

**Answers – use to correct yours after you attempt the questions**

- 1 (a) **A** centron/cell body  
**B** Schwann cell/myelin sheath  
**C** axon/axoplasm  
**D** node of Ranvier  
**Four for [3], Three for [2], Two for [1]** [3]
- (b) Arrow away from centron/from left to right; [1]
- (c) Schwann cell (myelin) insulates axon/action potentials (depolarisation) only occur at the nodes of Ranvier;  
the action potentials jump from node to node/saltatory conduction;  
*Unacceptable phrasing – ‘insulator of impulse’ or ‘impulse cannot travel through myelin sheath’.* [2]
- 2 (a) (i) A – I (isotropic)/light band;  
B – Z line;  
C – sarcomere;  
D – mitochondrion; [4]
- (ii) Muscle contracted; [1]
- (b) Free myosin binding sites on the actin filaments; [1]
- 3 (a) (i) Post synaptic membrane; [1]
- (ii) **Any three from**
- (binding with ACh receptor sites) causes depolarisation of the post synaptic membrane
  - inside the post-synaptic membrane becomes positive/influx of sodium ions through post synaptic membrane
  - an excitatory post-synaptic potential (EPSP) occurs
  - if a threshold is reached (e.g. enough sodium enter) an action potential occurs [3]
- (iii) Post synaptic nerve cell remains in an excited state/continuous stimulation of post synaptic membrane/less summation is needed to transmit across the synapse; [1]
- (b) (i) Block the ACh receptor sites/blocks channels which allow movement of ions across the membrane/induce the entry of negative ions ( $\text{Cl}^-$ )/induce the removal of positive ions ( $\text{Na}^+/\text{K}^+$ )/other appropriate response; [1]
- (ii) **Any two from**
- depolarisation is less likely to take place
  - prevents threshold being reached
  - thus an action potential is less likely to be created/rendering the nerve less capable of carrying an impulse [2]
- (iii) Increased reaction times/loss of motor control/may lead to dangerous behaviour/less pain felt; [1]
- 4 (a) (i) A: myosin;  
B: actin;  
**[one mark allowed for both answers but in incorrect order]** [2]
- (ii) A-band (dark/anisotropic)/region of overlapping filaments; [1]
- (b) (i) Synapse results in muscle contraction (and not further nerve impulses/depolarisation of sarcolemma)/T-tubules not in membrane of adjacent neurone; [1]
- (ii) Number of muscle fibres contract simultaneously [*correct muscle terminology needed*]; [1]
- (iii) **Any three from**
- calcium ions cause binding sites on actin filaments to be available/allows myosin and actin to bind
  - myosin head rotates
  - pull actin filaments over the myosin
  - ATP allows myosin to detach from actin
  - myosin head returns to original position and re-attaches to actin further along/(repeat of process/ratchet mechanism) [3]

- 6 (a) Rods are mostly found in the periphery/rods evenly distributed throughout the retina except at the fovea; while cones are concentrated in the fovea; [2]
- (b) Cones cannot work as there is insufficient light; rods cannot work as they are bleached; during dark-adaptation rhodopsin is resynthesised; [3]
- (c) Any three from
- blue-absorbing cones not involved/both green absorbing and red absorbing cones involved
  - green-absorbing and red-absorbing cones are equally involved
  - reference to values (approximately 85% of yellow light absorbed by both)
  - both green absorbing and red absorbing cones stimulate neurones of the optic nerve/neurones from blue absorbing cones are not stimulated [3]

- 5 (a) Actin; myosin; [2]  
If wrong way round allow [1]
- (b) Diagram A shows the image obtained from a t.s. through the region of overlap of thin and thick filaments/is a transverse section through the dark (A) band (non H zone); while B shows the image obtained in t.s. through the region where there are thin filaments (actin) only/is a transverse section through the light (I) band; [2]
- (c) A; since during contraction the filaments slide over each other/the I band decreases in width; [2]
- (d) (i) Calcium is released from the sarcoplasmic reticulum when an impulse is transmitted through the muscle fibre/calcium initiates the attachment of myosin heads to the actin filaments; [1]
- (ii) ATP is required for the detachment of the myosin heads from the actin filaments/ATP is required for re-orientation of (recharges) the myosin heads; [1]

- 3 (a) (i) Rhodopsin; [1]
- (ii) Maximises the amount of light absorbed by rhodopsin; [1]
- (iii) Supplies ATP, required for the regeneration of rhodopsin; [1]
- (b) (i) They exhibit retinal convergence/many rod cells synapse with a smaller number of bipolar cells which synapse with a single ganglion cell; [1]
- (ii) Additive effect (of retinal convergence)/summation; explanation of this in terms of sufficient transmitter being released/reaching threshold for action potential; [2]