11.2 Muscles and movement – *summary of mark schemes*

11.2.1	State the roles of bones, ligaments, muscles, tendons and nerves in human movement. Mark Scheme A. motor neurones carry impulses / messages to muscle; B. nerves / neurones stimulate muscles to contract; C. neurones control the timing of muscle contraction; D. muscles provide the force for / cause movement; E. muscles are attached to bone by tendons; F. bones act as levers; G. joints between bones control the range of movement; H. antagonistic muscles cause opposite movements;
11.2.2	Label a diagram of the human elbow joint, including cartilage, synovial fluid, joint capsule, named bones and antagonistic muscles (biceps and triceps). Mark Scheme A. humerus; B. radius; C. ulna; D. cartilage (on ends of bones); E. ligaments (connecting humerus with radius / ulna); F. capsule (sealing joint); G. synovial fluid; H. biceps (attached to radius); I. triceps (attached to ulna); J. tendons (connecting muscle to bone correctly);
11.2.3	Outline the functions of the structures in the human elbow joint named in 11.2.2. Mark Scheme A. labelled diagram showing, biceps, humerus, radius and ulna; B. cartilage reduces friction; C. synovial fluid lubricates the joint; D. synovial membrane secretes synovial fluid; E. capsule / capsular ligament seals the joint; F. ligaments prevent dislocation / restrict the range of movement / attach bones to one another; G. motor neurones stimulate muscles to contract; H. bones provide a firm anchorage for muscles; I. bones act as levers / change the torque / size / direction of forces; J. tendons attach muscle to bone; K. biceps and triceps are antagonistic; L. biceps is the flexor / bends the elbow joint and triceps is the extensor / straightens the elbow joint; M. biceps is attached to the radius and triceps is attached to the ulna;
11.2.7	Explain how skeletal muscle contracts, including the release of calcium ions from the sarcoplasmic reticulum, the formation of cross-bridges, the sliding of actin and myosin filaments, and the use of ATP to break cross-bridges and re-set myosin heads. Mark Scheme A. (skeletal) muscle is composed of myofibrils; B. operational unit is a sarcomere; C. viewed as a series of light and dark bands; D. muscle / sarcomeres contain actin filaments and myosin filaments; E. thin actin fibres; F. thick myosin fibres; G. arrival of action potential; H. release of Ca2+; I. from sarcoplasmic / endoplasmic reticulum; J. Ca2+ binds to troponin; K. causing troponin and tropomyosin to move (on actin);

	L. exposing binding sites on actin / for myosin; M. ATP binds to myosin heads releasing them / breaking cross bridges; N. ATP hydrolysed / split into ADP + Pi; O. ATP / energy causes myosin heads to change shape / swivel / become cocked; P. myosin heads bind / form cross-bridges to (exposed) actin binding sites; Q. myosin heads swivel / move actin (releasing ADP + Pi); R. myosin filaments move actin filaments towards centre of sarcomere; S. sliding of filaments / actin and myosin shortens the sarcomere;