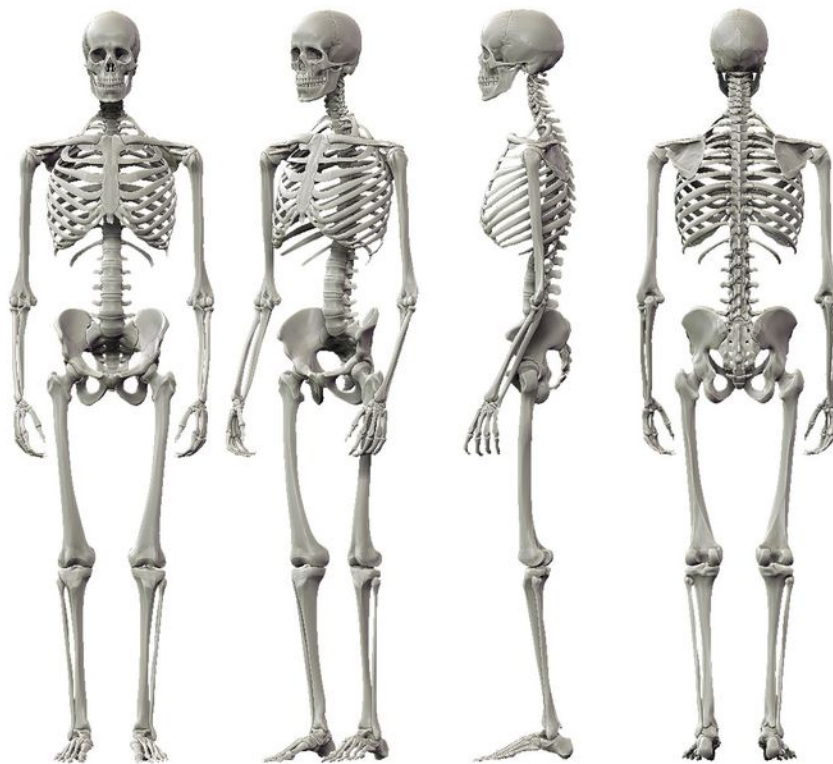


ANATOMY for Sport & Exercise Science

Unit 1

1.1 The Skeletal System



Name :

UNIT SPECIFICATION

Skeletal System - Bones

Anatomical Language

- Anatomical standing position (point of reference)
- Anterior
- Posterior
- Lateral
- Medial
- Proximal
- Distal
- Superior
- Inferior
- Peripheral
- Superficial
- Deep
- Supine
- Prone

Long Bone anatomy

- Periosteum
- Bone minerals
- Bone marrow
- Epiphysis
- Growth plates
- Diaphysis
- Cancellous bone
- Compact bone
- Articular cartilage.

Bony landmarks

- Notches
- Fossa
- Condyles
- Borders
- Processes
- Tuberosity

Process of bone growth & ossification

- Osteoclasts
- Osteoblasts
- Osteocytes
- Growth plates
- Epiphysis
- Bone remodelling
- Minerals - calcium, vitamin D

Skeletal bones

- Cranium
- Clavicle
- Ribs
- Sternum
- Scapula
- Humerus
- Radius
- Ulna
- Carpals
- Metacarpals
- Phalanges

Pelvis (ilium, ischium, pubis, iliac crest)

Vertebral column (cervical, thoracic, lumbar, sacrum, coccyx, curves of the spine) ☒

Femur

Patella

Tibia

Fibula

Tarsals

Calcaneus

Metatarsals

Bones of axial skeleton

Bones of appendicular skeleton

Types of bones

Long

Short

Flat

Sesamoid

Irregular

Skeletal system function

Supporting framework

Protection

Attachment for skeletal muscle

Source of blood cell production

Store of minerals

Movement

Skeletal System - Joints

Ligaments

- Role and function

Joints

- Fibrous (fixed)
- Cartilaginous (slightly moveable)
- Synovial (freely moveable)

Types of synovial joint

- Ball and socket
- Condylloid
- Gliding
- Saddle
- Hinge
- Pivot

Synovial Structure

- Joint capsule
- Bursa
- Articular cartilage
- Synovial membrane
- Synovial fluid
- Ligaments

Range of movement at joints

- Shape of bones and use

Muscular System

Types of muscles tissue

- Cardiac (non-fatiguing, involuntary).
- Skeletal (fatiguing, voluntary).
- Smooth (involuntary).

Types of muscle fibres

- Type I
- Type IIa
- Type IIx

Skeletal muscle anatomy

- Epimysium
- Perimysium
- Endomysium
- Fascicle

Neuromuscular junction

- Impulse & action potential
- NM junction
- Neurotransmitter

Sliding filament theory

- Calcium ions
- Myofibril
- Sarcomere
- Actin
- Myosin
- Cross-bridges
- H zone
- Z line

- A band
- I band
- Troponin
- Tropomyosin
- ATPase
- ATP

Types of muscle contraction

- Isometric
- Concentric
- Eccentric

Muscle fibre recruitment

- Recruitment at different levels of intensity of exercise

Muscles

- Deltoids (posterior, anterior, medial)
- Medial and lateral shoulder rotators
- Biceps brachii
- Triceps brachii
- Wrist flexors
- Wrist extensors
- Forearm supinators
- Forearm pronators
- Sternocleidomastoid
- Pectoralis major
- Rectus abdominis
- Obliques
- Transverse abdominis (TVA)

Quadriceps (rectus femoris, vastus medialis, vastus lateralis, vastus intermedius)

Iliopsoas

Tibialis anterior

Erector spinae

Trapezius

Rhomboids

Latissimus dorsi

Gluteals (gluteus maximus, gluteus medius, gluteus minimus)

Hamstrings (biceps femoris, semitendinosus, semimembranosus)

Gastrocnemius

Soleus

Antagonist muscle pairs

Agonist

Antagonist

Synergist

Fixator.

Movement Analysis

Types of movement

Flexion (horizontal flexion, hip flexion, shoulder flexion, plantarflexion, dorsiflexion, lateral flexion)

Extension (hyper-extension, horizontal extension, hip extension, shoulder extension)

Abduction

Adduction

Rotation (medial and lateral)

Circumduction

Pronation

Supination

Elevation

Depression

Protraction

Retraction

Planes of movement

Description of planes

Types of movement in each plane

Phases appropriate to the movement

Preparation

Execution

Follow through

Body sections for analysis

Upper body

Trunk

Lower body

Bones involved in the movement

Type of bone

Muscles involved in movement (muscle action)

Role / function of antagonistic pairs

Role / function of synergist muscles

Role / function of fixator muscles

Joints involved in movement

Type of joint

Bones forming each joint

Range of movement permitted at each joint.

Types of movements

Planes of movement

Movement efficiency

Dynamic (balanced) stability at joints and mobility at other joints

Kinetic chain

Transfer of movement across body segments

Transfer of loads and maintain force

Muscle balance

Mechanical efficiency

Functions of the Skeleton

Types of Bone

Type	Structure	Function	Examples

Bone (Endochondral) Formation, Growth & Re-modelling

What does endochondral mean?

What does osteogenesis mean?

Describe the process of bone growth. Use the diagram below and table provided. Ensure you use and understand the following terminology in your answer:

Osteoblasts
Epiphysis
Osteoclasts

Osteocytes
Diaphysis
Vitamin D

Minerals (calcium)
Bone re-modelling
Growth plates

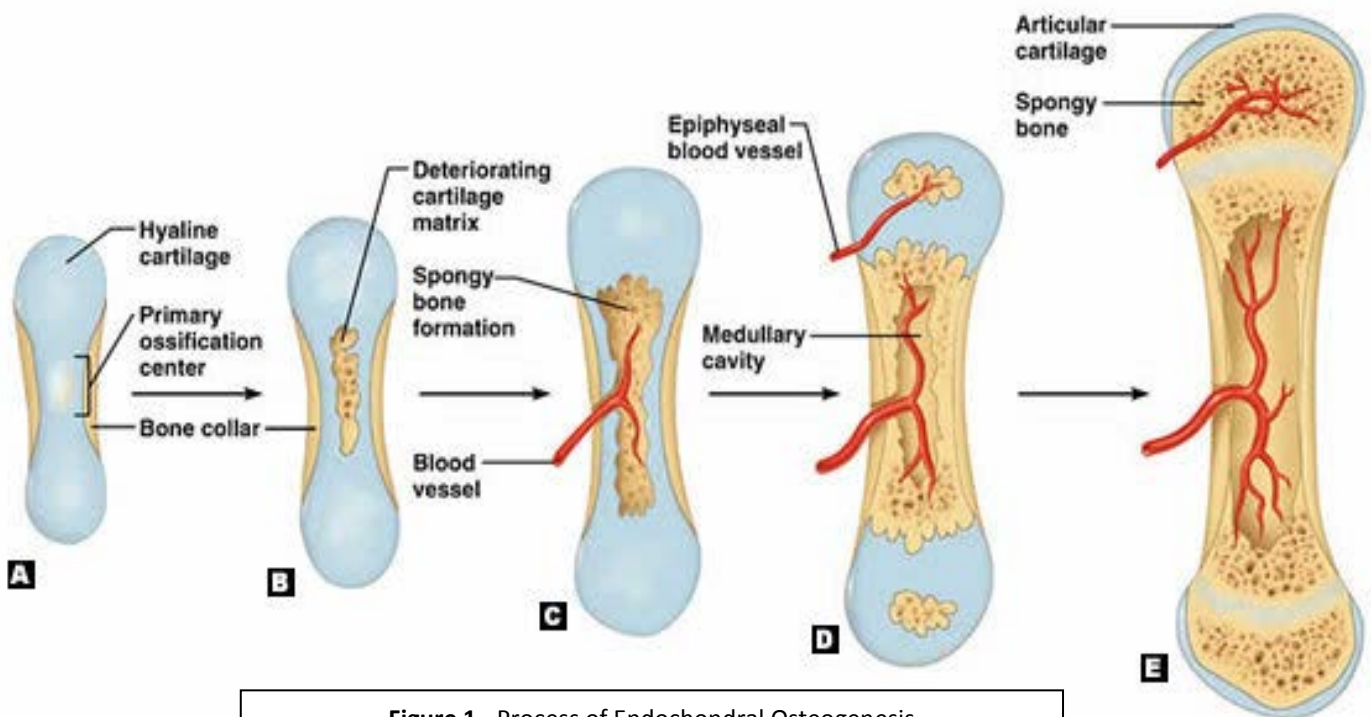
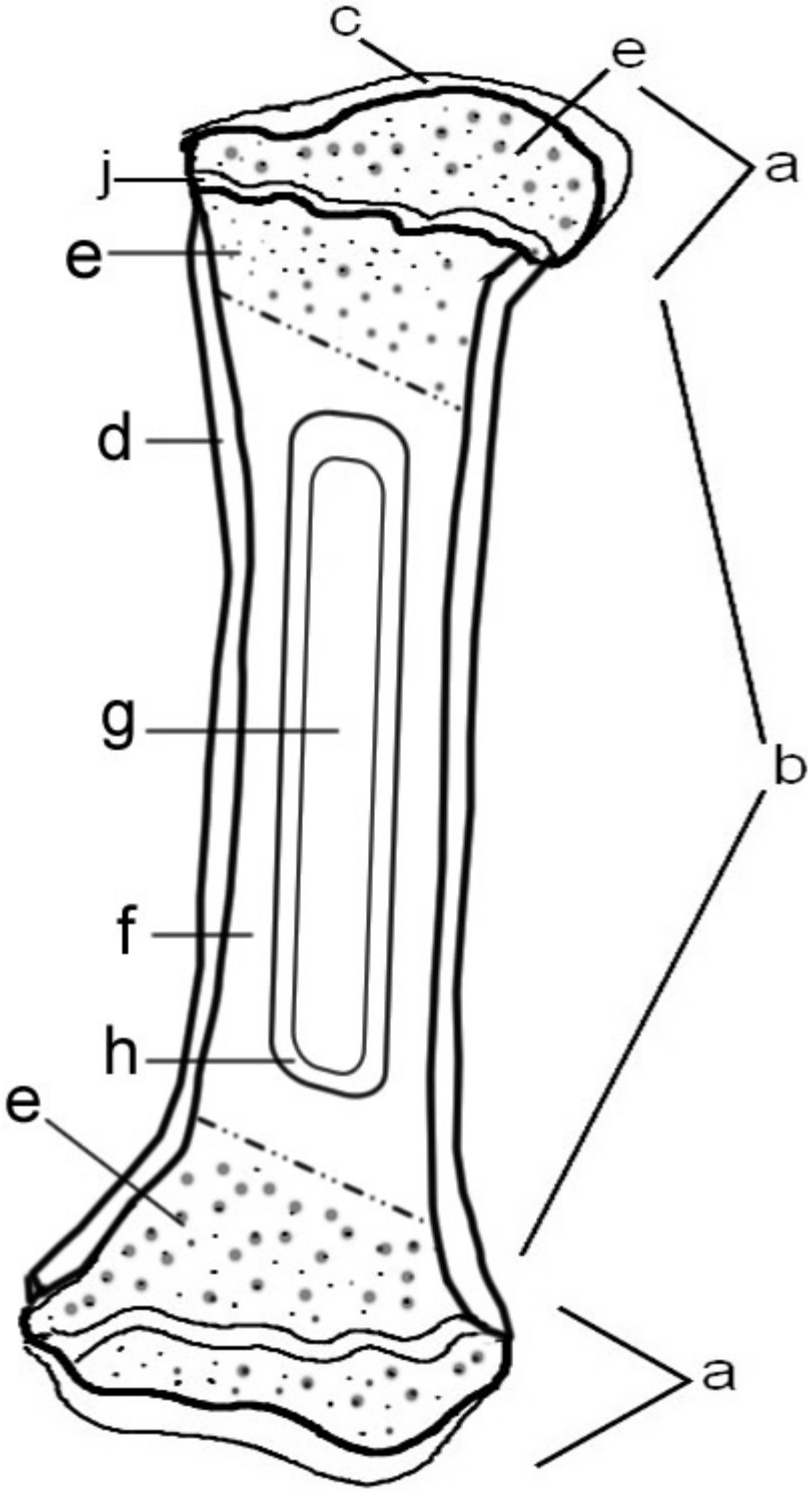


Figure 1 - Process of Endochondral Osteogenesis

Process of Osteogenesis (Bone Growth & re-modelling)

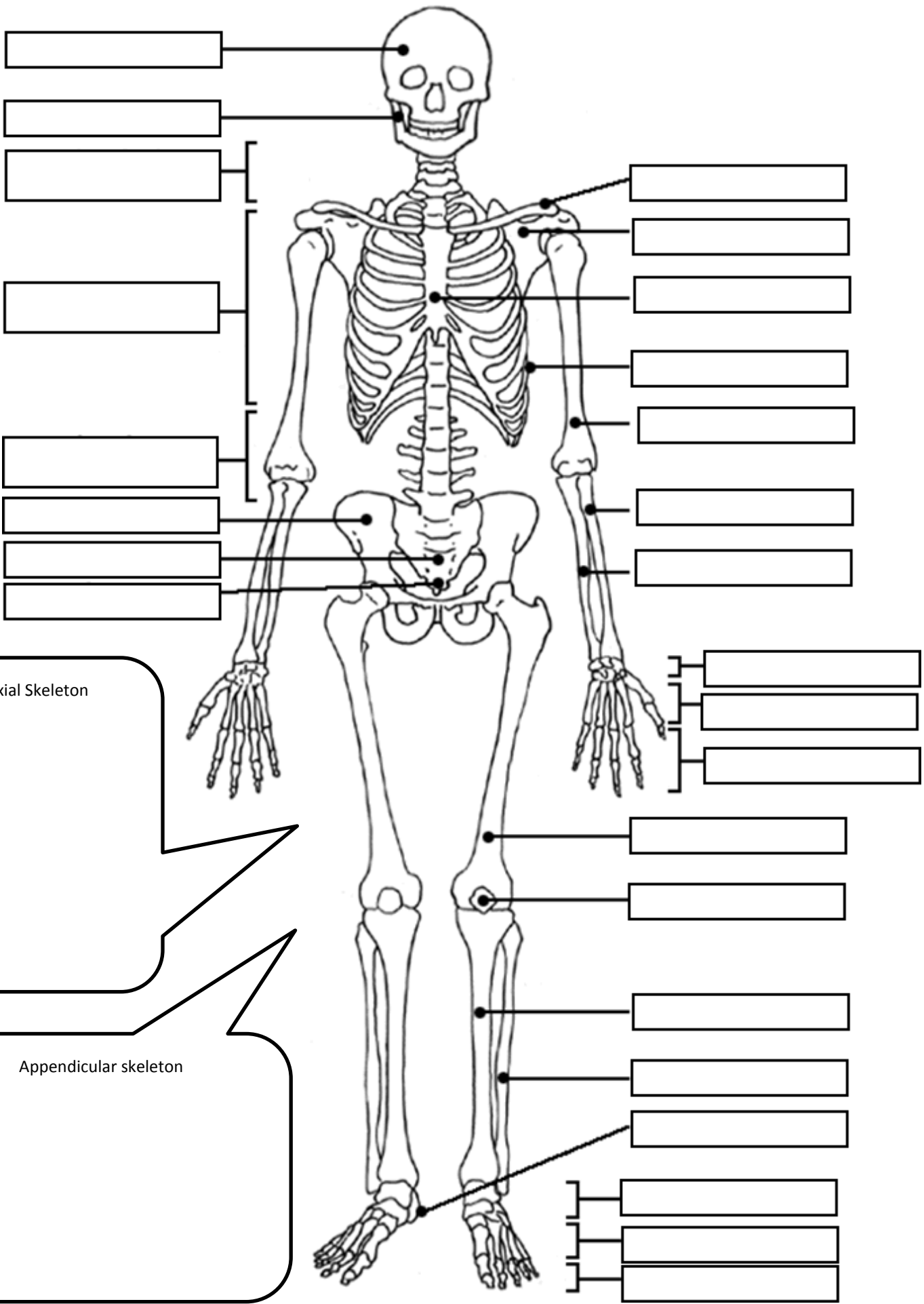
Stage	Description
A	
B	
C	
D	
E	

Long Bone Anatomy



Long Bone Anatomy

Long Bone Anatomy	Description
Periosteum	
Bone minerals	
Bone marrow	
Epiphysis	
Growth plates	
Diaphysis	
Cancellous bone	
Compact bone	
Articular cartilage	
Ligaments	



Axial Skeleton

Appendicular skeleton

Compare & contrast the structure and function of different types of bones.

Task Part 1: Annotate the sample paragraph below to recognise HOW it is constructed. What makes it effective?

There are several hundred bones in our body and they are structured differently to suit the different functions they have.

Bones such as the cranium, pelvis (ilium and ischium) and sternum are called 'flat bones'. The relative flat surfaces provide a protective cover for important internal organs, such as the brain, reproductive and urinary organs and the lungs / heart. Whilst a vertebra is an example of an 'irregular' types of bone, it is similar in that it does also function to protect the spinal cord and the holes through each vertebrae allow the nerve cord to run safely down the spine. Sesamoid bones, such as the patella (kneecap), also provide a protective role. It sits in the patellar tendon and protects knee joint as it moves.

Writing Style Activity

Compare & contrast the structure and function of different types of bones.

Task Part 2: Now write a paragraph yourself in the box, thinking about the things discussed.

PEER Annotations

Animated Bones: Question Sheet

Slide 1	<ul style="list-style-type: none"> a. State the bone name. b. What type of bone is it? c. State a bone at each end that it articulates with. 	
Slide 2	<ul style="list-style-type: none"> a. State the bone name. b. What type of bone is it? c. State a bone at each end that it articulates with. 	
Slide 3	<ul style="list-style-type: none"> a. State the bones names. b. What type of bone is it? c. How are they different from the other vertebral bones? 	
Slide 4	<ul style="list-style-type: none"> a. State the collective bone name. b. What type of bone is it? c. What are 2 bones' names shown? 	
Slide 5	<ul style="list-style-type: none"> a. State the bones names. b. What type of bone is it? c. What is their main function? 	
Slide 6	<ul style="list-style-type: none"> a. State the bone name. b. What type of bone is it? c. What bone does it articulate with to make a pivot joint? 	
Slide 7	<ul style="list-style-type: none"> a. State the bone name. b. What type of bone is it? c. What role does it have? 	
Slide 8	<ul style="list-style-type: none"> a. State the bone name. b. What type of bone is it? c. What role does it have? 	
Slide 9	<ul style="list-style-type: none"> a. State the bone name. b. What type of bone is it? c. State 2 functions of long bones. 	
Slide 10	<ul style="list-style-type: none"> a. State the bone name. b. What type of bone is it? c. Why does it combine with the scapula to form? 	

Classification of Joints

Make detailed notes about the THREE different classifications of joints. Give examples.

Consider :

Structure

Function

Range of movement

Stability

Anatomy of a Typical Synovial Joint

Draw and label a simple diagram of a typical synovial joint.

Structures	Structure – what is it like?	Function – What job does it do?
Ligament		
Synovial Membrane		
Synovial Fluid		
Articular Cartilage		
Joint Capsule		
Menisci		
Tendon		
Pad of Fat		
Bursae		

Types of Movement at Joints

Could you demonstrate and define the following joint movements?

Do you know where these can occur?

Flexion

- horizontal flexion
- hip flexion
- shoulder flexion
- plantarflexion
- dorsiflexion
- lateral flexion

Extension

- hyper-extension
- horizontal extension
- hip extension
- shoulder extension

Abduction

Adduction

Rotation

- medial rotation
- lateral rotation

Circumduction

Pronation

Supination

Elevation

Depression

Protraction

Retraction

Types of Synovial Joints

Make detailed notes about the THREE different classifications of joints. Give examples.

Consider :

Structural differences
Planes and Axes of movement
Types of movement possible

Locations in the body
Functional differences
Sporting examples

Types of Synovial Joint	Details

Animated Joints: Question Sheet

Slide 1	<ul style="list-style-type: none"> a. State the classification of joint b. State the type of joint. c. Give 2 examples of this joint d. State 2 possible joint movements 	
Slide 2	<ul style="list-style-type: none"> a. State the classification of joint b. State the type of joint. c. Give 1 examples of this joint d. State 2 possible joint movements 	
Slide 3	<ul style="list-style-type: none"> a. State the classification of joint b. State the type of joint. c. Give 2 examples of this joint d. State 2 possible joint movements 	
Slide 4	<ul style="list-style-type: none"> a. State the classification of joint b. State the type of joint. c. Give 2 examples of this joint 	
Slide 5	<ul style="list-style-type: none"> a. State the classification of joint b. State the type of joint. c. Give 2 examples of this joint d. State 1 possible joint movement 	
Slide 6	<ul style="list-style-type: none"> a. State the classification of joint b. Give 2 examples of this joint c. What is another name for this classification of joint? 	
Slide 7	<ul style="list-style-type: none"> a. State the classification of joint b. Give 2 examples of this joint c. What is another name for this classification of joint? 	
Slide 8	<ul style="list-style-type: none"> a. What is A? b. What is B? c. What is C? d. What is D? 	
Slide 9	<ul style="list-style-type: none"> a. State the classification of joint b. State the type of joint. c. Name the 2 bones. 	
Slide 10	<ul style="list-style-type: none"> a. State the classification of joint b. A section of vertebral column? c. B section of vertebral column? d. C section of vertebral column? 	

Writing Style Activity

Compare and contrast the structural and functional characteristics for the 5 regions of the spine – consider the 2 different types of synovial and the cartilaginous joints in the spine.

Task: Complete the written answer to this question.

A significant function of the role of the vertebral column is protection of the vital spinal cord that runs within it. **The cord is very delicate and vulnerable to damage which would be critical to anyone.** This function is similar the 3 main areas of the vertebral column (**cervical spine – 7 vertebrae, thoracic spine – 12 vertebrae and lumbar spine – 5 vertebrae**) and **they are all structured with a built in hole to allow for the cord to run through each individual vertebra.**

The vertebral column is a versatile and complex system of joints that allows movement in the back for several sporting actions. Movements that occur at the back **are flexion and extension, lateral flexion and extension and rotation of the trunk and neck.**

The vertebrae, in isolated pairs, allow minimal movement and are generally categorised as a form of 'cartilaginous joint'. **This is because the vertebrae of the cervical, thoracic and part of the lumbar spine all have**

