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Mark Scheme (Results)
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GCE

GCE Physical Education (6723) Paper 1

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Unit 3: Exercise and Training (6723)

Question Number	Answer	Mark
1 (a) (i)	VO_2 max – The maximum volume of O_2 that can be taken in and used per minute (per kg of bodyweight) Men generally have: • less body fat • larger hearts/lung capacity • more RBC/haemoglobin.	**(3)**
1 (a) (ii)	NB • test must be accurately named for 1 mark • marks for protocol awarded even if test named incorrectly. 1. <u>(NCF) multistage fitness test.</u> 2. a distance of 20 meters is marked out 3. a calibrated tape/CD plays a progressive series of bleeps 4. the athlete has to run the 20m in time to the bleeps 5. each stage, of which there are 20, the time between the bleeps decreases 6. when the athlete can no longer make the distance in time to the bleeps they must stop the test. 7. <u>astrand test</u> 8. athletes pedal on a cycle ergometer 9. at a constant workload for 7 minutes 10. the steady state heart rate is then looked up on published tables (nomogram) to determine an estimation of $V0^2$max. 11. <u>cooper test</u> 12. an area is marked and measured out 13. athletes run around the area for 12 minutes 14. the distance covered in the time is recorded with distances being cross referenced against a table of predictive data. 15. <u>incremental treadmill test/gas analysis test</u> 16. treadmill speed and/or gradient increase throughout 17. athlete continues to voluntary exhaustion 18. oxygen uptake is measured by gas analyser. Or other suitable alternative.	**(4)**

Question Number	Answer	Mark
1 (a) (iii)	1 mark for the correctly named method of training and 2 marks for appropriate characteristics. NB – to gain any marks students must state a method of training. 1. continuous 2. constant intensity/sub maximal 3. long duration 4. fartlek 5. varied intensity 6. over different terrains 7. long Intervals 8. W:R ratio 9. repeated.	**(3)**
1 (b) (i)	The sport (must be a sport not an activity) must be specific and relevant. eg 1. type I/slow twitch 2. marathon runner 3. type IIa/FOG 4. games player/middle distance runner. 5. type IIb/FTG 6. 100m sprinter.	**(6)**

Question Number	Answer	Mark
1 (b) (ii)	NB • fibre must be identified but no marks for renaming the fibre type. • no fibre named = no marks. 1 mark for correctly applied mode of training. 1 mark for the justification. 1 mark for targeted adaptation. <u>Type I –</u> 1. continuous 2. exerts med to low intensity but for a long duration 3. increased capacity to deal with O_2 eg increased myoglobin content/increased size/density of mitochondria/increased capillarisation/increased resistance to fatigue <u>Type IIa –</u> 1. fartlek/intervals/light weights – high rps 2. works relatively intensely but for longer than a traditional anaerobic fast twitch fibre can 3. increased capacity to deal with O_2/able to exert a greater force/intensity for longer/increased myoglobin content/other fibres begin to take on the characteristics of FOG fibres/increased tolerance of lactic acid/increased size/density of mitochondria/increased capillarisation/ increased resistance to fatigue/increased size of muscle fibre. <u>Type IIb-</u> 1. interval/weight training – high weight – low reps/ plyometrics 2. works maximally and therefore only for a short period 3. increased levels of PC and muscle glycogen/slight increase in resistance to fatigue/increased level of power generated/increased resistance to lactic acid/increased size of muscle fibre.	**(9)**

Question Number	Answer	Mark
2 (a)	NB The question asks for an identification of **how** warming up might improve performance. It **does not** ask for a list of responses. A warm up should increase heart rate and ventilation rates which can: 1. increase body/local muscular temp so that movement is more efficient/effective 2. increase strength 3. increase speed of O_2 delivery increasing the efficiency of energy production/reducing use of anaerobic system 4. increased venous return helps to facilitate an increased speed of CO_2/lactic acid removal thus preventing the metabolic process from slowing/being effected 5. > synovial fluid production Increase ROM/improve movement efficiency 6. initiate vascular shunting to ensure a greater O_2 delivery 7. begin the process of thermo regulation so preventing overheating 8. improve alertness/reaction times/ready to begin straight away 9. perform at a higher intensity for longer 10. reduce the risk of injury 11. Improve timing – increases skill level/increases confidence 12. allows opportunity to prepare mentally 13. improved physiology facilitates an improved performance 14. faster nerve impulses when warm.	**(6)**
2 (b)	1 mark for each correct identification. 1 mark for each correct location. 1 mark for characteristic. 1 mark for role. 1. <u>hyaline/articular cartilage</u> 2. on the articulating ends of bones at joints 3. blue in colour 4. is strong/smooth/shiny 5. slightly elastic 6. provides smooth movement/some shock absorption/reduce friction. 7. <u>white fibro cartilage</u> 8. the knee joints or intervertebral discs 9. very strong/tough 10. elastic qualities 11. provides stress relief and eliminates shock. 12. <u>fibrous cartilage</u> 13. the cranium 14. strong strap like - used to form immovable joints 15. can absorb significant loads 16. inelastic.	**(4)**

Question Number	Answer	Mark
2 (c)(i)	If the definition is vague ie does not stipulate < 60 bpm but mentions HR, then the definition receives 0 marks but the rest of the question is marked. If the definition for bradycardia is wrong then 0 marks for the whole question. Max of 2 marks for reasons why an aerobic athlete is likely to experience bradycardia: 1. bradycardia is a (decreased) resting heart rate below 60 bpm 2. aerobic athletes use oxygen and so the CV system works for a long duration 3. cardiac hypertrophy is a likely adaptation to regular aerobic exercise 4. increased size of chambers means the heart holds more / > end diastolic value 5. and is able to pump out more (> SV) blood per beat 6. aerobic athletes often experience a loss of body mass 7. less body mass and improved circulatory efficiency leads to the heart needing to beat less often.	**(3)**
2 (c)(ii)	Any two from the following: Structural 1. cardiac hypertrophy 2. vascularisation of the cardiac muscles 3. increased thickness of the ventricular myocardium 4. > No. of RBC. Any two from the following: Functional 5. > End diastolic Volume 6. > SV 7. > Strength of ventricular contraction 8. < End Systolic Volume. 9. > Q during exercise 10. increased parasympathetic nervous activity/slower SA node firing.	**(4)**
2 (d)	1. tidal volume (TV) 2. volume inspired or expired per breath at rest 3. inspiratory reserve volume (IRV) 4. maximum volume inspired after a normal inspiration 5. expiratory reserve volume (ERV) 6. maximum volume expired after a normal expiration 7. residual volume (RV) 8. volume remaining in the lungs after the most forceful expiration.	**(8)**

Question Number	Answer	Mark
3 (a)(i)	1. cardiac centre within the medulla contains the cardiac acceleratory and inhibitory centres 2. when stimulated the cardiac acceleratory centre engages the sympathetic nervous system to speed up heart rate 3. when stimulated the cardiac inhibitory centre engages the para sympathetic nervous system to slow down heart rate 4. the SA node receives the electric impulse and emits a regulated impulse 5. this is detected by, and results in atrial systole 6. the electrical impulse generated by the SA node is also received by the AV node 7. the AV node delays the impulse (0.10 secs) 8. the AV node transfers the signal to AV bundle (bundle of his) which sends out a new/stronger signal through the ventricles over specialized conducting fibres referred to as the Purkinje system 9. resulting in ventricular systole.	**(3)**

Question Number	Answer	Mark
3 (a) (ii)	1. <u>the autonomic nervous system</u> 2. within the medulla of the brain are two centres, the cardio-acceleratory centre and the cardio-inhibitory centre, which are linked to the SA node by nerve fibres 3. the sympathetic (increases) and the parasympathetic (decreases) nervous system work antagonistically to regulate the heart rate 4. the autonomic nervous system identifies situations of change eg changes in muscle chemistry/changes in blood pressure and a decrease in PH levels/build up of carbon dioxide and also lactic acid in the blood 5. this change will be noted and a message sent to the cardio-acceleratory centre, which engages the sympathetic nervous system and increases the heart rate 'OR' 6. <u>sensory control</u> 7. the medulla receives sensory information from receptors such as stretch receptors and baroreceptors 8. these detect increases in blood flow in these vessels 9. as blood pressure levels increase the arteries stretch to maintain a constant pressure 10. the stretch receptors identify the stretch and activate the baroreceptors 11. they then bring about a reflex that slows the heart 'OR' 12. <u>hormonal control of heart rate</u> 13. nervous impulses from the brain being sent to the adrenal glands, stimulating them to secrete the hormone adrenaline et al 14. hormones such as adrenaline/noradrenalin/epipherine prepare the body for emergencies 15. resulting in an increased HR/constriction of arterioles 16. resulting in a rise in blood pressure 17. overall, their effect is to prepare the athlete for a rise in blood carbon dioxide concentration before it really occurs.	**(4)**

Question Number	Answer	Mark
3 (b)(i)	1. arteries carry blood away from the heart with the exception of coronary arteries 2. veins carry blood back to the heart 3. veins act as a reservoir.	**(2)**
3 (b) (ii)	1 mark for characteristic of each and 1 mark for application of characteristic to the specific role. <u>arteries</u> characteristic: 1. the walls of arteries are generally thicker/more elastic 2. smaller lumen 3. stretch to allow blood surges to flow through application: 4. stretch allows rapid flow of blood. 5. this maintains a constant pressure within the vessel 6. this allows blood flow to be consistent from the heart to the capillaries 7. take blood away from heart <u>veins</u> characteristic: 1. inelastic walls 2. the pressure within them changes 3. contain valves to prevent backflow application: 4. valves prevent backflow 5. walls do not stretch 6. veins can act as blood reservoirs 7. return blood to the heart 8. an increase in pressure is required to open the valves and allow blood to flow through/back to the heart.	**(4)**
3 (c) (i)	1. validity is whether the test actually measures the components that you want it to 2. reliability is how accurate the test is and how able you are to replicate the test with fitness levels being the only variable.	**(2)**
3 (c) (ii)	1. NCF multistage fitness test measures VO_2max/aerobic fitness/cardiovascular fitness 2. astrand/cooper run/gas analysis.	**(2)**

Question Number	Answer	Mark
3 (c)(iii)	1. would not be valid for a rower as they do not run/ predominantly use their upper bodies/require other components of fitness 4. performing the test outside would not be reliable as weather would affect performance/the outcome.	**(2)**
3 (d)	No named sport = no marks. Components must be relevant to the sport. Only give the components if they are appropriate to the sport, but it is text book definitions that are required rather than applied examples, unless the applied example contains the necessary information. <u>Rugby:</u> 1. agility 2. the ability to change direction quickly, at speed and with control 3. trying to dodge an opponent 4. power 5. strength x speed 6. trying to accelerate quickly/applying force to stop an opponent 7. muscular endurance 8. the ability for the muscle/muscle group to exert a force over a long duration 9. the game lasts for 80 minutes and players need to be effective throughout the duration.	**(6)**

Question Number	Answer	Mark
4 (a)	Name (1 mark) 1. blood doping description (max 2 marks) 2. blood is removed, allowed to be replenished naturally 3. the blood is then replaced / re injected 4. artificial way of increasing the number of red blood cells/haemoglobin 5. more haemoglobin = greater oxygen carrying capacity 6. can significantly increase VO_2 max 7. blood transfusion either with the athletes own or with matching blood of someone else dangers (max 2 marks) 8. increased viscosity of the blood 9. elevating blood pressure 10. can lead to an increased risk of heart failure/stroke/thrombosis 11. can lead to kidney damage 12. infection 13. overloading the circulatory system 14. disqualification name (1 mark) 15. EPO/rEPO (Recombinant Erythropoietin) description (max 2 marks) 16. recombinant erythropoietin - genetically engineered EPO 17. artificially raising their red blood cell level and enhancing their bodies oxygen carrying capacity dangers (rEPO) (max 2 marks) 18. increased viscosity of the blood 19. elevating blood pressure 20. can lead to an increased risk of heart failure, stroke and thrombosis 21. disqualification 22. infection if injected name (1 mark) 23. anabolic steroids description (2 marks) 24. decrease recovery time 25. increase rate of protein synthesis dangers (2 marks) 26. heart disease 27. liver failure 28. mood swings 29. secondary male sex characteristics (for women) 30. disqualification. etc	**(7)**

Question Number	Answer	Mark
4 (b)(i)	1 mark for identifying each type of muscular contraction. 1 mark for each definition. Any three from the following: 1. <u>isotonic</u> 2. muscle length actively changes during the contraction producing movement 3. <u>isometric</u> 4. the muscle contracts without visibly changing length providing no movement 5. <u>isokinetic</u> 6. the speed of contraction is constant throughout the entire range of motion 7. <u>concentric</u> 8. muscle actively shortens 9. <u>eccentric</u> 5. muscle actively lengthens.	**(6)**
4 (b) (ii)	NB Type of muscle action must be identified but no mark awarded. No muscle action – no mark. Any three from the following: <u>isotonic</u> 1. when performing a biceps curl the biceps muscle initially shortens causing movement at the elbow <u>isometric</u> 2. when competing in the rugby scrum the muscles of the legs are working against the force of the opposition players so there is often no movement <u>isokinetic</u> 3. when training on specific equipment ie nautilus training can be made more efficient. A cyclist using gears on a bike to ensure that force and leg speed remain constant throughout a race <u>concentric</u> 4. when raising the bar in the bicep curl the bicep shortens <u>eccentric</u> 5. when lowering the bar in the bicep curl the bicep lengthens.	**(3)**

Question Number	Answer	Mark
4 (c)	A max of 3 marks for names of principles of training. 1. specificity 2. training that is sport specific/appropriate ie a netball player would use running predominantly within their training, (or similar) 3. progression 4. a training programme that allows the competitor to plan accurate and relevant progress over time (or similar) 5. overload 6. training that allows the competitor to work harder than previously accustomed and so increase speed or aerobic/ anaerobic capacity (or similar) 7. reversibility 8. training that acknowledges that too greater a recovery period will result in a loss of training benefits 9. thresholds 10. (FITT) training that is of an appropriate intensity/duration and frequency for the activity and that enables the athlete to train at varying intensities 11. variance 12. training that prevents the competitor from plateauing and becoming bored eg avoiding doing the same sort of shuttle runs etc (or similar) 13. overtraining 14. planning a training programme that allows the competitor to continue to improve without danger of doing too much. (or similar) train in moderation 15. recovery 16. training that allows the competitor optimum recovery time for the training level undertaken (or similar).	**(5)**
	eg 1. bounding 2. the force generated by landing forcibly and rapidly stretches the quadriceps muscle 3. rapid eccentric contraction on landing 4. the quadriceps immediately perform a concentric contraction/second jump 5. the stretch reflex action/produces a greater force than normal 6. good training for generating power/coordination 7. or similar.	**(4)**

Total for Paper: 50 Marks