

LEVEL 3 BTEC SPORT (EXTENDED CERTIFICATE)

YEAR 1						
	Term 1		Term 2		Term 3	
Unit Title	Unit 1: Anatomy and Physiology					Unit 2: Fitness Training and Programming for Health, Sport and Well-being
Approximate Number of Lessons	8	8	8	6	8	8
Curriculum Content	Learning aim A: The effects of exercise and sports performance on the skeletal system.	Learning aim B: The effects of exercise and sports performance on the muscular system.	Learning aim C: The effects of exercise and sports performance on the respiratory system.  Learning aim E: The effects of exercise and sports performance on the energy systems.	Learning aim D: The effects of exercise and sports performance on the cardiovascular system.	Revision and exam preparation	Learning aim A: Examine lifestyle factors and their effects on health and well-being.
Links to prior learning	Links to unit 1 and Unit 3 at BTEC Sport Level 1/2 .					Links to Unit 1 (Level 3)
Cultural Capital Opportunities	Keeping up to date with current sporting events. YouTube: Fittest on Earth – a decade of fitness. Read ‘How the body works: The Facts Simply Explained’					Read ‘The Science of Fitness’
Assessment Focus	End of unit skeletal assessment.	End of unit skeletal and muscular assessment	End of unit skeletal, muscular, respiratory and energy systems assessment	End of unit skeletal, muscular, respiratory, cardiovascular and energy systems assessment	External exam – May/June	Internal assessment
Name of Knowledge Organiser	Unit 1: Anatomy and physiology knowledge organiser. Pages 63-69 in the specification.					Unit 2 knowledge organiser. Page 31-37 in the specification.



<b>Unit Title</b>	<b>Unit 5: Application of Fitness Testing</b>		
<b>Approximate Number of Lessons</b>	16	14	14
<b>Curriculum Content</b>	Learning aim A: Understanding the principles of fitness testing	Learning aim B: Explore fitness tests and different components of fitness.	Learning aim C: Undertake evaluation and feedback of fitness test results.
<b>Links to prior learning</b>	Level ½ BTEC Sport – Unit 1 and 3		
<b>Cultural Capital Opportunities</b>	Keeping up to date with current sporting events. YouTube: Fittest on Earth – a decade of fitness. Attend a local sports clubs (speak to your teachers for advice). Read ‘The Science of Fitness’		
<b>Assessment Focus</b>	Written report on the principles of fitness testing. Presentation justifying the selection of fitness tests.	A report interpreting fitness test results.	Written fitness profile with recommendations for improvement.
<b>Name of Knowledge Organiser</b>	Page 61-67 om the specification		

YEAR 2						
	Term 1		Term 2		Term 3	
Unit Title	Unit 2: Fitness Training and Programming for Health, Sport and Well-being		Unit 3: Professional Development in the Sports Industry.			
Approximate Number of Lessons	8	8	8	6	8	8
Curriculum Content	Learning aim B: Understand the screening process for training programming.  Learning aim C: Understand programme-related nutritional needs	Learning aim D: Examine training methods for different components of fitness.  Learning aim E: Understand training programme design.	Learning aim A: Understand the career and job opportunities in the sports industry.	Learning aim B: Explore own skills using a skills audit to inform a career development action plan.	Learning aim C: Undertake a recruitment activity to demonstrate the processes that can lead to a successful job offer in a selected career pathway.	Learning aim D: Reflect on the recruitment and selection process and your individual performance.
Links to prior learning	Links to unit 1 and Unit 5.		Links to Unit 5 studied in year 1.			
Cultural Capital Opportunities	Keeping up to date with government recommendations. Keeping up to date with socioeconomic factors.		Keeping up to date with available jobs. Keeping up to date with gaps in the jobs market.			
Assessment Focus	Set Task - Jan		Written report.	Career development action plan.	Interview and recruitment activities.	SWOT analysis and report.
Name of Knowledge Organiser	Unit 2 knowledge organiser. Page 31-37 in the specification.		Pages 41-47 in the specification.			

## Components of fitness

### Physical fitness

- Aerobic endurance
- Strength
- Muscular Endurance
- Flexibility

- Speed
- Body composition

### Skill related Fitness

- Agility
- Balance
- Coordination
- Reaction Time
- Power

### Flexibility Training

#### Methods

- Static (Active/passive)
- Dynamic
- Proprioceptive neuromuscular Facilitation (PNF)

### Core Stability

#### Training Methods

- Yoga
- Pilates

### Agility Training

#### Methods

- SAQ

## Aerobic Endurance

### Training Methods

- Continuous
- Fartlek
- Interval
- Circuit Training

### Muscular Strength

#### Training Methods

- Resistance Machines
- Free weights
- Medicine ball
- Circuit Training
- Core stability (Pyramid Sets)

### Muscular Endurance

#### Training Methods

- Circuit
- Resistance Machines
- Free Weights
- Resistance Bands

### Speed

#### Training Methods

- Hollow Sprints
- Acceleration Sprints
- Interval Training
- Resistance drills

### Balance Training

#### Methods

- Static Balance
- Dynamic Balance

## Coordination Training

### Methods

- Sport Specific

### Reaction Time

#### Training Methods

- Using a stimulus

### Power Training

#### Methods

- Plyometrics

## Training Zones

### Anaerobic Threshold

80-100%

### Peak Performance

80-90%

### Aerobic

60-80%

### Fat Burning

60-70%

## Sets, Reps, Resistance, Rest

### Weight Training

#### Muscular Strength

Exercise	Reps	Sets	Weight	Rest
Bench Press	8	6	75% 1 rep max	3 mins

#### Muscular Endurance

Exercise	Reps	Sets	Weight	Rest
Bench Press	15	4	50% 1 rep max	30 secs

### Interval Training

#### Aerobic (Endurance)

Time	Sets	Reps	Work/Rest	Relief
3-5 mins	1	4	1:1	Walk

#### Lactate System

Time	Sets	Reps	Work/Rest	Relief
30-80 secs	3-5	5	1:3	Jog

#### ATP-PC

Time	Sets	Reps	Work/Rest	Relief
10- 20 secs	5	10	1:3	Walk

### Flexibility

Notes	Equipment
<ul style="list-style-type: none"> <li>• Maintenance Stretches</li> <li>• Developmental stretches</li> <li>• Pre-Activity stretches</li> </ul>	<ul style="list-style-type: none"> <li>• Towel</li> <li>• Belt</li> <li>• Mat</li> <li>• Partner</li> </ul>
<b>Static</b> (active & passive) <b>Dynamic</b>	

### Plyometrics & SAQ

Notes	Equipment
Plyometrics involves an eccentric muscle contraction followed by a powerful concentric muscular contraction	<ul style="list-style-type: none"> <li>• Ladders/cones</li> <li>• Jump Ropes</li> <li>• Hurdles</li> <li>• Benches</li> </ul>

### Speed

Equipment	
<ul style="list-style-type: none"> <li>• Resistance Bands</li> <li>• Parachutes</li> </ul>	<ul style="list-style-type: none"> <li>• Bungee Rope</li> <li>• Resistance Tyres</li> </ul>

### Yoga

#### Exercises

- Side plank
- Boat
- locust
- Dolphin

### Coordination

#### Exercises

- Ball catching
- Juggling Drills



## Exercise & Physical Activity

### Physical Benefits

- Strengthens Bones
- Improves Posture
- Improves Body Shape
- Reduces Risk of Chronic Diseases  
(Cancer, CHD, Type 2 Diabetes)

### Social Benefits

- Encourages Social interaction
- Improves Social Skills
- Reduces Isolation
- Improves self-esteem & Confidence

### Economic Benefits

- Reduces NHS Costs
- Creates Employment
- Supports Local Businesses
- Reduces Absenteeism at Work

### Psychological Benefits

- Relieves Stress
- Reduces depression
- Improves Mood

### Exercise Recommendations

**Children aged 5-18:** 60 minutes every day, 3 days should improve strength  
**Adults:** Active daily and do at least 150 minutes aerobic activity per week, 2 days improving strength

## Balanced Diet

Correct nutrients in the right quantities

### Benefits

- Improved Immune System
- Maintain healthy weight
- Reduced Risk of Chronic Disease

### Fluid Intake

- Water Intake = 2 - 2.5 litres per day
- Water Main Transport System Around the Body
- Regulates Temperature

### Caffeine Intake

- Caffeine is a Mild Stimulant
- Too Much Caffeine Can Lead to Physiological Side Effects Such as: Hypertension & Digestive Problems

### Calorie Intake:

**Men =2500**

**Women 2000**

### Recommended Caffeine

### Intake:

**400mg = 4-5 Cups of Coffee**

## Negative Lifestyle Factors on Health & Well-Being

Smoking	Alcohol	Stress
<ul style="list-style-type: none"><li>• Coronary Heart disease</li><li>• Lung &amp; Mouth Cancer</li><li>• Lung Disease</li><li>• Emphysema</li><li>• Bronchitis</li><li>• Infertility</li></ul>	<ul style="list-style-type: none"><li>• Stroke</li><li>• Liver Cirrhosis</li><li>• Hypertension</li><li>• Depression</li><li>• Brain damage</li><li>• Kidney Disease</li></ul>	<ul style="list-style-type: none"><li>• Hypertension</li><li>• Angina</li><li>• Stroke</li><li>• Heart Attack</li><li>• Stomach Ulcers</li><li>• Depression</li></ul>

Sedentary Lifestyle	Lack of Sleep
Less than 30 minutes of exercise per week, can lead to: CHD, Stoke, Type 2 Diabetes, Cancers and Hypertension	Sleep allows your body to restore itself, lack of sleep and insomnia is linked to: Heart Disease, Depression and Overeating

### Modification Techniques

#### Physical Activity

- Home**
- Walking
  - Housework/Gardening
  - Standing Up More
- Work**
- Stairs not Lift
  - Lunch Time Activity
- Leisure Time**
- Join Gym/Club
  - Family Outings
- Transport**
- Walk/Cycle (Pedometer)

#### Alcohol

- Self Help Groups
- Lower Alcohol Intake
- Counselling
- Alternative Therapy

#### Stress

- Assertiveness Training
- Goal Setting
- Time Management
- Physical Activity
- Positive Self-Talk
- Relaxation - Breathing techniques & Meditation
- Alternative Therapies Such as Counselling or Medication
- Work Life Balance

### Barriers to Change:

- Time
- Money
- Transport
- Location

#### Diet

- Eatwell Guide
- Timing of Meals
- Food Choice
- Portion Sizes
- Five a Day
- Reduce Salt Intake
- Healthy Alternatives

#### Smoking

- Acupuncture
- NHS Help line/Services
- Nicotine Replacement Therapy
- Electronic Cigarettes

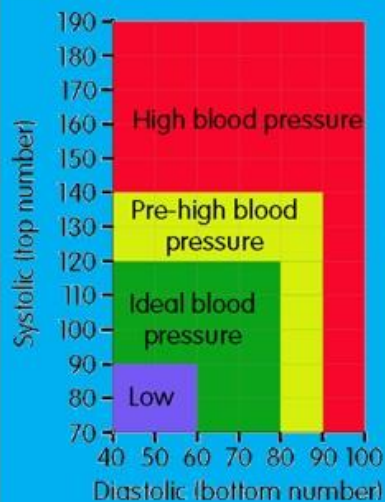
### Alcohol Intake:

**14 Units a Week**  
**2/3 Alcohol Free Days**



## Health Monitoring Tests

### Blood Pressure



Men's Resting Heart Rate Ranges						
Age	18-25	26-35	36-45	46-55	56-65	65+
Athlete	49-55	49-54	50-56	50-57	51-56	50-55
Excellent	56-61	55-61	57-62	58-63	57-61	56-61
Good	62-65	62-65	63-66	64-67	62-67	62-65
Above Average	66-69	66-70	67-70	68-71	68-71	66-69
Average	70-73	71-74	71-75	72-76	72-75	70-73
Below Average	74-81	75-81	76-82	77-83	76-81	74-79
Poor	82+	82+	83+	84+	82+	80+

Women's Resting Heart Rate Ranges						
Age	18-25	26-35	36-45	46-55	56-65	65+
Athlete	54-60	54-59	54-59	54-60	54-59	54-59
Excellent	61-65	60-64	60-64	61-65	60-64	60-64
Good	66-69	62-68	65-69	66-69	65-68	65-68
Above Average	70-73	69-72	70-73	70-73	69-73	69-73
Average	74-78	73-76	74-78	74-77	74-77	74-77
Below Average	79-84	77-82	79-84	78-83	78-83	78-83
Poor	85+	83+	85+	84+	84+	84+

### Blood Pressure Prevention

- Eat less salt
- Eat more Fruit & veg
- Maintain healthy Weight
- Exercise
- Reduce caffeine intake

### Waist to Hip Ratio

Can determine levels of obesity  
Divide waist in cm by Hips in cm  
Accepted health Ranges  
1.0 for Men  
0.85 for Women

### BMI Health Ranges

<18.5 - Underweight  
18.5 - 24.9 - Healthy Range  
25 - 30 - Above Healthy Range (May be Overweight)  
>30 - Classed as Being Obese (Risk of Stroke, CHD, Type 2 Diabetes)

### BMI

- Measure weight in kg and height in m
- Divide the weight by their height
- Divide the answer by their height again

## Macronutrients

**Carbohydrates** are your bodies most readily available energy source, stored in the muscle and liver as glycogen  
**Simple** (Sugar, Jam, Honey, Sweets, Fizzy Drinks)  
**Complex** (Pasta, Rice, Potatoes, Bread, Noodles)  
50-60% of total calories = complex carbohydrates

**Fats** used for energy, insulation and buoyancy, cell membranes, absorbing certain vitamins  
**Saturated** (Lard, Butter, Meat, Cream)

**Monounsaturated fats** (Olive Oil, Peanuts)

**Polyunsaturated** (Margarine, Sunflower Oil, Oily Fish)  
25-35% of total calories = fats (Men 30g Women 20g)

**Proteins** are used for growth and repair, Amino acids are the smallest unit of protein, can provide energy  
Foods that contain all **Essential Amino Acids (EAA's)** are called **Complete proteins** = Eggs, Meat, Fish, Milk  
**Incomplete proteins** are those that lack more than one EAA's = Cereals, Rice, Bread, Pasta)  
Men = 30g a day Women = 20g per day

## Micronutrients

### Vitamins

Vitamin A - Function of Eyes and Respiratory Tract (green veg)  
Vitamin B - Releases Energy from food (lean meat, eggs)  
Vitamin C - Essential for Healthy Skin, Bone, Tissue (citrus fruit & veg)  
Vitamin D - Healthy Bones as it Absorbs Calcium (fish, Eggs)

### Minerals

**Calcium** - Bones and teeth (dairy products meat, veg, fish, nuts)  
**Iron** - Component of Haemoglobin in the Blood (red meat, dried fruit)

## Terminology

**RDA** = Found on labels a good guide  
**Colour Coding** = Found on labels  
**EAR** = Estimated Average requirement  
**LRNI** = Lower Reference Nutritional Intake  
**SI** = Safe Intake  
**Energy Balance**  
**BMR** = Basal Metabolic Rate

### Hydration is affected by:

Climate, Exercise, Time of Year

### Dehydration Can cause:

Nausea, Headaches, Dizzy, Lack of Energy, Hot, Short of Breath

### Hyperhydration Can Cause:

Low Sodium Levels (Hyponatremia)

### Ergogenic Aids:

Energy Gels and Bars  
Protein Drinks

Carbohydrate loading

### Optimum Weight:

Adapt diet to gain or lose weight

### Sports Drinks:

**Isotonic:** During Exercise (4-8%)

**Hypertonic:** After Exercise (more than 8%)

**Hypotonic:** During Exercise (less than 4%)



## Aims Objectives & SMARTER Targets

### Goal Setting

- Gives an aim and a focus
- Increases motivation
- Improve confidence
- Less likely to get bored

### Aims

- What you hope to achieve, apply the:

### SMARTER Principle

**S** = Specific

**M** = Measurable

**A** = Achievable

**R** = Realistic

**T** = Time Phased

**E** = Exciting

**R** = Recorded

## Principles of Training

- **FITT**  
Frequency (How Often)  
Intensity (How Hard)  
Time (How Long)  
Type (Type of Training)
- **Specificity** - matches the sport
- **Overload** - Working harder than normal
- **Progression** - Gradually make training harder
- **Reversibility** - Fitness deteriorates
- **Adaptation** - The body programmes the muscle to remember
- **Variation** - Vary training to prevent boredom
- **Individual Needs** - Training has to be personal (age, fitness, skill, gender)
- **Rest & Recovery** - Essential to adapt and recover the muscles

### Periodisation

Macrocycles (1 - 4 Years)

Mesocycles (Monthly)

Microcycles (Weekly)

### Continuous Training

Good for aerobic fitness, lose weight accessible  
Boring, not always sport specific

### Fartlek Training

Good for team sports, less boredom, easy to use  
Too easy to cheat, can be difficult

### Circuit Training

Less boring, easily adapted for fitness/sports  
Take time to set up, requires equipment

### Interval Training

Can be both aerobic and anaerobic,  
Can be boring

### Free Weights

Full range of sporting movement  
Risk of injury, need a spotter

### Resistance Machines

Safer, good for beginners  
Expensive, no functional

## F.I.T.T. Principle (Examples)

Muscular Endurance	Muscular Strength	Power
<b>F</b> = Beginner 2-3 days per week, Advanced 4-5 days per week <b>I</b> = Many repetitions light weight 15-30 reps 40-50% of 1RM <b>T</b> = 30-60 min session <b>T</b> = Weight training/circuit training etc...	<b>F</b> = 3-4 days per week <b>I</b> = Low repetitions heavy weight 6-8 reps 70-80% of 1RM <b>T</b> = 30-60 min session <b>T</b> = Free weights, resistance machines, circuit training, etc...	<b>F</b> = 2-3 sessions per week <b>I</b> = 100% effort. The greater the intensity less reps more rest <b>T</b> = Each set no longer than 6-8 seconds <b>T</b> = Plyometrics

### Points to Remember

Consider:

The sport/fitness levels

What performer likes/dislikes

Availability of equipment/finances

Training is varied to maintain interest

### Nutritional Guidance

- Have you given specific guidance to the individuals requirements?
- Have you justified your recommendations?
- Have you linked to government recommendations?

### Training Methods/Programme

- Have you Followed all the principles of training?
- Have you been specific in your choice of training?
- Have you justified your choice of training?
- Have you referred back to the persons individual needs?
- Have you referred to the individuals aim/goal?
- Is training specific to the individuals skill/fitness?
- Have you included detail in the training programme?  
Sets, Reps, Intensity, Target Zones, Rest, Warm-Up, progression, cool down

### Writing Tick List

#### Interpreting Lifestyle

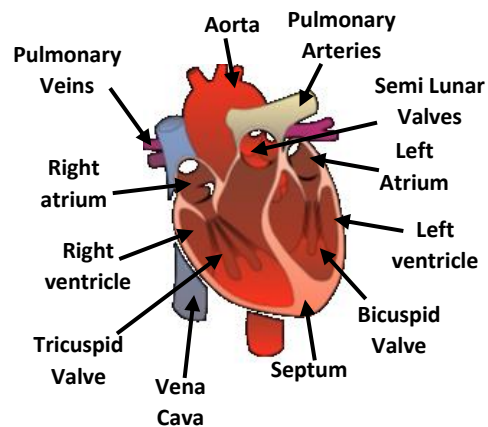
- Have you commented on all the highlighted points from the question?
- Have you mentioned Government Recommendations?
- Have you mentioned the positives and negatives of their lifestyle?

#### Lifestyle Modification

- Have you explained and justified the lifestyle modification techniques?
- Have you suggested alternative strategies?
- Have you been relevant to the individual throughout the answer?



## Structure of the Heart

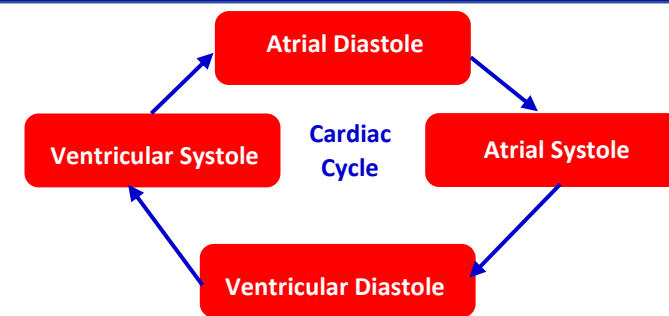
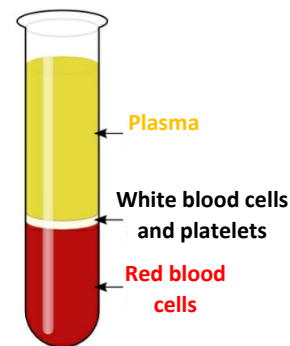


## Functions of the System

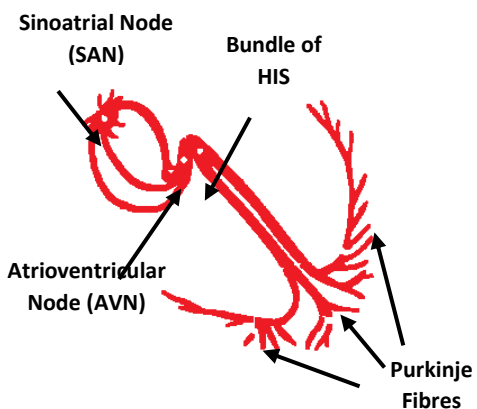
- 1) Delivering oxygen and nutrients
- 2) Removing waste products
- 3) Thermoregulation
- 4) Fighting infection
- 5) Clot blood



## Composition of blood



## Conduction of the Heart



**YOU THERE**  
(YEAH, YOUUUUUUU!!!)

THERE'S A DIFFERENCE  
BETWEEN EXERCISING  
AND TRAINING. LEARN IT!!!

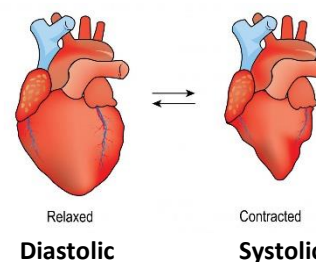
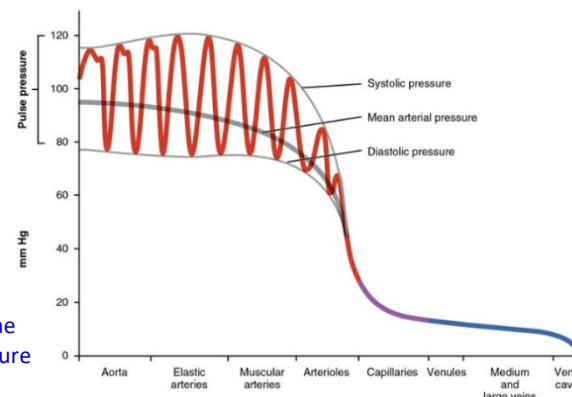
### Exercise (Short term)

- 1) Anticipatory rise
- 2) Increased heart rate
- 3) Increased Cardiac output
- 4) Increased blood pressure
- 5) redirection of blood

### Training (Long Term)

- 1) Cardiac hypertrophy
- 2) Decrease in resting heart rate
- 3) Decrease in resting stroke volume
- 4) Reduction in resting blood pressure
- 5) Decreased recovery time
- 6) Increased blood volume

## Blood pressure



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## Sympathetic nervous system



### Excites – fight or flight

- 1) Secretes adrenaline
- 2) Increases heartrate
- 3) Increased blood pressure
- 4) Increases contractility of the heart
- 5) Stimulates vasoconstriction/vasodilation

## Parasympathetic nervous system

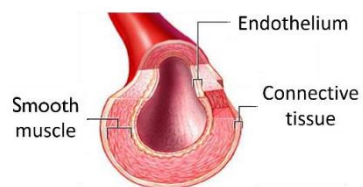


### Calms/relaxes

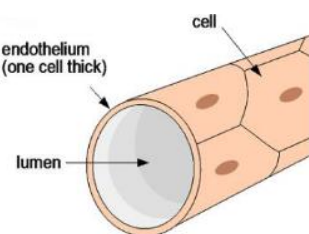
- 1) Decrease heart rate
- 2) Decrease blood pressure
- 3) Decrease cardiac output (Q)

## Structure of Blood Vessels

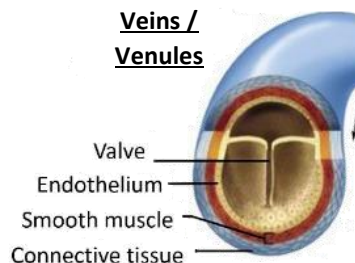
### Artery / Arterioles



### Capillary



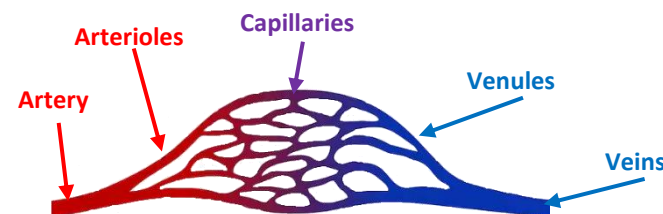
### Veins / Venules



- Takes blood **A**way from the heart (exception the pulmonary artery)
- Oxygenated blood
- Thick elastic walls
- High pressure

- One cell thick
- Diffusion
- Gaseous exchange (oxygen in CO2 waste out)

- Blood back to the heart
- Deoxygenated blood
- Thin walls
- Large lumen
- Lower pressure
- Valves



### Vasodilation



### Vasoconstriction

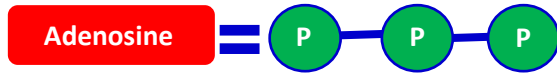


# Energy Systems

## Adenosine Triphosphate (ATP)

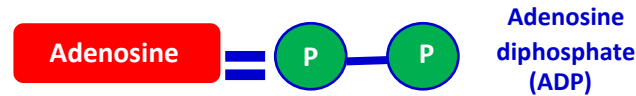
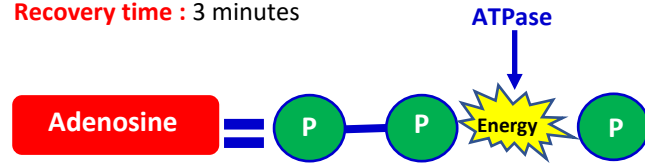
The energy comes from breaking the bonds between each phosphate

- ATP is the only usable form of energy in the body.
- The body has a store of **3 seconds of ATP**.
- Then there are 3 systems that can resynthesise it

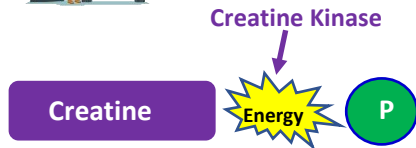


### ATP-PC System

**Type:** Anaerobic  
**Fuel source :** Phosphocreatine (PC)  
**Duration:** 8-10 seconds  
**Used in :** short explosive power  
**Recovery time :** 3 minutes

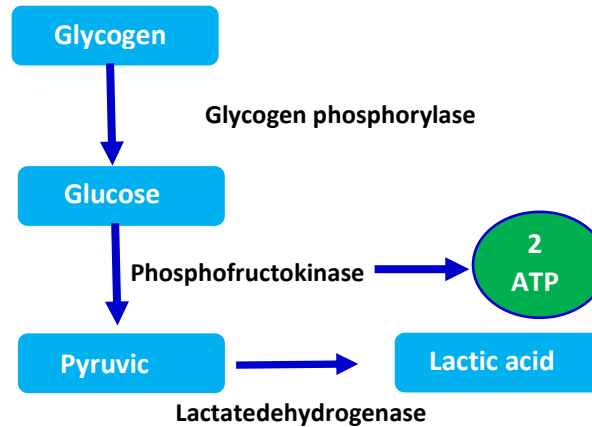


Let's Refuel using Creatine Phosphate



### Lactate System

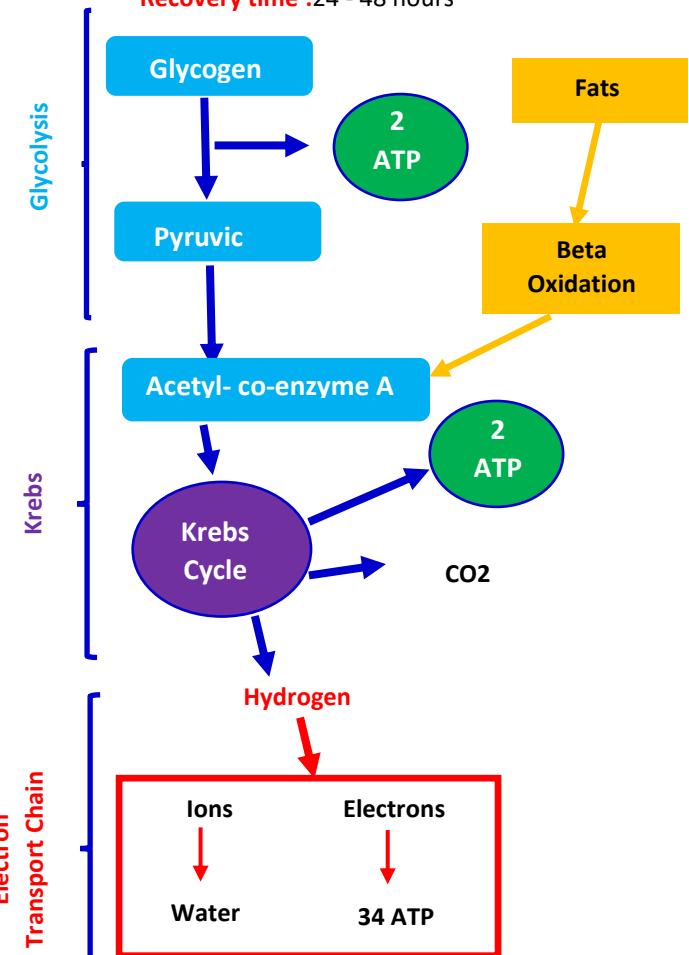
**Type:** Anaerobic Glycolysis  
**Fuel source :** Glycogen  
**Duration:** 10 secs to 2 mins  
**Used in :** stop start games/ court sports/400m  
**Recovery time :** 1-2 hours



This Process is known as Anaerobic Glycolysis

### Aerobic System

**Type:** Aerobic Glycolysis  
**Fuel source :** Glycogen and fat  
**Duration:** Longer than 2 mins  
**Used in :** Long distance and endurance events  
**Recovery time :** 24 - 48 hours



### Adaptations to Systems Long Term

**ATP-PC System**

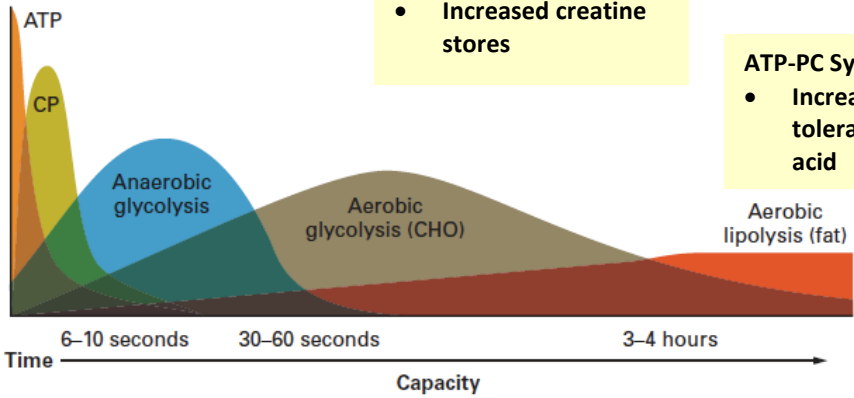
- Increased creatine stores

**ATP-PC System**

- Increased tolerance to lactic acid

**Aerobic System**

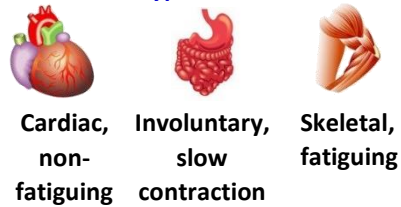
- Increased use of fats
- Increased storage of glycogen



**Total Yield: 38 ATP**

# The Muscular System

## Three types of Muscles



## Three types of Muscle Contraction

### Isometric Concentric Eccentric

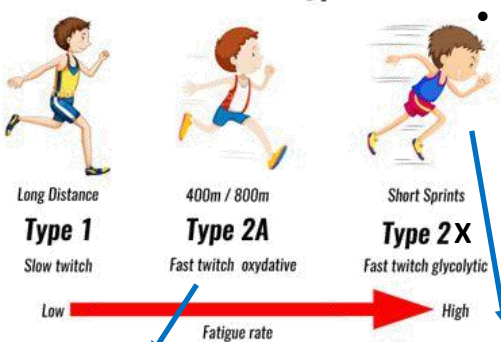
Length of muscle does not change

Muscle shortens

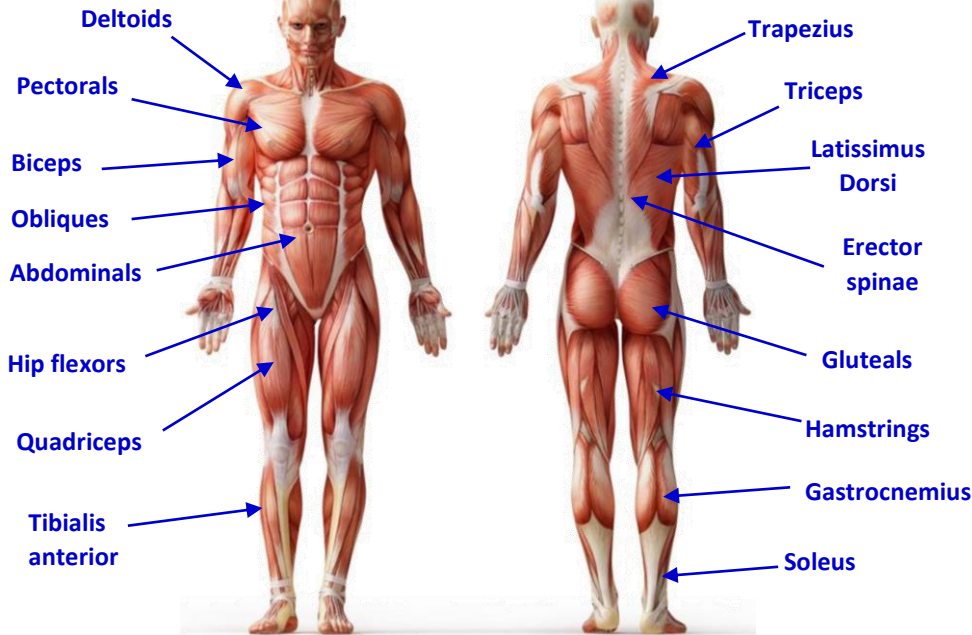


- Slow contraction
- Slow to fatigue
- Suited to aerobic activities
- Uses oxygen
- Rich blood supply
- Many mitochondria

## Muscle Fibre Types



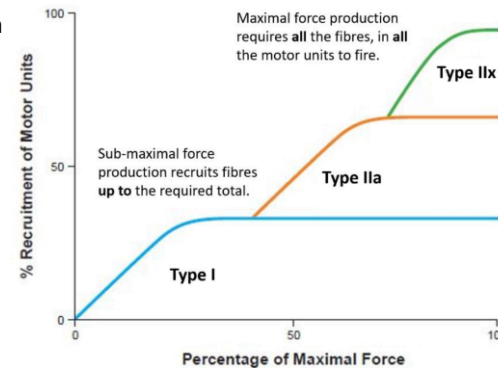
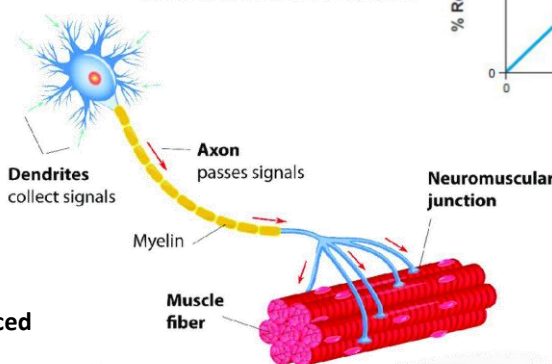
- Fast twitch fibres
- Fast contraction and powerful force
- Resistant to fatigue
- Need less oxygen
- Suited to speed, power and strength activities
- Fast twitch fibres
- Rapid contraction
- Large force produced
- Fatigue so better suited to anaerobic short events
- Stop- start- sports



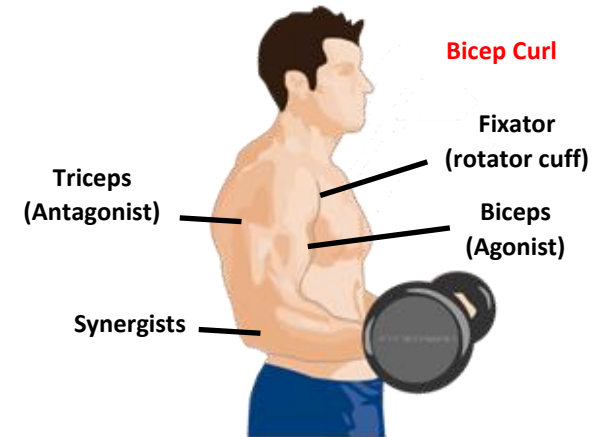
## All or nothing Law

- Nerve stimulation is needed for contraction
- Motor units used which contain motor neurons.
- When a motor unit is stimulated all the muscles attached will contract

## MOTOR NEURON



## Antagonistic Pairs



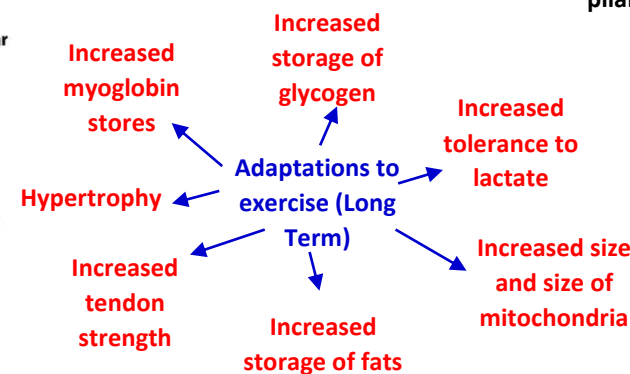
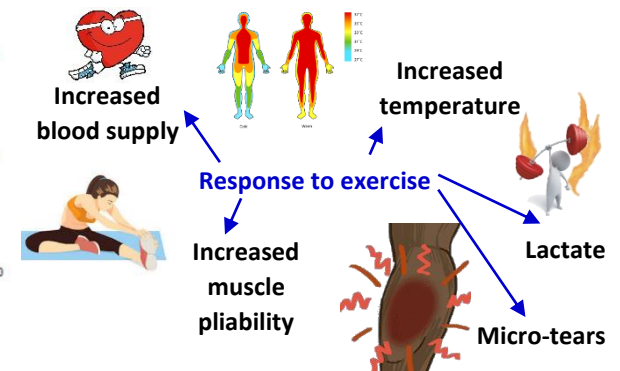
Antagonistic pairs = muscles that work together to produce movement (One muscle contracts whilst the other relaxes)

**Agonist** = muscle shortens to create movement

**Antagonist** = muscle relaxes during movement

**Fixator** = stops unwanted movement/stabilises

**Synergists** = Assists the agonist



## Additional Factors

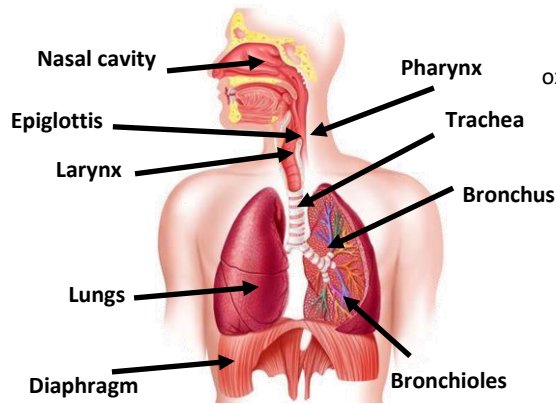
Age: Muscle atrophy

Cramp: involuntary contraction

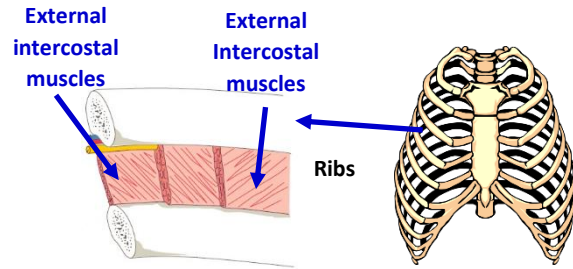
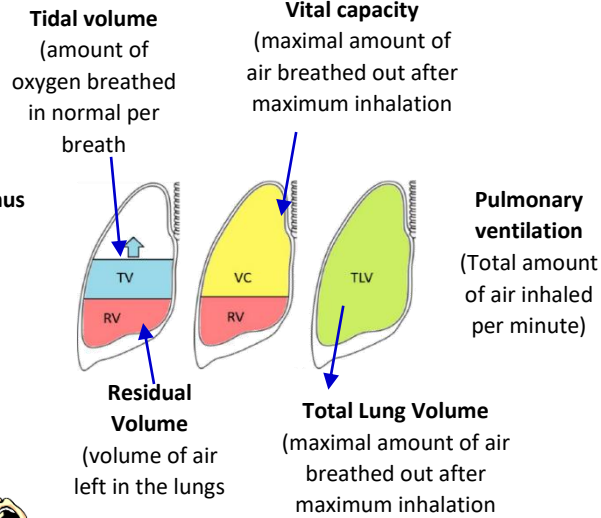


# The Respiratory System

## Structure of the Respiratory System

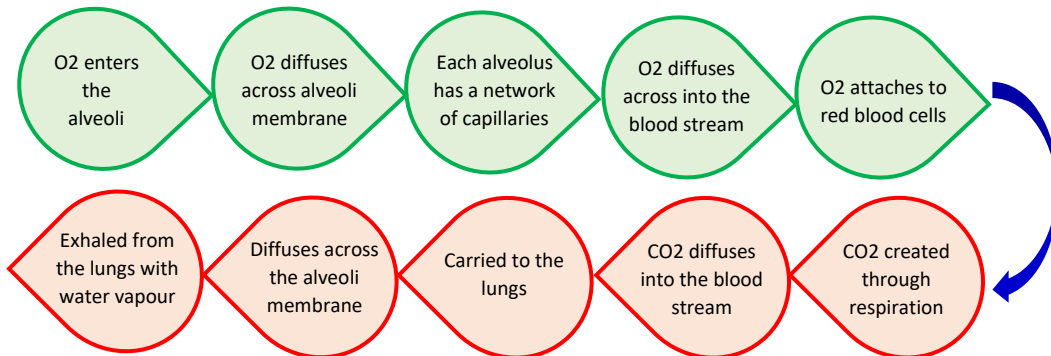
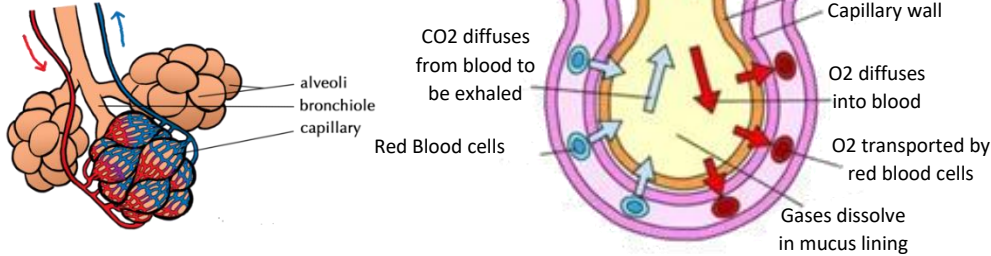


## Lung Volumes



## Gaseous Exchange

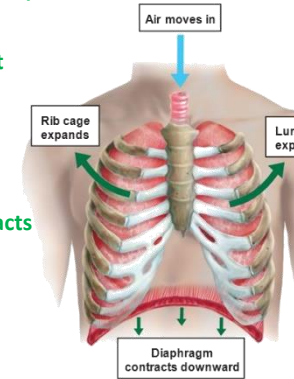
Process of exchanging oxygen and nutrients with waste products



## Inspiration (air in)

Intercostal muscles contract  
Ribs lifted  
Diaphragm contracts and flattens  
Thoracic cavity pressure drops

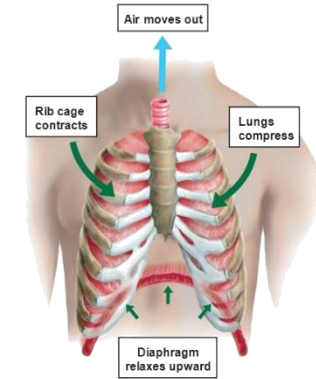
## Mechanics of breathing



Air drawn in

## Expiration (air out)

Intercostal muscles relax  
Ribs lower  
Diaphragm relaxes  
Thoracic cavity increased



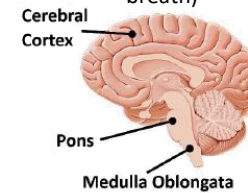
Air drawn out

## Control of ventilation

### Neural Control of Ventilation

#### Voluntary ventilation

Breathing can be controlled voluntarily by the cerebral cortex (e.g. holding your breath)



#### Voluntary ventilation

Breathing is controlled by the respiratory control centre (Medulla Oblongata)

### Chemical Control of Ventilation

#### Chemoreceptors

Located in the aorta and medulla oblongata

#### Detect changes in blood acidity (pH)

- Exercise will increase lactate production
- Breathing increases
- Lactic acid is broken down faster

#### Detect changes in blood CO<sub>2</sub> concentration

- Exercise will increase
- CO<sub>2</sub> removed more rapidly
- Breathing rate increases (dependent on exercise intensity)

## Response to Exercise (short term)



Increased breathing rate

Increased tidal volume

## Response to Training (Long term)



Increased vital capacity

Increased strength of respiratory muscles

Increased diffusion rates (O<sub>2</sub>/CO<sub>2</sub>)

### Additional Factors

Asthma

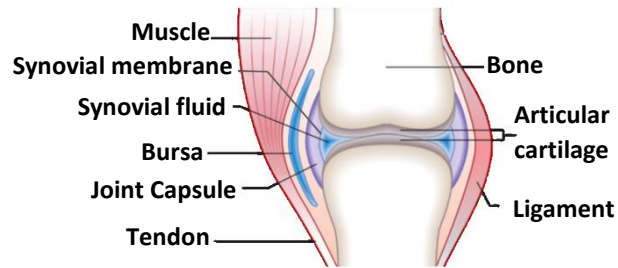
Effects of altitude/partial pressure

# Skeletal System

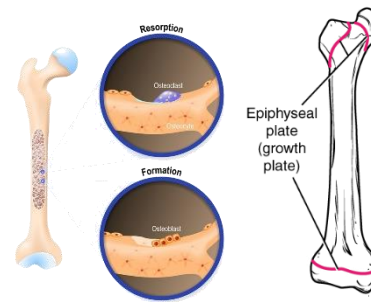
## Functions

- 1) Supporting framework
- 2) Protection
- 3) Attachment for muscles
- 4) Blood cell production
- 5) Storage of minerals
- 6) Leverage
- 7) Weight bearing
- 8) Reducing friction at joints

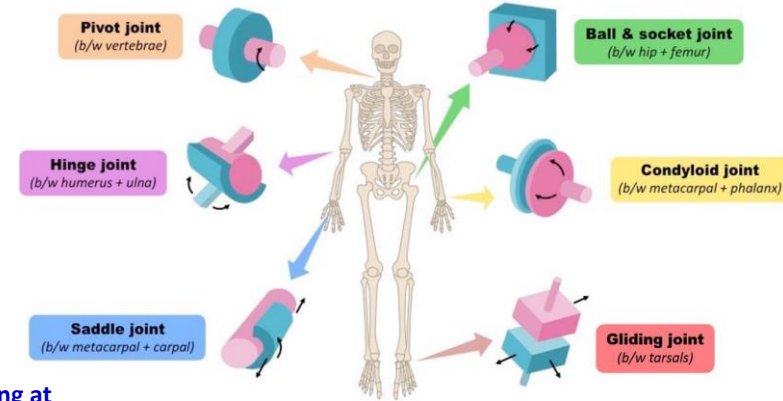
## Structure of a joint



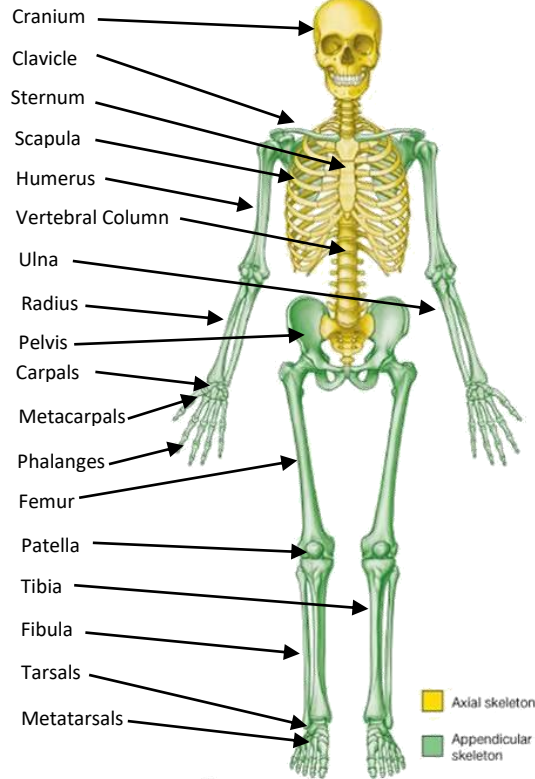
## Bone Growth



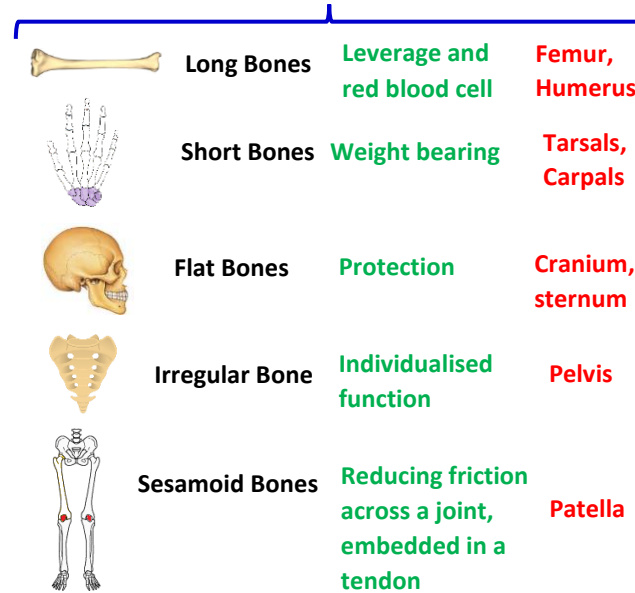
## 6 Types of synovial joint



## Bones



## Types of Bone



## Bones forming at specific joints

<b>Shoulder</b>
Scapula, Clavicle, Humerus
<b>Joint Type: Ball &amp; Socket</b>
<b>Elbow</b>
Humerus, Radius, Ulna
<b>Joint Type: Hinge</b>
<b>Wrist</b>
Carpals, Radius, Ulna
<b>Joint Type: Hinge</b>
<b>Hip</b>
Ilium, Pubis, Ischium, Femur
<b>Joint Type: Ball &amp; Socket</b>
<b>Knee</b>
Femur, Tibia, Fibula
<b>Joint Type: Hinge</b>
<b>Ankle</b>
Tibia, Fibula, Talus
<b>Joint Type: Hinge</b>

## Short Term Effects of exercise

Increases of mineral uptake in bones due to weight bearing exercises.

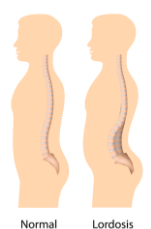
## Long Term Effects of exercise

- 1) Increased bone strength
- 2) Increased ligament strength

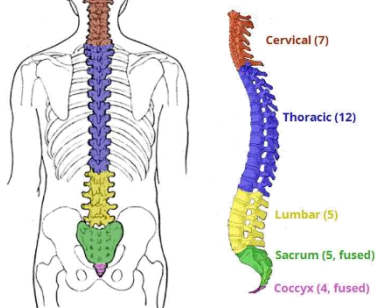
## Kyphosis



## Lordosis



## Vertebral Column



## Ranges of movement at synovial joints

