Prenatal Development Timeline

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

Unit 1: The First Week

Day 0 ï¿½ï¿½
- Embryonic period begins
- Fertilization resulting in zygote formation

Day 1 ï¿½ï¿½
- Embryo is spherically shaped with 12 to 16 cells

Day 1 - Day 1 ï¿½ï¿½
- Fertilization - development begins with a single-cell embryo!!!

Day 2 ï¿½ï¿½
- Early pregnancy factor (EPF)
- Activation of the genome
- Zygote divides into two blastomeres (24 â€“ 30 hours from start of fertilization)

Day 4 ï¿½ï¿½
- Embryonic disc
- Free floating blastocyst
- Hypoblast & epiblast
- Inner cell mass
- See where the back and chest will be

Day 5 ï¿½ï¿½
- Hatching blastocyst

Day 6 ï¿½ï¿½
- Embryo attaches to wall of uterus

1 week ï¿½ï¿½
- Chorion
- Placenta begins to form

Unit 2: 1 to 2 Weeks

1 week, 1 day ï¿½ï¿½
- Amnioblasts present; amnion and amniotic cavity formation begins
- Positive pregnancy test

1 week, 2 days ï¿½ï¿½
- Cells in womb engorged with nutrients

1 week, 4 days ï¿½ï¿½	Longitudinal axis
1 week, 5 days ï¿½ï¿½	Implantation complete
	Yolk sac
1 week, 6 days ï¿½ï¿½	Primordial blood vessels
	Amnion with single cell layer
	Chorionic villi
2 weeks ï¿½ï¿½	Yolk sac
	Yolk sac

Unit 3: 2 to 3 Weeks

2 weeks, 1 day ï¿½ï¿½	3 germ layers
	Rostral-caudal orientation
2 weeks, 2 days ï¿½ï¿½	Erythroblasts in yolk sac
	Three types of blood-forming cells in yolk sac
	Amnion with two cell layers
	Secondary villi
2 weeks, 4 days ï¿½ï¿½	Foregut, midgut, and hindgut
	Brain is first organ to appear
	Neural plate induced by notochordal process
	Connecting stalk
2 weeks, 6 days ï¿½ï¿½	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 ï¿½ï¿½	Blood and blood vessels
Unit 4: 3 to 4 Weeks	
3 weeks, 1 day ï¿½ï¿½	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 ï¿½ï¿½	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 ï¿½ï¿½	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 ï¿½ï¿½	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 ï¿½ï¿½	Early eyes
4 weeks, 3 days - 5 weeks ï¿½ï¿½	Germ cells migrate to gonads
4 weeks, 4 days ï¿½ï¿½	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 ï¿½ï¿½	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 ï¿½ï¿½	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 ï¿½ï¿½	Wrist joints are forming
5 weeks, 2 days ï¿½ï¿½	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
5ï¿½ weeks ï¿½ï¿½	Initial tooth formation
5ï¿½ weeks - 6 weeks ï¿½ï¿½	Subtle movement begins
5 weeks, 4 days ï¿½ï¿½	Cartilage formation
5 weeks, 5 days ï¿½ï¿½	Nerve cells differentiating
5 weeks, 5 days - 7 weeks, 1 day ï¿½ï¿½	Melanocytes in epidermis
5 weeks, 6 days ï¿½ï¿½	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 ï¿½ï¿½	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 ï¿½ï¿½	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
	Eyelid folds sometimes present
	Brainwave activity has begun
	Cerebrospinal fluid production begins
6ï¿½ weeks ï¿½ï¿½	The hands begin to move
	Volar pads on palms
	Bones first form in the collar bones and lower jaw
6 weeks, 5 days ï¿½ï¿½	Beginnings of occipital and sphenoid bones
	Cartilaginous styloid process
	Limbs point forward (ventrally)
	Anal membrane
	Lung, left: Oblique fissure defines upper and lower lobes

	Circulus arteriosus (Circle of Willis) complete
	Right coronary artery arises from aorta
	Tricuspid and mitral valves
	Primitive nasal cavity
	Eyelids: Upper and lower lids present and growing
	Occipital pole of cerebral hemispheres
6 weeks, 6 days ï¿½ï¿½	Feet polygon-shaped
	Cloacal membrane ruptures
7 weeks ï¿½ï¿½	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 ï¿½ï¿½	Upper limbs with slightly flexed elbows
	Sacrocaudal spinal cord formation (secondary neurulation) complete
7 weeks, 1 day - 8 weeks ï¿½ï¿½	Stomach: Folds in stomach wall
7 weeks, 2 days ï¿½ï¿½	Arteries and veins of heart complete
7 weeks, 3 days ï¿½ï¿½	The knee joints have arrived
	Wrists slightly flexed
	Eyelids growing rapidly
	Cerebral hemispheres cover more than half of diencephalon
7ï¿½ weeks ï¿½ï¿½	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 ï¿ï¿½½	The fingers are free
7 weeks, 5 days ï¿ï¿½½	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 ï¿ï¿½½	The toes are free
8 weeks ï¿ï¿½½	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
	The 8-week embryo has formed more than 4,000 permanent body parts.

Unit 9: 8 to 9 Weeks

8ï¿½ weeksï¿ï¿½½	Eyelids completely fused
	Neurons synapse in cerebral cortex (marginal zone)
9 weeks ï¿ï¿½½	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 ï¿ï¿½½	Early vocal cords
	My weight will rise more than 75% this week
9ï¿½ weeksï¿ï¿½½	I yawn when I want
9 weeks, 4 days ï¿ï¿½½	Yawns
10 weeks ï¿ï¿½½	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 ï¿ï¿½½	Langerhans cells enter epidermis
10ï¿½ weeksï¿ï¿½½	Volar and plantar pads regress

11 weeks ï¿½ï¿½	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 ï¿½ï¿½	Weight increases by 60% this week
12 weeks ï¿½ï¿½	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
Unit 13: 3 to 4 Months	
13 weeks ï¿½ï¿½	Teeth are growing
	Cilia lining airways
	Most of body sensitive to touch
	Crown-heel length 15 cm
14 weeks ï¿½ï¿½	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 ï¿½ï¿½	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 ï¿½ï¿½	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 ï¿½ï¿½	Retina has discrete layers
18 weeks ï¿½ï¿½	Cream-like substance protects skin
	Sweat glands
	Insulin secretion
	Speaking motion of larynx
	Corpus callosum complete
19 weeks ï¿½ï¿½	Melanin production
	Number of oogonia peak (at about 7 million) within fetal ovaries
	Daily cycles in biological rhythms
20 weeks ï¿½ï¿½	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 ï¿½ï¿½	Eyelids separate, eyes open and close
21 weeks ï¿½ï¿½	Stratum corneum

21 weeks - 22 weeks ï¿½ï¿½ If born prematurely from this point on, survival is possible

22 weeks ï¿½ï¿½ Cornea structure

Behavioral states

23 weeks ï¿½ï¿½ Brain weight 100 grams

24 weeks ï¿½ï¿½ Blink-startle response; females before males

Crown-heel length 34.5 cm

Unit 16: 6 to 7 Months

25 weeks ï¿½ï¿½ Intestinal lining contains all adult cell types

Rods & cones

The ability to taste

26 weeks ï¿½ï¿½ Additional fat deposits decrease wrinkles

Tear production

The ability to smell has arrived

26 weeks - 38 weeks ï¿½ï¿½ Brain weight increases 400% to 500%

27 weeks ï¿½ï¿½ Pupils react to light

28 weeks ï¿½ï¿½ Distinguishes sounds of different frequencies

Crown-heel length 39.5 cm

Unit 17: 7 to 8 Months

30 weeks ï¿½ï¿½ Breathing motions are common even though there is no air in the womb

6-layered cerebral cortex

Head circumference 30 cm

32 weeks ï¿½ï¿½ 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 ï¿½ï¿½	Prenatal food affects newborn taste preferences
34 weeks ï¿½ï¿½	Rapid weight gain
35 weeks ï¿½ï¿½	Firm grip
	Amniotic fluid volume peaks
36 weeks ï¿½ï¿½	Surfactant production accelerates
	Brain weight 300 grams
	Crown-heel length 48.5 cm
Unit 19: 9 Months to Birth	
37 weeks ï¿½ï¿½	Fetus drinks an estimated 15 oz (or 450cc) of amniotic fluid/day
38 weeks ï¿½ï¿½	Air breathing begins
	By term, the typical umbilical cord measures 20 to 24 inches (50 to 60 cm)
	Heart beats 54 million times before birth
	Major circulatory changes
	Spinal cord ends at third lumbar vertebrae
	Brain weight 350 grams
	Crown-heel length 50 cm
	Fetus initiates labor
	Head circumference 35 cm
	Time to be born!