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Exemplar Candidate Work

PHYSICAL EDUCATION

H155/H555
For first teaching in 2016

Component 01 – Physiological factors affecting performance

Version 1

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Contents

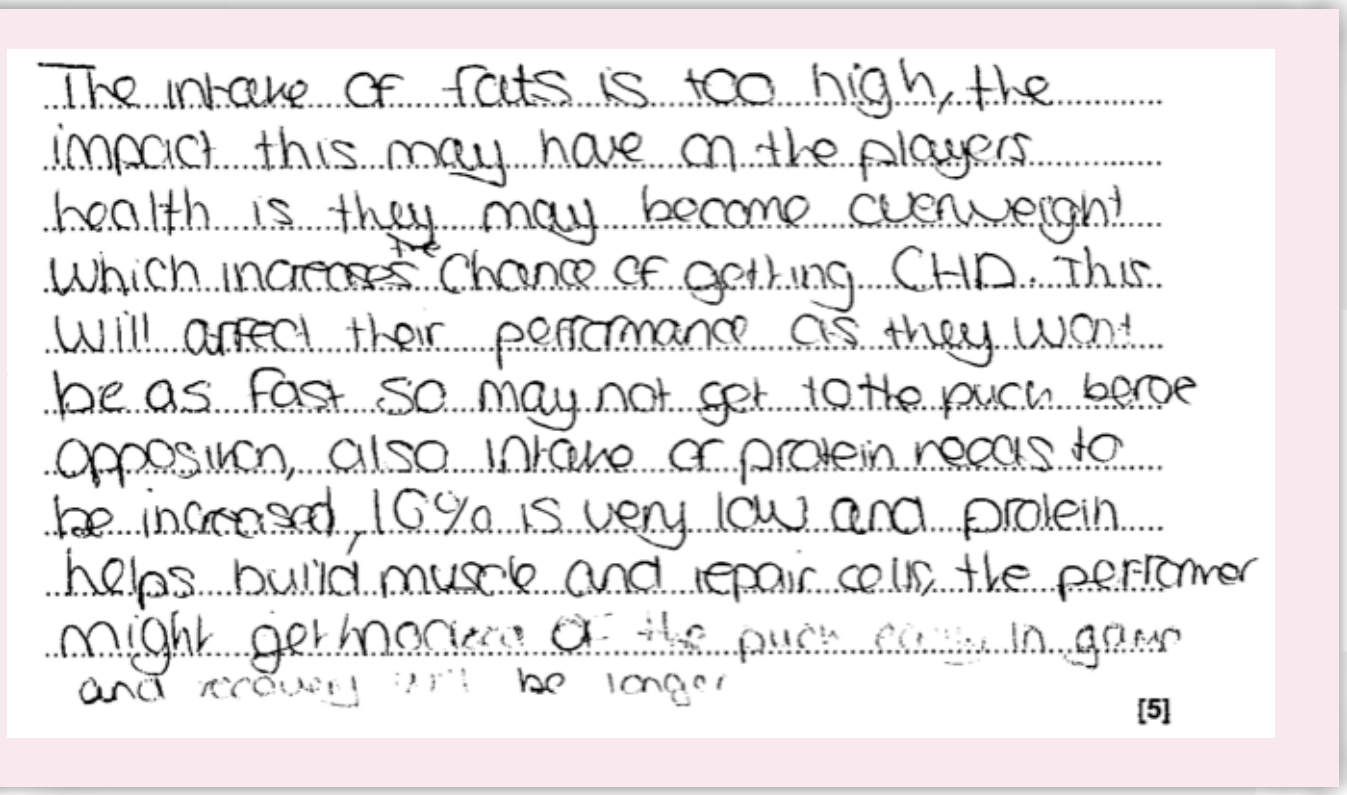
Question 8 (a)

Table 2 shows the weekly breakdown of a hocket player's diet.

Table 2

Component of diet	Weekly intake
Carbohydrates	50%
Fats	40%
Proteins	10%
Vitamins and minerals	Well below recommended guidelines
Fruits and vegetables	Below recommended guidelines

(a) Evaluate the potential impact of this diet on the player's health and physical performance. Recommend changes that should be made to the intake of carbohydrates, fats and proteins. **[5]**


The intake of fats is too high, the impact this may have on the players health is they may become overweight which increases the chance of getting CHD. This will affect their performance as they won't be as fast so may not get to the puck before opposition, also intake of protein needs to be increased, 10% is very low and protein helps build muscle and repair cells, the performer might get injuries of the puck could in game and recovery will be longer

[5]

Examiner commentary

Mark = 2/5

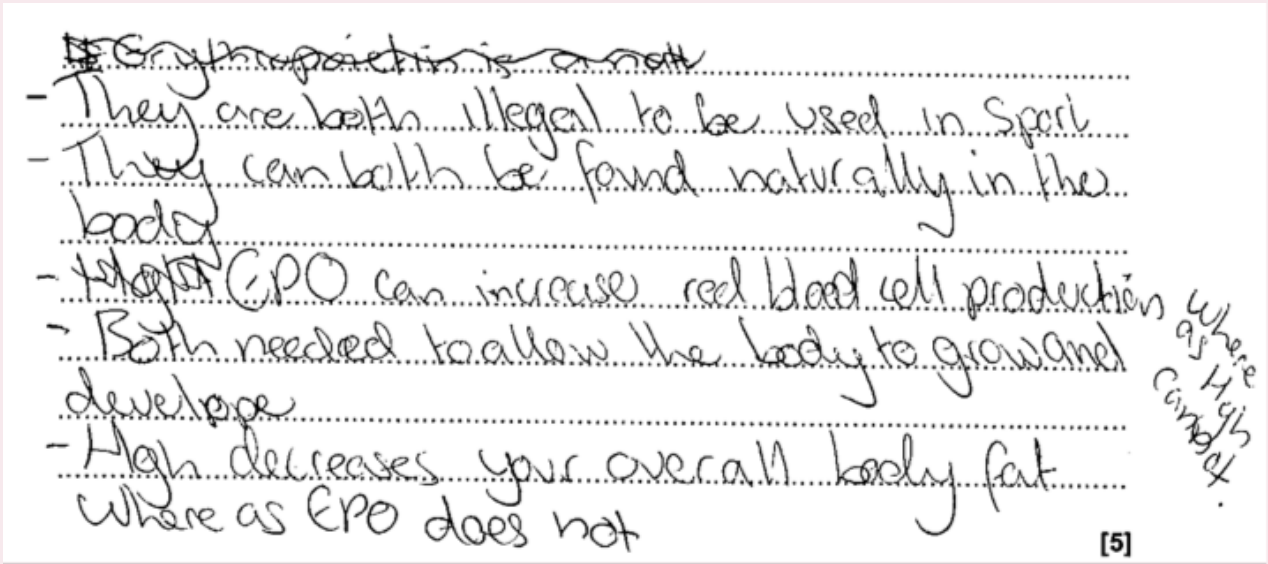
This candidate scored two out of a possible five marks. The candidate analysed one impact of fats being too high and linking this with player becoming 'overweight'. This achieves point 2 on the mark scheme. The candidate identifies that protein levels are too low and links this with the performer being too weak illustrated via a practical example (point 3 on the mark scheme).

The candidate does not recommend any specific changes in the diet so is unable to access the marks allocated for this section.

The candidate could have improved the response by analysing the impact of the diet in more detail and explaining the effects of the low percentage of vitamins and the high percentage of fats. The candidate would also gain more marks if the response included recommended changes such as an increase in proteins or carbs for example.

Question 8 (b)

Compare erythropoietin (EPO) and human growth hormone (HGH) as ergogenic aids to performance.
[5]


- Erythropoietin is a noth
- They are both illegal to be used in Sport
- They can both be found naturally in the body
- Where EPO can increase red blood cell production where as HGH can't.
- Both needed to allow the body to grow and develope
- Hgh decreases your overall body fat where as EPO does not

[5]

Examiner commentary

Mark = 2/5

The candidate scored two out of a possible five marks for this question.

The candidate correctly identified that both substances are illegal (point 1 on the mark scheme). The candidate gave the response that both are found naturally but this does not answer the question on their roles as ergogenic aids so scores no marks for this. The candidate then states that EPO can increase red blood cell production and this is worth credit (point 3 on the mark scheme). There is then no more credit worthy material.

The candidate could have improved by ensuring that the comparison of the two substances linked with their use as ergogenic aids. For example what type of athlete might use them and what aspect of fitness that each attempts to improve.

Question 9 Sample answer 1 – Full mark

An elite marathon runner will have a very high aerobic capacity.

Explain how the aerobic system provides energy during a marathon and how cardiovascular adaptations as a result of an aerobic training programme can enhance aerobic capacity. **[20]**

The aerobic system uses oxygen to produce energy and this system becomes predominant after 3 minutes of exercise. After 20 minutes of exercise the main fuel switches from glycogen to fats because fats produce twice the energy /ATP per gram than glycogen, but glycogen is still needed to assist fat metabolism

The aerobic pathway:

Glycolysis

Glycogen

↓ Glycogen Phosphorylase

Glucose

↓ Phosphofructokinase

Pyruvic acid → Lactic acid + 2ATP (Lactate Dehydrogenase)

Pyruvic acid then enters kreb's cycle - a series of chemical reactions that produce 2ATP per glucose molecule. Then there's an electron transport chain that produces 34 ATP. The collective ATP output of the aerobic energy system is 38 ATP per glucose molecule.

ATP is resynthesised, ADP + Pi + energy from aerobic system → ATP.

Cardiovascular adaptations start to occur after 8-19 months of aerobic training and the ability of the body to provide and sustain energy for exercise increases (aerobic capacity increases).

One cardiovascular adaptation is capillarisation around the muscles. This increases the surface area for oxygen diffusion into the muscles so more oxygen is received by working muscles per unit time. Therefore, aerobic respiration can take place for longer/more efficiently so energy production can be sustained.

Also, there is an increase in the Red Blood cell count, which increases the amount of Haemoglobin per volume of blood. Therefore, more oxygen can be carried by red blood cells to working muscles in a set time and at any intensity so aerobic production of energy can continue.

Pertaining to this, there is an improvement in elasticity of the vessel walls, allowing a more effective and significant vasular shunt to take place. This means that a greater percentage of the body's blood flows via the muscles, so more oxygen is utilised by muscles than by other systems in the body, resulting in a greater reception of oxygen by working muscles so aerobic ATP synthesis can occur for longer and anaerobic respiration

is delayed, allowing the performer to continue providing energy energy for exercise; preventing OBLA. OBLA can also be delayed by the improved buffering capacity of the blood. More HCO_3^- ions are produced by the kidneys which can "mop up" the H^+ ions in the blood that accumulate as a result of anaerobic respiration, reversing the acid effects and maintaining a steady pH. This therefore prevents glycolytic / aerobic enzymes from being denatured / inhibited, so the processes of glycolysis and Krebs / the electron transport chain can still occur and still produce energy to resynthesise ATP. Therefore the aerobic capacity of the performer is increased and they can provide energy for longer periods of work.

Finally, the heart undergoes hypertrophy as a result of aerobic training and it's pumping strength increases. Therefore, Stroke Volume increases and Cardiac Output increases. This results in more efficient pumping of blood so the cardiac muscle can pump more blood around the body with less effort. Therefore, more blood becomes oxygenated per unit time and reaches the working muscles per unit time. The muscles thus receive more oxygen and can aerobically produce energy for longer, resynthesising ATP to extend the exercise duration. These adaptations generally improve the use of oxygen to resynthesise ATP as the aerobic system produces the most ATP out of all the energy systems.

Examiner commentary

Mark = 20/20 full marks

This question is marked using a levels mark scheme and this is judged as level 4 with top marks - 20/20.

The candidate is comprehensive in his/her response and covers much of the indicative content on the mark scheme. The response is also well written and is logical in its structure which is an important factor when judging the quality of written communication (an integral part of the levels mark scheme).

The opening paragraph sets the scene well and starts with the effects of aerobic fitness and goes on to identify and develop the point about fats being a fuel producing ATP. The process of glycolysis is also explained well with a helpful and illustrative diagram. Pyruvic acid is then explored with many developed points to support the explanation. The electronic transport chain is explained as well as is the energy production.

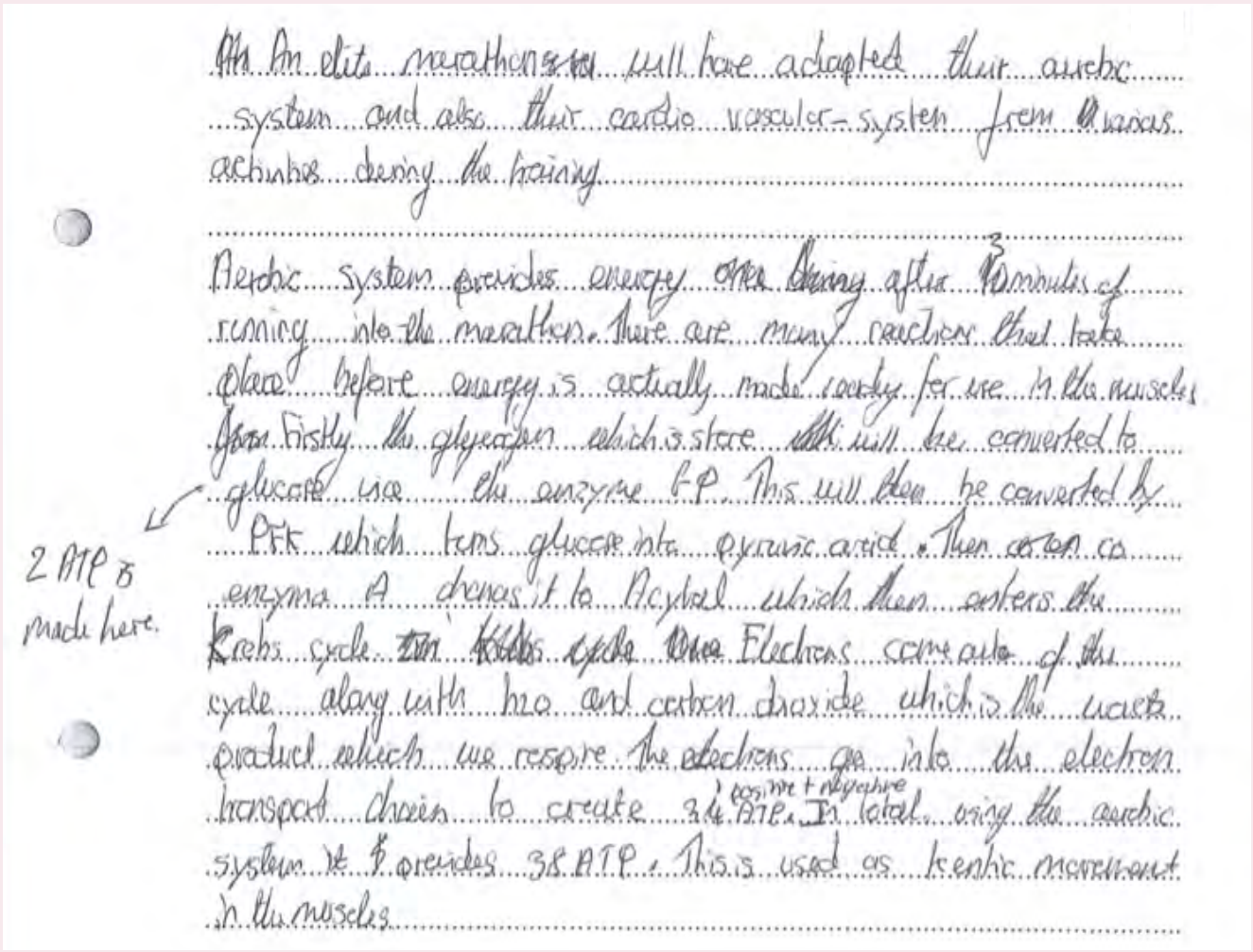
The candidate then explains well the cardiovascular adaptations that are a result of n aerobic training programme and again covers much of the expected responses in the mark scheme. Each point is developed well for example, that capillarisation increases the surface area enabling more oxygen to be utilised. The elasticity of blood vessels is covered along with the increase in blood flow. OBLA is again explained well and glycolysis further explained. Most main adaptations are covered, including the heart through hypertrophy and the resulting increase in stroke volume.

A comprehensive answer showing detailed knowledge and understanding of the aerobic system and how energy is produced along with a detailed explanation of cardiovascular adaptations and showing how they can enhance aerobic capacity. Links are also effectively made between the aerobic system and the cardiovascular adaptations as a result of training thus covering well the assessment objectives for this question. A model answer.

Question 9 Sample answer 2 – Level 3

An elite marathon runner will have a very high aerobic capacity.

Explain how the aerobic system provides energy during a marathon and how cardiovascular adaptations as a result of an aerobic training programme can enhance aerobic capacity. **[20]**



An elite marathon runner will have adapted their aerobic system and also their cardio vascular system from various activities during the training.

Aerobic system provides energy once during after 10 minutes of running into the marathon. There are many reactions that take place before energy is actually made ready for use in the muscles. Firstly the glycogen which is store will be converted to glucose use the enzyme G-P. This will then be converted by PFK which turns glucose into pyruvic acid. Then acetyl co enzyme A changes it to Acetyl which then enters the Krebs cycle ~~the Krebs cycle~~ Once Electrons come out of the cycle along with h2o and carbon dioxide which is the waste product which we respire. The electrons go into the electron transport chain to create 34 ATP. In total using the aerobic system it provides 38 ATP. This is used as kinetic movement in the muscles.

2 ATP is made here.

From a result of aerobic training programme this would enhance the cardiovascular system and would be a cause of many adaptations in the elite marathon runner.

For instance the marathon runner will have stronger cardiac muscle which will lead to an increase of pressure in the arteries as blood is pumped out more forcefully enabling more blood to transport oxygen as there is more readily available. The marathon runner will also have more an adaptation where he may have more mitochondrion where more aerobic respiration can take place in his cells which will enable him/her to run for a prolonged period of time. The association also becomes easier with haemoglobin with oxygen as if more O^2 is available from an ↑ in HR then it can associate easier making the respiratory system more efficient.

Vascular

An adaptation may be that in the muscles there may be an increase of amount of glycogen stores which means for aerobic breakdown there will always be something there for synthesis of ATP.

Another adaptation may be that there will have more muscle so they can bring the ribs out more to hold more oxygen and also the diaphragm can flatten more to also enable further oxygen to be held in the lungs.

Examiner commentary

Mark = 14/20 full marks

This question is marked using a levels mark scheme and this is judged as level 3.

The candidate showed good knowledge of the aerobic system and how it provides energy. The candidate also gives some good information about how cardiovascular adaptations can enhance aerobic capacity. The candidate describes rather than explains at times and only partly develops each point in the response. The candidate gave more information about the adaptations than the first part on the aerobic system and this was partly why higher marks were not awarded. In the first part points about glycogen and enzymes were well made but were sketchy in their expression and did not give a fully developed explanation. Short sharp sentences gave the process but did not explain fully enough for higher marks. Expression at times was hampered by numerous crossings out and some sentences made little sense.

In the second part the candidate became more fluent, although again brief note-type points did not give the depth required for higher mark. Points 7 and 8 in the mark scheme about heart and vascular adaptations were made well but the explanation did not expand enough to show links to enhancing aerobic capacity.

This candidate would have benefitted from a short plan of action which could then be used as a platform to build upon with further more in-depth explanations.

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