

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	—	■ Embryo is spherically shaped and called a morula comprised of 12 to 16 blastomeres
		■ Embryo is spherically shaped with 12 to 16 cells
		■ 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
		■ Blastomeres begin rapidly dividing
		■ Zygote divides into two blastomeres (24 – 30 hours from start of fertilization)
Day 3	—	■ Compaction
Day 4	—	■ Embryonic disc
		■ Free floating blastocyst
		■ Hypoblast & epiblast
		■ Inner cell mass
		■ See where the back and chest will be
Day 5	—	■ Hatching blastocyst
Day 6	—	■ Embryo attaches to wall of uterus
		■ Solid syncytiotrophoblast & cytotrophoblast
1 week	—	■ Chorion
		■ Chorionic cavity
		■ Extra-embryonic mesoderm (or mesoblast)
		■ 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
		■ Bilaminar embryonic disc
1 week, 2 days	—	■ Corpus luteum of pregnancy
		■ Cells in womb engorged with nutrients
		■ Exocoelomic membrane
		■ Isolated trophoblastic lacunae
		■ Embryonic disc 0.1 mm diameter
1 week, 4 days	—	■ Intercommunicating lacunae network
		■ Longitudinal axis
		■ Prechordal plate

	<ul style="list-style-type: none"> Trophoblastic vascular circle
1 week, 5 days	<ul style="list-style-type: none"> Implantation complete Yolk sac
	<ul style="list-style-type: none"> Embryonic disc diameter: 0.15 to 0.20 mm
1 week, 6 days	<ul style="list-style-type: none"> Blood islands in umbilical vesicle Allantois Angiogenesis in chorionic mesoblast Blood vessels in villi Connecting stalk Primordial blood vessels
	<ul style="list-style-type: none"> Amnion with single cell layer Chorionic villi
2 weeks	<ul style="list-style-type: none"> Embryonic epiblast gives rise to primitive streak and primitive node and Yolk sac Yolk sac
Unit 3: 2 to 3 Weeks	
2 weeks, 1 day	<ul style="list-style-type: none"> 3 germ layers Cloacal membrane Primitive groove 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 Primordial germ cells Allantoic diverticulum Allantoic diverticulum Amnion with two cell layers Notochordal process Secondary villi
2 weeks, 4 days	<ul style="list-style-type: none"> Foregut, midgut, and hindgut Uteroplacental circulation well established Prechordal plate with 1 retinal field Brain is first organ to appear Caudal eminence Neural ectoderm Neural groove and neural folds Neural plate induced by notochordal process Notochordal and neurenteric canals Notochordal plate Connecting stalk Primitive pit (or notochordal pit)
2 weeks, 5 days	<ul style="list-style-type: none"> Prechordal plate with 2 retinal fields
2 weeks, 6 days	<ul style="list-style-type: none"> Numerous blood islands in umbilical vesicle Septum transversum (primitive diaphragm) Foregut

	 Oropharyngeal membrane
	 Pharyngeal pouch 1
	 Stomodeum forming
	 Beginnings of the heart can be seen
	 Blood vessels emerge simultaneously in umbilical vesicle, embryo proper, amnion, and connecting stalk
	 Common umbilical artery
	 Dorsal aortae (paired)
	 First pair of aortic arches
	 Heart: Cardiogenic plate, cardiac jelly, myocardial mantle, and endocardial plexus
	 Left ventricle, right ventricle, conotruncus
	 Paired pericardial cavities
	 Paired tubular heart
	 Forebrain, midbrain, and hindbrain
	 Hindbrain with four rhombomeres
	 Isthmus rhombencephali demarcates midbrain and hindbrain
	 Mesencephalon (or midbrain)
	 Neural cord within caudal eminence
	 Neural groove deepens substantially
	 Primary neuromeres
	 Three main divisions of brain
	 Cephalic and caudal folds
	 Neural crest: Rostral and facial
	 Primitive streak reaches neurenteric canal
	 Somites with central somitocoels: Pairs 1 through 3
3 weeks	 Blood and blood vessels

Unit 4: 3 to 4 Weeks	
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3 weeks, 1 day	 Thyroid primordium emerges from floor of pharynx
	 Nephrogenic cord emerges (at 10 somites)
	 Cloaca
	 Common coelomic cavity divides into peritoneal, pericardial, and pleural cavities
	 Liver: Hepatic plate (endoderm)
	 Midgut emerging
	 Pharyngeal arches 1 and 2
	 Pharyngeal cleft 1
	 Second pharyngeal cleft and pouch
	 Pharyngeal groove and ridge with laryngotracheal sulcus
	 Respiratory outgrowth
	 Atria (right and left) far apart
	 Bulbis cordis
	 Circulatory system function begins
	 Endocardial tubes fuse forming tubular heart

	 Heart begins beating
	 Pericardial sac
	 Pericardium
	 Primary head vein
	 Sinus venosus
	 Tubular heart begins folding
	 Umbilical arteries
	 Umbilical veins (right and left)
	 Optic primordia fill neuromere D2
	 Otic pits
	 Chiasmatic plate
	 Mesencephalic flexure
	 Neural tube
	 Neuromeres D1 and D2 (in diencephalon)
	 Optic sulcus in forebrain
	 Pontine region identifiable near cranial nerves VII and VIII
	 Segment D in rhombencephalon
	 Some secondary neuromeres
	 Superior colliculus
	 Telencephalon
	 Telencephalon (or telencephalic) medium
	 Body cavities
	 Hyoid arch
	 Mandibular arch and maxillary process
	 Neural crest: Trigeminal, facioacoustic, glossopharyngeal-vagal, and occipitospinal
	 Somites: Pairs 4 through 12
3 weeks, 3 days	 Primordial germ cells begin moving from umbilical vesicle to hindgut
	 Thyroid complete
	 Face: Maxillary and mandibular processes (bilaterally)
	 Cloacal membrane
	 Mesonephric duct emerges from nephrogenic cord
	 Nephric vesicles
	 Cystic primordium
	 Hepatic diverticulum
	 Liver
	 Membrane between future mouth and throat may begin to rupture
	 Angiogenesis along surface of central nervous system
	 Aortic sac
	 Atrioventricular canal
	 Capillary plexus begins forming around brain and spinal cord
	 Conotruncus

	Conus cordis emerging from right ventricle
	Endocardium
	Heart contractions produce peristaltic blood flow
	Internal carotid arteries
	Interventricular septum
	Primordium of myocardium
	Sinus venosus separating from left atria
	Trabeculated outpouches along primary cardiac tube representing primordia of left and right ventricles
	Trigeminal and otic arteries
	Facio-vestibulocochlear ganglia (CN VII, CN VIII)
	Glossopharyngeal and vagal ganglia
	Optic evagination (starting at 14 somites)
	Otic vesicle
	Trigeminal ganglia (CN V)
	Neural crest: Optic crest emerges during Carnegie Stages 11 and 12
	Nose: Nasal plate
	Optic vesicles form (17 to 19 somites)
	Adenohypophysial pouch
	Adenohypophysis
	Lamina terminalis
	Mesencephalon contains tectum and tegmentum
	Neural crest production and migration continue
	Neurohypophysial primordia
	Neuropore (near brain) closes
	Notochord
	Segmentation of mesoblast alongside neural tube bilaterally
	Somites: Pairs 13 through 20
3 weeks, 3 days - 5 weeks, 6 days	All eight rhombomeres (Rh 1 through Rh 7, Rh D) - Present in stages 11 through 17
3 weeks, 5 days	Telopharyngeal bodies
	Alimentary epithelium invades stroma of liver
	Alimentary epithelium proliferates in primordia of stomach, liver, and dorsal pancreas
	First part of pancreas
	Gastric portion of foregut elongates (25 to 28 somites)
	Hepatic primordium with abundant vascular plexus
	Omental bursa
	Oropharyngeal membrane is ruptured
	Pharyngeal arch 3
	Pharyngeal arches with dorsal and ventral parts
	Umbilical vesicle elongates
	Cervical sinus
	Laryngotracheal groove

	■ Lung bud
	■ Tracheo-esophageal septum
	■ Atrioventricular canal
	■ Common cardinal veins (right and left)
	■ Descending aorta
	■ Heart circulates blood to and from central nervous system, umbilical vesicle, and chorion
	■ Hepatocardiac channels (right and left)
	■ Rostral and caudal cardinal veins along brain and spinal cord feeding common cardinal veins
	■ Septum primum and foramen primum sometimes present
	■ Sinu-atrial foramen prevents backflow into sinus venosus
	■ Sinus venosus collects venous blood from entire embryo
	■ Superior vena cava, inferior vena cava, and sinus venosus collecting all venous blood
	■ Unidirectional circulation
	■ Vitelline arteries and veins
	■ Hypoglossal cord (CN XII) enters pharyngeal arch 4
	■ Otocyst nearly closed
	■ Nasal discs form part of ectodermal ring
	■ Optic vesicles covered by sheath (formed by mesencephalic and optic crest)
	■ Brain involves 40% of neural tube
	■ Brain: Embryonic commissural plate
	■ Ectodermal ring complete
	■ Hypoglossal nucleus (CN XII)
	■ Lowermost spinal cord formation begins
	■ Mamillary recess
	■ Marginal layer in rhombencephalon
	■ Mesencephalic flexure at 90 degrees
	■ Mesencephalon with two neuromeres: M1 and M2
	■ Motor neurons in basal plate of rhombencephalon
	■ Neural tube closes (lower back)
	■ Neurofibrils form in rhombencephalon
	■ Primary neurulation ends
	■ Primordia of ventral thalamus and subthalamus in diencephalon
	■ Sulcus limitans
	■ Sulcus limitans in midbrain
	■ Somites: Pairs 21 through 29
	■ Upper limb primordium at level of somites 8 to 10
	□ Progressively C-shaped embryo
4 weeks	■ Spleen primordia
	■ Thymic primordia

	Lower lip forms from merging of mandibular processes
	Melanoblasts in epidermis
	Skin is so thin, you can see through it!
	Gonadal ridge extends from C-7 to T-8 levels
	Primordial germ cells migrate to mesonephric ridges
	Primordial germ cells number several hundred
	Urorectal septum
	Thyroid bilobed and attached to pharynx by thyroglossal duct
	Diaphragm primordia
	Glomeruli emerge in mesonephros
	Mesonephric duct attached to cloaca
	Nephric tubules now S-shaped
	Urogenital sinus
	Urorectal cleavage line
	Diverticulum ilei marks division between foregut and hindgut
	Esophagus primordia
	Intestines growing in length
	Mesentery from end of duodenum to proximal half of colon
	Opening between gut and umbilical vesicle decreases
	Pancreas: Ventral pancreas
	Pharyngeal pouches 1 through 4
	Pharynx
	Pleuroperitoneal canals
	Small & large intestines
	Stalk of umbilical vesicle lengthens and narrows
	Stomach assumes shape of a spindle
	Umbilical vesicle at height of development
	Vitelline duct
	Bronchial buds
	Lungs begin filling chest cavity
	Mesenchyme from coelomic epithelium surrounds esophagus and lung buds
	Trachea
	Anterior, middle, and posterior cerebral plexuses
	Aorta branches include dorsal intersegmental, lateral segmental, and ventral segmental arteries
	Aortic arches 4 and 6
	Artery from the common iliac artery feeds each lower limb bud
	Atrioventricular bundle
	Cardiac contractions still under myogenic control
	Celiac artery, superior and inferior mesenteric arteries
	Circulatory system "well established"

	<ul style="list-style-type: none"> Common iliac arteries (right and left, from dorsal aorta bifurcation)
	<ul style="list-style-type: none"> Contractions well coordinated and sequential from sinus venosus to atria to ventricles
	<ul style="list-style-type: none"> Ductus venosus
	<ul style="list-style-type: none"> Functioning two-chamber heart
	<ul style="list-style-type: none"> Gas exchange through placenta begins
	<ul style="list-style-type: none"> Gelatinous reticulum (or cardiac mesenchyme)
	<ul style="list-style-type: none"> Heart chambers bulging with fluid
	<ul style="list-style-type: none"> Heart now functions as two parallel pumps
	<ul style="list-style-type: none"> Heart rate (about) 113 beats/min
	<ul style="list-style-type: none"> Heart: Atrioventricular cushions (rostroventral and caudodorsal)
	<ul style="list-style-type: none"> Heart: Myocardium wall 3 to 4 cells thick
	<ul style="list-style-type: none"> Liver: Hepatocardiac vein
	<ul style="list-style-type: none"> Primary head veins (right and left) drain anterior, middle, and posterior cerebral plexuses and feed precardinal veins
	<ul style="list-style-type: none"> Septum primum, foramen primum
	<ul style="list-style-type: none"> Small arteries emerging throughout mesoderm
	<ul style="list-style-type: none"> Ventricle walls trabeculated
	<ul style="list-style-type: none"> Vertebral arteries
	<ul style="list-style-type: none"> Vitelline veins empty exclusively into hepatic plexus
	<ul style="list-style-type: none"> Most cranial nerve ganglia
	<ul style="list-style-type: none"> Trigeminal, glossopharyngeal, and vagal preganglia
	<ul style="list-style-type: none"> Basement membrane of otic disc surrounds otic vesicle
	<ul style="list-style-type: none"> Endolymphatic appendage
	<ul style="list-style-type: none"> Otic invagination
	<ul style="list-style-type: none"> Otic vesicle closes
	<ul style="list-style-type: none"> Brain: Commissural plate
	<ul style="list-style-type: none"> Cerebellum
	<ul style="list-style-type: none"> Common afferent tract
	<ul style="list-style-type: none"> Fourth ventricle
	<ul style="list-style-type: none"> Interstitial nucleus (part of medial longitudinal fasciculus)
	<ul style="list-style-type: none"> Isthmus rhombencephali (a new neuromere)
	<ul style="list-style-type: none"> Oculomotor (CN III) and trochlear nuclei (CN IV) in mesencephalon (midbrain) and isthmus respectively
	<ul style="list-style-type: none"> Retinal and lens discs
	<ul style="list-style-type: none"> Terminal-vomeronasal neural crest
	<ul style="list-style-type: none"> Amnion surrounds connecting stalk and vitelline stalk
	<ul style="list-style-type: none"> Amnion surrounds embryo
	<ul style="list-style-type: none"> Cervical flexure
	<ul style="list-style-type: none"> Hyoid arch subdivides into dorsal and ventral segments
	<ul style="list-style-type: none"> Limb buds - the first sign of arms and legs
	<ul style="list-style-type: none"> Lower limb buds

	<ul style="list-style-type: none"> ■ 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	■ Thymus
	■ Parathyrogenic zones
	■ Thyroglossal duct
	■ Thyroid pedicle lengthens
	■ Dorsal contour develops depression at level of sclerotomes 4 and 5
	■ Muscular plates between upper and lower limb buds
	■ Glomerular capsules, partially vascularized
	■ Mesonephric corpuscle
	■ Metanephrogenic cap emerges from ureteric bud
	■ Ureteric buds
	■ Angiogenesis within peri-esophageal mesenchyme
	■ Epiploic foramen
	■ Lesser sac (omental bursa)
	■ Small intestine forming coils
	■ Tongue: Hypopharyngeal eminence
	■ Arytenoid swellings (right and left)
	■ Capillary network surrounds pulmonary mesenchyme
	■ Epithelial lamina of larynx
	■ Lungs: Right and left primary (or main stem) bronchi
	■ Mesenchyme covering esophagus and respiratory tree separates
	■ Mesenchyme surrounds bronchi
	■ Pleura (mesothelium) surrounds part of mesenchyme
	■ Right main bronchus longer than left
	■ Atria walls thin, ventricle walls thick and trabeculated
	■ Atrioventricular cushions not fused
	■ Common pulmonary vein drains pulmonary plexuses into left atrium
	■ Conotruncal ridges or cushions (remnants of cardiac jelly)
	■ Epicardium
	■ Outflow tract still with one lumen
	■ Posterior communicating arteries
	■ Pulmonary arch (sixth aortic arch) forms from aorta and aortic sac
	■ Pulmonary capillary network fed by pulmonary arteries, drain into left atrium
	■ Sinu-atrial (SA) node
	■ Superior mesenteric artery and vein
	■ Upper limb buds with early marginal blood vessel

	Brachial plexus
	Cervical plexus
	Dorsal roots
	Hypoglossal nerve roots unite (CN XII)
	Lens and retina invaginate to form optic cup
	Primordium of cochlear duct
	Rami communicantes
	Spinal nerves reach muscle primordia
	Upper limb buds innervated
	External ear: Auricular hillocks merging
	Eyes located on sides of head
	Lens pits
	Lens vesicle open to surface (lens pore)
	Nose: Nasal pits
	Nose: Nasal plate (or disc) flat or concave
	Pigment in retina (external layer of optic cup)
	D1 and D2 no longer identifiable within diencephalon
	75% of midbrain covered by marginal layer
	All 16 secondary neuromeres
	Brain enlarges 50% since Carnegie Stage 13
	Brain: Cerebral hemispheres appear and begin rapid growth
	Brain: Lateral ventricles
	Cerebellum with intermediate and ventricular layers
	Cerebellum: Primordium found in alar plate of rhombomere 1
	Corpora striata primordia connected by commissural plate
	Cranial nerve 3
	Di-telencephalic sulcus
	Dorsal and ventral thalami
	Dorsal funiculus
	Hypothalamic sulcus
	Hypothalamus
	Mamillary region
	Medial and lateral longitudinal fasciculi
	Median ventricular eminence
	Pontine flexure
	Preoptic sulcus extends between optic evaginations
	Preoptico-hypothalamo-tegmental tract
	Primary meninx surrounds most of brain
	Rhombic lip
	Spinal cord wall with three zones: ventricular (ependymal) zone, mantle (intermediate) zone, and marginal zone
	Subthalamus with medial striatal ridge emerging

	■ Synencephalon
	■ Tegmentum
	■ Tentorium cerebelli, medial portion
	■ Terminal-vomer nasal crest contacts brain (olfactory area)
	■ Torus hemisphericus (TH)
	■ Velum transversum
	■ Ventral longitudinal fasciculus
	■ Ventral segment of hyoid arch subdivides
4 weeks, 5 days	■ Primordium of antitragus emerges from ventral subsegment of hyoid arch
	■ Gonad framework found in coelomic epithelium
	■ Thyroid detached from epithelium of pharynx in some embryos
	■ Lower limb bud rounded proximally and tapered distally
	■ Mesenchymal skeleton in upper and lower limbs
	■ Right and left neural processes
	■ Sclerotomic material around notochord (rhombomere D level)
	■ Vertebrae well defined
	■ Vertebral centra
	■ Primary urogenital sinus
	■ Ureteric bud extends to pelvis of the ureter
	■ Bladder and rectum are separating caudal to ureters
	■ Caecum
	■ Dense mesenchyme surrounds much of gastrointestinal tract
	■ Esophagus elongates, passes dorsal to carina and between main stem bronchi
	■ Gall bladder and cystic duct
	■ Liver: Hepatic ducts
	■ Ventral pancreas appears as an offshoot of the cystic duct
	■ Lobar bud swellings denote areas of secondary bronchi
	■ Remnants of coelomic epithelium forming visceral pleura
	■ Atrioventricular cushions apposed
	■ Blood flow divided into right and left streams through atrioventricular canal, ventricles, outflow tract, and aortic sac
	■ Blood vessels penetrate diencephalon
	■ Capillary plexus surrounds esophagus
	■ Capillary plexus surrounds lung buds
	■ Cardiac mesenchyme surrounds ventricles and outflow tract
	■ Coronary arteries (terminal end)
	■ Foramen secundum begins in septum primum

	<ul style="list-style-type: none"> ■ Left ventricle with thicker walls and greater volume than right
	<ul style="list-style-type: none"> ■ Semilunar cusps
	<ul style="list-style-type: none"> ■ Capsule present around lens
	<ul style="list-style-type: none"> ■ Corneal epithelium overlying optic cup
	<ul style="list-style-type: none"> ■ Ear: Endolymphatic duct
	<ul style="list-style-type: none"> ■ Geniculate and vestibulocochlear ganglia separating
	<ul style="list-style-type: none"> ■ Lens body now present containing some lens fibers
	<ul style="list-style-type: none"> ■ Lower limb buds innervated
	<ul style="list-style-type: none"> ■ Optic stalk
	<ul style="list-style-type: none"> ■ Utricle, endolymphatic duct, and endolymphatic sac
	<ul style="list-style-type: none"> ■ Utriculo-endolymphatic fold
	<ul style="list-style-type: none"> ■ External ear primordia emerges from caudolateral portion of mandibular arch
	<ul style="list-style-type: none"> ■ Face: Lateral and medial nasal processes bilaterally
	<ul style="list-style-type: none"> ■ Lateral nasal processes along dorsolateral lip of nasal pits
	<ul style="list-style-type: none"> ■ Lens vesicles closed, pores absent
	<ul style="list-style-type: none"> ■ Nose: Nasal discs recede forming nasal pits
	<ul style="list-style-type: none"> ■ Optic chiasm
	<ul style="list-style-type: none"> ■ Adult lamina terminalis
	<ul style="list-style-type: none"> ■ Amygdaloid area
	<ul style="list-style-type: none"> ■ Brain with five main sections
	<ul style="list-style-type: none"> ■ Cerebellar plate
	<ul style="list-style-type: none"> ■ Cerebellum with marginal layer
	<ul style="list-style-type: none"> ■ Fibers of dorsal funiculus reach level of C1
	<ul style="list-style-type: none"> ■ First axodendritic synapses in cervical spinal cord
	<ul style="list-style-type: none"> ■ First nerve fibers
	<ul style="list-style-type: none"> ■ Habenular nucleus
	<ul style="list-style-type: none"> ■ Habenulo-interpeduncular tract
	<ul style="list-style-type: none"> ■ Lateral striatal ridge (derived from telencephalon and comprised mainly of neostriatum)
	<ul style="list-style-type: none"> ■ Lateral ventricular eminence
	<ul style="list-style-type: none"> ■ Locus caeruleus
	<ul style="list-style-type: none"> ■ Longitudinal zones in diencephalon
	<ul style="list-style-type: none"> ■ Marginal layer throughout most of diencephalon
	<ul style="list-style-type: none"> ■ Material for sympathetic trunks scattered in cervical region
	<ul style="list-style-type: none"> ■ Median striatal ridge (paleostriatum)
	<ul style="list-style-type: none"> ■ Mesencephalic tract of CN 5
	<ul style="list-style-type: none"> ■ Most cranial nerves seen
	<ul style="list-style-type: none"> ■ Olfactory fibers reach brain
	<ul style="list-style-type: none"> ■ Optic groove (also called preoptic recess)
	<ul style="list-style-type: none"> ■ Postoptic recess
	<ul style="list-style-type: none"> ■ Primordium of epiphysis
	<ul style="list-style-type: none"> ■ Rhombomeres still identifiable

	■ Superior colliculi and its commissure
	■ Superior medullary velum
	■ Supramamillary commissure
	■ Synapses among motor neurons in spinal cord
	■ Tectobulbar tract
	■ Tentorium
	■ Third ventricle
	■ Trigemino-cerebellar tract
	■ Trochlear nerve root and decussation (CN IV)
	■ Hand plate emerges from distal upper limb bud
	□ Frontonasal prominence
5 weeks	■ ACTH [adrenocorticotropin hormone]
	■ Growth hormone
	■ Pituitary gland
	□ Limb buds form hand plates
	■ Permanent kidneys
	■ Arytenoid and epiglottal swellings
	■ Bronchial tree branching accelerates
	■ Lobar pattern mimics adult pattern
	■ T-shaped laryngeal inlet
	■ 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	■ Apical epidermal ridges
	■ Mammary ridge
	■ Maxillary and premaxillary fields still widely separated
	■ Nipples emerge from mammary crest
	■ Gonad region separates from mesonephros
	■ Gonadal primordium
	■ Labioscrotal swelling
	■ Urogenital fold and groove
	■ Suprarenal gland: Cortex primordium
	■ Suprarenal gland: Medulla
	■ Thyroid detaches from pharynx
	■ Thyroid with right and left lobes connected by an isthmus
	□ Cartilage in mandibular arch
	□ Hand area with central carpal region and digital plate with marginal vein
	□ Pre-chondrocranium: Otic capsule, nasal capsule, and parachordal condensations
	□ Primordia of primary palate
	□ Ribs: Primordia now present for all 12 pairs

	<ul style="list-style-type: none"> ☐ Vertebral column with 36 levels of ganglia and myotomes
	<ul style="list-style-type: none"> ■ Extra-ocular premuscle masses receive cranial nerve fibers [oculomotor (CN III), trochlear (CN IV), and abducens (CN VI) nerves]
	<ul style="list-style-type: none"> ■ Gluteal mesoderm
	<ul style="list-style-type: none"> ■ Infrahyoid premuscle masses
	<ul style="list-style-type: none"> ■ Limb mesoderm
	<ul style="list-style-type: none"> ■ Sternocleidomastoid-trapezius premuscle mass with spinal accessory nerve (CN11)
	<ul style="list-style-type: none"> ■ Thigh and thigh mesoderm
	<ul style="list-style-type: none"> ■ Tongue premuscle mass
	<ul style="list-style-type: none"> ■ Metanephros at level of sacrum
	<ul style="list-style-type: none"> ■ Urethral plate
	<ul style="list-style-type: none"> ■ Lesser omentum (ventral mesogastrum)
	<ul style="list-style-type: none"> ■ Peritoneal cavity
	<ul style="list-style-type: none"> ■ Rectum
	<ul style="list-style-type: none"> ■ Stomach: Greater and lesser curvatures
	<ul style="list-style-type: none"> ■ Yolk stalk disappears
	<ul style="list-style-type: none"> ■ Bronchial tree expanding
	<ul style="list-style-type: none"> ■ Cervical sinus diminished in size
	<ul style="list-style-type: none"> ■ Epiglottis
	<ul style="list-style-type: none"> ■ Primitive Larynx
	<ul style="list-style-type: none"> ■ Anterior, middle, and posterior cerebral arteries
	<ul style="list-style-type: none"> ■ Atrioventricular (AV) node
	<ul style="list-style-type: none"> ■ Atrioventricular cushions fuse with interventricular septum
	<ul style="list-style-type: none"> ■ Circle of Willis almost complete
	<ul style="list-style-type: none"> ■ Conotruncal septum
	<ul style="list-style-type: none"> ■ Endocardial cushions (rostroventral and caudodorsal) begin fusing around atrioventricular canal forming right and left atrioventricular canals and two separate blood streams
	<ul style="list-style-type: none"> ■ External carotid artery
	<ul style="list-style-type: none"> ■ Foramen primum disappearing
	<ul style="list-style-type: none"> ■ Hepatic portal vein
	<ul style="list-style-type: none"> ■ Infundibulum of right ventricle
	<ul style="list-style-type: none"> ■ Jugular lymph sac
	<ul style="list-style-type: none"> ■ Lateral atrioventricular cushions
	<ul style="list-style-type: none"> ■ Mesencephalic artery
	<ul style="list-style-type: none"> ■ Myelencephalic artery
	<ul style="list-style-type: none"> ■ Perilental blood vessels
	<ul style="list-style-type: none"> ■ Primitive cavernous sinus drains primitive maxillary and supraorbital veins
	<ul style="list-style-type: none"> ■ Primitive renal plexus
	<ul style="list-style-type: none"> ■ Right ventricle feeds sixth (pulmonary) aortic arches; left ventricle feeds fourth aortic arches

	<ul style="list-style-type: none"> ■ Semilunar valves (aortic and pulmonary) are forming ■ Ventricles each with three parts: inlet, trabecular pouch, and outflow tract
	<ul style="list-style-type: none"> ■ Ventricles enlarge and deepen side-by-side forming an ever growing interventricular septum ■ Celiac plexus
	<ul style="list-style-type: none"> ■ Cochlear nerve present ■ Femoral and obturator nerves innervate rostrolateral part of lower limb
	<ul style="list-style-type: none"> ■ Hypoglossal nerve (CN XII) reaches tongue ■ Intercostal nerves
	<ul style="list-style-type: none"> ■ Lumbar and sacral plexuses ■ Musculocutaneous, radial, ulna, and median nerves enter upper limb bud
	<ul style="list-style-type: none"> ■ Nasal pits face more ventrally, still widely separated ■ Nasofrontal groove ■ Olfactory fibers connect nasal pits with brain ■ Olfactory fibers enter brain ■ Olfactory tubercle present
	<ul style="list-style-type: none"> ■ Peroneal and tibial nerves innervate caudomedial part of lower limb ■ Phrenic nerve ■ Pigment in retina visible externally
	<ul style="list-style-type: none"> ■ Primordium of cochlear pouch ■ Tibial nerve innervates foot area ■ Auricular hillocks on hyoid arch (antitragus and helix) ■ Auricular hillocks on mandibular arch (tragus and crus) ■ Blind nasal sac ■ Nasal fin
	<ul style="list-style-type: none"> ■ Alar lamina emerging with dense rhombic lip ■ All cranial nerves identifiable ■ Archipallium, paleopallium, and neopallium ■ Area epithelialis
	<ul style="list-style-type: none"> ■ Brain: Primordial plexiform layer in area of future temporal lobe ■ Cajal-Retzius cells ■ Commissure of the trochlear nerve ■ Diencephalic subthalamic nucleus
	<ul style="list-style-type: none"> ■ Dorsal and ventral thalami separated by groove ■ Dorsal funiculus fibers reach medulla oblongata ■ Epiphysis cerebri ■ Glial cells identifiable adjacent to neurons ■ Greater petrosal nerve ■ Hippocampus: Gyrus dentatus ■ Infundibular recess and infundibulum ■ Interventricular foramen large

	■ Marginal ridge
	■ Medial and lateral ridges of corpus striatum are continuous
	■ Median forebrain bundle
	■ Neurohypophysial outgrowth
	■ Olfactory tubercle
	■ Pontine flexure deepens
	■ Posterior commissure
	■ Recurrent laryngeal nerve
	■ Reticular formation more defined
	■ Retinal fissure closes
	■ Splanchnic nerve
	■ Sulcus limitans hippocampi
	■ Superior laryngeal nerve
	□ Second pharyngeal arch more prominent
	□ Third pharyngeal arch recedes
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	■ Facial growth centers grow and begin merging forming nose and upper jaw
	■ Genital eminence forms phallus or genital tubercle
	■ Gonad grows into oval shape with irregular surface
	□ Auditory ossicles identifiable in mesenchyme
	□ Cartilage in occipital sclerotomes (1-4)
	□ Digital rays in hand plate
	□ Femur: Chondrification begins
	□ Foot with rounded digital plate
	□ Hypoglossal foramen (or canal) through sclerotome 4 (area of future occipital bone)
	□ Odontogenic epithelium emerges in six areas (four maxillary and two mandibular)
	□ Primary palate components (right and left) fuse in midline
	□ Primitive palatine groove
	□ Primordium of cartilage within nasal septum
	□ Vertebral centra begin chondrification
	■ Primordia of orbital muscles
	■ Calices
	■ Mesonephros can produce urine
	■ Pelvis of the ureter with three main divisions
	■ Vesico-urethral canal
	■ Biliary ducts within liver

	<ul style="list-style-type: none"> Dorsal and ventral pancreas fuse but retain separate ducts
	<ul style="list-style-type: none"> Duodenum enlarges proximal to and distal to bile and pancreatic ducts
	<ul style="list-style-type: none"> Esophagus developing a submucous coat surrounding epithelium
	<ul style="list-style-type: none"> Intestinal loop begins umbilical herniation
	<ul style="list-style-type: none"> Primordial vermiform appendix
	<ul style="list-style-type: none"> Stomach regions include gastric canal, fundus, corpus (or body), and pyloric antrum
	<ul style="list-style-type: none"> Trachea: Precursors of tracheal cartilages
	<ul style="list-style-type: none"> Anterior choroid artery
	<ul style="list-style-type: none"> Condensing mesenchyme around junction between left and right atria and cardiac tube is precursor to mitral and tricuspid valves
	<ul style="list-style-type: none"> Outflow tract rotates counterclockwise
	<ul style="list-style-type: none"> Right and left atrioventricular canals totally separated
	<ul style="list-style-type: none"> All parasympathetic cranial nerve ganglia identifiable
	<ul style="list-style-type: none"> All spinal nerves present
	<ul style="list-style-type: none"> Cell islands in olfactory tubercle
	<ul style="list-style-type: none"> Crescentic lens cavity
	<ul style="list-style-type: none"> Geniculate ganglion separate from vestibulocochlear nerve
	<ul style="list-style-type: none"> Globular process emerges from each medial nasal process
	<ul style="list-style-type: none"> Nasal fin connecting nasal disc and surface epithelium
	<ul style="list-style-type: none"> Nasofrontal grooves
	<ul style="list-style-type: none"> Olfactory tubercle with cellular islands
	<ul style="list-style-type: none"> Hyomandibular groove enlarges (onset of concha and external auditory meatus formation)
	<ul style="list-style-type: none"> Medial rims of nasal pits form nasal septum
	<ul style="list-style-type: none"> Nostril becomes continuous with nasal sac
	<ul style="list-style-type: none"> Primary lens fibers
	<ul style="list-style-type: none"> Retinal fissure closed
	<ul style="list-style-type: none"> Capillaries between adenohypophysis and hypothalamus
	<ul style="list-style-type: none"> Commissure of the oculomotor nerves
	<ul style="list-style-type: none"> Cortical nucleus in amygdaloid body
	<ul style="list-style-type: none"> Dentate and isthmic nuclei in cerebellum
	<ul style="list-style-type: none"> Dura begins forming in basal area
	<ul style="list-style-type: none"> Epiphysis cerebri with intermediate layer
	<ul style="list-style-type: none"> First hint of septal nucleus
	<ul style="list-style-type: none"> Frontal and temporal poles of cerebral hemispheres
	<ul style="list-style-type: none"> Gustatory fibers separate from common afferent tract
	<ul style="list-style-type: none"> Hemispheric stalk
	<ul style="list-style-type: none"> Intermediate layer in tectum mesencephali
	<ul style="list-style-type: none"> Interventricular foramen

	<input type="checkbox"/> Mesencephalon with intermediate layer
	<input type="checkbox"/> Somites: Pairs 38 and 39
	<input type="checkbox"/> Spinal cord reaches caudal tip of body
	<input type="checkbox"/> Subarachnoid space
	<input type="checkbox"/> Synapses in spinal cord between interneurons and primary afferent neurons
	<input type="checkbox"/> Ventral thalamus with intermediate layer
6 weeks	<input type="checkbox"/> Face withdraws from light touch around mouth
	<input type="checkbox"/> Blood forming in liver
	<input type="checkbox"/> Milk lines
	<input type="checkbox"/> Nipples along side of trunk
	<input type="checkbox"/> Adrenal glands
	<input type="checkbox"/> Glucagon in pancreas
	<input type="checkbox"/> Handplates develop subtle flattening
	<input type="checkbox"/> Joints
	<input type="checkbox"/> Medial skull cartilages: Parachordal, hypophyseal, and trabecular
	<input type="checkbox"/> Tooth buds (primary teeth)
	<input type="checkbox"/> Diaphragm is largely formed
	<input type="checkbox"/> Intestines fill base of umbilical cord
	<input type="checkbox"/> External ears
	<input type="checkbox"/> Synapses form in spinal cord
	<input type="checkbox"/> Crown-heel length 1.6 cm

Unit 7: 6 to 7 Weeks

6 weeks, 2 days	<input type="checkbox"/> Angiogenesis begins inside gonads
	<input type="checkbox"/> Gonad grows into oval shape with irregular surface
	<input type="checkbox"/> Ostium (abdominal) of uterine tube at rostral end of paramesonephric duct (in female embryos)
	<input type="checkbox"/> Paramesonephric duct forms from rostral end of mesonephric duct
	<input type="checkbox"/> Testicular cords in gonads of male embryos
	<input type="checkbox"/> Testicular cords in male gonad
	<input type="checkbox"/> Elbow regions sometimes identifiable
	<input type="checkbox"/> Embryo with cervical and lumbar flexures
	<input type="checkbox"/> Embryo with dorsal concavity
	<input type="checkbox"/> Finger rays with early interdigital notching
	<input type="checkbox"/> Hands polygon-shaped
	<input type="checkbox"/> Humerus, radius, and ulna
	<input type="checkbox"/> Humerus: Chondrocytes in phases one through three
	<input type="checkbox"/> Scapula and clavicle
	<input type="checkbox"/> Semicircular ducts form in order: anterior, posterior, and lateral
	<input type="checkbox"/> Sternum: Episternal cartilage created from fusion of right and left sternal bars
	<input type="checkbox"/> Tibia and fibula
	<input type="checkbox"/> Toe rays sometimes present

	■ Deltoid muscle
	■ External and internal abdominal oblique muscles
	■ Levator scapulae muscle
	■ Longus cervicis and semispinalis cervicis muscles
	■ Pectoralis major muscles
	■ Platysma muscle
	■ Rectus abdominis muscle
	■ Rectus capitus posterior and semispinalis capitis muscles
	■ Serratus anterior muscles
	■ Splenius and longissimus muscles
	■ Stapedius muscle
	■ "Common excretory duct is disappearing"
	■ Cloacal membrane ruptures (stages 18-19)
	■ Primordia of secretory tubules
	■ Esophagus with muscular and submucous coats
	■ Submandibular gland primordia
	■ Bronchial tree with subsegmental buds
	■ Bronchial tree with well established segmental bronchi
	■ Lingula of left upper lobe
	■ Aortic and pulmonary valves assuming shape of a cup
	■ Brachiocephalic veins, right and left
	■ Inferior vena cava
	■ Interventricular septum: membranous part begins forming
	■ Left subclavian artery feeds left axillary and vertebral arteries and left thyrocervical trunk
	■ Mesenchyme ridges in place of future mitral and tricuspid valves
	■ Origin of left coronary artery
	■ Pulmonary and aortic blood flows completely separate
	■ Right subclavian artery originates from brachiocephalic artery and feeds right thyrocervical trunk and axillary and vertebral arteries
	■ Secondary interventricular foramen sometimes closing (stage 18-21) interventricular septum
	■ Septum secundum and foramen ovale (stages 18-21)
	■ Bucconasal membrane
	■ Bucconasal membrane detaches opening up nasal airway
	■ Crus commune
	■ Ethmoidal epithelium emerges from upper medial nasal wall
	■ Frontonasal angle (marks location of future nasal bridge)
	■ Mesenchyme thickenings mark beginning of "sclera and its muscular attachments"

	■ Nasal tip emerges
	■ Nerve fibers in retina
	■ Optic fibers
	■ Retina's outer lamina heavily pigmented
	■ Vomeronasal nerve and ganglion
	■ Vomeronasal organ marked by groove and located in fold of lower medial nasal wall
	■ Choanae
	■ Conjunctival sac marked by groove
	■ Cornea and conjunctiva
	■ Ear: Stapes primordium surrounds stapedia artery
	■ External ear: Crus helcis forming from auricular hillocks two and three (from mandibular arch)
	■ Eyelid folds sometimes present
	■ Nasal fin splits forming choanae and bucconasal membrane
	■ Nasolacrimal duct begins as epithelial strand emanating from nasomaxillary groove
	■ Nostrils, nasal wings, and nasal septum easily seen
	■ Olfactory bulb sometimes with olfactory ventricle
	■ Primary lens fibers filling lens vesicle cavity
	■ Adenohypophysis no longer open to pharyngeal cavity
	■ Arhistriatum
	■ Brain: Dentate nucleus in internal cerebellar swellings
	■ Brain: Pineal recess emerges representing anterior lobe of epiphysis
	■ Brainwave activity has begun
	■ Cerebrospinal fluid production begins
	■ Choroid plexuses in fourth and lateral ventricles
	■ Corpus striatum much larger extending to preoptic sulcus; has subtle groove
	■ External cerebellar swellings contain future flocculus
	■ Four amygdaloid nuclei
	■ Fourth ventricle: Choroid folds
	■ Hippocampus reaches olfactory region
	■ Interpeduncular fossa
	■ Neurohypophysis walls are folded
	■ Nucleus ambiguus of the vagus (CN10)
	■ Prosencephalic septum
	■ Red nucleus
	■ Substantia nigra
	■ Supraoptic commissure
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	■ Greater thymic bud

	<ul style="list-style-type: none"> ▢ Cheeks form by merging of maxillary and mandibular processes
	<ul style="list-style-type: none"> ▢ Mammary gland primordium
	<ul style="list-style-type: none"> ▢ Mammary ridge disappears leaving only mammary gland primordium
	<ul style="list-style-type: none"> ▢ Female duct
	<ul style="list-style-type: none"> ▢ Gonads extend from levels T-10 to L-2
	<ul style="list-style-type: none"> ▢ Rete ovarii (in female embryos)
	<ul style="list-style-type: none"> ▢ Rete testis begins emerging from seminiferous cords (Stage 19-23) (in male embryos)
	<ul style="list-style-type: none"> ▢ Tunica albuginea in male embryos
	<ul style="list-style-type: none"> ▢ Suprarenal gland: Cortex
	<ul style="list-style-type: none"> ▢ Suprarenal gland: Medulla populated by prechromaffin cells
	<ul style="list-style-type: none"> ▢ Arms point forward
	<ul style="list-style-type: none"> ▢ Beginnings of occipital and sphenoid bones
	<ul style="list-style-type: none"> ▢ Bilateral cartilaginous sternal bars tie ribs together; sternal bars join cranially to form the episternal bar in the midline
	<ul style="list-style-type: none"> ▢ Cartilage within otic capsule envelops semicircular canals and cochlear duct
	<ul style="list-style-type: none"> ▢ Cartilaginous styloid process
	<ul style="list-style-type: none"> ▢ Ear: Cartilaginous malleus, incus, and stapes (the middle ear ossicles)
	<ul style="list-style-type: none"> ▢ Ectomeninx covers lateral and dorsal surfaces of brain (laying the foundation for the flat bones of the skull)
	<ul style="list-style-type: none"> ▢ Intervertebral discs form from caudal condensed portion of sclerotomes
	<ul style="list-style-type: none"> ▢ Ischium and ilium
	<ul style="list-style-type: none"> ▢ Labiodental lamina: Inner dental lamina and outer labiokingival band
	<ul style="list-style-type: none"> ▢ Laryngeal cartilages
	<ul style="list-style-type: none"> ▢ Limbs point forward (ventrally)
	<ul style="list-style-type: none"> ▢ Orbitosphenoid cartilage located within ectomeninx near optic stalk
	<ul style="list-style-type: none"> ▢ Ossification begins in maxilla (stages 19 -20)
	<ul style="list-style-type: none"> ▢ Primitive palate (or intermaxillary segment)
	<ul style="list-style-type: none"> ▢ Rib primordia become cartilaginous
	<ul style="list-style-type: none"> ▢ Ribs each have an identifiable head and shaft
	<ul style="list-style-type: none"> ▢ Trachea: Tracheal cartilage
	<ul style="list-style-type: none"> ▢ U-shaped labiodental lamina form along upper and lower oral cavity
	<ul style="list-style-type: none"> ▢ Vertebral column represented by cartilaginous centrum, neural arch, and short transverse process
	<ul style="list-style-type: none"> ▢ Esophagus: Muscularis layer adjacent to esophageal plexus
	<ul style="list-style-type: none"> ▢ Gluteal muscle group
	<ul style="list-style-type: none"> ▢ Iliopsoas muscles

	Infrahyoid muscles
	Internal intercostal muscles
	Limb extensor muscles located dorsally
	Limb flexor muscles located ventrally
	Midgut: Muscularis
	Muscle tissue forming around phrenic nerve within septum transversum portion of diaphragm
	Pharyngeal constrictor muscle
	Premuscle mass of the muscles of mastication innervated by mandibular nerve
	Quadratus lumborum muscle
	Rhomboid and scalene muscles
	Sternocleidomastoid and trapezius muscles distinct and innervated by separate branches of spinal accessory nerve (CN XI)
	Thenar and hypothenar eminences
	Tongue forms from swellings in floor of pharynx
	Tongue: Extrinsic muscles identifiable
	Tongue: Intrinsic muscles identifiable
	Transversospinal and erector spinae muscle groups
	Upper limb flexors innervated by musculocutaneous, median, and ulnar nerves
	Major calyces, cranial and caudal, with collecting tubules within metanephrogenic mass
	Mesonephros extends from T-9 to L-3
	Metanephros extends from T-12 to L-2
	Renal capsule covers distal collecting tubules
	Renal vesicles form in part of metanephros
	Ureter forms from "proximal segment of metanephric diverticulum"
	Urogenital sinus comprised of three parts: Bladder, pelvic, and phallic portions
	Anal folds adjacent to anal membrane
	Anal membrane
	Duodenum: "Assumes the shape of an arc"
	Greater omentum
	Lateral palatine process
	Liver: rapid growth, right side greater than left
	Median mandibular groove disappears as mandibular processes merge in midline
	Palatine fossa (from pharyngeal pouch 2)
	Primitive oral cavity
	Primitive rima oris replaces stomodeum
	Stomach wall layers: Mucosa, submucosa, muscularis, and serosa
	Submandibular and parotid gland buds
	Submandibular gland duct

	<ul style="list-style-type: none"> ■ Bronchial tree: First generation of subsegmental bronchi complete
	<ul style="list-style-type: none"> ■ Glottis, primitive
	<ul style="list-style-type: none"> ■ Lung sac, right: Oblique and horizontal fissures define upper, lower, and middle lobes
	<ul style="list-style-type: none"> ■ Lung sac: Apex and base
	<ul style="list-style-type: none"> ■ Lung, left: Oblique fissure defines upper and lower lobes
	<ul style="list-style-type: none"> ■ "Septum primum fuses with endocardial cushions" obliterating ostium primum and creating the ostium secundum
	<ul style="list-style-type: none"> ■ Apex of left ventricle
	<ul style="list-style-type: none"> ■ Circulus arteriosus (Circle of Willis) complete
	<ul style="list-style-type: none"> ■ External iliac arteries
	<ul style="list-style-type: none"> ■ Iliac lymph sac
	<ul style="list-style-type: none"> ■ Intercostal and subcostal arteries
	<ul style="list-style-type: none"> ■ Internal thoracic artery and costocervical trunk
	<ul style="list-style-type: none"> ■ Mesenteric lymph sac
	<ul style="list-style-type: none"> ■ Mesonephric artery feeds mesonephros, gonads, and suprarenal glands
	<ul style="list-style-type: none"> ■ Origin of right coronary artery
	<ul style="list-style-type: none"> ■ Paired common iliac veins feed inferior vena cava
	<ul style="list-style-type: none"> ■ Papillary muscles
	<ul style="list-style-type: none"> ■ Pontine, superior cerebellar, and anterior and posterior inferior cerebellar arteries replace myelencephalic and metencephalic arteries
	<ul style="list-style-type: none"> ■ Primitive marginal sinus drains diencephalon
	<ul style="list-style-type: none"> ■ Primitive tentorial sinus drains cerebral vesical
	<ul style="list-style-type: none"> ■ Primitive transverse and sigmoid sinuses
	<ul style="list-style-type: none"> ■ Pulmonary arteries (right and left)
	<ul style="list-style-type: none"> ■ Splenic vein
	<ul style="list-style-type: none"> ■ Tricuspid and mitral valves
	<ul style="list-style-type: none"> ■ Anterior chamber between iridopupillary membrane and thickened ectoderm
	<ul style="list-style-type: none"> ■ Auditory tube and primitive tympanic cavity form from tubotympanic recess pharyngeal pouch 1)
	<ul style="list-style-type: none"> ■ Celiac, superior mesenteric, and inferior mesenteric preaortic ganglia
	<ul style="list-style-type: none"> ■ Choana
	<ul style="list-style-type: none"> ■ Cochlear duct tip grows upward
	<ul style="list-style-type: none"> ■ Esophageal plexus formed by vagal nerves (CN X)
	<ul style="list-style-type: none"> ■ Facial nerve (CN VII) branches: Chorda tympani, greater petrosal, posterior auricular, and digastric
	<ul style="list-style-type: none"> ■ Facial nerve (CN VII) reaches cervicomandibular region
	<ul style="list-style-type: none"> ■ Glossopharyngeal nerve (CN IX) innervates stylopharyngeus pre-muscle mass
	<ul style="list-style-type: none"> ■ Hypoglossal nerve (CN XII) innervates separating tongue muscles

	■ Linguoingival groove
	■ Nasolacrimal duct forms from maxillonasal groove
	■ Nasolacrimal ducts extend from medial eyes to primitive nasal cavity
	■ Nerve fibers begin extending from retina
	■ Optic fibers enter chiasmatic plate
	■ Primitive nasal cavity
	■ Primordial vitreous body
	■ Superior, middle, and inferior cervical ganglia
	■ Trigeminal nerve (CN V) with ophthalmic, maxillary, and mandibular divisions reach their destinations
	■ Vagal trunks, anterior and posterior, extending into abdomen
	■ Eyelids: Upper and lower lids present and growing
	■ Sacculae and cochlear duct
	■ Adenohypophysis: Lateral lobes of pars tuberalis
	■ Adenohypophysis: Pars intermedia emerging
	■ Brain: Internal capsule formation underway
	■ Cerebral hemispheres cover half of diencephalon
	■ Dorsal and ventral cochlear nuclei
	■ Fourth ventricle: Lateral recesses
	■ Ganglion of nervus terminalis
	■ Globus pallidus externus in the diencephalon
	■ Habenular commissure
	■ Intermediate layer in dorsal thalamus
	■ Lemniscal decussation
	■ Lower limb nerves (femoral, obturator, sciatic, common peroneal, and tibial) identifiable
	■ Medial accessory olivary nucleus
	■ Neurohypophyseal bud
	■ Nuclei of forebrain septum
	■ Nucleus accumbens
	■ Occipital pole of cerebral hemispheres
	■ Optic stalk with barely discernible lumen
	■ Paraphysis marks dividing line in roof between telencephalon and diencephalon
	■ Primitive filum terminale
	■ Radial nerve innervates upper limb extensors
	■ Rhombomeres no longer distinguishable
	■ Subcommissural organ
	■ Zona limitans intrathalamica between dorsal and ventral thalami
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.
	 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	 Facial processes no longer distinguishable
	 Ovaries full of primitive oogonia, intermediate pregranulosa cells, and mesenchyme
	 Testes with short straight tubules
	 Upper limbs with slightly flexed elbows
	 Diaphragm: Central tendon
	 Renal vesicles with S-shaped lumina
	 Submandibular gland: Solid epithelial ducts enlarge and begin to branch
	 Adenohypophysis with new capillaries on rostral surface
	 Scalp vascular plexus
	 Cochlear duct tip growing horizontally
	 Lens cavity completely filled
	 Optic commissure
	 Optic fibers extend to optic chiasma
	 Cornea with three layers
	 Brain: Inferior colliculus (in mesencephalon)
	 Cerebral hemispheres expand beyond lamina terminalis
	 Cerebral hemispheres extend over two-thirds of diencephalon
	 Interpeduncular groove
	 Medial septal nucleus
	 Nigrostriatal fibers
	 Nucleus of diagonal band
	 Sacrocaudal spinal cord formation (secondary neurulation) complete
	 Sensory pathways: Cuneate and gracile decussating fibers
	 Septum verum
	 Spinothalamic tract
7 weeks, 1 day - 8 weeks	 Stomach: Folds in stomach wall
7 weeks, 2 days	 Arteries and veins of heart complete
7 weeks, 3 days	 Volar pads begin to emerge on fingertips

	<ul style="list-style-type: none"> Chondrocranium with dorsum sellae and hypophysial fossa
	<ul style="list-style-type: none"> Dens (of second cervical vertebrae)
	<ul style="list-style-type: none"> Sternoclavicular joint and manubrium
	<ul style="list-style-type: none"> The knee joints have arrived
	<ul style="list-style-type: none"> Trachea: Thyroid cartilage
	<ul style="list-style-type: none"> Wrists slightly flexed
	<ul style="list-style-type: none"> Gluteus medius and gluteus minimus muscles
	<ul style="list-style-type: none"> Iliacus muscles
	<ul style="list-style-type: none"> Mylohyoid and infrahyoid muscles
	<ul style="list-style-type: none"> Orbicularis oculi muscles
	<ul style="list-style-type: none"> Submandibular gland: Solid ducts with definitive branches
	<ul style="list-style-type: none"> Anterior and posterior choroid arteries
	<ul style="list-style-type: none"> Left superior vena cava disappears (Stages 21-23)
	<ul style="list-style-type: none"> Scalp vascular plexus moving toward vertex
	<ul style="list-style-type: none"> Cornea: Substantia propria layer
	<ul style="list-style-type: none"> Fibers of optic nerve reach brain
	<ul style="list-style-type: none"> Eyelids growing rapidly
	<ul style="list-style-type: none"> Anterior and inferior horns of lateral ventricle
	<ul style="list-style-type: none"> Brain: Insula within cerebral hemisphere
	<ul style="list-style-type: none"> C-shaped lateral ventricle
	<ul style="list-style-type: none"> Cerebral hemispheres cover 75% of diencephalon
	<ul style="list-style-type: none"> Cerebral hemispheres cover more than half of diencephalon
	<ul style="list-style-type: none"> Cortical plate within primordial plexiform layer
	<ul style="list-style-type: none"> Glial and neurilemmal (Schwann) cells within cranial nerves
	<ul style="list-style-type: none"> Global pallidus internus
	<ul style="list-style-type: none"> Internal fiber layer of cerebellum
	<ul style="list-style-type: none"> Lateral olfactory tract
	<ul style="list-style-type: none"> Primordium of dentate nucleus
	<ul style="list-style-type: none"> Pyramidal cells in hippocampus
	<ul style="list-style-type: none"> Subthalamic nucleus proper, entopeduncular nucleus, and globus pallidus externus within subthalamus
	<ul style="list-style-type: none"> Sulcus transversus rhombencephali
	<ul style="list-style-type: none"> Ventral part of lateral geniculate body
7½ weeks	<ul style="list-style-type: none"> Hands begin to touch face The hands touch each other as do the feet!
	<ul style="list-style-type: none"> Fingertips thicken
	<ul style="list-style-type: none"> Plantar pads toes
	<ul style="list-style-type: none"> 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
	<ul style="list-style-type: none"> Bone-forming cells emerge
	<ul style="list-style-type: none"> Endolymphatic and jugular foramina

	<input type="checkbox"/> Hands can reach one another and fingers can overlap
	<input type="checkbox"/> Optic foramen, foramen rotundum, internal acoustic foramen
	<input type="checkbox"/> Osteoblasts emerge
	<input type="checkbox"/> Pelvis: Obturator foramen
	<input checked="" type="checkbox"/> Obturator internus muscles
	<input checked="" type="checkbox"/> Rectus femoris muscle
	<input checked="" type="checkbox"/> Large glomeruli present within metanephros
	<input checked="" type="checkbox"/> Submandibular gland: Secondary branching with lumen formation starting at oral end of duct
	<input checked="" type="checkbox"/> Costodiaphragmatic recess of pleural cavity
	<input checked="" type="checkbox"/> Chordae tendineae (Stages 22 and 23)
	<input checked="" type="checkbox"/> Intradural veins (sinuses)
	<input checked="" type="checkbox"/> Scalp vascular plexus 75% of the way to the vertex
	<input checked="" type="checkbox"/> Cochlear duct's second loop growing upward
	<input checked="" type="checkbox"/> Scleral condensation
	<input checked="" type="checkbox"/> Tragus and antitragus taking shape
	<input checked="" type="checkbox"/> Eyelids continue growing rapidly over the surface of the cornea
	<input checked="" type="checkbox"/> Optic nerve acquires a sheath
	<input checked="" type="checkbox"/> Brain: Claustrum
	<input checked="" type="checkbox"/> Brain: Cortical plate within cerebral hemispheres
	<input checked="" type="checkbox"/> Brain: Internal capsule with connections to epithalamus, dorsal thalamus, and mesencephalon
	<input checked="" type="checkbox"/> Brain: Putamen
	<input checked="" type="checkbox"/> Cerebral hemispheres cover 75% of diencephalon
	<input checked="" type="checkbox"/> Commissural plate thickens
	<input checked="" type="checkbox"/> Cortical plate expanding rapidly
	<input checked="" type="checkbox"/> Folds in roof of third ventricle
	<input checked="" type="checkbox"/> Nerve fibers between neopallial subplate and internal capsule
	<input checked="" type="checkbox"/> Thalamocortical fibers
7 weeks, 6 days	<input type="checkbox"/> The toes are free
8 weeks	<input checked="" type="checkbox"/> Complex response to touch
	<input checked="" type="checkbox"/> More frequent hand-to-face contact
	<input checked="" type="checkbox"/> Mouth opens & closes
	<input checked="" type="checkbox"/> Squinting
	<input checked="" type="checkbox"/> The embryo floats and rolls over in the womb
	<input checked="" type="checkbox"/> Hairs first appear in eyebrows & around mouth
	<input checked="" type="checkbox"/> Skin multi-layered, loses transparency
	<input checked="" type="checkbox"/> Ductus deferens
	<input checked="" type="checkbox"/> Interstitial cells forming within testis
	<input checked="" type="checkbox"/> Testicular tubules
	<input checked="" type="checkbox"/> Male embryos are making testosterone already!
	<input type="checkbox"/> Anterior inferior iliac spine
	<input type="checkbox"/> Costal cartilage

	<input type="checkbox"/> Enamel organ
	<input type="checkbox"/> Femur: Head and acetabular fossa
	<input type="checkbox"/> Glenoid fossa
	<input type="checkbox"/> Greater trochanter
	<input type="checkbox"/> Head of humerus
	<input type="checkbox"/> Inguinal ligament
	<input type="checkbox"/> Joint development: Cavitation underway in hip, knee, and ankle (in some embryos)
	<input type="checkbox"/> Joint development: Cavitation underway in shoulder, elbow, and wrist (in some embryos)
	<input type="checkbox"/> Nucleus pulposus (from notochord)
	<input type="checkbox"/> Ossification underway in scapula and distal phalanges in some embryos
	<input type="checkbox"/> Pubic symphysis
	<input type="checkbox"/> Scapular spine and notch
	<input type="checkbox"/> Skull: Foramen magnum (wide)
	<input type="checkbox"/> Skull: Ossification underway in some embryos
	<input type="checkbox"/> Superior and inferior pubic rami
	<input type="checkbox"/> The embryo's joints are similar to adult joints
	<input type="checkbox"/> Ulna: Styloid process and olecranon
	<input type="checkbox"/> Vertebrae cartilaginous (33 or 34 in number)
	<input checked="" type="checkbox"/> Anterior digastric muscles
	<input checked="" type="checkbox"/> Depressor anguli oris muscle
	<input checked="" type="checkbox"/> Diaphragm complete
	<input checked="" type="checkbox"/> Esophagus: Longitudinal muscles
	<input checked="" type="checkbox"/> Obliquus superior capitis muscle
	<input checked="" type="checkbox"/> Obturator externus, gluteus maximus, and hamstring muscles
	<input checked="" type="checkbox"/> Posterior belly of the digastric muscle
	<input checked="" type="checkbox"/> Psoas tendon
	<input checked="" type="checkbox"/> Rectus sheath with anterior and posterior lamina
	<input checked="" type="checkbox"/> Temporal and lateral pterygoid muscles
	<input checked="" type="checkbox"/> Zygomaticus major muscle
	<input checked="" type="checkbox"/> Bladder: Muscularis layer
	<input checked="" type="checkbox"/> Kidneys at level of first three lumbar vertebrae
	<input checked="" type="checkbox"/> Metanephros: Numerous large glomeruli
	<input checked="" type="checkbox"/> Metanephros: Secretory tubules elongating and becoming convoluted
	<input checked="" type="checkbox"/> Sinus tubercle
	<input checked="" type="checkbox"/> Urethra
	<input checked="" type="checkbox"/> Urine production and release
	<input checked="" type="checkbox"/> Gastrolial ligament
	<input checked="" type="checkbox"/> Nerves reaching intestinal loop
	<input checked="" type="checkbox"/> Peristalsis in large intestine
	<input checked="" type="checkbox"/> Submandibular gland: Lumen present in terminal portions of duct

	<ul style="list-style-type: none"> Submandibular gland: Mesodermal sheath surrounds gland
	<ul style="list-style-type: none"> Unfused uvula (edge of unfused palatine shelf) and secondary palate
	<ul style="list-style-type: none"> Occasional breathing motions begin Pseudoglandular stage begins
	<ul style="list-style-type: none"> Azygos vein Blood supply to the brain closely resembles adult pattern
	<ul style="list-style-type: none"> Hemiazygos veins Inferior epigastric artery
	<ul style="list-style-type: none"> Inferior vena cava valve at junction of right atrium Scalp vascular plexus nearing vertex
	<ul style="list-style-type: none"> Submandibular glands: Angiogenesis begins around epithelial tree (ducts) Superior sagittal sinus
	<ul style="list-style-type: none"> Cochlear duct's 2.5 coils nearly complete Cranial nerve distribution mimics adult pattern Ear drum Eye: Secondary vitrous body Lens: Secondary lens fibers emerging Retina: Eight layers present Retina: Four of the ten adult layers present Tympanic membrane Eyelids fusing laterally and medially Optic tract reaches ventral portion of lateral geniculate body
	<ul style="list-style-type: none"> "The hindbrain "presents striking resemblance to that of the newborn." "The rhombencephalon...presents striking resemblance to that of the newborn."
	<ul style="list-style-type: none"> Amygdala area Brain represents 43% of embryo Brain: Caudate nucleus and putamen within corpus striatum Cerebellar commissures Cerebellum with external germinal layer Cerebral hemispheres cover lateral portion of diencephalon Choroid plexus now lobular Cortical plate covers nearly all of neopallial surface Dura lines entire vertebral canal Fasciculus cuneatus and fasciculus gracilis form the decussation of the medial lemnisci Greater palatine nerve Grey and white matter Hippocampus reaches temporal pole

	<input checked="" type="checkbox"/> Inferior and superior cerebellar peduncles
	<input checked="" type="checkbox"/> Most cisterns present
	<input checked="" type="checkbox"/> Principal nucleus of inferior olivary nuclei
	<input checked="" type="checkbox"/> Pyramidal decussations
	<input checked="" type="checkbox"/> Right- and left-handedness emerges
	<input checked="" type="checkbox"/> Suprapineal recess
	<input checked="" type="checkbox"/> Suprascapular nerve
	<input checked="" type="checkbox"/> Vermis of cerebellum
	<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

8 weeks, 1 day	<input checked="" type="checkbox"/> Humerus: Bone marrow replaces cartilage
8 weeks, 1 day - 9 weeks	<input checked="" type="checkbox"/> Anal canal patent
8½ weeks	<input checked="" type="checkbox"/> Eyelids completely fused
	<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 type="checkbox"/> Female fetuses have early reproductive cells in their ovaries
	<input type="checkbox"/> Thyroid gland weighs 2 grams
	<input checked="" type="checkbox"/> Small intestine peristalsis
	<input checked="" type="checkbox"/> External capsule
	<input checked="" type="checkbox"/> Face, hands, and feet sense light touch
	<input checked="" type="checkbox"/> Olivary nucleus with five components

Unit 10: 9 to 10 Weeks

9 weeks - 10 weeks	<input checked="" type="checkbox"/> Early vocal cords
	<input checked="" type="checkbox"/> Larynx recanalizes
	<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 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 checked="" type="checkbox"/> Glomeruli formation begins

	<ul style="list-style-type: none"> ■ Physiologic herniation ends ■ Commissure of the fornix ■ Corpus callosum begins Crown-heel length 7.5 cm
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Unit 11: 10 to 11 Weeks

10 weeks - 12 weeks	■ Langerhans cells enter epidermis
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
	■ Small intestine lined with villi
	■ 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
	■ Sebaceous glands
	■ Many different hormones are present in pituitary gland
	■ Thyroid gland produces hormone
	■ Palate fuses
	■ Upper limbs reach final proportion
	■ All facial muscles in final positions
	■ Bladder resembles smooth muscle
	■ Bile production begins in liver
	■ Bowel movements
	■ There are taste buds all over the mouth
	■ Corpus callosum
	■ Crura cerebri
	■ Myelination in spinal cord
	 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

	<ul style="list-style-type: none"> 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
16 weeks	<ul style="list-style-type: none"> Quickening Fat deposits upper & lower limbs Tooth enamel Colon lined with villi Bronchial tree nearly complete Canalicular stage begins 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"> Apocrine sweat glands 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 Sulci on surface of cerebral hemispheres
20 weeks	<ul style="list-style-type: none"> All skin layers and structures Peyer's patches 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"> Periderm disappears 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 —  Blink-startle response; females before males
 Crown-heel length 34.5 cm

Unit 16: 6 to 7 Months

25 weeks —  Intestinal lining contains all adult cell types
 Rods & cones

 The ability to taste

26 weeks —  Additional fat deposits decrease wrinkles
 Tear production

 Terminal sac stage begins

 The ability to smell has arrived

26 weeks - 38 weeks —  Brain weight increases 400% to 500%

27 weeks —  Pupils react to light

28 weeks —  Distinguishes sounds of different frequencies

 Crown-heel length 39.5 cm

Unit 17: 7 to 8 Months

30 weeks —  Breathing motions are common even though there is no air in the womb

 6-layered cerebral cortex

 Head circumference 30 cm

32 weeks —  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 —  Prenatal food affects newborn taste preferences

34 weeks —  Rapid weight gain

35 weeks —  Firm grip

 Amniotic fluid volume peaks

36 weeks —  Surfactant production accelerates

 Brain weight 300 grams

 Crown-heel length 48.5 cm

Unit 19: 9 Months to Birth

37 weeks —  Fetus drinks an estimated 15 oz (or 450cc) of amniotic fluid/day

38 weeks —  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

