G.C.S.E. PHYSICAL EDUCATION

Unit 1

Factors Affecting Participation and Performance

SKELETON AND JOINTS

Name: ........................................

G.C.S.E. P.E. Teacher: ........................................

Winterhill Physical Education Department
By the end of this booklet you should be able to:

- Understand what the 4 major functions of the skeleton are.

- Describe and explain why these functions are relevant to performance and participation in physical activity.

- Use examples from major bones to highlight the roles above.

- Describe and explain how the different types of joints (ball and socket, gliding, hinge & pivot joints) affect participation and performance by allowing specific ranges of movement (flexion, extension, rotation, abduction & adduction).

- Understand and explain the value to performance of healthy and efficient joints including ligament, cartilage and synovial fluid problems.
THE SKELETAL SYSTEM

The skeleton is the framework of the human body. The skeletal system is made up of a range of different types of bones and has four major functions:

- Shape and support
- Movement
- Protection
- Blood production

Shape and Support
Without the skeleton, the body would have no framework or support itself on - the skeleton gives us our shape. The skeleton also gives the body its size. Taller people have longer bones than short people, and in some cases the weight of the skeleton will influence the overall bodyweight.

Movement
Joints allow the body to move. Movement occurs when the muscles that are attached to the bones on either side of a joint contract (shorten) and make the joint move. This movement is called ................................ Different joints work in different ways and movement is greater at some joints than at others. The greatest range of movement is at the ................................, the ................................. and the ................................. in the upper body, and the ................................., the ................................. and the ................................. in the lower body.

A smaller but important amount of movement is found at other joints such as the hands, the neck and the spine in the upper body, and in the feet in the lower body.

Protection
The skeleton protects the vital soft tissue organs of the body.
Complete worksheet 1, protecting bones.
WORKSHEET 1
PROTECTING BONES

At the top of each oval below is the name of a protective bone. Add to the ovals the organs that each bone protects.

CRANIUM

RIBS

PELVIC GIRDLE

VERTEBRAL COLUMN
Blood Production
Blood is made in ........... .................., particularly in the marrow of the long bones of the body. Blood contains both red and white blood cells. The red blood cells carry .................. to the muscles, which they need in order to work. The white blood cells fight infection in the body.

TYPES OF BONES

The skeleton is made up of 206 bones and over 100 joints. There are four types of bone, each type having a special function. The four types are:

- Long bones
- Irregular bones (including short bones)
- Flat bones

Long Bones
These are the bones in the legs, arms and the long bones in the hands and feet. They are not solid bones but contain marrow in the centre. This structure allows them to be strong without being too heavy. Long bones are the 'levers' of the body and act to increase the range of movement caused by the contraction of the muscles.

Flat Bones
These are plate like bones which form the skull (cranium). The scapula, patella, the sternum, the pelvis and the ribs are also examples of flat bones. A larger surface area is needed for protective purposes and the attachment of a variety of muscles.

Irregular Bones
Vertebrae and the small bones of the hands and feet are examples of irregular bones. These types of bones are spongy inside with an outer layer of compact bone.
WORKSHEET 2
GROUPING AND CLASSIFYING BONES

- Study the diagram of a skeleton.
- Colour in the bones, according to their classification. Use a different colour for long, flat and irregular.
- Fill in the colours on the key—one colour for each class of bone.

KEY:

☐ Long Bones
☐ Flat Bones
☐ Irregular Bones
WORKSHEET 3
NAMING BONES

- Label the skeleton with the bones in the body.
WORKSHEET 4
BONES THAT LINK WITH SPORTING PERFORMANCE

What to do

1. Look at the pictures below of people playing different sports.

2. Decide which bones the people are using in the particular action they are performing. Think of the action, for example, is it throwing, which involves the arms, or is it making a landing, and if so on which part of the body? When you have worked out which part of the body is performing the main task, think of the bones in that region of the body.

A

B

C

D

A

B

C

D

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JOINTS AND MOVEMENT

Joints are found where two or more bones meet. Most moving joints are called ……………….. …………………. ……………….. ……………….. are enclosed inside a capsule filled with a lubricating fluid called synovial fluid. This fluid greatly reduces the friction on the joint surfaces as they move against each other. A membrane seals the capsule so that the fluid does not leak out.

**Cartilage**

Joint surfaces are also covered by smooth, slippery hyaline cartilage. This cartilage aids in the production of synovial fluid and is smooth and hard to help movement. Joints also include white fibro-cartilage. This cartilage is tough and elastic, acting as a shock absorber providing vital cushioning against impacts. Synovial joints such as the ……………….. contain fibro-cartilage to cushion the joint against the impact of walking, running and jumping.

**Ligaments and Tendons**

Ligaments and tendons hold joints together. Ligaments attach bones to bones and they are strong elastic fibres. Tendons attach muscles to bones. All of the major joints of the body rely on ligaments and tendons for balance and stability. Both ligaments and tendons can be strained or torn as a result of violent movement.
Label the diagram of the knee joint
Types of Movement

Different kinds of joints allow different amounts of movement. Using page 9 in the GCSE P.E. for OCR textbooks, complete the table below.

<table>
<thead>
<tr>
<th>Type of Movement</th>
<th>Description of Movement</th>
<th>Diagram</th>
<th>Example of Movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abduction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adduction</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Types of Joint

There are four types of joints that are important in physical activity and sport:
- Ball and socket joint
- Hinge joint
- Gliding joint
- Pivot joint

Using pages 9, 10 & 11 complete the table below.

<table>
<thead>
<tr>
<th>Type of Joint</th>
<th>Type of movement, including sporting examples</th>
<th>Where the joint is found in the body</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball and Socket</td>
<td></td>
<td></td>
<td>One end of a bone is shaped like a ball, and fits into a hollow socket at the end of another bone. The joint is held together by ligaments and tendons. Also a synovial joint, contained inside a capsule of synovial fluid, with hyaline cartilage on the 2 surfaces of the joint.</td>
</tr>
<tr>
<td>Hinge</td>
<td></td>
<td></td>
<td>The 2 bone ends have smooth hyaline surfaces that are shaped to move against each other. Strong ligaments stop the bones from sliding off each other.</td>
</tr>
<tr>
<td>Gliding</td>
<td></td>
<td></td>
<td>Small bones move over one another to increase the flexibility of the hands and feet. Strong ligaments link them together and stop them moving too far.</td>
</tr>
<tr>
<td>Pivot</td>
<td></td>
<td></td>
<td>A pivot joint works by the end of one bone having a 'peg' that fits into a 'ring' formed by the other bone.</td>
</tr>
</tbody>
</table>
WORKSHEET 7
TYPES OF SYNOVIAL JOINTS

What to do

1. Look at the pictures of three athletes below, and work out which joint is involved in the action they are performing. Write the name of the type of joint next to each picture.

2. Add labels to each of the diagrams, giving the names of the bones involved.
Joints and Performance

Flexibility exercises can help maintain a good range of movement, or even increase the range of movement joints allow. Overstretching however can damage the ligaments and muscle tendons. A thorough warm up prior to any exercise will increase the blood flow to the ligaments and tendons and will help to reduce the risk of injury. Twisting and turning movements and heavy impacts can also damage ligaments and tendons. This happens most in sports involving physical contact or sudden changes in direction, such as rugby or football tackles.
Homework/Extension Tasks

Complete the homework tasks on the additional pages in this booklet. Remember to number the questions and date your work.

1) Describe how bones and muscles work together to produce movement.

2) Give an example from any sport of how each of the four functions of the skeleton plays a part in physical activity.

3) Explain how and why the synovial capsule protects a synovial joint.

4) Complete the Skeleton worksheet – ‘Interpreting a table’

5) Select one movement from each of three activities of your choice and describe, using the correct terminology, the movements involved at specific joints.

6) Describe, using the correct terminology, the movement at the elbow and knee joints during a basketball free throw.
# THE SKELETON
## INTERPRETING A TABLE

### Homework 4

### What to do
Read the table carefully and answer the questions below:

<table>
<thead>
<tr>
<th>Name</th>
<th>Cervical</th>
<th>Thoracic</th>
<th>Lumbar</th>
<th>Sacral</th>
<th>Coccyx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of</td>
<td>7</td>
<td>12</td>
<td>5</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Where in the body</td>
<td>Neck</td>
<td>Chest</td>
<td>Lower back</td>
<td>Pelvic area</td>
<td>Base of the spine</td>
</tr>
<tr>
<td>Most important function</td>
<td>Top two vertebrae - atlas and axis, help turn the neck - protects spinal cord</td>
<td>Attached to the ribs and help with breathing - protects spinal cord</td>
<td>In the area of the column where the greatest amount of movement occurs so bears a lot of weight - protects spinal cord</td>
<td>They are fused together and make up part of the pelvic girdle</td>
<td>Fused together</td>
</tr>
<tr>
<td>What is attached</td>
<td>Neck muscles</td>
<td>Ribs</td>
<td>Back muscles</td>
<td>Joins spine and pelvic girdle</td>
<td>Base of spine attached only to the sacral vertebrae</td>
</tr>
</tbody>
</table>

1. How many vertebrae are there in total?

2. Which vertebrae are found in the chest region of the body?

3. Which vertebrae are the largest in the body?

4. What is the main job of the thoracic vertebrae?

5. There are two types of vertebrae that are fused. Which are they?

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USING THE INTERNET

Below are a number of useful website addresses to help you research this topic in more detail. (Add on any other sites you find).

www.bbc.co.uk/education/gcsebitesize/physicaleducation
www.physcialeducation.co.uk
www.sports-injury-clinic.com
www.Teachpe.com
www.pe4u.co.uk
www.TeachPE.com
<table>
<thead>
<tr>
<th>WORD</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Abduction</td>
<td></td>
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<tr>
<td>2) Adduction</td>
<td></td>
</tr>
<tr>
<td>3) Ball &amp; Socket Joint</td>
<td></td>
</tr>
<tr>
<td>4) Extension</td>
<td></td>
</tr>
<tr>
<td>5) Fibro-Cartilage</td>
<td></td>
</tr>
<tr>
<td>6) Flat Bones</td>
<td></td>
</tr>
<tr>
<td>7) Flexibility</td>
<td></td>
</tr>
<tr>
<td>8) Flexion</td>
<td></td>
</tr>
<tr>
<td>9) Gliding Joint</td>
<td></td>
</tr>
<tr>
<td>10) Hinge Joint</td>
<td></td>
</tr>
<tr>
<td>11) Hyaline Cartilage</td>
<td></td>
</tr>
<tr>
<td>12) Irregular Bones</td>
<td></td>
</tr>
<tr>
<td>13) Joint</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>14) Ligaments</td>
<td></td>
</tr>
<tr>
<td>15) Long Bones</td>
<td></td>
</tr>
<tr>
<td>16) Pivot Joints</td>
<td></td>
</tr>
<tr>
<td>17) Rotation</td>
<td></td>
</tr>
<tr>
<td>18) Skeleton</td>
<td></td>
</tr>
<tr>
<td>19) Synovial Joint</td>
<td></td>
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<tr>
<td>20) Tendons</td>
<td></td>
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<td>21)</td>
<td></td>
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