

Prenatal Development Timeline

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|---|--|--|---|
| ■ Nervous | ■ Cardiovascular | ■ Muscular | ■ Early Events |
| ■ Special Senses | ■ Respiratory | ■ Skeletal | ■ Growth Parameters |
| ■ Blood & Immune | ■ Gastrointestinal | ■ Endocrine | ■ General |
| ■ Skin/Integument | ■ Renal/Urinary | ■ Reproductive | ■ Movement |

Unit 1: The First Week

Day 0	—	■ Embryonic period begins
Day 1	—	■ Fertilization resulting in zygote formation
Day 1 - Day 1	—	■ Fertilization - development begins with a single-cell embryo!!!
Day 2	—	■ Early pregnancy factor (EPF) ■ Activation of the genome
	—	■ Zygote divides into two blastomeres (perhaps 30 hours or so after fertilization)
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Day 3	—	■ Embryo is spherically shaped with 12 to 16 cells
Day 4	—	■ Embryonic disc ■ Free floating blastocyst ■ Inner cell mass ■ See where the back and chest will be
Day 5	—	■ Hatching blastocyst
Day 6	—	■ Embryo attaches to wall of uterus
1 week	—	■ Chorion ■ Hypoblast & epiblast ■ Placenta begins to form

Unit 2: 1 to 2 Weeks

1 week, 1 day	—	■ Positive pregnancy test ■ Amnioblasts present; amnion and amniotic cavity formation begins
1 week, 2 days	—	■ Cells in womb engorged with nutrients
1 week, 4 days	—	■ Longitudinal axis
1 week, 5 days	—	■ Implantation complete ■ Yolk sac
1 week, 6 days	—	■ Primordial blood vessels ■ Amnion with single cell layer ■ Chorionic villi
2 weeks	—	■ Yolk sac ■ Yolk sac
































Unit 3: 2 to 3 Weeks

2 weeks, 1 day	—	■ 3 germ layers ■ Rostral-caudal orientation
2 weeks, 2 days	—	■ Erythroblasts in yolk sac ■ Three types of blood-forming cells in yolk sac













	Amnion with two cell layers
	Secondary villi
2 weeks, 4 days	Foregut, midgut, and hindgut
	Brain is first organ to appear
	Connecting stalk
2 weeks, 5 days	Neural plate induced by notochordal process
2 weeks, 6 days	Numerous blood islands in umbilical vesicle
	Foregut
	Stomodeum forming
	Beginnings of the heart can be seen
	Blood vessels emerge simultaneously in umbilical vesicle, embryo proper, amnion, and connecting stalk
	Dorsal aortae (paired)
	Paired tubular heart
	Forebrain, midbrain, and hindbrain
	Neural groove deepens substantially
	Three main divisions of brain
	Neural crest: Rostral and facial
3 weeks	Blood and blood vessels

Unit 4: 3 to 4 Weeks

3 weeks, 1 day	Midgut emerging
	Respiratory outgrowth
	Atria (right and left) far apart
	Circulatory system function begins
	Endocardial tubes fuse forming tubular heart
	Heart begins beating
	Pericardium
	Primary head vein
	Sinus venosus
	Tubular heart begins folding
	Umbilical arteries
	Umbilical veins (right and left)
	Neural tube
	Body cavities
	Hyoid arch
3 weeks, 3 days	Thyroid complete
	Cystic primordium
	Liver
	Membrane between future mouth and throat may begin to rupture
	Neuropore (near brain) closes
	Notochord
3 weeks, 5 days	First part of pancreas
	Pharyngeal arch 3
	Lung bud

	 Descending aorta
	 Internal carotid arteries
	 Unidirectional circulation
	 Brain involves 40% of neural tube
	 Lowermost spinal cord formation begins
	 Neural tube closes (lower back)
	 Somites: Pairs 21 through 29
	 Upper limb primordium at level of somites 8 to 10
	 Progressively C-shaped embryo
4 weeks	 Skin is so thin, you can see through it!
	 Esophagus primordia
	 Intestines growing in length
	 Pancreas: Ventral pancreas
	 Pharynx
	 Small & large intestines
	 Bronchial buds
	 Lungs begin filling chest cavity
	 Trachea
	 Circulatory system "well established"
	 Functioning two-chamber heart
	 Heart chambers bulging with fluid
	 Heart now functions as two parallel pumps
	 Heart rate (about) 113 beats/min
	 Most cranial nerve ganglia
	 Cerebellum
	 Fourth ventricle
	 Amnion surrounds embryo
	 Limb buds - the first sign of arms and legs
	 Lower limb buds
	 Umbilical cord emerging
	 Upper and lower limb buds

Unit 5: 4 to 5 Weeks

4 weeks, 3 days - 5 weeks	 Germ cells migrate to gonads
4 weeks, 4 days	 Lungs: Right and left primary (or main stem) bronchi
	 Sinu-atrial (SA) node
	 Brain enlarges 50% since Carnegie Stage 13
	 Brain: Cerebral hemispheres appear and begin rapid growth
	 Brain: Lateral ventricles
4 weeks, 5 days	 Caecum
	 Blood vessels penetrate diencephalon
	 Coronary arteries (terminal end)
	 Brain with five main sections
	 First nerve fibers
	 Hypothalamus

	<ul style="list-style-type: none"> Most cranial nerves seen Synapses among motor neurons in spinal cord Third ventricle
5 weeks	<ul style="list-style-type: none"> ACTH [adrenocorticotropin hormone] Growth hormone Pituitary gland Limb buds form hand plates Permanent kidneys Bronchial tree branching accelerates Lobar pattern mimics adult pattern Pacemaker cells Head is one third of entire embryo
Unit 6: 5 to 6 Weeks	
5 weeks, 1 day	<ul style="list-style-type: none"> Wrist joints are forming
5 weeks, 2 days	<ul style="list-style-type: none"> Thyroid detaches from pharynx Atrioventricular (AV) node Circle of Willis almost complete Cochlear nerve present Musculocutaneous, radial, ulna, and median nerves enter upper limb bud All cranial nerves identifiable
5½ weeks	<ul style="list-style-type: none"> Initial tooth formation
5½ weeks - 6 weeks	<ul style="list-style-type: none"> Subtle movement begins
5 weeks, 4 days	<ul style="list-style-type: none"> Cartilage formation
5 weeks, 5 days	<ul style="list-style-type: none"> Nerve cells differentiating
5 weeks, 5 days - 7 weeks, 1 day	<ul style="list-style-type: none"> Melanocytes in epidermis
5 weeks, 6 days	<ul style="list-style-type: none"> Cartilage in occipital sclerotomes (1-4) Primordial vermiform appendix All spinal nerves present Dura begins forming in basal area Frontal and temporal poles of cerebral hemispheres Somites: Pairs 38 and 39 Synapses in spinal cord between interneurons and primary afferent neurons
6 weeks	<ul style="list-style-type: none"> Face withdraws from light touch around mouth Blood forming in liver Nipples along side of trunk Adrenal glands Glucagon in pancreas Handplates develop subtle flattening Joints Tooth buds (primary teeth) Diaphragm is largely formed Intestines fill base of umbilical cord

	<ul style="list-style-type: none"> ■ Synapses form in spinal cord Crown-heel length 1.6 cm
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Unit 7: 6 to 7 Weeks

6 weeks, 2 days	<ul style="list-style-type: none"> Elbow regions sometimes identifiable Hands polygon-shaped Toe rays sometimes present ■ Submandibular gland primordia ■ Inferior vena cava ■ Origin of left coronary artery ■ Optic fibers ■ Brainwave activity has begun ■ Cerebrospinal fluid production begins
6½ weeks	<ul style="list-style-type: none"> ■ The hands begin to move Volar pads on palms Bones first form in the collar bones and lower jaw
6 weeks, 5 days	<ul style="list-style-type: none"> Beginnings of occipital and sphenoid bones Cartilaginous styloid process Humerus, radius, and ulna ■ Deltoid muscle ■ Anal membrane ■ Lung, left: Oblique fissure defines upper and lower lobes ■ Circulus arteriosus (Circle of Willis) complete ■ Origin of right coronary artery ■ Tricuspid and mitral valves ■ Primitive nasal cavity ■ Occipital pole of cerebral hemispheres
6 weeks, 6 days	<ul style="list-style-type: none"> Feet polygon-shaped ■ Cloacal membrane ruptures
7 weeks	<ul style="list-style-type: none"> ■ Head rotates ■ Leg movements ■ B lymphocytes in liver Ovaries Testes begin to differentiate ■ Insulin in pancreas Foot plates notched ■ Hiccups ■ Tendons attach muscle to bone ■ The heart has four chambers and is nearly complete. ■ The heart rate peaks at 165 to 170 beats per minute. Crown-heel length 2.2 cm

Unit 8: 7 to 8 Weeks

7 weeks, 1 day	<ul style="list-style-type: none"> Upper limbs with slightly flexed elbows ■ Sacrocaudal spinal cord formation (secondary neurulation) complete
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7 weeks, 1 day - 8 weeks	<ul style="list-style-type: none"> Stomach: Folds in stomach wall
7 weeks, 2 days	<ul style="list-style-type: none"> Arteries and veins of heart complete
7 weeks, 3 days	<ul style="list-style-type: none"> Wrists slightly flexed Cerebral hemispheres cover more than half of diencephalon
7½ weeks	<ul style="list-style-type: none"> Hands begin to touch face The hands touch each other as do the feet! Fingertips thicken Plantar pads toes The knee joints have arrived EKG pattern similar to adult
7 weeks, 4 days	<ul style="list-style-type: none"> The fingers are free
7 weeks, 5 days	<ul style="list-style-type: none"> Bone-forming cells called osteoblasts emerge Hands can reach one another and fingers can overlap Brain: Internal capsule with connections to epithalamus, dorsal thalamus, and mesencephalon Cerebral hemispheres cover 75% of diencephalon Cortical plate expanding rapidly
7 weeks, 6 days	<ul style="list-style-type: none"> The toes are free
8 weeks	<ul style="list-style-type: none"> Complex response to touch More frequent hand-to-face contact Mouth opens & closes Squinting The embryo floats and rolls over in the womb Hairs first appear in eyebrows & around mouth Skin multi-layered, loses transparency Male embryos are making testosterone already! The embryo's joints are similar to adult joints Diaphragm complete Esophagus: Longitudinal muscles Urethra Urine production and release Peristalsis in large intestine Occasional breathing motions begin Blood supply to the brain closely resembles adult pattern Cranial nerve distribution mimics adult pattern Retina: Four of the ten adult layers present Tympanic membrane "The hindbrain "presents striking resemblance to that of the newborn." Brain represents 43% of embryo Grey and white matter Right- and left-handedness emerges Crown-heel length 4.3 cm Embryo contains approximately 1 billion (10⁹) cells

	<input type="checkbox"/> Embryonic Period Ends
	<input type="checkbox"/> The embryo has more than 4,000 parts (adults have about 4,500)

Unit 9: 8 to 9 Weeks

8½ weeks	<input checked="" type="checkbox"/> Neurons synapse in cerebral cortex (marginal zone)
9 weeks	<input checked="" type="checkbox"/> Bends hip & knee if sole of foot touched
	<input checked="" type="checkbox"/> Drinking fluid is becoming routine
	<input checked="" type="checkbox"/> Sucking the thumb
	<input checked="" type="checkbox"/> The young fetus now sighs, stretches, moves the head, opens the mouth, and moves the tongue
	<input checked="" type="checkbox"/> Tongue movement
	<input checked="" type="checkbox"/> Female fetuses have early reproductive cells in their ovaries
	<input checked="" type="checkbox"/> Thyroid gland weighs 2 grams
	<input checked="" type="checkbox"/> Small intestine peristalsis
	<input checked="" type="checkbox"/> Face, hands, and feet sense light touch

Unit 10: 9 to 10 Weeks

9 weeks - 10 weeks	<input checked="" type="checkbox"/> Early vocal cords
	<input type="checkbox"/> My weight will rise more than 75% this week
9½ weeks	<input checked="" type="checkbox"/> I yawn when I want
9 weeks, 4 days	<input checked="" type="checkbox"/> Yawns
10 weeks	<input checked="" type="checkbox"/> Eyes roll downward reflexively
	<input checked="" type="checkbox"/> Palatine tonsils
	<input checked="" type="checkbox"/> Fingernails and toenails begin to grow!
	<input checked="" type="checkbox"/> Three-layered epidermis
	<input checked="" type="checkbox"/> Tiny unique fingerprints have arrived!
	<input checked="" type="checkbox"/> Now, all the bones are getting harder
	<input checked="" type="checkbox"/> Tooth buds (secondary teeth)
	<input checked="" type="checkbox"/> Glomeruli formation begins
	<input checked="" type="checkbox"/> Physiologic herniation ends
	<input checked="" type="checkbox"/> Corpus callosum begins
	<input type="checkbox"/> Crown-heel length 7.5 cm

Unit 11: 10 to 11 Weeks

10 weeks - 12 weeks	<input checked="" type="checkbox"/> Langerhans cells enter epidermis
10½ weeks	<input checked="" type="checkbox"/> Volar and plantar pads regress
11 weeks	<input checked="" type="checkbox"/> The face now makes complex expressions
	<input checked="" type="checkbox"/> Immunological competence
	<input checked="" type="checkbox"/> Intermediate layer
	<input checked="" type="checkbox"/> Nose & lips completely formed
	<input checked="" type="checkbox"/> Now you can tell if your baby is a girl or a boy!
	<input checked="" type="checkbox"/> Thyroid gland weighs 12 grams
	<input checked="" type="checkbox"/> Intestines absorb water & glucose
	<input checked="" type="checkbox"/> Auditory cells: inner & outer hair cells
	<input type="checkbox"/> Crown-heel length

Unit 12: 11 to 12 Weeks

11 weeks - 12 weeks	□ Weight increases by 60% this week
12 weeks	■ Hands touch the mouth up to 50 times per hour
	■ T lymphocytes leave thymus
	■ Many different hormones are present in pituitary gland
	■ Thyroid gland produces hormone
	■ Palate fuses
	■ Upper limbs reach final proportion
	■ Bladder resembles smooth muscle
	■ Bile production begins in liver
	■ Bowel movements
	■ There are taste buds all over the mouth
	■ Corpus callosum
	□ Crown-heel length 12 cm
	□ Head circumference 10 cm

Unit 13: 3 to 4 Months

13 weeks	□ Teeth are growing
	■ Cilia lining airways
	■ Most of body sensitive to touch
	□ Crown-heel length 15 cm
14 weeks	■ Girls move their jaws more than the boys do
	■ Light touch to mouth evokes turn toward stimulus
	■ 4-lobed cerebral cortex
	■ Cerebellum resembles adult structure
	□ Crown-heel length 17 cm
	□ Fat deposits in cheeks
15 weeks	■ Stem cells arrive in bone marrow
	■ Body fat emerges throughout the body
	■ Glucagon in fetal bloodstream
	■ Digestive enzymes
	□ Crown-heel length 19.5 cm
16 weeks	■ Quickening
	■ Fat deposits upper & lower limbs
	■ Tooth enamel
	■ Bronchial tree nearly complete
	■ Hormonal stress response to invasive procedures
	□ Crown-heel length 21 cm

Unit 14: 4 to 5 Months

17 weeks	■ Retina has discrete layers
18 weeks	■ Cream-like substance protects skin
	■ Sweat glands
	■ Insulin secretion
	■ Speaking motion of larynx
	■ Corpus callosum complete

19 weeks	<ul style="list-style-type: none"> — Melanin production — Number of oogonia peak (at about 7 million) within fetal ovaries
20 weeks	<ul style="list-style-type: none"> — Daily cycles in biological rhythms — All skin layers and structures — Surfactant production (low levels) — Hearing and responding to sound begins — Hearing and responding to sound begins — Crown-heel length 28 cm — Head circumference 20 cm

Unit 15: 5 to 6 Months

21 weeks	<ul style="list-style-type: none"> — Stratum corneum
21 weeks - 22 weeks	<ul style="list-style-type: none"> — If born prematurely from this point on, survival is possible
22 weeks	<ul style="list-style-type: none"> — Behavioral states
23 weeks	<ul style="list-style-type: none"> — Brain weight 100 grams
24 weeks	<ul style="list-style-type: none"> — Blink-startle response; females before males — Crown-heel length 34.5 cm

Unit 16: 6 to 7 Months

25 weeks	<ul style="list-style-type: none"> — Intestinal lining contains all adult cell types — Rods & cones — The ability to taste
26 weeks	<ul style="list-style-type: none"> — Additional fat deposits decrease wrinkles — Tear production — The ability to smell has arrived
26 weeks - 38 weeks	<ul style="list-style-type: none"> — Brain weight increases 400% to 500%
27 weeks	<ul style="list-style-type: none"> — Pupils react to light
28 weeks	<ul style="list-style-type: none"> — Distinguishes sounds of different frequencies — Crown-heel length 39.5 cm

Unit 17: 7 to 8 Months

30 weeks	<ul style="list-style-type: none"> — Breathing motions are common even though there is no air in the womb — 6-layered cerebral cortex — Head circumference 30 cm
32 weeks	<ul style="list-style-type: none"> — Esophagus: Lower esophagus muscles functional — Glomeruli formation complete — Alveoli — Memory - music preferences — Crown-heel length 45 cm

Unit 18: 8 to 9 Months

32 weeks - 36 weeks	<ul style="list-style-type: none"> — Prenatal food affects newborn taste preferences
34 weeks	<ul style="list-style-type: none"> — Rapid weight gain
35 weeks	<ul style="list-style-type: none"> — Firm grip — Amniotic fluid volume peaks
36 weeks	<ul style="list-style-type: none"> — Surfactant production accelerates

	<input type="checkbox"/> Brain weight 300 grams <input type="checkbox"/> Crown-heel length 48.5 cm
Unit 19: 9 Months to Birth	
37 weeks	<input type="checkbox"/> Fetus drinks an estimated 15 oz (or 450cc) of amniotic fluid/day
38 weeks	<input type="checkbox"/> Air breathing begins <input type="checkbox"/> By term, the typical umbilical cord measures 20 to 24 inches (50 to 60 cm) <input type="checkbox"/> Heart beats 54 million times before birth <input type="checkbox"/> Major circulatory changes <input type="checkbox"/> Spinal cord ends at third lumbar vertebrae <input type="checkbox"/> Brain weight 350 grams <input type="checkbox"/> Crown-heel length 50 cm <input type="checkbox"/> Fetus initiates labor <input type="checkbox"/> Head circumference 35 cm <input type="checkbox"/> Time to be born!