PHYSICS
Demonstrate knowledge of science in sport
18975 Level 1 2 credits

REVISION NOTES FOR ELEMENTS 1 & 2

Element 1: Changes occur when we exercise.

Some are **short-term** effects. This means they occur while we are doing the exercise and carry on maybe for a little time after we stop.

- **Our pulse rate increases** – this is because our heart beats faster to pump blood around our body faster. Our cells need to get food and oxygen faster to carry our respiration – to release energy from food.
- **We breathe faster** – our breathing speeds up to get more oxygen into our lungs (and blood), and to get rid of more carbon dioxide.
- **Our body temperature increases** - when we exercise our muscles produce heat so our body temperature rises.
- **We sweat more** - the evaporation of sweat cools our body. The heat energy needed to evaporate the sweat is taken from the body and so our body temperature falls.

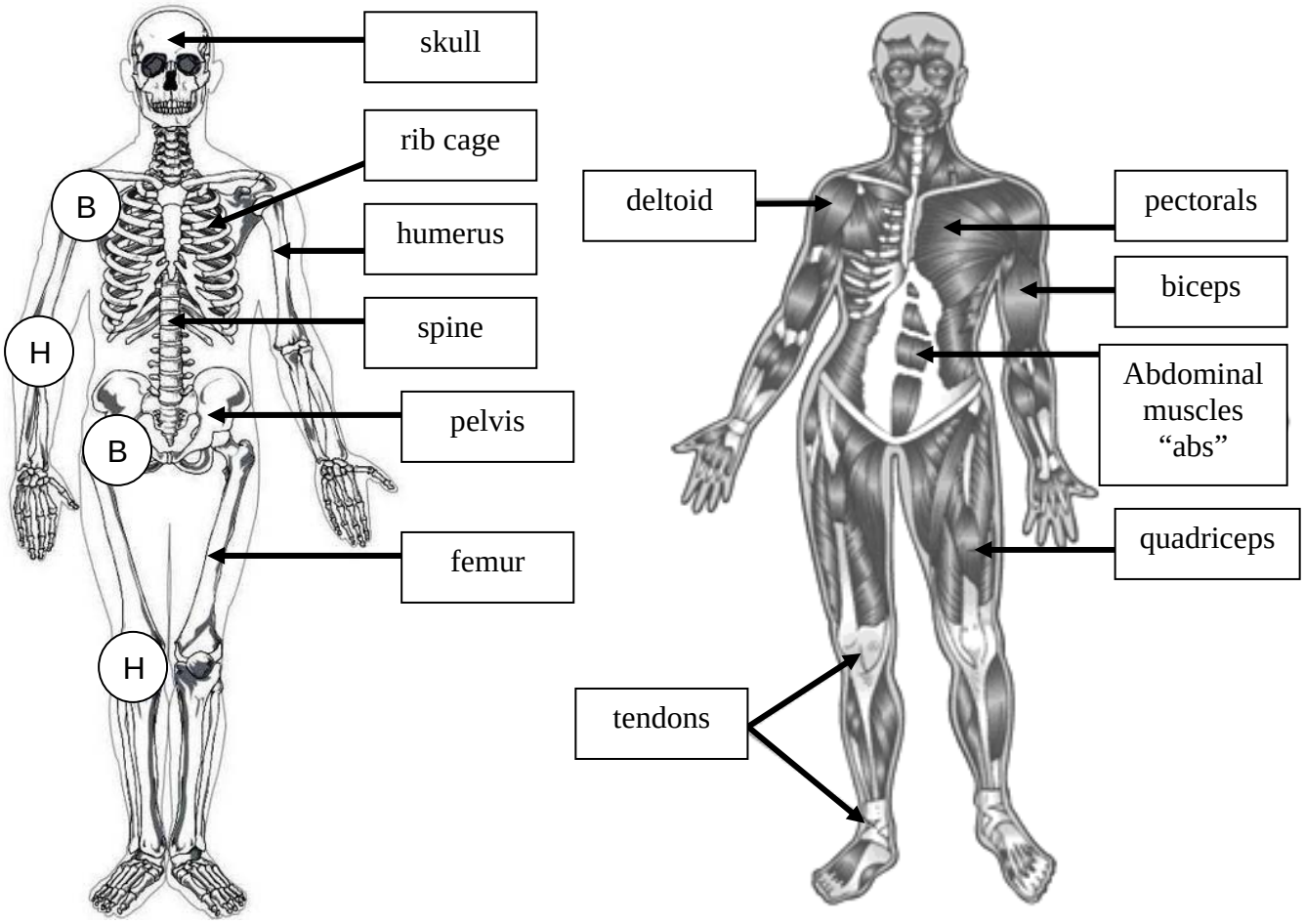
Some effects of exercise are more **long-term** and may take weeks or months before they become noticeable.

- **Greater stamina** – stamina is the strength or staying power; if you have greater stamina you can "keep going longer" and don't get tired so quickly
- **Greater strength** – with regular exercise your muscles get bigger and stronger – so you can lift more, pull stronger, hit harder or run faster
- **Improved skill** – repeating an activity and practicing it means you will get better at it – more skilful, better technique
- **Greater suppleness** – suppleness (or flexibility) is the range of movement of joints. More flexible athletes are better players in their sport.
- **Speed** – with greater stamina, strength and suppleness the athlete will be able to run faster.
- **Recovery rate is faster** - The time which it takes for pulse and breathing rate to return to normal is called the recovery time, and the fitter you are, the shorter your recovery time.
- **Lower base pulse rate** – training makes your heart able to pump more blood every beat. A fit person therefore has a lower resting pulse (or base pulse).

Element 2: The structure of the skeleto-muscular system.

Parts of the system.

- **Bones**
  - Skull protects your brain; rib cage protects the vital organs (heart and lungs) in the chest
  - Give you shape
  - Are moved at joints by muscles
- **Joints** - a joint is where two or more bones meet.
- **Muscles** - muscles are attached to bones, which are jointed. When the muscles contract the bones move.
- **Tendons** - join muscle to bone enabling movement



Different joint types produce different ranges of movement.

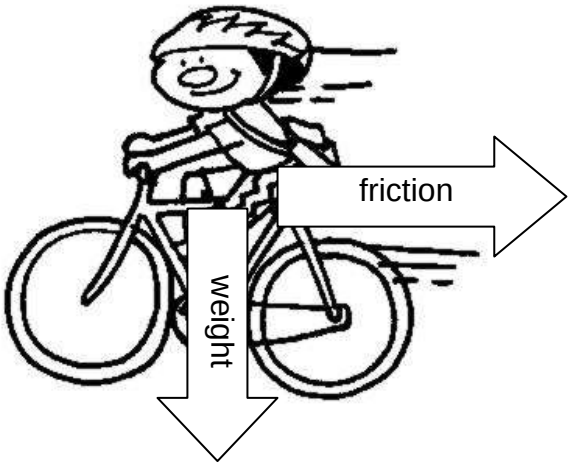
B **ball and socket joint** - found in the shoulder and hip. This joint allows the greatest range of movement.

H **hinge joint** - found at the elbow and knee. It allows bending and straightening. The range of movement is like a door hinge.

Element 3: Forces and their effect in sport.

Forces

- Friction - is a force which occurs when two surfaces rub against one another. Friction tends to stop things sliding past each other. When a boy cycles, friction between the air and the boy and bike slows it down. This is called air resistance.
- Weight - **weight** is a measurement of the gravitational force acting on an object. A 70 kg mass on Earth has a weight of 700N.



The effect of forces

- Balanced forces – the object either doesn't move OR if it is moving, it carries on moving at the same (constant) speed.
- Unbalanced forces – if forces acting on an object are unbalanced then a stationary object will either start to move OR if it is already moving it will accelerate or decelerate.

Element 4: Calculation of simple work and energy examples in a sport context.

Work done and energy transferred are measured in joules (J).
The work done on an object can be calculated if the force & distance moved are known.

Work done (J) = Force (N) x distance moved (m)

a) A weight-lifter lifts a weight of 700 N a height of 1.5 m. How much work does he do?

Work done (J) = Force (N) x distance moved (m)
Work done (J) = 700 x 1.5
Work done = 1050 J (He has used 1050 J of energy in the process.)

b) A high jumper has a weight of 500 N. She goes over a bar 1.4 metres high. How much work does she do?

Work done (J) = Force (N) x distance moved (m)
Work done (J) = 500 x 1.4
Work done = 700 J

c) As part of his rugby training a boy pushes a training sled 5 m. He puts 600N of force into pushing the sled. How much energy has been transferred?
Work done (J) = Force (N) x distance moved (m)
Work done (J) = 600 x 5
Work done = 3000 J. 3000 J of energy has been transferred