the placenta there is more or less extensive bleeding or haemorrhage and tearing of tissue from the uterine wall eg. Man, Rabbit, Dog, Cat, etc
3. **Contra-Deciduate placenta** – implantation or association is intimate but both fetal and maternal tissue are absorbed insitu by maternal leucocytes eg. Parameles and Talpa(mole)

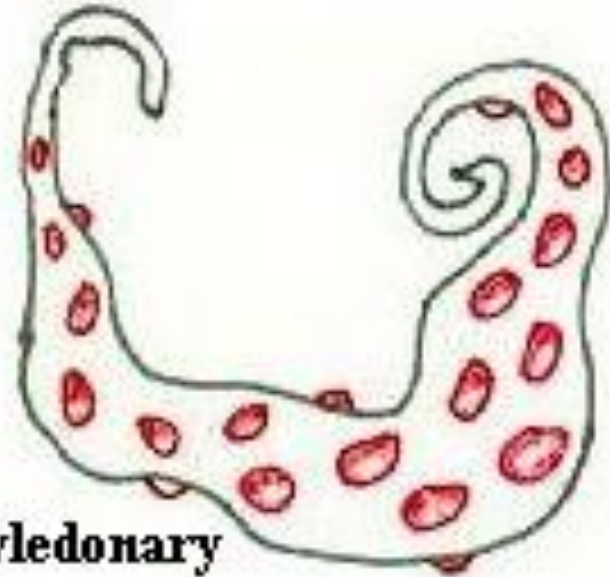
CLASSIFICATION BASED ON DISTRIBUTION OF VILLI OR CHORION

1. **Diffused** – Villi scattered all over the surface of chorion eg. Ungulates, Mare, Lemur, Pig etc
2. **Cotyledonary** – Villi distributed in isolated patches eg. Goat and Ruminants like Deer, Sheep, Cattle etc
3. **Zonary** – Villi arranged in definite band or girdle encircling the middle of blastocyst or chorion sac eg. Carnivores, Cats, Dogs etc
4. **Discoidal** – Villi located in one or two discoidal areas or patches eg. Mouse, Rat, Rabbit, Monkey, Apes and Man

TYPES OF PLACENTA

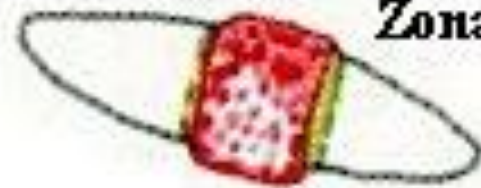
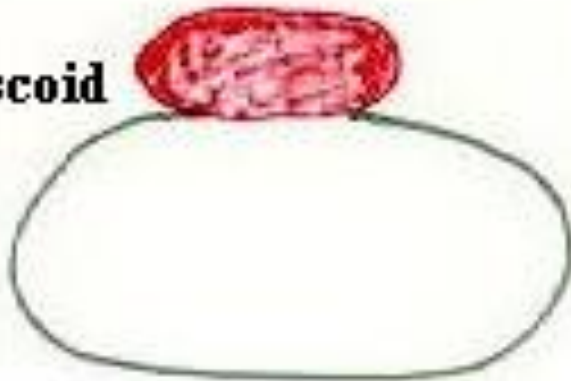


Diffuse



Cotyledonary

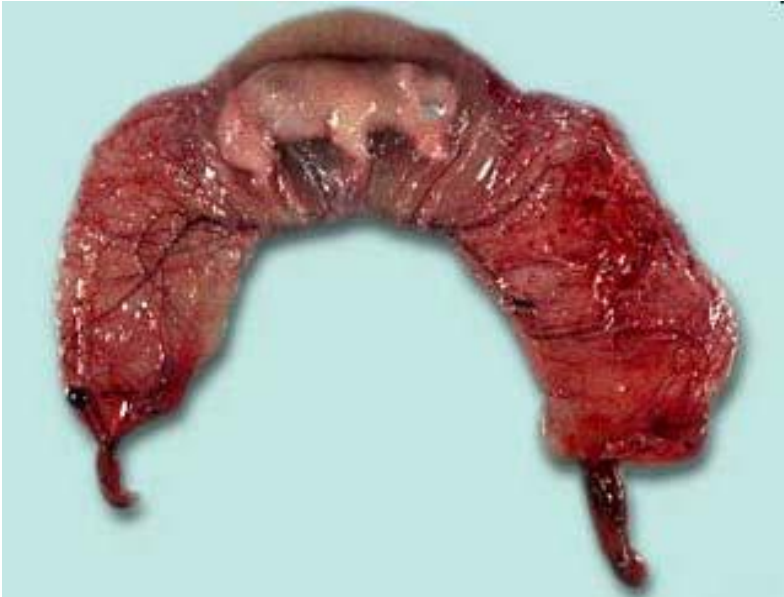
Discoid



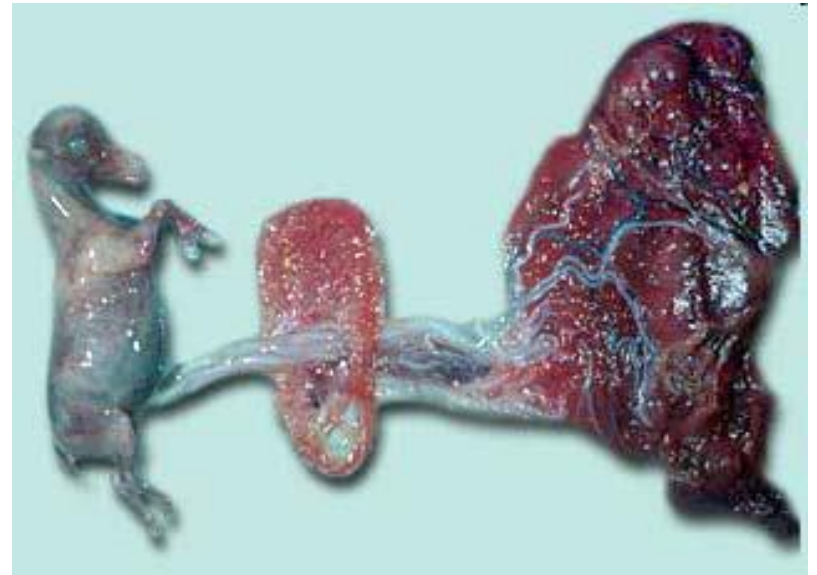
Zonary

DIFFUSE	Horse, Pig
COTYLEDONARY	Cows, Ewes, Other ruminants
ZONARY	Dogs, Cats, Seals, Bears, Elephants
DISCOIDAL	Primates (incl. Humans) and Rodents

DIFFUSE PLACENTA



PIG



HORSE

COTYLEDONARY PLACENTA -RUMINANT



ZONARY PLACENTA



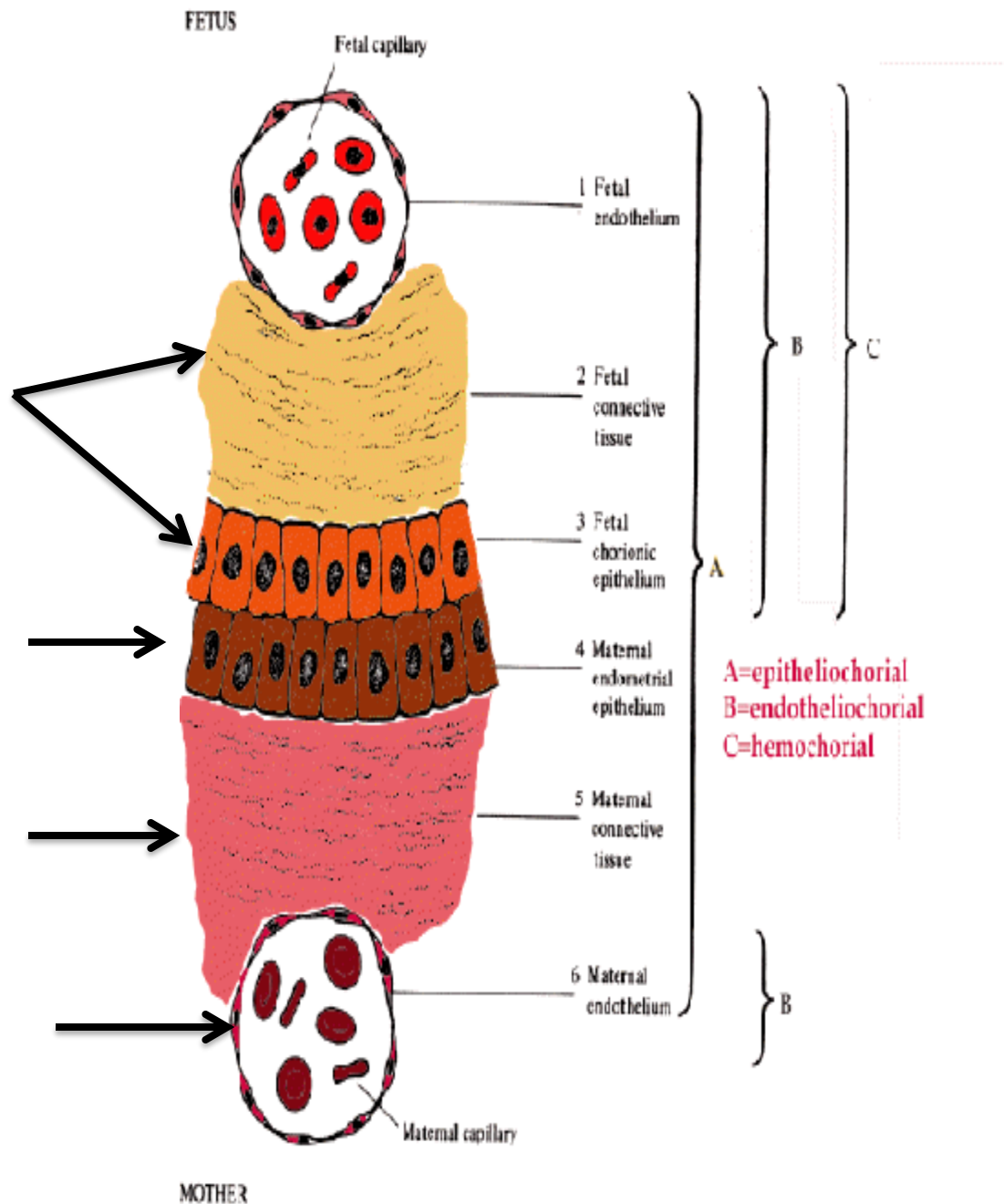
DISCOIDAL PLACENTA -PRIMATES



HISTOLOGICAL CLASSIFICATION OF PLACENTA

Based on the histological relationship of embryonic villi with the uterine wall and degree of erosion

1. **Epithelio-chorial** – The trophoblast or chorionic epithelium and uterine epithelium remain in close contact but both retain their original layer eg. Marsupials ,Ungulates (pig & horses) & Lemur
2. **Syndesmo-chorial** – Chorionic villi erode the uterine wall , so that the uterine epithelium is ruptured and the chorionic villi comes in contact with the connective tissue of the uterine wall eg. Sheep & Cow (ruminants)
3. **Endothelio-chorial** – Both uterine epithelium and connective tissue is eroded so that the chorionic villi comes in contact with endothelium of maternal blood vessel eg. Dogs ,Cats & other carnivores
4. **Haemo-chorial** – Uterine epithelium , connective tissue and endothelium all are eroded and the chorionic villi baths in the maternal blood eg. Man
5. **Haemo-endothelial** – Foetal capillaries lie freely in maternal blood eg. Rabbit



PHYSIOLOGY OF PLACENTA

- IT ACTS AS THE NUTRITIVE RESPIRATORY, AND EXCRETORY ORGANS OF THE FOETUS.
- IT ALLOWS SELECTIVE DIFFUSION , PREVENTING THE PASSAGE OF HARMFUL MATERIALS FROM THE MATERNAL INTO THE FOETAL BLOOD.
- IT ACTS AS AN IMPORTANT ENDOCRINE GLAND DURING PREGNANCY.
- IT STORES GLYCOGEN FOR THE FOETUS BEFORE THE LIVER IS FORMED.
- ITS TROPHOBLAST DIGESTS PROTEINS BEFORE PASSING THEM INTO THE FOETAL BLOOD.

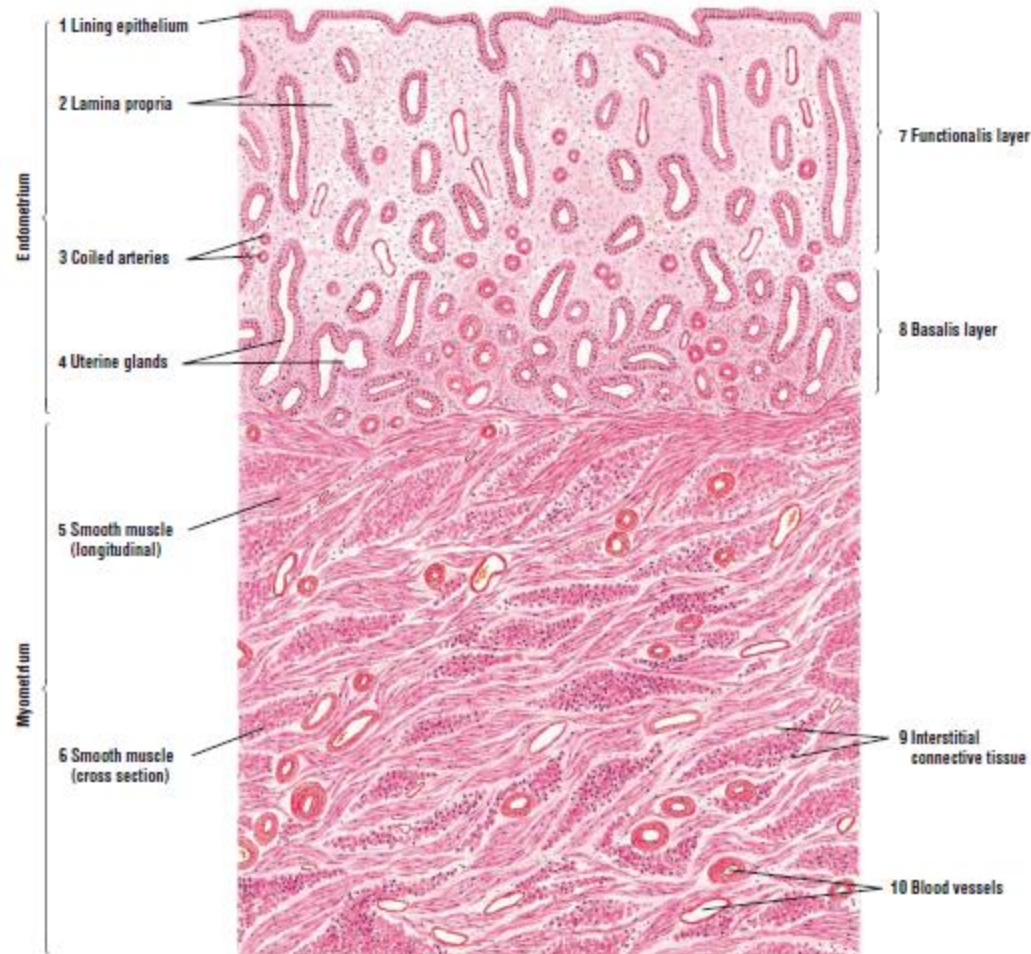


FIGURE 19.12 ■ Uterine wall: proliferative (follicular) phase. Stain: hematoxylin and eosin. Low magnification.

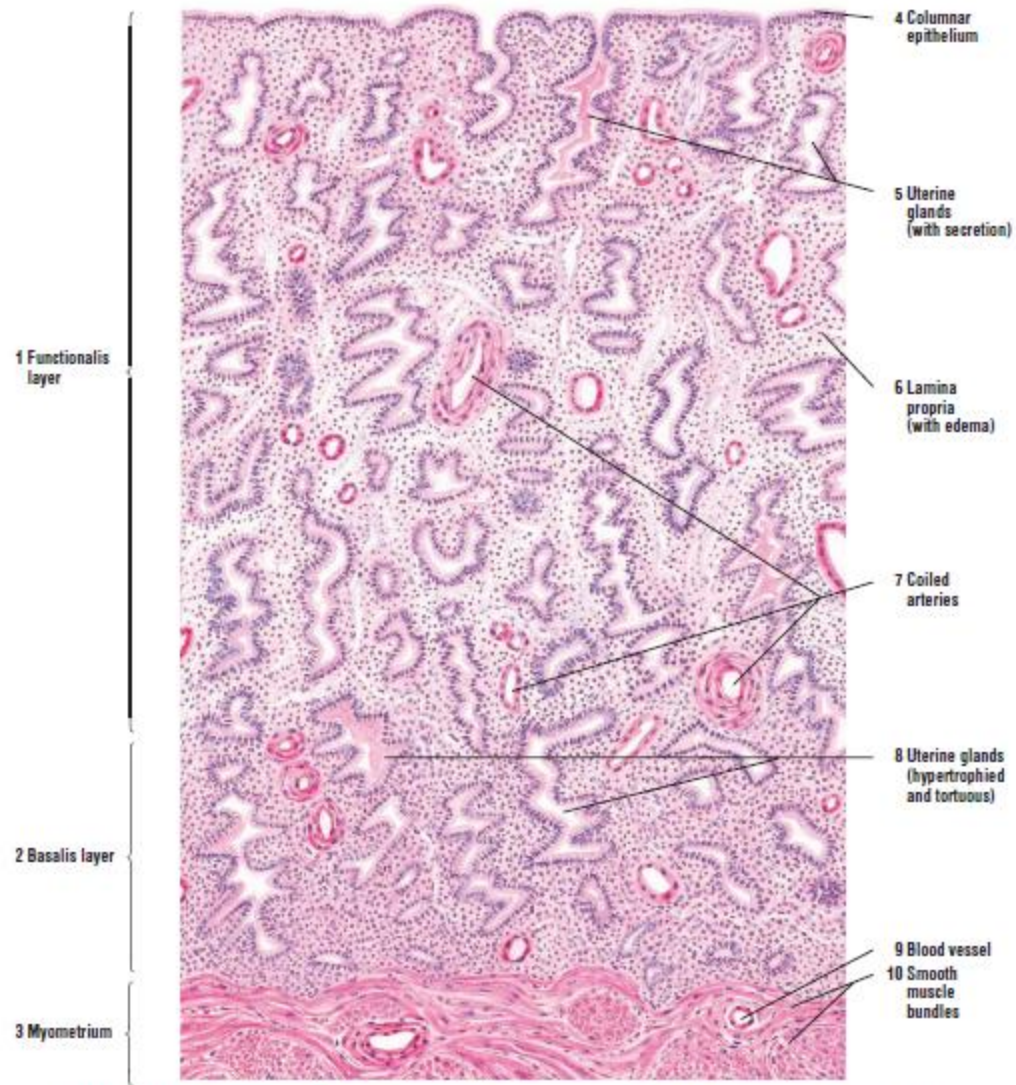


FIGURE 19.13 ■ Uterine wall: secretory (luteal) phase. Stain: hematoxylin and eosin. Low magnification.

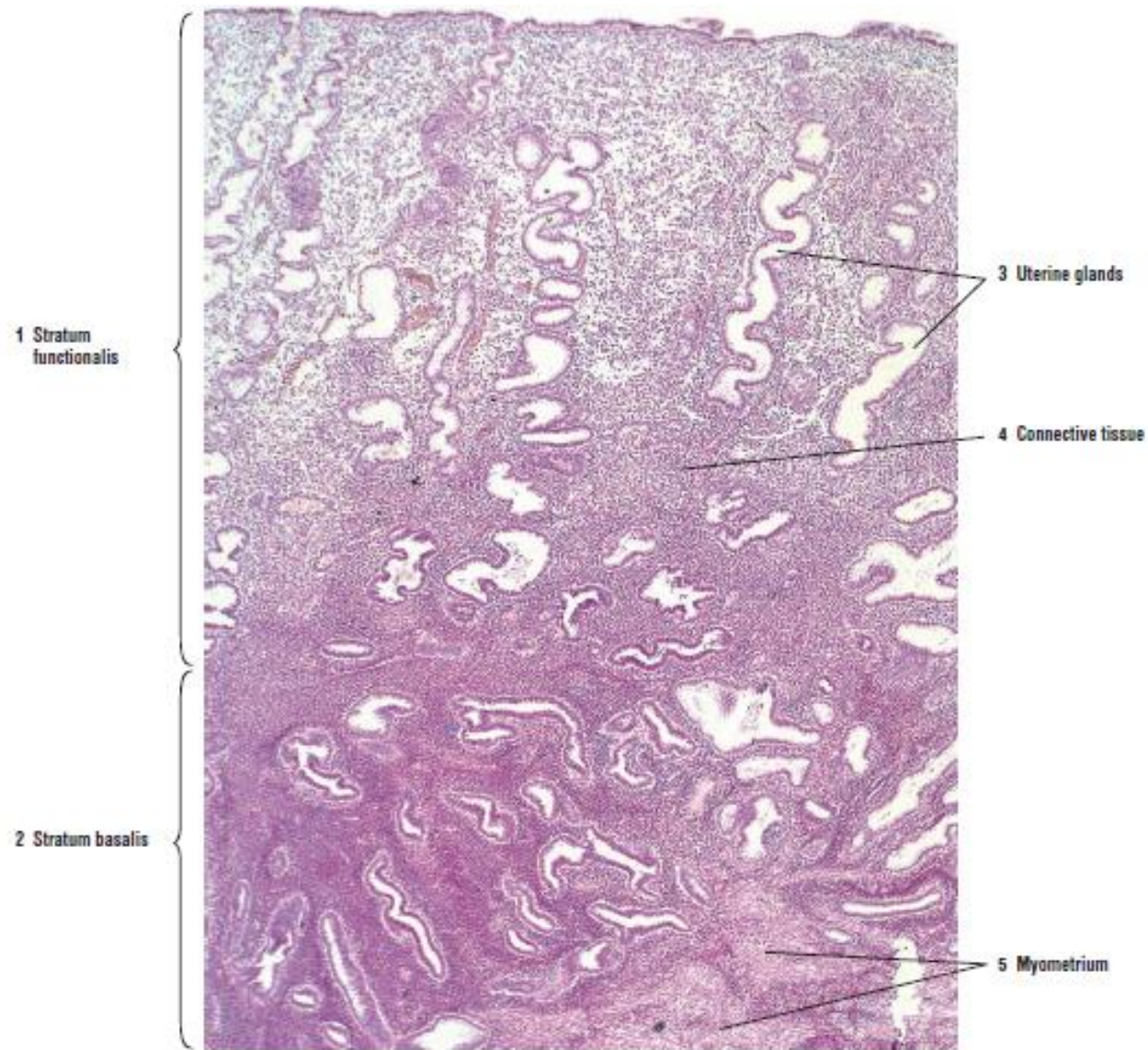


FIGURE 19.14 ■ Uterine wall (endometrium): secretory (luteal) phase. Stain: hematoxylin and eosin. $\times 10$.

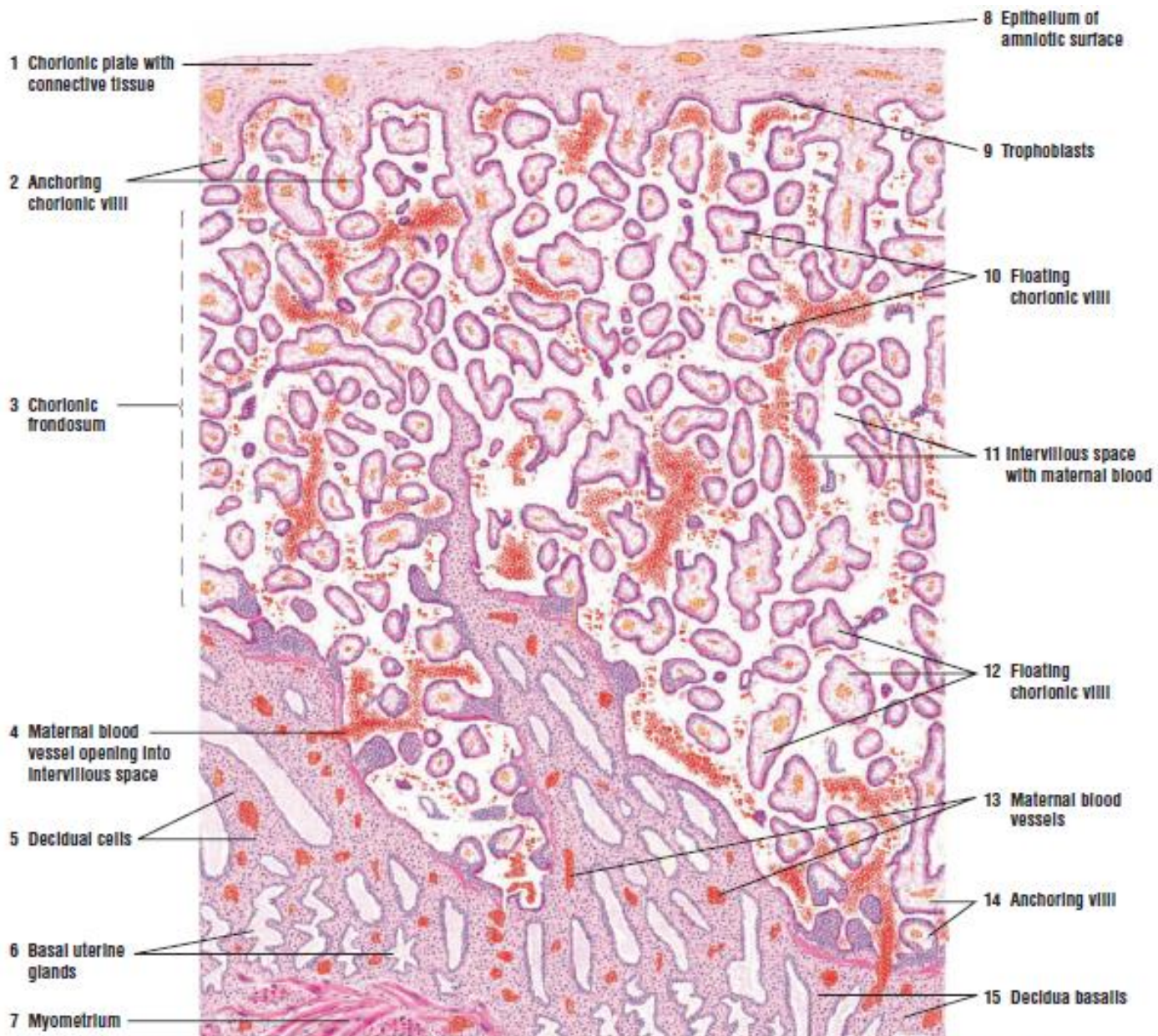


FIGURE 19.21 ■ Human placenta (panoramic view). Stain: hematoxylin and eosin. Low magnification.

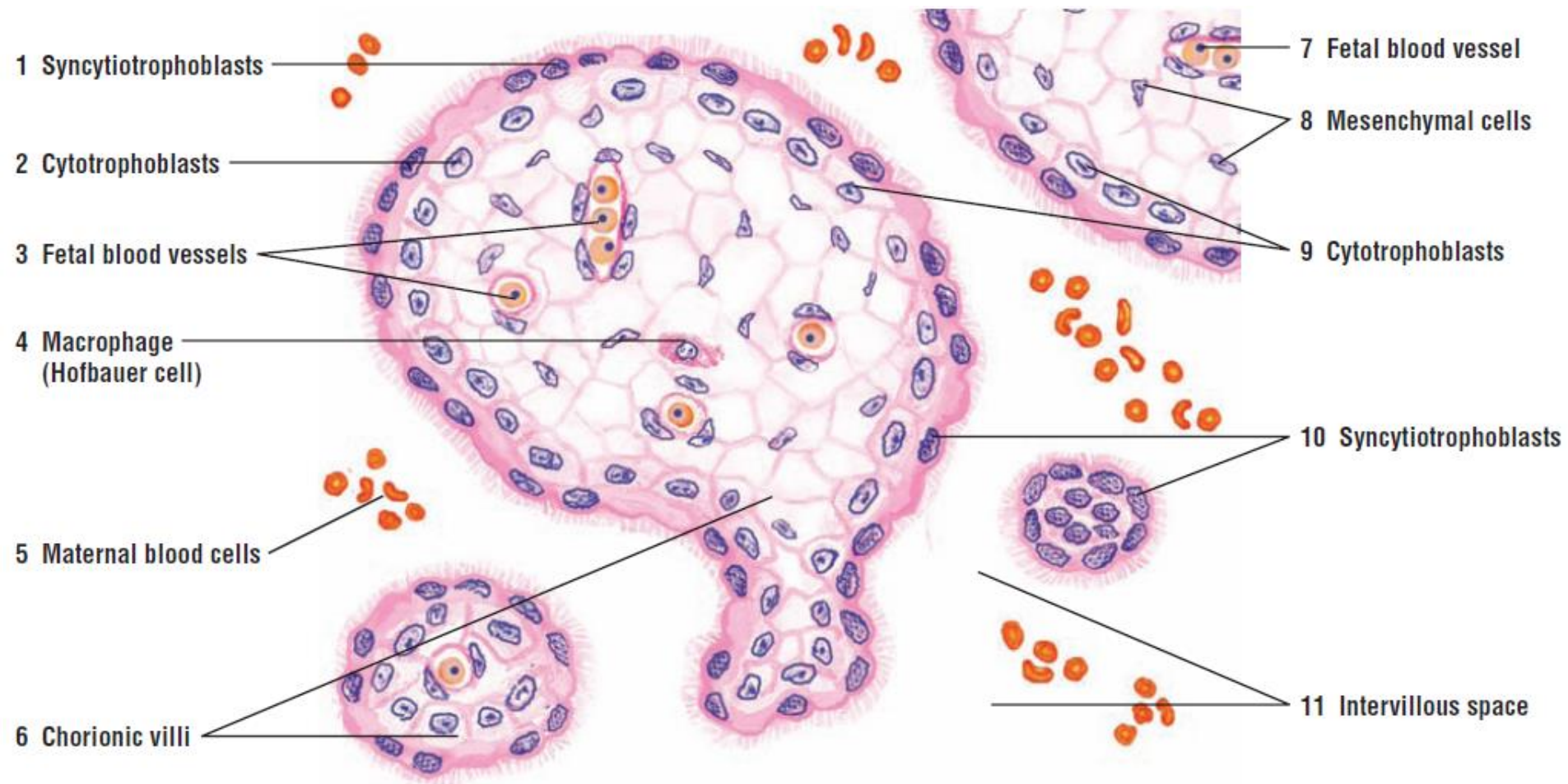


FIGURE 19.22 ■ Chorionic villi: placenta during early pregnancy. Stain: hematoxylin and eosin. High magnification.

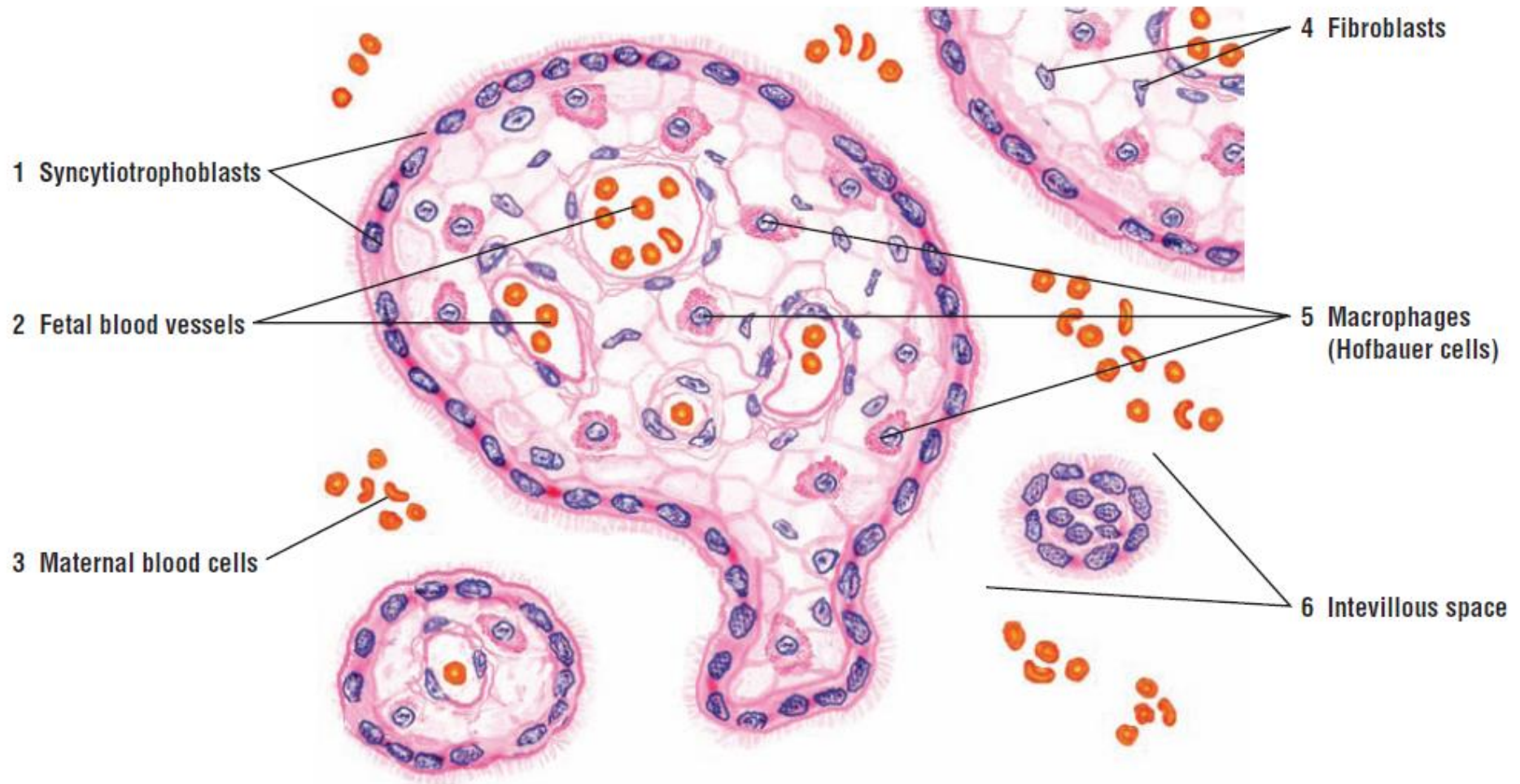


FIGURE 19.23 ■ Chorionic villi: placenta at term. Stain: hematoxylin and eosin. High magnification.