

Markscheme

May 2017

Sports, exercise and health science

Standard level

Paper 2

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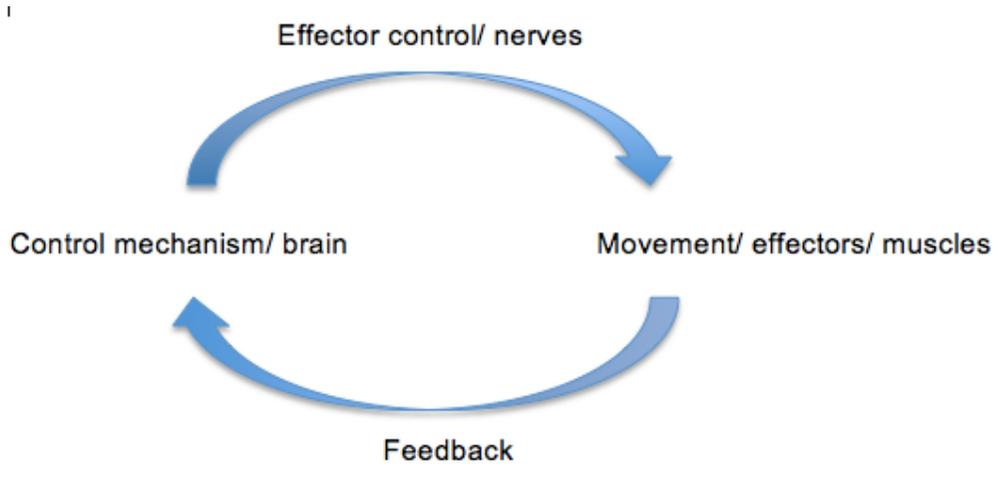
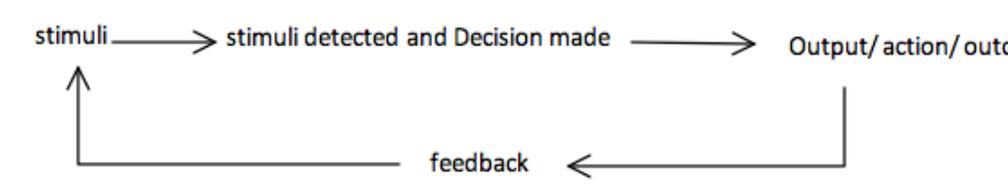
Section A

Question		Answers	Notes	Total
1.	a	<p>3 – 6 ✓ = -3 (mL kg⁻¹ min⁻¹) ✓ OR 6 – 3 ✓ = 3 (mL kg⁻¹ min⁻¹) ✓</p>	<i>Units not required.</i>	2
	b	<p>positive relationship between increasing training intensity and VO₂max ✓ at the higher intensity level there is a greater increase/positive acceleration in VO₂max ✓</p>		2 max
	c	<p>randomization is used to avoid bias/so that all groups were equal in ability and potential to respond ✓ randomization is one way to help ensure that results are demonstrating causality ✓</p>		2 max
	d	<p>increased left ventricular volume/increased stroke volume ✓ lower resting heart rate ✓ lower working heart rate (when working at the same comparative level as before training) ✓ increase in max cardiac output ✓ hypertrophy of the heart ✓ decrease resting blood pressure ✓</p>		2 max

1.	e	<p><i>Example:</i> <i>For a runner:</i> by running different routes/ distances ✓ running with different people ✓ run in different conditions, eg altitude, weather ✓ running at different speeds/ intensity over the run ✓ running with music ✓ runner doing rowing or some other form of physical activity that would enhance components of fitness ✓</p>		2 max
	f	boys/males ✓		1
	g	<p>i cardiac output = stroke volume × heart rate ✓ OR $Q = SV \times HR$ ✓</p>		1
		<p>ii 52×192 ✓ $= 9984 \text{ mL min}^{-1} / 9.9 \text{ L min}^{-1} / 10 \text{ L min}^{-1}$ ✓</p>	<p><i>ECF from 1gi calculation</i> <i>Units not required.</i></p>	2
	h	<p>peak VO_2 is greater for boys (1.41) than girls (1.23) ✓ because boys are able to extract / utilise more oxygen from blood/ greater arterio-venous difference in males (14.8) than females (12.6) ✓ a greater SV/Q/HR in boys / means that more oxygen can be transported around the body ✓ boys have a lower respiratory exchange ratio value which can mean that their ability to utilise oxygen is greater than the girls ✓</p>		3 max

Question		Answers	Notes	Total
2.	a	compact ✓		1
	b	<p>learning is a continuous process while performance occurs at one time ✓</p> <p>OR</p> <p>learning causes permanent change while performing is temporary ✓</p> <p>learning may be difficult to measure but performance can be measured accurately ✓</p> <p>OR</p> <p>learning may be assessed but performance can have a quantitative measure ✓</p> <p><i>eg, a golfer's handicap may change due to learning while a single good shot is performance ✓</i></p>	<p><i>Award [1 max] if no example is given from a named sport.</i></p> <p><i>Accept answers in the converse.</i></p> <p><i>Accept other valid examples.</i></p>	2 max
	c	<p>gross as involves large muscle movements ✓</p> <p>closed as it takes place in a stable environment ✓</p> <p>continuous as cycle is repeated / no obvious beginning or end ✓</p> <p>internally paced as swimmer controls the rate skill is executed ✓</p> <p>coactive as performed at same time as others ✓</p> <p>competitors are performing at the same time but where they are physically separated ✓</p>		3 max

Question			Answers	Notes	Total
3.	a	i	<p><i>Concentric contraction:</i> the muscle shortens while developing tension ✓ biceps during a bicep curl when the forearm comes up toward the upper arm ✓</p>		1 max
		ii	<p><i>Eccentric contraction:</i> the muscle lengthens while developing tension ✓ biceps when lowering a weight during the curl – the forearm is moved away from the upper arm ✓</p>		1 max
	b		<p>ATP is the only usable source of energy by the cell/ releases energy for muscle contraction ✓ ATP is present at the myosin head <ready to be used> ✓ ATP gets broken down to ADP/ loss of Pi initiates power stroke ✓ ADP can be re-joined with P which can be achieved from the use of more ATP / the breakdown of CP / PC / ATP / ADP P is reversible ✓</p>		3 max

<p>3.</p>	<p>c</p>	<p>1</p>  <p>OR</p> 	<p><i>The sketch needs to show that the components are linked in an enclosed loop.</i></p> <p><i>Award [1] for loop from brain to movement.</i></p> <p><i>Award [1] for movement/ output to feedback to brain.</i></p>	<p>2 max</p>
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Section B

Question		Answers		Notes	Total
4.	a	<p><i>Cartilage:</i> joins bone to bone (as in cartilaginous joints) ✓ allows limited movement (in cartilaginous joints) ✓</p> <p><i>Ligament:</i> attaches bone to bone (in synovial joints) ✓ helps provide stability for synovial joints ✓</p> <p><i>Tendon:</i> attaches (skeletal) muscle to bone ✓ helps provide stability for synovial joints ✓</p>		Award [1] per type of connective tissue.	2
	b	<p><i>Erythrocytes:</i> transports oxygen ✓ transports carbon dioxide ✓</p> <p><i>Leucocytes:</i> fight disease and infection ✓</p> <p><i>Platelets:</i> responsible for clotting the blood ✓</p>		Award [1 max] per cell type.	3
	c	<p>Strengths can do many subjects at once ✓ minimal equipment needed ✓ it has subjects working to their sub-max – not too stressful ✓ easy to score/administer ✓</p>	<p>Limitations equipment is specific – bench of a set height, metronome set to a beat ✓ specific to leg muscle and action/ not specific to a sport ✓ set bench height favours taller participants ✓ heart rate measure can be of varying accuracy ✓</p>	Award [2 max] if only strengths or limitations are given.	3

4.	d	<p>insulin is released from the pancreas when blood glucose is high/when blood glucose levels increase after eating ✓</p> <p>insulin helps to maintain a stable/normal level of blood glucose ✓</p> <p>inhibits gluconeogenesis ✓</p> <p>insulin inhibits glucagon ✓</p> <p>inhibits lipolysis ✓</p> <p>promotes glycogenesis ✓</p> <p>insulin promotes the uptake of glucose into fat cells ✓</p> <p>it encourages an anabolic reaction ✓</p>	<p><i>Accept converse.</i></p>	<p>6</p>
	e	<p><i>Rotation:</i> movement of bone/limb around a central/longitudinal axis ✓</p> <p><i>Flexion:</i> bending or decreasing the angle between 2 bones ✓</p> <p><i>Extension:</i> increasing the angle between 2 bones ✓</p> <p><i>Abduction:</i> movement of the bone/ limb away from the midline of the body ✓</p> <p><i>Adduction:</i> movement of the bone toward the midline of the body ✓</p> <p><i>Circumduction:</i> when the end of the bone makes a circle and the bone makes the shape of a cone ✓</p> <p><i>Depression:</i> movement at the shoulder downwards towards the feet ✓</p> <p><i>Elevation:</i> movement of lifting the shoulders towards the head ✓</p>	<p><i>Name it and describe it for [1].</i> <i>Award [1 max] for each.</i></p> <p><i>For abduction the intent must be shown for movement to be away from the midline and adduction toward the midline</i></p>	<p>6</p>

Question		Answers	Notes	Total										
5.	a	<table border="1"> <tr> <th>Fibrous</th> <th>Cartilaginous</th> </tr> <tr> <td>no movement</td> <td>slight movement ✓</td> </tr> <tr> <td>stable</td> <td>less stable ✓</td> </tr> <tr> <td>bones held by fibres</td> <td>bones held by cartilage ✓</td> </tr> <tr> <td>eg, bones of the skull/ pelvis</td> <td>eg, vertebrae to ribs/ sternum to ribs ✓</td> </tr> </table>	Fibrous	Cartilaginous	no movement	slight movement ✓	stable	less stable ✓	bones held by fibres	bones held by cartilage ✓	eg, bones of the skull/ pelvis	eg, vertebrae to ribs/ sternum to ribs ✓	Award [1 max] per line.	2
		Fibrous	Cartilaginous											
		no movement	slight movement ✓											
		stable	less stable ✓											
		bones held by fibres	bones held by cartilage ✓											
eg, bones of the skull/ pelvis	eg, vertebrae to ribs/ sternum to ribs ✓													
b	<p><i>Warm-up:</i> usually consists of light continuous activity which builds in intensity/aerobic activity to help warm up the body/ loads the blood with oxygen ✓</p> <p><i>Stretching activities:</i> are done as part of the warm-up and cool down phase ✓ stretching may increase flexibility/reduce injury ✓</p> <p><i>Endurance training:</i> where a person works for long periods of time to exercise their heart, lungs and large muscle groups ✓</p> <p><i>Cool down:</i> done at the end of the exercise session to enable the body to gradually come back to a resting state ✓</p> <p><i>Flexibility training:</i> stretching of the body to help improve the range of movement/ can be dynamic, static, PNF ✓</p> <p><i>Resistance training:</i> loading the muscles while doing exercise to help promote the maintenance and growth of muscle tissue ✓</p> <p><i>Incorporation of recreational activities and sports:</i> this could be walking or jogging with others/this is to help motivate individuals ✓</p>	Name it and describe it for [1]. Award [1 max] for each.	6											

5.	c	<p>cardiovascular drift is the gradual increase in HR seen in an athlete doing prolonged <steady state> exercise ✓</p> <p>dehydration contributes to cardiovascular drift ✓</p> <p>cardiovascular drift is associated with increased blood viscosity ✓</p> <p>over prolonged periods of exercise stroke volume decreases ✓</p> <p>blood being sent to the skin/vasodilation for cooling reduces stroke volume to active muscles causing HR to increase ✓</p> <p>to maintain cardiac output HR increases ✓</p> <p>exercise in a hot environment exaggerates cardiovascular drift ✓</p>		3
	d	<p>uses glucose as the fuel ✓</p> <p>used at the start of exercise</p> <p>OR</p> <p>is dominant for up to 3 minutes ✓</p> <p>used in high intensity exercise/eg, 400m sprint ✓</p> <p>anaerobic ✓</p> <p>has lactic acid as a byproduct ✓</p> <p>lactic acid limits longer duration exercise ✓</p> <p><1 glucose> makes 2 ATP with this system ✓</p> <p>occurs in the cell cytoplasm/sarcoplasm/outside the mitochondria ✓</p> <p>the breakdown of glucose is activated by a reduction in PC levels ✓</p>		6

5.	e	<p>differences in the partial pressure/concentration of oxygen in the alveoli and blood create a pressure/concentration gradient ✓</p> <p>oxygen travels from areas of high partial pressure/concentration to low partial pressure/ concentration ✓</p> <p>transfer of O₂ is into the blood stream/capillary (at the alveoli) ✓</p> <p>oxygen is dissolved at the alveoli in order to move across and into the blood stream ✓</p> <p>oxygen diffusion increases as one moves from rest to exercise ✓</p> <p>while exercising, muscles require more O₂ to be used in the metabolic process</p> <p>OR</p> <p>venous oxygen is depleted and O₂ exchange at the alveoli is facilitated ✓</p>		3
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Question		Answers	Notes	Total
6.	a	<p><i>Muscle contractility:</i> the ability of a muscle to contract forcefully ✓</p> <p><i>Extensibility:</i> a muscle can be stretched beyond its normal resting length ✓</p> <p><i>Elasticity:</i> the ability of a muscle to recoil back to its original resting length after stretching ✓</p> <p><i>Excitability:</i> control by nerve stimuli ✓</p> <p><i>Atrophy:</i> a decrease in size due to a lack of exercising a muscle group ✓ this change in size is primarily due to a decrease in the number of myofibrils and sarcomeres inside the muscle fiber ✓</p> <p><i>Hypertrophy:</i> an increase in muscle size ✓</p> <p><i>Fed by capillaries:</i> which supply oxygen/ remove CO₂ ✓</p>	Award [1 max] per characteristic.	2
	b	<p>acetylcholine is the neurotransmitter/initiates muscle contraction ✓ allows electrical impulse to pass from the nerve to the muscle ✓</p> <p>OR</p> <p>converts electrical impulse into a chemical message ✓ Acetylcholine is produced in the cytoplasm of the terminal end/ stored in vesicles ✓ acetylcholine diffuses across the synaptic cleft ✓ binds with post synaptic receptors/receptors at motor end plate ✓ acetylcholine increases the permeability <of sarcolemma> to sodium/ stimulates the release of calcium ions ✓</p>		3

<p>c</p>	<p><i>Intrinsic:</i> information received from inside the performer/is received via proprioceptors/it is the “feel” associated with movement ✓ could be positive or negative ✓</p> <p><i>Extrinsic:</i> received from outside the performer/received via senses/such as sight and sound through exteroceptors from coaches ✓</p> <p><i>Knowledge of performance:</i> information about the execution of the performance ✓ usually from external sources but can be internally obtained if the performer is experienced enough ✓</p> <p><i>Knowledge of results:</i> information about the outcome of performance/it is obtained externally from your senses ✓</p> <p><i>Positive:</i> used to encourage and reinforce good behaviour such as praise, rewards ✓ could be the feeling or sound created from a good contact ✓</p> <p><i>Negative:</i> received if performance is not correct (the aim is to discourage performance) ✓</p> <p><i>Concurrent:</i> received during the activity ✓ could be intrinsic or extrinsic ✓</p> <p><i>Terminal:</i> received after the activity has occurred ✓</p>	<p>Award [1 max] for each type of feedback.</p>	<p>6</p>
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<p>d</p>		<p>Coding changing the information into a word/number/movement code, (which is shorter and easier to remember) ✓ eg, in many sports key moves are coded to help team members recall information quickly (as well as hide information from opposition) ✓</p> <p>Chunking information is grouped together, instead of being presented/taught as individual items ✓ eg, in the breaststroke the three actions of “reach, glide and pull” are better grouped together/ practised as one movement ✓ allows more information to be memorized in a single glance/situation ✓</p> <p>Association new learning is linked to what players already know/ movement patterns are matched to something already known to the performer ✓ eg, throwing a javelin is like throwing a water polo ball ✓</p>	<p><i>Award [1 max] per method.</i></p>	<p>3</p>
<p>e</p>		<p>muscles work in opposing/antagonistic pairs/groups ✓ a contracting muscle/prime mover is the agonist ✓ the relaxing muscle/muscle that opposes the action is the antagonist ✓ when an agonist is stimulated the antagonist neuron is inhibited ✓</p> <p><i>Example for knee:</i> <i>During the preparation phase/flexion at the knee:</i> hamstring group is acting as the agonist ✓ quadriceps is acting as the antagonist ✓</p> <p><i>As the leg extends at the knee/action/execution phase:</i> quadriceps is the agonist ✓ hamstring is the antagonist ✓</p>	<p><i>Students can identify either the backswing (preparation) or the action stage.</i></p> <p><i>Award [4 max] for a description.</i></p> <p><i>Award [4 max] for the example.</i></p>	<p>6</p>