Revision Notes on Locomotion and Movement

Types of Bones and their Description

Name	No.	Description
Frontal	1	Forms the forehead (anterior or front part of the top of cranium) and some upper parts (roofs) of eye orbits or sockets and nasal cavities. A newborn infant displays a faint suture in midline of frontal, indication that adult frontal is actually formed of two completely fused frontal.
Parietals	2	Articulated to and situated just behind frontal. Form the main parts of bulging top and sides of cranium.
Occipital	1	Articulated to and situated just behind parietals. Forms posterior (back) and lower (base) parts of cranium. Foramen magnum is a large perforation in this bone. On each side of the foramen, the occipital bears a prominent elevation called occipital condyle. The condyles articulate the skull with first vertebra (atlas). Thus, human skull is dicondylic.
Temporals	2	Form lower parts of right and left sides of cranium, as well as, the floor of cranial cavity. These house structures of internal and middle ears and form a part of external auditory meatuses. The middle ear of each side encloses the three small ear ossicles – malleus, incus and stapes.
Sphenoid	1	A typically butterfly-shaped bone that forms the middle and anterior parts of base of cranium in front of occipital in the middle and temporals on the sides. It articulates with all skull bones, keeping these firmly together. It also forms parts of lateral walls and floors of eye orbits.
Ethmoid	1	A small, irregular bone in front of sphenoid and behind nasal bones. It fashions the front (anterior) extremity and closer of cranial cavity. It also contributes to the architecture of eye orbits and proximal parts of nasal chambers.
Nasals	2	Small, oblong bones in middle of upper part of face, forming proximal part of the bridge of our nose. The remaining, lower part of our nose is formed of cartilage.
Inferior nasal conchae (Turbinales)	2	Two highly coiled, scroll-like processes of ethmoid bone, called conchae project into each nasal cavity from lateral wall of the proximal bony part of concerned nasal chamber. One ethmoidal concha is superior (uppermost). The other one is called middle concha, because it is followed by a thin, separate scroll-like bone which is named inferior nasal concha or turbinate.
Vomer	1	A thin, elongated, platelike bone, forming a part of the septum which separates the two nasal cavities.
Lacrimals	2	Small and thin, finger-shaped bones, each located in front part of the medial (inner) side of corresponding eye orbit. these form a part of the passages of corresponding tear ducts.
Zygomatics (Malars)	2	Cheek-bones; form the prominences of our cheeks and parts of the floor and side walls of eye orbits.
Palatines	2	L-shaped bones that form the back (posterior) part of our hard palate (roof of mouth). Also contribute to the framework of nasal cavities and floor of eye orbits.
Maxillae	2	Large, upper jaw bones that form the major part of our face and upper jaw. Comprise entire front (anterior) part of our hard palate. Also contribute to the architecture of eye orbits and nose. Bear the teeth of upper jaw.
Mandible	1	Largest bone of our face, and strongest of all bones of the body. Forms entire lower jaw and bears all lower jaw teeth. Articulated with temporal bones of skull.

Important Tips

(1) Exoccipital and sphenethmoid bones are cartilaginous, sphenethmoid is unpaired bone.

(2) Pterygoid is the Y-shaped bone.

(3) Zygomatic arch is found in upper jaw and formed by maxilla, squamosal and jugal.

(4) The bones common to face and cranium are frontal.

(5) Turbinal bones are present in the nasal passage.

(6) Dermatocranium of skull comprises of membranous bone.

(7) Turbinals bones are present in the nasal passage and increase the sensory surface of olfactory chambers.

(8) Tympanic bulla enclosing the tympanus in mammal.

(9) Coronoid process is a part of lower jaw in mammalian skull.

(10) Lacrimal bone is situated infront of the eye orbit close to the frontal bone.

(11) Mastoid bone is found in auditory region.

(12) Frontoparietal is the membranous bone in frog.

(13) Anterior cornua of the hyoid apparatus of frog articulate with auditory capsule.

(14) Hyoid apparatus of frog is situated in the floor of pharynx.

(15) Sella turcica is found in base-sphenoid bone. It is a depression in skull which lodges the pituitary body.

(16) Amphibian & mammalia has dicondylic skull and reptiles, birds has monocondylic skull.

(17) Alar process is a part of hyoid apparatus.

(18) The hyoid apparatus of frog is entirely cartilaginous except posterior cornua.

(19) Septum axillary in the paired bone in frog.

(20) Pterygoid and palatines are paired bones on ventral side of skull of frog.

(21) Hammer shaped bone in skull of frog is squamosal.

(22) Pterygoid is membranous bone in frog skull.

(23) Frog has no basisphenoid bone.

(24) Vomer is paired dorsal bone in frog skull.

Difference between Thoracic and Lumbar vertebra

S.No.	Characters	Thoracic vertebra	Lumbar vertebra
1.	Neural spine	Long undivided and downward directed.	Short, flat and upward directed.
2.	Facet for ribs	Present on transverse process and centrum.	Absent.
3.	Transverse process	Club-shaped.	Thin and elongated.

Difference between Male and Female pelvis

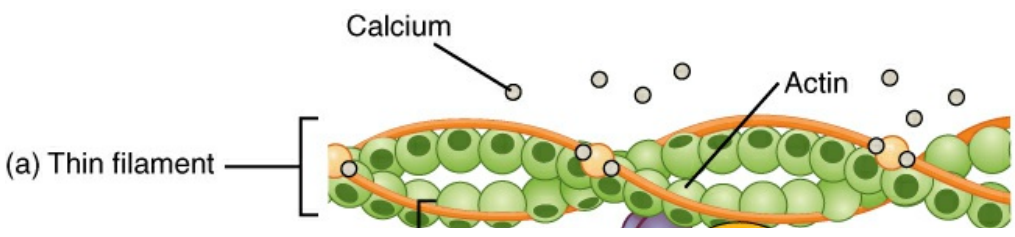
S.No.	Characters	Male pelvis	Female pelvis
1.	Nature of bones of pelvic girdles	Heavier and longer	Lighter and smaller
2.	Sacrum	Less concave	More concave anteriorly
3.	Pelvis	Shallow, narrow and round	Deep, wide and funnel-shaped

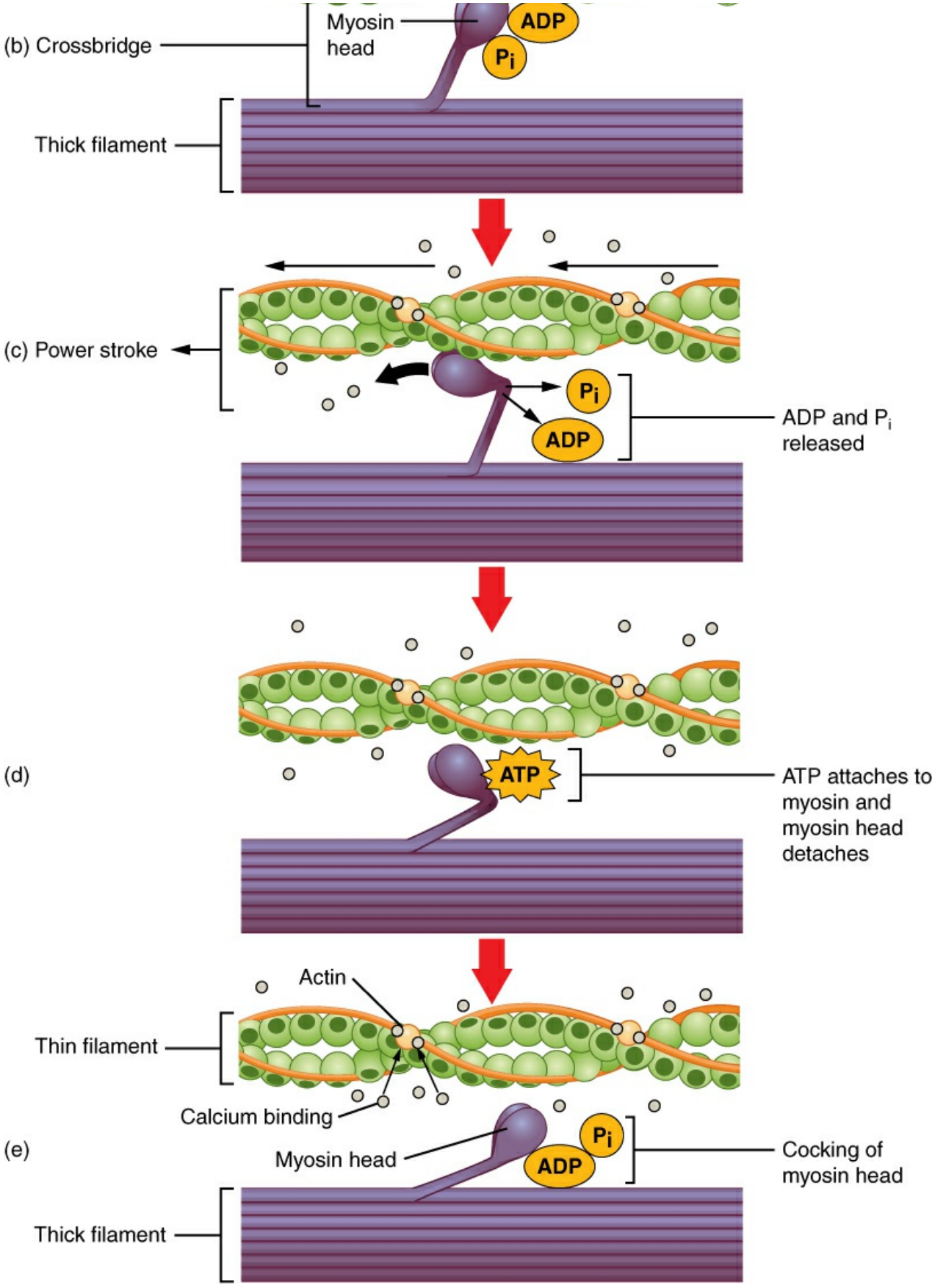
MAN

Important points of skeleton

Total number of bones : 206 Bones	
Skull : 29 Bones Cranium : 8 Bones Occipital : 1 Bone Parietal : 2 Bones Frontal : 1 Bones Temporal : 2 Bones Sphenoid : 1 Bone Ethmoia : 1 Bone	Facial region : 14 Bones Nasals : 2 Bones Vomer : 1 Bones Terbinal : 2 Bones Lacrymal : 2 Bones Zygomatic : 2 Bones Palaline : 2 Bones Maxilla : 2 Bones Mandible : 1 Bones
Coccyx : Fusion of 4 caudal vertebrae In boy : 5 sacral vertebrae In adult : Only one sacrum RIBS in man : 12 pairs True ribs : 7 pairs False ribs : 3 pairs Floatting ribs : 2 pairs	Vertebral formula = 33 C TH L S C – – – – – 7 12 5 5 4 Sacrum coccyx In adult = 26 C TH L S C – – – – – 7 12 5 1 1 Sacrum coccyx
Ear ossicles Mallus : 2 Bones Incus : 2 Bones Stapes : 2 Bones Hyoid : 1 Bone	Vertebral column : 26 Bones Sternum : 1 Bone Ribs : 24 Bone Pectoral girdle : 4 Bones Pelvic girdle : 2 Bones Fore limbs : 60 Bones (30 in each) Hind limbs : 60 Bones (30 in each) Total : 206 Bones In child : Bones 300

Muscle Contraction





From excitation to contraction to relaxation, following occurs within a skeletal muscle:

(1) An electrical signal (action potential) travels down a nerve cell. This in turn causes to release a chemical

message (neurotransmitter). This chemical message is released into a small gap between the nerve cell and muscle cell. This gap is called synapse.

(2) The neurotransmitter then crosses the gap. It binds to a protein (receptor) on the muscle-cell membrane which causes an action potential in the muscle cell.

(3) The action potential spreads along the muscle cell.

(4) The action potential enters the cell through T-tubule.

(5) The action potential opens gate in the muscle's calcium store.

(6) Calcium ions flow into the cytoplasm.

(7) Calcium ions bind to troponin-tropomyosin molecules. These are located in the grooves of the actin filaments.

(8) The sites on actin where myosin can form crossbridges are covered by the rod-like tropomyosin molecule.

(9) On binding calcium ions, troponin changes shape. It then slides tropomyosin out of the groove, exposing the actin-myosin binding sites.

(10) Myosin interacts with actin by cycling crossbridges. The muscle thereby creates force, and shortens.

(11) After the action potential has passed, the calcium gates close automatically.

(12) Calcium pumps remove calcium from the cytoplasm. These pumps are located on the sarcoplasmic reticulum.

(13) As the calcium gets pumped back into the sarcoplasmic reticulum, calcium ions come off the troponin.

(14) The troponin returns to its normal shape.

(15) Troponin allows tropomyosin to cover the actin-myosin binding sites on the actin filament.

(16) As no binding sites are available now, hence no crossbridges can form, and the muscle relaxes.

Note:-

(1) The activities of muscle contraction and relaxation require energy.

(2) Muscles use energy in the form of ATP. The energy from ATP is used to reset the myosin crossbridge head and release the actin filament.

(3) In order to make ATP, the muscles do the following:

(a) Breaks down creatine phosphate.

(b) add phosphate to ADP to create ATP.

(c) Carry out anaerobic respiration, by which glucose is broken down to lactic acid and ATP is formed.

(d) Carry out aerobic respiration. Due to which glucose, glycogen, fats and amino acids are broken down in the presence of oxygen to produce ATP.