A-Level PE Anatomy and Physiology

Skeletal, muscular and neuromuscular systems

1. Joints

Joint	Joint Type	Articulating bones
Ankle	Hinge	Talus, tibia, fibula
Knee	Hinge	Femur, tibia
Hip	Ball and socket	Pelvis, femur
Shoulder	Ball and socket	Scapula, humerus
Elbow	Hinge	Radius, ulna, humerus

2. Antagonistic Pairs

Joint action	Agonist	Antagonist
Elbow flexion	Bicep brachii	Tricep brachii
Elbow extension	Tricep brachii	Bicep brachii
Ankle plantar-flexion	Gastrocnemius	Tibialis anterior
Ankle dorsi-flexion	Tibialis anterior	Gastrocnemius
Knee flexion	Hamstrings (semi-membranosis, semi-tendonosis, bicep femoris)	Quadriceps (vastus latoralis, vastus medialis, vastus intermedius, rectus femoris)
Knee extension	Quadriceps	Hamstrings
Hip flexion	Iliopsoas	Gluteals
Hip extension/hyper-extension	Gluteals	Iliopsoas
Hip adduction	Adductors (adductor brevis, longus, magnus)	Gluteus medius/minimus

3. Planes and Axes

	Plane/Axes	Movements
Remember		
Science Teachers	Sagittal plane and transverse axis	flexion, extension/hyper-extension, plantar-flexion and dorsi-flexion
Fake Science	Frontal plane and sagittal axis	adduction and abduction
To Learners	Transverse plane and longitudinal axis	rotation, horizontal adduction, horizontal abduction

4. Muscle Fibre Types

Characteristic	Type 1 (slow oxidative)	Type 2a (fast oxidative glycolytic)	Type 2x (fast glycolytic)
Contraction speed (m/sec)	Slow	Fast	Very Fast
Motor neurone speed	Small	Large	Large
Motor neurone conduction capacity	Slow	Fast	Fast
Force produced	Low	High	High
Fatigability	Low	Medium	High
Mitochondrial density	High	Medium	Low
Myoglobin	High	Medium	Low
Capillary density	High	Medium	Low
Aerobic capacity	Very high	Medium	Low

5. Varying the strength of a contraction

Motor Unit	A motor neurone and its muscle fibres.
Multiple unt summation	Increase the number of units that are stimulated at the same time
Larger units	Stimulate the larger motor units within a muscle
Muscle Fibre Type	Stimulate Type 2X for a more powerful contraction
All or Nothing Law	Impulses have to be of sufficient intensity to stimulate all of the muscle fibres in a motor unit in order for them to contract. If not none of them do.
Wave Summation	Where there is a repeated nerve impulse with no time to relax, so a smooth, sustained contraction occurs rather than twitches.
Tetanic Contraction	(Tetanus) A sustained powerful muscle contraction caused by a series of fast repeating stimuli.
Spatial Summation	When the strength of contraction changes by altering the number and size of the muscle's motor units

6. PNF Proprioceptive Neuromuscular Facilitation

Advanced stretching technique that is used to increase flexibility.

Physiology

Muscle spindles – Proprioceptors that detect how far and how fast a muscle is being stretched and produce the **stretch reflex.**

Golgi Tendon Organs – Detect tension in muscles during isometric contraction and cause **autogenic inhibition** (where there is a sudden relaxation of the muscle in response to high tension).

Method – Also knows as the CRAC method

A passive stretch is performed with the help of a partner and extends the leg until tension is felt.
An isometric contraction is then performed for at least 10 seconds by pushing against their partner who supplies just

7. Types of Contraction

Isotonic Contraction	When the length of a muscle changes as it contracts – movement is occurring.

enough resistance to hold the leg in a stationary position. This delays the stretch reflex. As the leg is passively stretched again, the antagonist muscle relaxes. Re-stretch to show increase in ROM.	Anaerobic capacity	Low	High	Very high	**Isotonic Concentric**	When the muscle shortens as it contacts
	Myosin ATPase activity	Low	High	Very high	**Isotonic Eccentric**	When the muscle lengthens as it contracts (downward squat/press-up)
					Isometric	When there is no change in length as the muscle contracts. Static.