

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)
	—	■ Zygote divides into two blastomeres (perhaps 30 hours or so after fertilization)
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	 Early eyes
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
	 Eyes located on sides of head
	 Lens pits
	 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)

	 Nose: Nasal pits
	 Optic chiasm
	 Brain with five main sections
	 First nerve fibers
	 Hypothalamus
	 Most cranial nerves seen
	 Synapses among motor neurons in spinal cord
	 Third ventricle
5 weeks	 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	 Wrist joints are forming
5 weeks, 2 days	 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	 Initial tooth formation
5½ weeks - 6 weeks	 Subtle movement begins
5 weeks, 4 days	 Cartilage formation
5 weeks, 5 days	 Nerve cells differentiating
5 weeks, 5 days - 7 weeks, 1 day	 Melanocytes in epidermis
5 weeks, 6 days	 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	 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
	External ears
	Synapses form in spinal cord
	Crown-heel length 1.6 cm

Unit 7: 6 to 7 Weeks

6 weeks, 2 days	Elbow regions sometimes identifiable
	Hands polygon-shaped
	Toe rays sometimes present
	Submandibular gland primordia
	Inferior vena cava
	Origin of left coronary artery
	Optic fibers
	Eyelid folds sometimes present
	Brainwave activity has begun
	Cerebrospinal fluid production begins
6½ weeks	The hands begin to move
	Volar pads on palms
	Bones first form in the collar bones and lower jaw
6 weeks, 5 days	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
	Eyelids: Upper and lower lids present and growing
	Occipital pole of cerebral hemispheres
6 weeks, 6 days	Feet polygon-shaped
	Cloacal membrane ruptures
7 weeks	Head rotates
	Leg movements
	B lymphocytes in liver
	Ovaries
	Testes begin to differentiate
	Insulin in pancreas
	Foot plates notched
	Hiccups

	<ul style="list-style-type: none"> ■ 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
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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
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 ■ Eyelids growing rapidly ■ 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

	<input type="checkbox"/> Cranial nerve distribution mimics adult pattern
	<input type="checkbox"/> Retina: Four of the ten adult layers present
	<input type="checkbox"/> Tympanic membrane
	<input type="checkbox"/> "The hindbrain "presents striking resemblance to that of the newborn."
	<input type="checkbox"/> Brain represents 43% of embryo
	<input type="checkbox"/> Grey and white matter
	<input type="checkbox"/> Right- and left-handedness emerges
	<input type="checkbox"/> Crown-heel length 4.3 cm
	<input type="checkbox"/> Embryo contains approximately 1 billion (10 ⁹) 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 type="checkbox"/> Eyelids completely fused
	<input type="checkbox"/> Neurons synapse in cerebral cortex (marginal zone)
9 weeks	<input type="checkbox"/> Bends hip & knee if sole of foot touched
	<input type="checkbox"/> Drinking fluid is becoming routine
	<input type="checkbox"/> Sucking the thumb
	<input type="checkbox"/> The young fetus now sighs, stretches, moves the head, opens the mouth, and moves the tongue
	<input type="checkbox"/> Tongue movement
	<input type="checkbox"/> Female fetuses have early reproductive cells in their ovaries
	<input type="checkbox"/> Thyroid gland weighs 2 grams
	<input type="checkbox"/> Small intestine peristalsis
	<input type="checkbox"/> Face, hands, and feet sense light touch

Unit 10: 9 to 10 Weeks

9 weeks - 10 weeks	<input type="checkbox"/> Early vocal cords
	<input type="checkbox"/> My weight will rise more than 75% this week
9½ weeks	<input type="checkbox"/> I yawn when I want
9 weeks, 4 days	<input type="checkbox"/> Yawns
10 weeks	<input type="checkbox"/> Eyes roll downward reflexively
	<input type="checkbox"/> Palatine tonsils
	<input type="checkbox"/> Fingernails and toenails begin to grow!
	<input type="checkbox"/> Three-layered epidermis
	<input type="checkbox"/> Tiny unique fingerprints have arrived!
	<input type="checkbox"/> Now, all the bones are getting harder
	<input type="checkbox"/> Tooth buds (secondary teeth)
	<input type="checkbox"/> Glomeruli formation begins
	<input type="checkbox"/> Physiologic herniation ends
	<input 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 type="checkbox"/> Langerhans cells enter epidermis
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10½ weeks	—	□ Volar and plantar pads regress
11 weeks	—	■ The face now makes complex expressions
		■ Immunological competence
		□ Intermediate layer
		□ Nose & lips completely formed
		■ Now you can tell if your baby is a girl or a boy!
		■ Thyroid gland weighs 12 grams
		■ Intestines absorb water & glucose
		■ Auditory cells: inner & outer hair cells
		□ 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

	<ul style="list-style-type: none"> Bronchial tree nearly complete Hormonal stress response to invasive procedures Crown-heel length 21 cm
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Unit 14: 4 to 5 Months

17 weeks	<ul style="list-style-type: none"> Retina has discrete layers
18 weeks	<ul style="list-style-type: none"> 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 Daily cycles in biological rhythms
20 weeks	<ul style="list-style-type: none"> 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

20 weeks - 24 weeks	<ul style="list-style-type: none"> Eyelids separate, eyes open and close
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"> Cornea structure 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
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	<input type="checkbox"/> Head circumference 30 cm
32 weeks	<input checked="" type="checkbox"/> Esophagus: Lower esophagus muscles functional
	<input checked="" type="checkbox"/> Glomeruli formation complete
	<input checked="" type="checkbox"/> Alveoli
	<input checked="" type="checkbox"/> Memory - music preferences
	<input type="checkbox"/> Crown-heel length 45 cm

Unit 18: 8 to 9 Months

32 weeks - 36 weeks	<input checked="" type="checkbox"/> Prenatal food affects newborn taste preferences
34 weeks	<input type="checkbox"/> Rapid weight gain
35 weeks	<input checked="" type="checkbox"/> Firm grip
	<input type="checkbox"/> Amniotic fluid volume peaks
36 weeks	<input checked="" type="checkbox"/> 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 checked="" type="checkbox"/> Fetus drinks an estimated 15 oz (or 450cc) of amniotic fluid/day
38 weeks	<input checked="" type="checkbox"/> Air breathing begins
	<input checked="" type="checkbox"/> By term, the typical umbilical cord measures 20 to 24 inches (50 to 60 cm)
	<input checked="" type="checkbox"/> Heart beats 54 million times before birth
	<input checked="" type="checkbox"/> Major circulatory changes
	<input checked="" 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!