

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	<ul style="list-style-type: none"> Embryonic period begins Fertilization resulting in zygote formation
Day 1	<ul style="list-style-type: none"> Embryo is spherically shaped with 12 to 16 cells
Day 1 - Day 1	<ul style="list-style-type: none"> Fertilization - development begins with a single-cell embryo!!!
Day 2	<ul style="list-style-type: none"> Early pregnancy factor (EPF) Activation of the genome Zygote divides into two blastomeres (24 - 30 hours from start of fertilization)
Day 4	<ul style="list-style-type: none"> Embryonic disc Free floating blastocyst Hypoblast & epiblast Inner cell mass See where the back and chest will be
Day 5	<ul style="list-style-type: none"> Hatching blastocyst
Day 6	<ul style="list-style-type: none"> Embryo attaches to wall of uterus
1 week	<ul style="list-style-type: none"> Chorion Placenta begins to form
Unit 2: 1 to 2 Weeks	
1 week, 1 day	<ul style="list-style-type: none"> Amnioblasts present; amnion and amniotic cavity formation begins Positive pregnancy test
1 week, 2 days	<ul style="list-style-type: none"> Cells in womb engorged with nutrients
1 week, 4 days	<ul style="list-style-type: none"> Longitudinal axis
1 week, 5 days	<ul style="list-style-type: none"> Implantation complete Yolk sac
1 week, 6 days	<ul style="list-style-type: none"> Primordial blood vessels Amnion with single cell layer Chorionic villi
2 weeks	<ul style="list-style-type: none"> Yolk sac Yolk sac
Unit 3: 2 to 3 Weeks	
2 weeks, 1 day	<ul style="list-style-type: none"> 3 germ layers Rostral-caudal orientation
2 weeks, 2 days	<ul style="list-style-type: none"> Erythroblasts in yolk sac Three types of blood-forming cells in yolk sac Amnion with two cell layers Secondary villi

2 weeks, 4 days	<ul style="list-style-type: none"> Foregut, midgut, and hindgut Brain is first organ to appear Neural plate induced by notochordal process Connecting stalk
2 weeks, 6 days	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Blood and blood vessels
Unit 4: 3 to 4 Weeks	
3 weeks, 1 day	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Thyroid complete Cystic primordium Liver Membrane between future mouth and throat may begin to rupture Internal carotid arteries Neuropore (near brain) closes Notochord
3 weeks, 5 days	<ul style="list-style-type: none"> 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 - 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
	Hypothalamus
4 weeks, 5 days	Caecum
	Blood vessels penetrate diencephalon
	Coronary arteries (terminal end)
	Brain with five main sections
	First nerve fibers
	Most cranial nerves seen
	Synapses among motor neurons in spinal cord

	<div></div> Third ventricle
5 weeks	<div></div> ACTH [adrenocorticotropin hormone]
	<div></div> Growth hormone
	<div></div> Pituitary gland
	<div></div> Limb buds form hand plates
	<div></div> Permanent kidneys
	<div></div> Bronchial tree branching accelerates
	<div></div> Lobar pattern mimics adult pattern
	<div></div> Pacemaker cells
	<div></div> Head is one third of entire embryo
Unit 6: 5 to 6 Weeks	
5 weeks, 1 day	<div></div> Wrist joints are forming
5 weeks, 2 days	<div></div> Thyroid detaches from pharynx
	<div></div> Atrioventricular (AV) node
	<div></div> Circle of Willis almost complete
	<div></div> Cochlear nerve present
	<div></div> Musculocutaneous, radial, ulna, and median nerves enter upper limb bud
	<div></div> All cranial nerves identifiable
5½ weeks	<div></div> Initial tooth formation
5½ weeks - 6 weeks	<div></div> Subtle movement begins
5 weeks, 4 days	<div></div> Cartilage formation
5 weeks, 5 days	<div></div> Nerve cells differentiating
5 weeks, 5 days - 7 weeks, 1 day	<div></div> Melanocytes in epidermis
5 weeks, 6 days	<div></div> Cartilage in occipital sclerotomes (1-4)
	<div></div> Primordial vermiform appendix
	<div></div> All spinal nerves present
	<div></div> Dura begins forming in basal area
	<div></div> Frontal and temporal poles of cerebral hemispheres
	<div></div> Somites: Pairs 38 and 39
	<div></div> Synapses in spinal cord between interneurons and primary afferent neurons
6 weeks	<div></div> Face withdraws from light touch around mouth
	<div></div> Blood forming in liver
	<div></div> Nipples along side of trunk
	<div></div> Adrenal glands
	<div></div> Glucagon in pancreas
	<div></div> Handplates develop subtle flattening
	<div></div> Joints
	<div></div> Tooth buds (primary teeth)
	<div></div> Diaphragm is largely formed
	<div></div> Intestines fill base of umbilical cord
	<div></div> Synapses form in spinal cord
	<div></div> Crown-heel length 1.6 cm

Unit 7: 6 to 7 Weeks	
6 weeks, 2 days	<ul style="list-style-type: none"> Elbow regions sometimes identifiable Hands polygon-shaped Humerus, radius, and ulna Toe rays sometimes present Deltoid muscle Submandibular gland primordia Inferior vena cava Left coronary artery arises from aorta 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 Limbs point forward (ventrally) Anal membrane Lung, left: Oblique fissure defines upper and lower lobes Circle of Willis complete Right coronary artery arises from aorta 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
7 weeks, 1 day - 8 weeks	<ul style="list-style-type: none"> Stomach: Folds in stomach wall

7 weeks, 2 days	Arteries and veins of heart complete
7 weeks, 3 days	The knee joints have arrived
	Wrists slightly flexed
	Cerebral hemispheres cover more than half of diencephalon
7½ weeks	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	The fingers are free
7 weeks, 5 days	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	The toes are free
8 weeks	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 (10 ⁹) cells
	Embryonic Period Ends

	<input type="checkbox"/> The 8-week embryo has formed more than 4,000 permanent body parts.
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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	<input type="checkbox"/> Weight increases by 60% this week
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12 weeks	<ul style="list-style-type: none"> 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 Bowel movements Liver: Bile production begins There are taste buds all over the mouth Corpus callosum Crown-heel length 12 cm Head circumference 10 cm
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Unit 13: 3 to 4 Months

13 weeks	<ul style="list-style-type: none"> Teeth are growing Cilia lining airways Most of body sensitive to touch Crown-heel length 15 cm
14 weeks	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<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

	<div></div> Number of oogonia peak (at about 7 million) within fetal ovaries
	<div></div> Daily cycles in biological rhythms
20 weeks	<div></div> All skin layers and structures
	<div></div> Surfactant production (low levels)
	<div></div> Hearing and responding to sound begins
	<div></div> Hearing and responding to sound begins
	<div></div> Crown-heel length 28 cm
	<div></div> Head circumference 20 cm
Unit 15: 5 to 6 Months	
21 weeks	<div></div> Stratum corneum
21 weeks - 22 weeks	<div></div> If born prematurely from this point on, survival is possible
22 weeks	<div></div> Behavioral states
23 weeks	<div></div> Brain weight 100 grams
24 weeks	<div></div> Blink-startle response; females before males
	<div></div> Crown-heel length 34.5 cm
Unit 16: 6 to 7 Months	
25 weeks	<div></div> Intestinal lining contains all adult cell types
	<div></div> Rods & cones
	<div></div> The ability to taste
26 weeks	<div></div> Additional fat deposits decrease wrinkles
	<div></div> Tear production
	<div></div> The ability to smell has arrived
26 weeks - 38 weeks	<div></div> Brain weight increases 400% to 500%
27 weeks	<div></div> Pupils react to light
28 weeks	<div></div> Distinguishes sounds of different frequencies
	<div></div> Crown-heel length 39.5 cm
Unit 17: 7 to 8 Months	
30 weeks	<div></div> Breathing motions are common even though there is no air in the womb
	<div></div> 6-layered cerebral cortex
	<div></div> Head circumference 30 cm
32 weeks	<div></div> Esophagus: Lower esophagus muscles functional
	<div></div> Glomeruli formation complete
	<div></div> Alveoli
	<div></div> Memory - music preferences
	<div></div> Crown-heel length 45 cm
Unit 18: 8 to 9 Months	
32 weeks - 36 weeks	<div></div> Prenatal food affects newborn taste preferences
34 weeks	<div></div> Rapid weight gain
35 weeks	<div></div> Firm grip
	<div></div> Amniotic fluid volume peaks
36 weeks	<div></div> Surfactant production accelerates
	<div></div> 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!