

Prenatal Development Timeline

- | | | | |
|---|--|--|---|
| ■ 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	■ Embryo is spherically shaped with 12 to 16 cells
Day 1 - 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)
Day 2	■ Activation of the genome
Day 2	■ Zygote divides into two blastomeres (24 - 30 hours from start of fertilization)
Day 4	■ Embryonic disc
Day 4	■ Free floating blastocyst
Day 4	■ Hypoblast & epiblast
Day 4	■ Inner cell mass
Day 4	■ See where the back and chest will be
Day 5	■ Hatching blastocyst
Day 6	■ Embryo attaches to wall of uterus
1 week	■ Chorion
1 week	■ Placenta begins to form























Unit 2: 1 to 2 Weeks

1 week, 1 day	■ Positive pregnancy test
1 week, 1 day	■ 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
1 week, 5 days	■ Yolk sac
1 week, 6 days	■ Primordial blood vessels
1 week, 6 days	■ Amnion with single cell layer
1 week, 6 days	■ Chorionic villi
2 weeks	■ Yolk sac
2 weeks	■ Yolk sac















Unit 3: 2 to 3 Weeks
















2 weeks, 1 day	■ 3 germ layers
2 weeks, 1 day	■ Rostral-caudal orientation
2 weeks, 2 days	■ Erythroblasts in yolk sac
2 weeks, 2 days	■ Three types of blood-forming cells in yolk sac
2 weeks, 2 days	■ Amnion with two cell layers
2 weeks, 2 days	■ Secondary villi

2 weeks, 4 days	Foregut, midgut, and hindgut
	Brain is first organ to appear
	Neural plate induced by notochordal process
2 weeks, 6 days	Connecting stalk
	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
3 weeks	Three main divisions of brain
	Neural crest: Rostral and facial
	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
	Internal carotid arteries
	Neuropore (near brain) closes
3 weeks, 5 days	Notochord
	First part of pancreas
	Pharyngeal arch 3
	Lung bud
	Descending aorta



























	 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
	 Nose: Nasal pits
	 Brain enlarges 50% since Carnegie Stage 13
	 Brain: Cerebral hemispheres appear and begin rapid growth
	 Brain: Lateral ventricles
	 Hypothalamus
4 weeks, 5 days	 Caecum
	 Blood vessels penetrate diencephalon
	 Coronary arteries (terminal end)

	 Optic chiasm
	 Brain with five main sections
	 First nerve fibers
	 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
	□ Humerus, radius, and ulna
	□ Toe rays sometimes present
	■ Deltoid muscle
	■ 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
	■ 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
	■ Tendons attach muscle to bone
	■ The heart has four chambers and is nearly complete.

	<ul style="list-style-type: none"> ■ 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
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"> ■ The knee joints have arrived ■ 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 ■ 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

	<ul style="list-style-type: none"> ■ 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 Embryonic Period Ends The embryo has more than 4,000 parts (adults have about 4,500)
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Unit 9: 8 to 9 Weeks









8½ weeks	<ul style="list-style-type: none"> ■ Eyelids completely fused ■ Neurons synapse in cerebral cortex (marginal zone)
9 weeks	<ul style="list-style-type: none"> ■ Bends hip & knee if sole of foot touched ■ Drinking fluid is becoming routine ■ Sucking the thumb ■ The young fetus now sighs, stretches, moves the head, opens the mouth, and moves the tongue ■ Tongue movement Female fetuses have early reproductive cells in their ovaries Thyroid gland weighs 2 grams ■ Small intestine peristalsis ■ Face, hands, and feet sense light touch

Unit 10: 9 to 10 Weeks















9 weeks - 10 weeks	<ul style="list-style-type: none"> ■ Early vocal cords My weight will rise more than 75% this week
9½ weeks	<ul style="list-style-type: none"> ■ I yawn when I want
9 weeks, 4 days	<ul style="list-style-type: none"> ■ Yawns
10 weeks	<ul style="list-style-type: none"> ■ Eyes roll downward reflexively ■ Palatine tonsils Fingernails and toenails begin to grow! Three-layered epidermis Tiny unique fingerprints have arrived! Now, all the bones are getting harder Tooth buds (secondary teeth) ■ Glomeruli formation begins ■ Physiologic herniation ends ■ Corpus callosum begins Crown-heel length 7.5 cm

Unit 11: 10 to 11 Weeks



10 weeks - 12 weeks	<ul style="list-style-type: none"> ■ Langerhans cells enter epidermis
10½ weeks	<ul style="list-style-type: none"> Volar and plantar pads regress
11 weeks	<ul style="list-style-type: none"> ■ 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
	 Bronchial tree nearly complete
	 Hormonal stress response to invasive procedures

	<ul style="list-style-type: none"> <input type="checkbox"/> Crown-heel length 21 cm
Unit 14: 4 to 5 Months	
17 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Retina has discrete layers
18 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Cream-like substance protects skin <input type="checkbox"/> Sweat glands <input type="checkbox"/> Insulin secretion <input type="checkbox"/> Speaking motion of larynx <input type="checkbox"/> Corpus callosum complete
19 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Melanin production <input type="checkbox"/> Number of oogonia peak (at about 7 million) within fetal ovaries <input type="checkbox"/> Daily cycles in biological rhythms
20 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> All skin layers and structures <input type="checkbox"/> Surfactant production (low levels) <input type="checkbox"/> Hearing and responding to sound begins <input type="checkbox"/> Hearing and responding to sound begins <input type="checkbox"/> Crown-heel length 28 cm <input type="checkbox"/> Head circumference 20 cm
Unit 15: 5 to 6 Months	
20 weeks - 24 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Eyelids separate, eyes open and close
21 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Stratum corneum
21 weeks - 22 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> If born prematurely from this point on, survival is possible
22 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Cornea structure <input type="checkbox"/> Behavioral states
23 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Brain weight 100 grams
24 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Blink-startle response; females before males <input type="checkbox"/> Crown-heel length 34.5 cm
Unit 16: 6 to 7 Months	
25 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Intestinal lining contains all adult cell types <input type="checkbox"/> Rods & cones <input type="checkbox"/> The ability to taste
26 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Additional fat deposits decrease wrinkles <input type="checkbox"/> Tear production <input type="checkbox"/> The ability to smell has arrived
26 weeks - 38 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Brain weight increases 400% to 500%
27 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Pupils react to light
28 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Distinguishes sounds of different frequencies <input type="checkbox"/> Crown-heel length 39.5 cm
Unit 17: 7 to 8 Months	
30 weeks	<ul style="list-style-type: none"> <input type="checkbox"/> Breathing motions are common even though there is no air in the womb <input type="checkbox"/> 6-layered cerebral cortex <input type="checkbox"/> Head circumference 30 cm
32 weeks	<ul style="list-style-type: none"> <input 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!