

# **BTEC Revision Guide Skeletal System**



NAME:

A1 - Structure of skeletal system	Pre Revision	Post Revision
<p><b>Can you locate and name the major bones of the body?</b>            cranium, clavicle, ribs, sternum, scapula, humerus, radius, ulna, carpals, metacarpals, phalanges, pelvis, femur, patella, tibia, fibula, tarsals, metatarsals, vertebral column:</p> <ul style="list-style-type: none"> <li>• cervical</li> <li>• thoracic</li> <li>• lumbar</li> <li>• sacrum</li> <li>• coccyx</li> </ul>		
<p><b>Do you know the various types of bones and their function in sporting situations? Can you give examples of each?</b></p> <ul style="list-style-type: none"> <li>• long - movement</li> <li>• short - support</li> <li>• flat - protection</li> <li>• sesamoid - reduce friction at a joint</li> <li>• irregular - various</li> </ul>		
<p><b>Can you label the various areas of the skeleton?</b></p> <ul style="list-style-type: none"> <li>• axial Skeleton</li> <li>• appendicular Skeleton</li> </ul>		
<p><b>Can you name and describe the postural deviations?</b></p> <ul style="list-style-type: none"> <li>• neutral Spine</li> <li>• kyphosis</li> <li>• scoliosis</li> </ul>		
<p><b>Can you describe the process of bone growth using the words?</b></p> <ul style="list-style-type: none"> <li>• ossification</li> <li>• osteoblasts</li> <li>• osteoclasts</li> <li>• epiphyseal plate</li> </ul>		
A2 - Function of skeletal system		
<p><b>Can you name the 8 main functions of the skeleton and link to sporting examples and situations?</b></p> <ul style="list-style-type: none"> <li>• supporting framework</li> <li>• protection</li> <li>• attachment for skeletal muscle</li> <li>• source of blood cell production</li> <li>• store of minerals</li> <li>• leverage</li> <li>• weight bearing</li> <li>• reduce friction across a joint</li> </ul>		

## A3 - Joints

**Can you classify the different types of joints and give examples of each one?**

- fibrous (fixed)
- cartilaginous (slightly moveable)
- synovial (freely moveable)

**Can you name the main types of synovial joints and give examples of each one?**

- ball and socket
- condyloid
- gliding
- saddle
- hinge
- pivot

**Can you name the bones that form the following joints and link to specific sporting situations?**

- shoulder
- elbow
- wrist
- hip
- knee
- ankle

**Can you draw, label and explain the structure of synovial joints and their use in sporting techniques and actions?**

- joint capsule
- bursa
- articular cartilage
- synovial membrane
- synovial fluid
- ligaments

**Can you list the range of movement at synovial joints? Can you explain, due to shape of articulating bones and their use in sporting actions?**

flexion, extension, dorsiflexion, plantarflexion, lateral flexion, horizontal flexion and horizontal extension, hyperextension, abduction, adduction, horizontal abduction and adduction, rotation, circumduction

## A4 Responses of the skeletal system to a single sport or exercise session

**Can you explain how the mineral uptake and production of synovial fluid can increase performance?**

## A5 Adaptations of the skeletal system to exercise

Can you explain the long-term adaptations of exercise on the skeletal system and sports performance?

- increased bone strength
- increased ligament strength

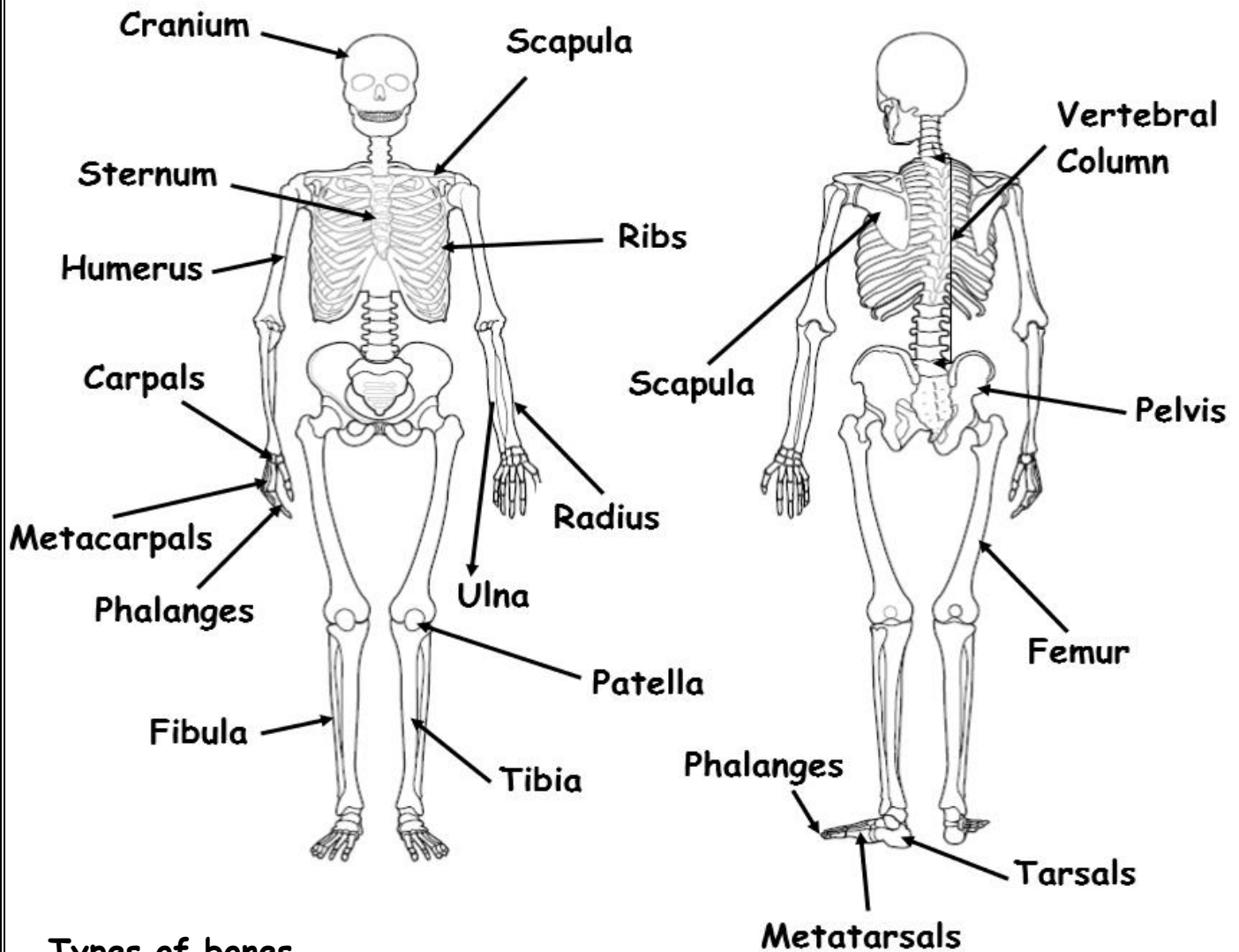
## A6 Additional factors affecting the skeletal system

Can you explain the impact of exercise and sports performance on the skeletal system?

- **Skeletal disease** - arthritis, osteoporosis, and the effect of exercise in offsetting these conditions.
- **Age** - young children and resistance training issues stunting bone growth.

# A The effects of exercise and sports performance on the skeletal system

## A1 Structure of skeletal system



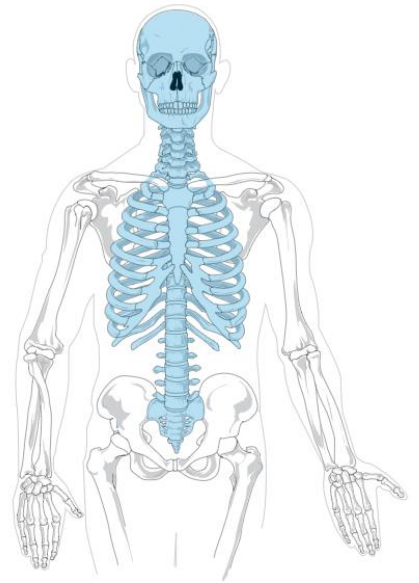
## Types of bones

Type of bone	Characteristics	Examples
Long Bones	Longer than they are wide Act as levers to create movement Produce red blood cells	Humerus Tibia Femur
Short Bones	Are as long as they are wide Used for weight bearing Absorb shock	Tarsals Carpals
Flat Bones	Wide and flat, normally thin Protect vital organs Attach muscles and produce blood	Sternum Ribs Pelvis
Irregular	Irregular shape Many functions such as, protection, attach muscles, support, movement,	Lumbar Thoracic Cervical

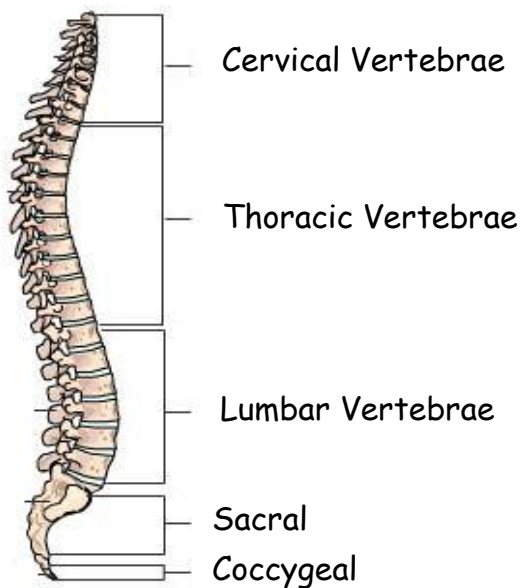
Sesamoid	Held within a tendon Reduce friction between the joint	Patella
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## Areas of the skeleton

Area of the skeleton	Bones
Axial Skeleton	Is the main core or axis of the skeleton: <ul style="list-style-type: none"> <li>• Cranium</li> <li>• Sternum</li> <li>• Ribs</li> <li>• Vertebral Column</li> </ul>
Appendicular Skeleton	Contains bones that are attached to the axial skeleton <ul style="list-style-type: none"> <li>• Limbs</li> <li>• Shoulder girdle (Scapula)</li> <li>• Pelvic girdle</li> </ul>



## Vertebral column



### Main Functions


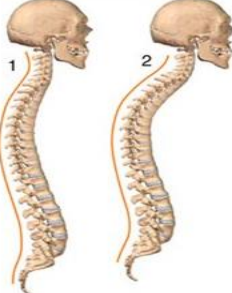
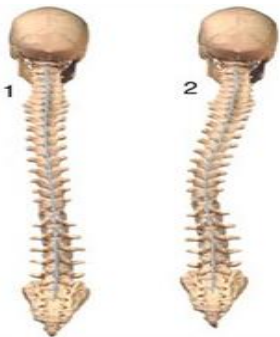
- Protection of the spinal cord
- Movement
- Muscle attachment
- Attachment of ribs

Section	Function
Cervical	7 cervical vertebrae. The first two are called axis and atlas and form a pivot joint that allows the head to move, They also the attach muscles of the neck
Thoracic	12 thoracic vertebrae. They are bigger than the cervical and attach the ribs which protect the heart and lungs. The attach the muscles of the back.
Lumbar	5 lumbar vertebrae. They are the biggest of the moveable vertebrae. They support the weight of the other vertebrae and attach the muscles of the lower back.



Sacral	5 sacral vertebrae that are fused together. It helps form the wall of the pelvis. it also supports the weight of the vertebrae
Coccygeal	4 coccygeal vertebrae that are fused together. Has no function

## Postural defects

Defect	Picture	Description
<b>Neutral Spine</b>		A good posture with the correct position of the three natural curves (S shape). When viewing the spine from the front (anterior), it should be completely vertical. Occasionally the spine may suffer from disorders which can cause the natural curves to change.
<b>Kyphosis</b>		The excessive outward curve of the thoracic region of the spine resulting in a 'hunchback' appearance. This is often caused by poor posture but can be caused by deformities of the vertebrae.
<b>Scoliosis</b>		The abnormal curvature of the spine either to the left or to the right (lateral curvature). Most likely to occur in the thoracic region. Often found in children but can be found in adults. This condition is not thought to be linked to bad posture and the exact reasons for it are unknown, although it seems to be inheritable.

## Process of bone growth




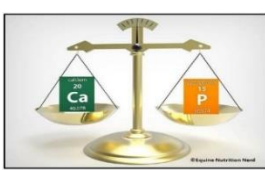
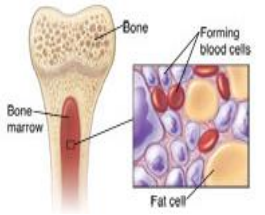


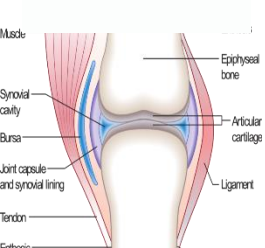
Bone is a living organ that is continuously being reshaped through a process called remodelling. **Ossification** is the process in which bones are formed. Throughout this process parts of the bone are reabsorbed so that unnecessary **calcium** is removed (via cells called **osteoclasts**) while new layers of bone tissue are created.

The cells that bring the calcium to your bones are known as **osteoblasts** and are responsible for creating bone matter. Osteoblast activity increases when you exercise, so your bones will become stronger the more exercise you do. This means your bone calcium stores increase to cope with the demand for calcium, so exercising also reduces the risk of osteoporosis. Activities that can build stronger bones include tennis, netball, basketball, aerobics, walking and running.

The ends of each long bone contain growing areas - or plates - which allow the bone to grow longer. This continues throughout childhood until they reach full maturity. These

areas are called the **epiphyseal plates** and allow the long bones to extend. Once a long bone is fully formed, the head - or end of each bone - fuses with the main shaft (diaphysis) to create the **epiphyseal line**

## A2 Functions of skeletal system

Function		Explanation
Protection		<p>The skeleton protects vital organs:</p> <ul style="list-style-type: none"> <li>• Cranium protects the brain</li> <li>• Pelvis protects the reproductive organs</li> <li>• Ribs protect the heart and lungs</li> </ul>
Attachment for Skeletal Muscle		<p>Bones provide anchors for muscles to attach. Tendons attach muscles to bone muscles pull on bones to create movement</p>
Leverage		<p>Long bones provide a lever system against which muscles can pull to create movement</p>
Storing of Minerals		<p>Bones store minerals such as calcium and phosphorus which is essential for bone growth and maintenance of bone health</p>
A Source of Blood Cell production		<p>Bone marrow stored in bones produces red and white blood cells. Red blood cells carry oxygen for energy. White blood cells fight infection</p>
Support Framework		<p>Bones give your body shape and help support the body so we can stand up straight and attach muscles</p>
Weight Bearing		<p>Bones are very strong and will support the weight of the body the pelvis and tarsals supports the weight of the body</p>
Reduce friction Across a Joint		<p>The skeleton has many different types of joints. Synovial joint secrete synovial fluid that reduced friction between bones.</p>



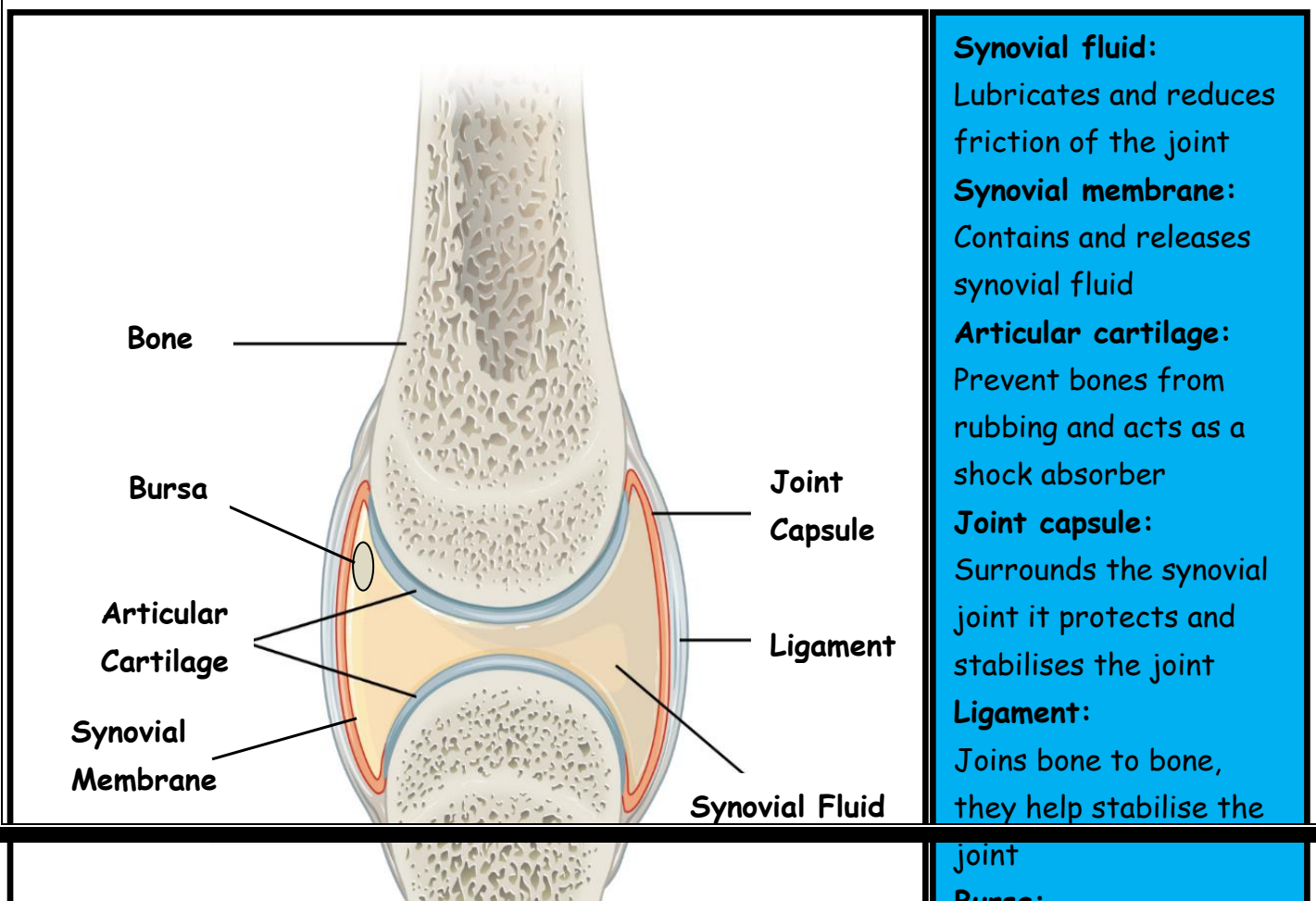
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## A3 Joints

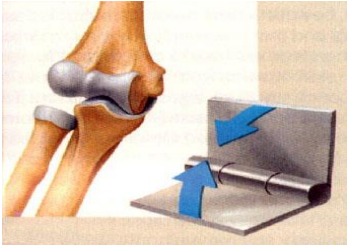

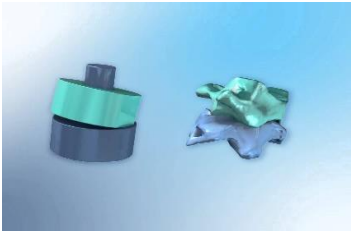
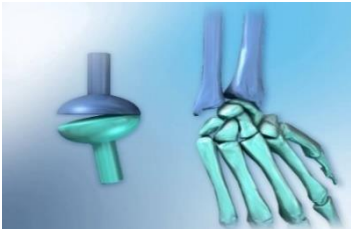
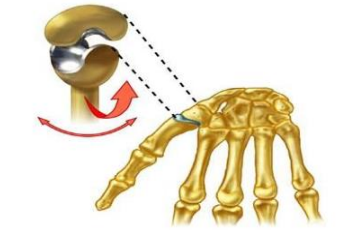

### Classification of joints

Type of Joint	Characteristics	Examples
Fixed Joint (Fibrous)	These joints are fixed and allow no movement	Cranium Sacrum Coccygeal
Slightly Moveable (Cartilaginous)	These joints are slightly moveable	Between the individual vertebrae
Moveable (Synovial)	These are freely moveable joints. The shape of bones determines the range of movement	Elbow (hinge) Shoulder (ball & socket) Thumb (saddle)

### Structure of synovial joints



Epiphyseal  
Line

Type of joint	Where found in the skeleton	Types of movements	Bones involved
<b>Hinge</b> 	Knee & Elbow  Ankle	Flexion Extension  Planter Flexion Dorsi Flexion	<b>Knee:</b> Femur, Tibia, Fibula, Patella <b>Elbow:</b> Humerus, Radius, Ulna <b>Ankle:</b> Tibia, Fibula, Tarsals
<b>Ball and socket</b> 	Shoulder & Hip	Flexion Extension Adduction Abduction Rotation Circumduction	<b>Shoulder:</b> Scapula, Humerus, Clavicle  <b>Hip:</b> Pelvis, Femur
<b>Pivot</b> 	Neck	Rotation	<b>Cervical vertebrae:</b> Axis, Axial
<b>Condyloid</b> 	Wrist	Flexion Extension Adduction Abduction Circumduction	<b>Wrist:</b> Ulna, Radius, Carpals
<b>Saddle</b> 	Thumb	Flexion Extension Adduction Abduction Circumduction	<b>Thumb:</b> Carpals, Metacarpals
<b>Gliding</b> 	Hands & Feet	Limited movement in all directions	<b>Hands:</b> Between the Carpals <b>Feet:</b> Between the Tarsals

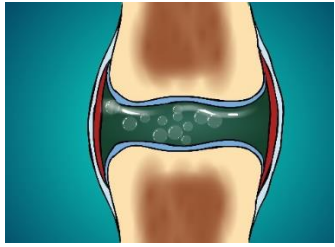

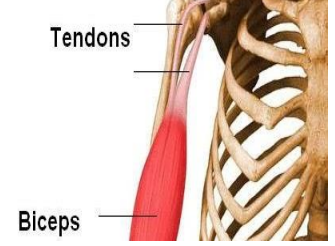
## Types of Synovial joints

### Types of movement at synovial joints



Joint Action	Explanation	Example
<b>Flexion</b>	Reducing the angle between the bones of a limb at a joint: muscles contract, moving the joint into a bent position.	Bending the elbow Bicep curl
<b>Extension</b>	Straightening a limb to increase the angle at the joint	Straightening the elbow
<b>Dorsi-Flexion</b>	An upward movement, as in moving the foot to pull the toes towards the knee	Toes upwards when hurdling
<b>Plantar-Flexion</b>	A movement that points the toes downwards by straightening the ankle	Toes pointed when diving in the pike position
<b>Lateral Flexion</b>	The movement of bending sideways	Goal keeper diving to the side when saving the ball
<b>Horizontal Flexion &amp; Extension</b>	Similar to flexion and extension but on a horizontal plane	Bending and straightening of the elbow when it is out in front of you
<b>Hyper Extension</b>	Involves movement beyond the normal anatomical position in a direction opposite to flexion.	Shoulder extended behind the back
<b>Abduction</b>	Movement away from the body's vertical midline	Upward phase of a star jump (shoulder)
<b>Adduction</b>	Movement towards the body's vertical midline	Inward phase of a sidestep (hip)
<b>Horizontal Abduction &amp; Adduction</b>	This is the movement of bringing your arm across your body (flexion) and then back again (extension).	Shoulder action when performing a drive shot in tennis
<b>Rotation</b>	Circular movement around an axis of a joint.	Turning the head sideways (axis & atlas)

<b>Circumduction</b>	This is a circular movement that is a combination of flexion, extension, adduction and abduction.	Shoulder action when performing a front crawl
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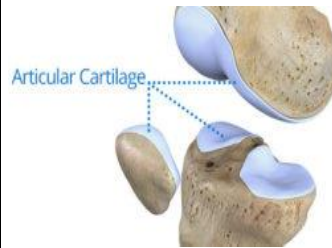
#### A4 Responses of the skeletal system to a single sport or exercise session (immediate/short-term)

Response		Explanation
<b>Synovial fluid production</b>		When we exercise synovial fluid is produced this reduces the friction between joints increasing the range of movement at the joint. When the fluid is released it becomes less viscous
<b>Uptake of minerals</b>		Exercise stimulates the uptake of calcium, this makes the bones stronger with less chance of injury
<b>Increased pliability of ligaments</b>		Tendons become more pliable which would increase the range of movement at the joint

#### A5 Adaptations of the skeletal system to exercise (long-term)

Response		Explanation
<b>Increase in bone density and strength</b>		Regular weight bearing exercise results in bones becoming bigger and stronger, this means that you are less likely to get injured such as a fracture
<b>Increased ligament strength</b>		Regular exercise strengthens ligaments. This stabilises the joint so it is less likely to get injured such as a dislocation

**Increased thickness of articular cartilage**



Regular exercise will thicken the articular cartilage this will protect the joint from wear and tear

## A5 Additional factors affecting the skeletal system

Factor	Explanation
<p><b>Arthritis</b></p>	<p>Arthritis is a condition where there is an inflammation within a synovial joint, causing pain and stiffness in the joint. The most common type of arthritis is osteoarthritis. This is caused by general wear and tear over a long period of time. This reduces the normal amount of cartilage tissue, which may result in the ends of the bones rubbing together.</p> <p>However, regular exercise can prevent arthritis. During physical activity your joints will produce more synovial fluid which will not only improve the joint lubrication, reducing friction between the bones, but will also provide important minerals to the cartilage.</p>
<p><b>Osteoporosis</b></p>	<p>Osteoporosis is the weakening of bones caused by a loss in calcium or a lack of vitamin D. As you get older your bones slowly lose their mineral density and naturally become brittle, fragile and more likely to break under stress. However, physical activity and exercise can help prevent osteoporosis by promoting increased uptake of minerals within the bones, resulting in an increase in bone mineral density. Resistance training and weight bearing exercise is a good method of preventing osteoporosis as overloading the skeleton will increase bone density.</p>
<p><b>Age</b></p> <p>Stunted Growth</p>	<p>The skeletal system is a living tissue that is constantly growing and repairing itself so that it can provide support and protection. Generally, exercise and sports will benefit you. The exception to this is resistance training (weight training) in children as this can cause more harm than good. The reason for this is that a child's bones are still</p>

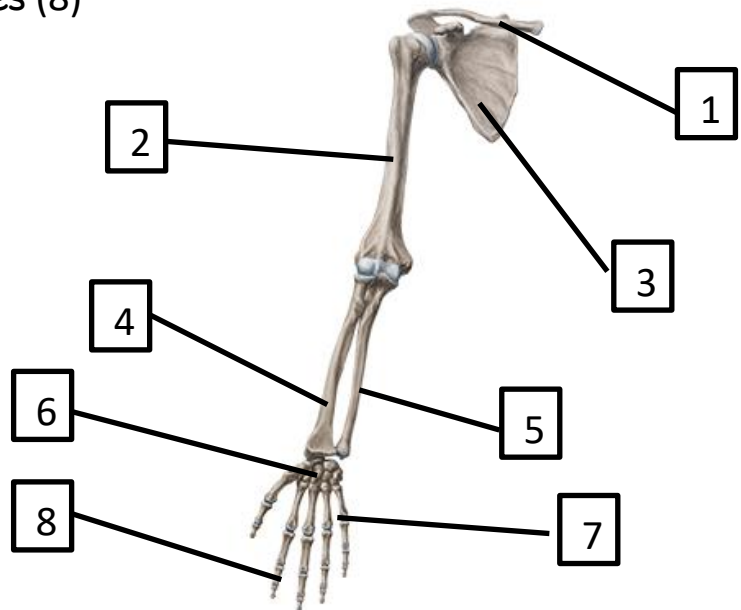


growing and putting too much force on them can damage the epiphyseal plates which are found at each end of the long bones. Damage to these plates during childhood and puberty can result in stunted bone growth.




## BTEC - End of Unit Test (Skeletal System)

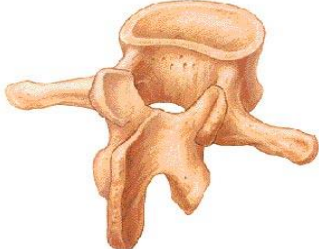
### 1. Identify the following Bones (8)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.



### 2. From the pictures identify the bone and the type of bone? (4)

	<p>Bone:</p>
	<p>Type of Bone:</p>
	<p>Bone:</p>
	<p>Type of Bone:</p>
	<p>Bone:</p>
	<p>Type of Bone:</p>

	Bone:
	Type of Bone:

3. Match the following words to their description? (5)

Sacrum	Thoracic	Coccygeal	Lumbar	Cervical
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	These are the smallest of the vertebrae, the top two are called the axis and atlas.
	These vertebrae are found in the middle of the vertebral column and attach the ribs.
	These are the largest of the movable vertebrae, they support the weight and attach muscles.
	These are 5 fused vertebrae that sits in between the pelvis, it helps support the weight.
	These are 4 fused vertebrae and have no function.

4. What bones make up the axial skeleton? (2)

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5. From the picture below name the postural deviation and give a brief description? (3)

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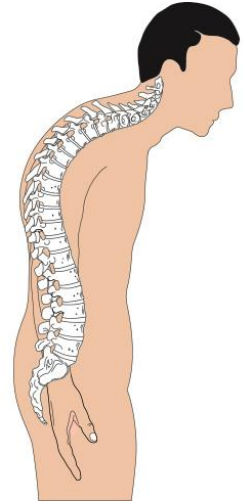
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6. Explain the process in which bones grow? (3)

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7. Explain how the following functions of the skeleton are important in a netball match? (4)



Support	
Protection	
Blood Cell Production	
Storage of Minerals	

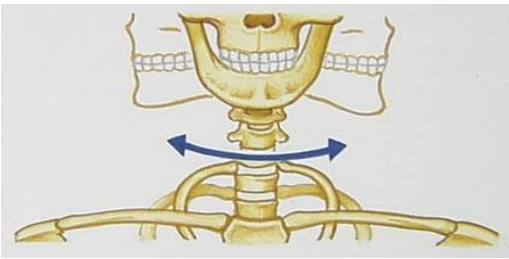

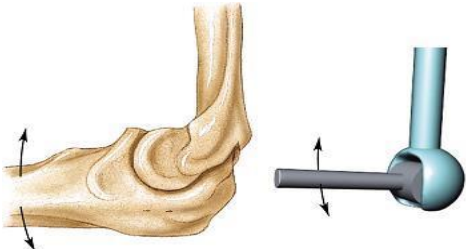
8. What are the three classifications of joints? (3)

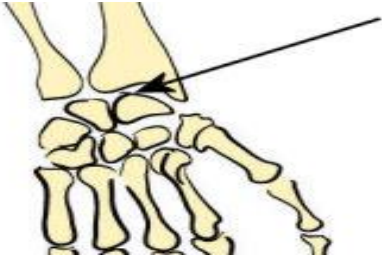
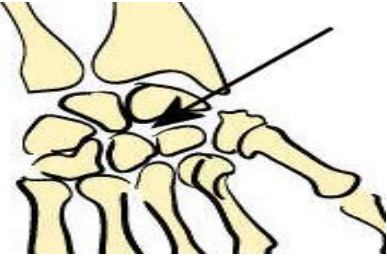
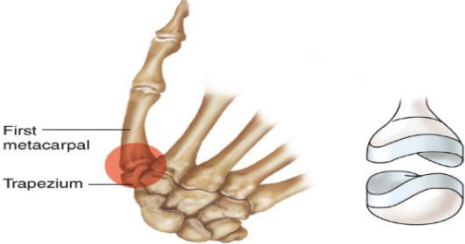
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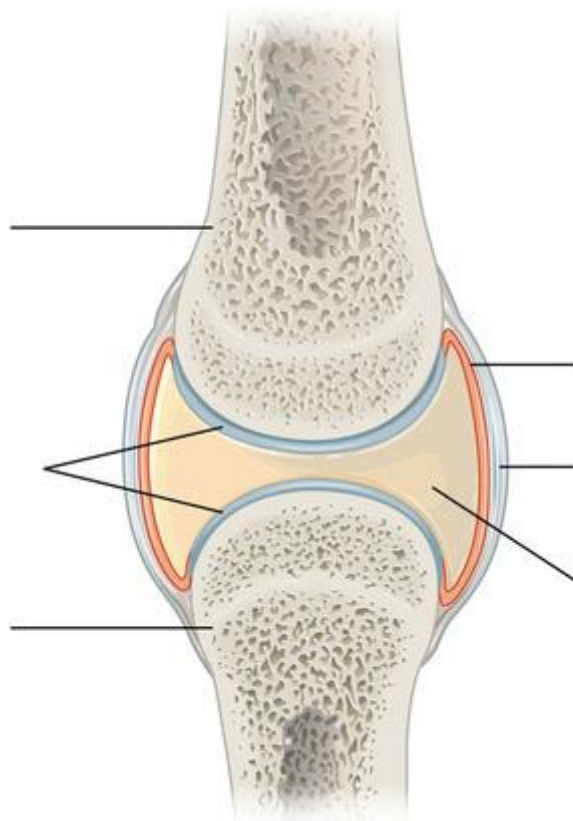
9. From the pictures below identify the type of joint and give an example of where it can be found in the body? (6)

	Type:  Found:
	Type:  Found:
	Type:  Found:

	Type:  Found:
	Type:  Found:
	Type:  Found:

10. From the words below label the Synovial joint? (6)

Bone	Epiphyseal Line	Articular Cartilage	Synovial Membrane	Synovial Fluid	Ligament
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11. Explain the function of a ligament and synovial fluid. Give a sporting example of how they aid performance? (4)

Ligament:

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Aids Performance:

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Synovial Fluid:

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Aids Performance:

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12. Fill in the table by matching the description to the range of movement? (7)

Flexion	Extension	Dorsiflexion	Plantarflexion
Lateral Flexion	Horizontal Flexion	Horizontal Extension	Hyper-Extension
Abduction	Adduction	Horizontal Adduction	Horizontal Abduction
Circumduction	Rotation		

Range of movement	Description
	The movement of bending sideways.
	Reducing the angle between bones at a joint. E.g. bending.
	Movement towards the body's vertical midline.
	Movement of pulling the toes towards the knee.
	A circular motion.
	Movement of bringing your arm across your body.



	A movement beyond the normal anatomical position in a direction opposite to flexion.
	A circular motion that results in a conical motion.
	Straightening of a limb to increase the angle at a joint.
	Movement of pointing the toes downwards.
	Bending the elbow while the arm is held out.
	A movement away from the body's midline.
	Movement of bringing your arm backwards from across your body.
	Straightening the elbow while the arm is held out.

13. From the pictures below identify the highlighted joint action, the type of joint and name the bones that make up the joint? (4)



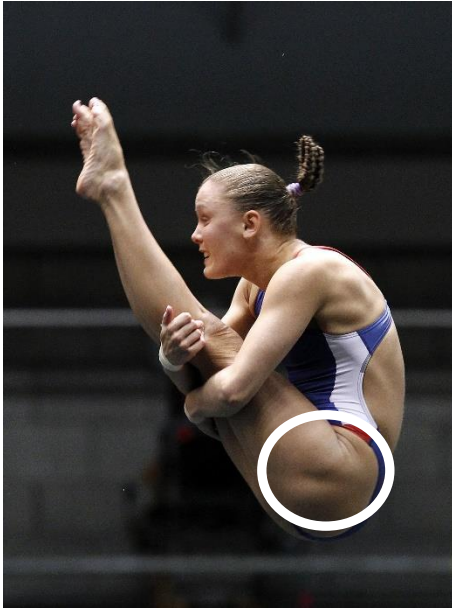
## Knee Joint

Type of joint: \_\_\_\_\_

Joint Action: \_\_\_\_\_

Bones that make up the joint:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_



## Hip Joint

Type of joint: \_\_\_\_\_

Joint Action: \_\_\_\_\_

Bones that make up the joint:

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

14. Explain the response to the skeletal system when warm-up up ready to play sport? (3)

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15. Explain the long-term adaptations to exercise on the skeletal system? (3)

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16. Tom has the first stages of osteoporosis. He has been advised to take part in exercise to help prevent his condition. Identify one type of exercise that tom could take part in to prevent the osteoporosis from getting worse Explain how exercise can help prevent osteoporosis? (1)

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17. Explain how weight bearing exercise can help prevent osteoporosis?  
(2)

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18. Julie has been diagnosed with arthritis, her doctor has prescribed physical activity. Explain how exercise can help with arthritis? (2)

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19. Jason is twelve years old, he has started weight training at the local gym, explain the dangers on the skeletal system of weight training at an early age? (2)

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20. There are many different shapes and sizes of bones that make up the skeletal system. Explain how the different types of bones in the skeleton have different roles and functions and evaluate how the different types of bones effect performance? (8 Marks)

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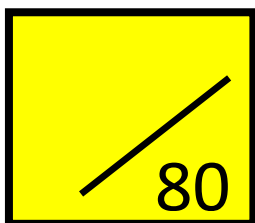
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## Self-Assessment

- You are now going to assess your work
- Fill in any incorrect answers in *Green pen*
- Give yourself a score below



## Self-Assessment

Write a short post it note on your knowledge of the skeletal system. What are your strengths and what are your weaknesses?

