

# 2023 VCE Physical Education external assessment report

## General comments

The 2023 Physical Education examination provided students with the opportunity to display key knowledge and skills through a range of questions.

Students are expected to accurately apply key terms from definitions when referring to major concepts. This was evident when referring to Newton's laws (Questions 8a. and 11) as well as when describing fitness components (Question 3c.) or skill acquisition principles (Question 4c.). Use of correct terminology remains an important part of the study design.

The critiquing of a training program (Question 5c.) was done well by many students. However, students should be aware of parameters involved in different training methods (Questions 8d. and 9d.) to ensure accurate responses are made. Practical class sessions provide great opportunities for learning in this area.

The two evaluation questions (Questions 10b. and 6b.) should be reviewed carefully. An evaluation question requires the students to make a logical argument using supporting evidence for and against different points.

The extended answer questions (Questions 7a. and 11) provided students with an opportunity to demonstrate their knowledge of major concepts while applying knowledge to a specific situation. Some students provided generic answers to the energy system situation rather than using specific information from the stem of the question. In Question 11, some students separated the three concepts that needed to be interrelated.

Students are advised to review their understanding of  $VO_2$  maximum (Question 2), particularly in reference to absolute and relative values. Justification for inclusion of fitness tests (Question 2b.) from a physiological, psychological and sociocultural perspective is also an area that students and teachers are advised to pay particular attention to.

Finally, the need to understand and respond to command terms is an important examination skill that should be reviewed. This will give the best indication of how to construct an answer for the given question.

## Specific information

Note: Student responses reproduced in this report have not been corrected for grammar, spelling or factual information.

This report provides sample answers, or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

## Section A – Multiple-choice questions

Shaded and bolded items in the table indicate the correct response.

Question	Correct answer	% A	% B	% C	% D	Comments
1	A	<b>86</b>	5	7	3	
2	C	18	7	<b>66</b>	9	
3	B	26	<b>49</b>	23	2	Extending the arm increases the length of the resistance arm thus decreasing the mechanical advantage.
4	B	9	<b>84</b>	5	2	
5	D	0	27	6	<b>66</b>	
6	C	19	1	<b>78</b>	2	
7	B	2	<b>55</b>	32	11	
8	A	<b>56</b>	40	3	1	
9	D	6	13	7	<b>74</b>	
10	D	4	7	1	<b>87</b>	
11	C	17	10	<b>44</b>	29	Selection C is the only vascular (blood or blood vessels) adaptation.
12	A	<b>71</b>	10	18	1	
13	D	1	1	1	<b>96</b>	
14	A	<b>71</b>	2	3	4	
15	C	8	13	<b>64</b>	15	

## Section B

### Question 1a.

Marks	0	1	2	Average
%	32	17	51	1.2

Accepted responses included reference to:

- family
- peers/friends
- gender
- SES
- community
- role models
- cultural norms

The following is a sample response:

*Alcott may have had a very supportive family, who encouraged him and helped provide access to tennis training and coaching. This would have made it easier for him to successfully participate in wheelchair tennis and become an elite player.*

## Question 1bi.

Marks	0	1	2	3	Average
%	17	27	35	22	1.6

Students were required to explain the relationship between individual and task constraints and how this led to the rule change and how it impacts on performance.

Students who scored highly were able to link how the difficulty in manoeuvring the chair (in comparison to non- wheelchair tennis) led to modifying the task by allowing two bounces. This led to greater performance by allowing rallies to last longer with more balls kept in play.

The following is a sample response.

*By allowing the ball to bounce twice (task constraint), this impacts the individual constraint as wheelchair players may take more time to maneuver toward the ball and around the court. The rule change allows them more time to return the ball and makes the game more accessible allowing for more balls to be returned enabling an improved performance in wheelchair tennis.*

## Question 1bii.

Marks	0	1	2	Average
%	28	33	39	1.1

Students were required to discuss how the modification to the rules of wheelchair tennis could influence the motor skill development and participation of wheelchair tennis players.

Students who scored highly were able to directly link the rule change (two bounces) to an increase in opportunities to hit the ball and thus develop motor skills. This would in turn increase the motivation to participate further.

Some students spoke generally about how there would be an increase in participation without directly referencing back to the rule change as the catalyst for this.

The following is a sample response.

*The athlete would have more time to reach and return the ball, this could increase the opportunity for wheelchair tennis players to improve their motor skill development by having more rallies and hitting more balls. This in turn increases motivation to participate further.*

## Question 2ai.

Marks	0	1	Average
%	25	75	0.8

The correct answer was aerobic power.

Note: The term aerobic capacity was not accepted.

## Question 2aii.

Marks	0	1	2	3	Average
%	42	24	19	15	1.1

Students were required to justify the selection of the VO<sub>2</sub> maximum cycle ergometer test from a physiological, psychological and sociocultural perspective.

Students who scored well were able to clearly differentiate between the three perspectives and had an understanding of the VO<sub>2</sub> maximum test.

Some students gave generic answers that were not relevant to the stated test – for example, stating that the test is cheap and easy to run.

The following is a sample response.

*Physiologically suitable for Jai as he is an elite athlete and capable of performing the maximal test or the test is physiologically suitable as it is also performed on a bike which replicates the muscle action and movements in cycling.*

*Psychologically, as Jai is an elite cyclist he will be motivated to push himself to their maximal capacity which is required in the test.*

*From a sociocultural perspective - being a professional cyclist, Jai would have access to expensive equipment required to complete the test.*

## Question 2b.

Marks	0	1	2	Average
%	72	20	8	0.4

Students were required to explain why a relative VO<sub>2</sub> maximum value would be more relevant to an elite cyclist compared with an absolute value.

Students who scored well clearly understood the parameters around a relative value, particularly in relation to an athlete's body mass being an important factor for comparison.

The following is a sample response.

*A relative measurement takes into consideration the mass of the cyclist whereas absolute does not. This allows for a better comparison between cyclists as VO<sub>2</sub> can be assessed per kilogram of body weight.*

*This will give a better indication of an athlete's ability to use oxygen for Aerobic energy production.*

## Question 2c.

Marks	0	1	2	3	Average
%	31	22	39	8	1.3

Acceptable chronic adaptations of the cardiovascular system included:

- increased red blood cells
- increased haemoglobin (Hb)
- increased cardiac output (Q) at maximum
- increased stroke volume
- increased left ventricle size (hypertrophy)
- increased VO<sub>2</sub> difference

- increased blood flow at working muscles
- increased capillarisation to working muscles
- increased blood volume.

Students were required to describe the adaptation and explain how the specific adaptation led to a higher  $VO_2$  maximum.

The following is a sample response.

*Increased red blood cells will allow the elite cyclist to carry more oxygen in their blood therefore allowing more ATP to be resynthesized using oxygen allowing the athlete to work at a higher intensity aerobically, increasing their  $VO_2$  max*

## Question 2d.

Marks	0	1	2	Average
%	59	28	13	0.6

Students were required to explain the benefits of consuming protein and carbohydrates together for recovery.

Students who scored well were able to explain the benefits of co-ingestion of both nutrients and show an understanding of how this speeds recovery.

Some students stated the benefits of each nutrient individually without describing the purpose of co-ingestion.

The following is a sample response.

*The combination of consuming both carbohydrates and proteins in chocolate milk enhances absorption which leads to a **faster/more rapid** replenishment of muscle glycogen stores which allows for a **faster** recovery.*

## Question 3ai.

Marks	0	1	2	Average
%	17	28	55	1.4

Acceptable acute responses were:

- increased tidal volume
- increased  $O_2$  uptake/intake
- increased pulmonary diffusion
- increased ventilation.

## Question 3aii.

Marks	0	1	2	Average
%	47	38	15	0.7

Students were required to describe how a selected acute response would assist player performance in the centre position.

Students who scored well were able to provide a direct link as to how the selected response was able to increase aerobic performance.

The following is a sample response.

Asher would experience an increase in pulmonary diffusion which would result in an increased volume of oxygen being extracted by the alveoli/lungs and used by the body assisting him to work **aerobically** at a higher intensity, improving his performance to run up and down the court.

### Question 3b.

Marks	0	1	2	3	4	Average
%	20	16	45	14	4	1.7

Students were required to explain two differences between aerobic requirements of a centre player as compared to a goalkeeper.

Students who scored highly were able to use specific data from the provided table to explain two clear differences in aerobic energy requirements between the two positions.

Some students did not use data to explain the differences or focused on anaerobic energy requirements rather than aerobic.

The following is a sample response.

*As centre, Asher spent approximately 35% of game time utilizing medium to high intensity aerobic efforts as opposed to only 14% moderate to high aerobic efforts as goal keeper. He required this greater aerobic effort as he was required to cover more ground over a greater part of the court.*

*As goalkeeper, Asher spent approximately 65% of game time in low intensity aerobic effort as opposed to only 38% of game time in low intensity aerobic effort as a centre. This means there were more opportunities to use the aerobic system to restore CP stores whilst he was playing the goal keeper position.*

### Question 3c.

Marks	0	1	2	Average
%	16	55	29	1.1

Students were required to explain the importance of speed when playing in the goalkeeper position.

Students who scored highly were able to demonstrate an understanding of the meaning of 'speed' and give a clear specific example of why it is important in this position.

The following is a sample response.

*Speed is the ability to get from point A to B in the fastest time possible. This is important as the Goalkeeper would need to defend their opponent who may be moving toward the ball quickly.*

### Question 3d.

Marks	0	1	2	Average
%	52	11	36	0.9

Acceptable standardised fitness tests included:

- 20-metre sprint test
- 35-metre sprint test

Note: Sprint tests longer than 35 metres were not deemed acceptable as they exceed the length of a netball court.

The following is a sample response.

*The 20m sprint test requires the participant to sprint 20m in the fastest time possible using a stopwatch or timing gates to measure scores.*

### Question 4a.

Marks	0	1	Average
%	5	95	1.0

The correct answer was 'gross'.

### Question 4b.

Marks	0	1	2	3	4	Average
%	5	15	34	35	11	2.3

Students were required to predict the effect on a cricketer's stability if their back foot was raised in the air, and the associated effect on performance.

Students who scored well mentioned a reduction in stability due to a smaller base of support or the change of the position of the line of gravity or the shifting of the centre of gravity. They were also able to state an associated negative effect on performance.

Some students were able to identify the reduction in stability but were not able to link this to a decreased performance.

The following is a sample response.

*Stability will be decreased by lifting the back leg in the air, this will cause the cricketer to have a smaller base of support. This makes it difficult for the cricketer to control their equilibrium while performing the shot. This will result in an inability to summate their force which will result in less power in the shot.*

### Question 4c.

Marks	0	1	2	3	Average
%	36	13	25	24	1.4

Students were required to provide one example of intrinsic feedback and explain how a cricketer may use it to increase performance.

Students who scored highly were able to provide a specific example of intrinsic feedback in relation to:

- visual feedback
- auditory feedback
- kinaesthetic feedback
- proprioception

Some students were unable to demonstrate an understanding of intrinsic feedback or were unable to link this directly to how a cricketer may use it.

The following is a sample response.

*Using visual intrinsic feedback the batter could watch the ball out of the bowler's hand to determine the speed and direction of the oncoming ball. This will help them determine the correct shot to play.*

### Question 5a.

Marks	0	1	Average
%	11	89	0.9

The correct answer is 'muscular power'.

### Question 5b.

Marks	0	1	2	Average
%	45	32	22	0.8

Students were required to list two safety protocols to be adhered to during plyometric training.

Acceptable responses were:

- complete appropriate warm up before session
- wear suitable footwear
- use appropriate surface
- strength base / correct technique recommended before commencing plyometrics
- stop exercise when technique fails
- take ample rest between sets
- should be completed no more than 2 times per week.

### Question 5c.

Marks	0	1	2	3	4	Average
%	13	17	26	24	20	2.2

Students were required to critique the effectiveness of a plyometric training session as listed.

Students who scored highly were able to identify a strength of the program and a weakness of the program as well as a way to improve the stated weakness. They were also able to state that the program was partly effective or not effective in its current format.

The following is a sample response.

*The program is somewhat effective. The inclusion of 3 sets of jump squats, plyo box jumps and drop jumps are all specific to the lower body for long jump and completed with the correct repetitions. The reps for the weighted lunges are too high at 25. To improve this program, the weighted lunges should be reduced to 8 reps to correctly train the fitness component of muscular power.*

## Question 5d.

Marks	0	1	2	3	Average
%	36	12	21	32	1.5

Students were required to identify and describe one chronic adaptation of the muscular system from plyometric training and how this would lead to an increase in long jump performance.

Acceptable adaptations were:

- increase in size of myofibrils, actin and myosin (per muscle fibre)
- increase in number of myofibrils
- increase in total amount of contractile protein
- increased ATP/CP stores
- increased ATPase
- increased size/strength of connective tissue
- increased recruitment of motor units
- increased rate of motor unit recruitment
- increased hypertrophy of muscle.

The following is a sample response.

*An increase in the number of myofibrils would enable the muscle to exert a larger force when contracting which improves performance as the long jumper would have a more explosive take off and jump further.*

## Question 5e.

Marks	0	1	2	Average
%	10	45	45	1.4

Students were required to describe how a long jumper would complete mental imagery at the start of their run-up, and how it could improve performance.

The following is a sample response.

*The long jumper is able to picture the performance in their mind using as many senses as possible. This improves neural pathways between the brain and muscles allowing for smoother technical performance.*

## Question 6a.

Marks	0	1	2	Average
%	17	53	30	1.1

Students were required to describe why using a direct approach would be successful with beginner swimmers.

Students who scored well were able to describe the success using one of the following direct coaching benefits.

- Is time-efficient and maximises practice time.
- Keeps learner 'on task'.
- Allows for a rapid rate of learning.
- Emphasises the development of correct technique.
- Allows learning to be explicit.
- Coach-centred so direct feedback can be provided to cognitive learner.

The following is a sample response.

*Direct coaching provides the learner with explicit instructions with a clear emphasis on developing technique, which could improve swimming technique therefore allowing an improved performance.*

## Question 6b.

Marks	0	1	2	3	4	Average
%	6	14	33	40	7	2.3

Students were required to evaluate the type of practice variability recommended for beginner swimmers when taking into consideration skill classification of swimming in a pool.

Students who scored well were able to state that blocked practice would be beneficial in teaching a beginner swimmer as the pool is a closed environment. They were also required to explain why random practice would not be as effective. This is required when answering an evaluation question.

The following is a sample response.

*As swimming in a pool is a closed environment, there is no inter trial variability and it is self-paced, beginner swimmers would benefit from blocked practice. This enables the swimming skills to be repeated, allowing a greater chance for their swimming stroke to develop and improve. Random practice would not be as effective as there would be less opportunity to refine technique and consolidate skill execution.*

## Question 7a

Marks	0	1	2	3	4	5	6	Average
%	6	10	22	29	21	10	2	2.9

Students were required to use specific examples from collected data to explain energy system interplay within a basketball game.

Students who scored highly were able to:

- use yield to describe why the aerobic system was the major energy contributor throughout the game
- use rate to describe why the ATP PC system would provide the energy during high intensity activity
- discuss the role of the anaerobic glycolysis system during periods of sustained high intensity activity
- explain where there would be times to restore the ATP/PC system
- use data and examples from game to justify responses.

Some students provided generic answers where they sequentially spoke about the three systems without relating them to specific examples.

The following is a sample response.

*During Rebecca's game all three energy systems contribute to ATP resynthesis. The aerobic energy system (large yield) will contribute the most due to the long duration (30 min). The ATP-CP system will provide energy for activities such as explosive jumping for 8 rebounds as well as defensive efforts of 1 steal and 1 blocked shot as this energy system has the fastest rate. The 2-minute break at quarter time and three-quarter time and 5-minute break at half time will allow for CP restoration via the aerobic energy system. As Rebecca performs repeated high intensity efforts to shuffle, lunge and rebound lasting 22-36 seconds, CP stores will deplete and there is a greater contribution from the anaerobic glycolysis system, which also provides energy at a fast rate. As the game continues and oxygen uptake increases, there is an increased contribution from the aerobic system.*

## Question 7b.

Marks	0	1	2	Average
%	63	23	14	0.5

Students were required to explain the purpose of conducting an activity analysis for a basketball team.

Students who scored highly were able to explain the purpose of an activity analysis (identify the energy systems, fitness components, muscle groups/actions involved in basketball).

Some students were unable to understand the purpose of an activity analysis and mistook its reasoning to be a tactical/technical analysis for the team.

The following is a sample response.

*An activity analysis allows the coach to identify the energy systems and fitness components involved in basketball. This allows relevant fitness tests to be chosen and the creation of a specific training program.*

## Question 7c.

Marks	0	1	Average
%	61	39	0.4

The correct answer was 'specificity'.

## Question 8a.

Marks	0	1	2	Average
%	28	33	39	1.1

Students were required to describe how Newton's first law of motion applied to the start of a 100m sprint.

Students who scored well demonstrated a sound understanding of the first law and could directly apply it to the start of the 100m race. Some students mistook Newton's third law (action/reaction) for Newton's first law.

The following is a sample response.

*The sprinter will remain still (at rest) until they apply a force against the blocks which results in a change in motion to sprint forward off the blocks to start the race.*

## Question 8b.

Marks	0	1	2	Average
%	49	24	27	0.8

Students were required to use graph data to outline why elite sprinters were able to complete the 100m sprint faster than student runners.

Students who scored well were able to reference the graph and highlight a higher maximum speed for the elite sprinter or a longer period of positive acceleration than the student sprinter.

Some students only referenced the final time without explaining why this result occurred.

The following is a sample response.

The elite sprinter completes the 100m faster due to their higher maximum speed of ~11.6 m/s in comparison to the students at ~8m/s. This means they can cover distance over a shorter time (speed), resulting in a faster time of 10.02 seconds in comparison to 13.00 seconds.

### Question 8c.

Marks	0	1	2	Average
%	30	54	16	0.9

Students were required to justify the selection of a short interval training program for elite sprinters.

Students who scored well were able to justify the selection by stating that the training method trains a specific fitness component or energy system used in the 100m sprint.

The following is a sample response.

*Short interval training trains the ATP-CP energy system or trains the fitness component of speed which makes it specific to the requirements of the 100m sprint event.*

### Question 8d.

Marks	0	1	2	3	4	Average
%	16	18	20	23	23	2.2

Acceptable answer ranges were:

Repetition time	Work-to-rest ratio	Intensity	Type of recovery
3 to 10 seconds	1:5 (up to 1:10)	+ 95% HRmax 9-10 RPE Maximal	Passive

### Question 8e.

Marks	0	1	Average
%	18	82	0.8

Acceptable responses were:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	x		x		x	

OR

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
x		x		X		X

Note: Four sessions would be accepted as long as there is a day between each session.

## Question 9a.

Marks	0	1	Average
%	40	60	0.6

The correct answer was 'long interval training'.

## Question 9b.

Marks	0	1	Average
%	57	43	0.5

Acceptable answers were:

- Increase from 6 to 7 repetitions.
- Increase work time by no more than 10%.
- Decrease rest period by no more than 10%.

## Question 9c.

Marks	0	1	Average
%	52	48	0.5

Acceptable answers were:

- Complete the run on a treadmill.
- Run at a different location/venue, e.g. around her local park.
- Run with a friend.
- Train in a group.

## Question 9d.

Marks	0	1	2	3	Average
%	18	19	19	44	1.9

Students were required to design the conditioning phase of an alternative training method that the athlete could use for the 10km run.

Students who scored highly selected either continuous training, fartlek training or HIIT methods. They correctly outlined the correct intensity, duration and rest periods (if required).

The following is a sample response.

*The student could have undertaken continuous training as an alternative. The student could run for 20 minutes continuously at an intensity of 75% maximum heart rate.*

## Question 9e.

Marks	0	1	Average
%	12	88	0.9

Acceptable answers were:

- a training diary/log
- digital activity tracker
- fitness app
- heart rate monitor.

## Question 9f.

Marks	0	1	2	Average
%	39	42	19	0.8

Students were required to explain how using their selected strategy could prevent overtraining.

Students who scored highly were able to explain what type of data could be collected and how this data could be used to prevent overtraining.

Some students merely stated how the strategy is carried out without specific reference to how it may be used to prevent overtraining.

The following is a sample response.

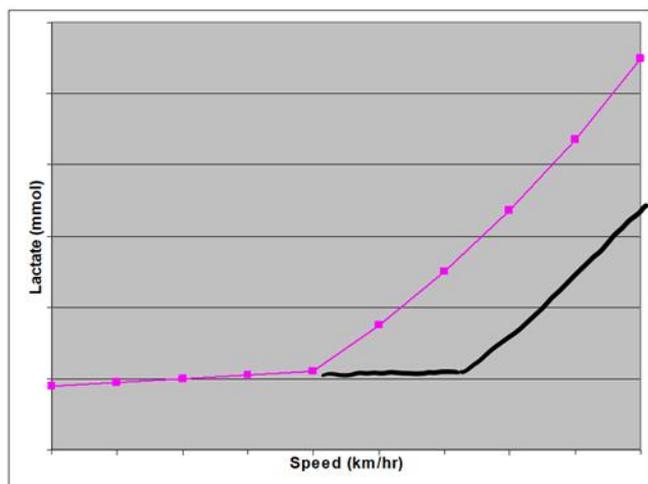
*By keeping a diary Emily can notice a change in post exercise soreness as well as a drop in motivation. This data may indicate that Emily needs to adjust her training load and has adequate rest between sessions.*

## Question 9g.

Marks	0	1	Average
%	37	63	0.7

Acceptable answers showed a right shift to the graph shape, indicating that LIP occurred at a higher speed (km/h)

The following is a sample response.



## Question 9h.

Marks	0	1	2	3	Average
%	58	14	15	13	0.9

Students were required to discuss one muscular adaptation to aerobic training that could improve an athlete's lactate inflection point and how this would benefit them in a 10km marathon festival run.

Students who scored highly discussed one of the following adaptations and how it would improve the athlete's lactate inflection point.

- increased mitochondria mass
- increased capability to oxidise fats and carbohydrates (oxidative enzymes)

These are the only two muscular adaptations that lead to an improved lactate inflection point. (Refer to VCAA's *Clarification of content: Lactate Inflection Point.*)

The following is a sample response.

*An increase in mitochondria mass leads to an increased ability to resynthesis ATP aerobically at a higher intensity. This increases her LIP allowing Emily to run at a faster rate whilst still using her aerobic system, resulting in a faster 10km time.*

## Question 10ai.

Marks	0	1	2	Average
%	35	32	34	1.0

Students were required to analyse whether the subject reached a steady state by referring to the table of data.

Students who scored highly were able to state (using data as a reference) that there was no point where the student's heart rate was stable and not increasing throughout the time trial. Therefore, a steady state was not reached.

The following is a sample response.

*Annie did not reach a steady state. This is because heart rate gradually increased from 150bpm in minute 1 to 190bpm at minute 8 without there being a point where heart rate was unchanged.*

## Question 10aii.

Marks	0	1	Average
%	23	77	0.8

The correct answer is 'excess post-exercise oxygen consumption (EPOC)'.

Note: 'EPOC' is an accepted abbreviation.

## Question 10aiii.

Marks	0	1	2	Average
%	56	32	11	0.6

The following were acceptable answers:

- restore PC
- removal of metabolic by-products
- return body temperature to resting
- restoration of O<sub>2</sub> to myoglobin.

## Question 10b.

Marks	0	1	2	3	Average
%	9	36	46	8	1.5

Students were required to evaluate the most effective recovery method after a 2km time trial.

Responses that scored highly stated that an active recovery was the most effective and gave a reason why it would make recovery more effective. They also included a reason why passive recovery would not be as appropriate.

Some students mentioned that an active recovery helps remove metabolic by-products but did not mention that this would occur faster with an active recovery.

The following is a sample response:

*An active recovery would be most suitable. This is because during the 2km run there would have been an accumulation of metabolic by-products which an active recovery would help remove faster by increasing blood flow. A passive recovery would not be suitable, as it does not maintain a higher blood flow therefore increases the risk of venous pooling.*

## Question 11

Mark	0	1	2	3	4	5	6	7	8	Average
%	11	10	16	21	20	12	7	2	0.6	3.1

In this extended answer, students were required to explain the interrelationship between Newton's laws of motion, fuel usage and fitness components for a successful performance in the canoe slalom event.

Students who scored highly were able to show an interrelationship between the three factors mentioned. For example, Newton's third law, glycogen use and muscular endurance, or Newton's first law, CP use and muscular power.

Some students presented the answer in three different sections. They demonstrated some knowledge in all three areas but did not show any links or interrelationship, which was the intention of the question.

The following is a sample response.

*Jessica Fox was able to successfully win gold in the canoe slalom by using a combination of muscular power, agility, speed, muscular endurance and anaerobic capacity. The canoe would remain at rest, until Fox applies a force using her paddle which allows her to move towards the first gate (Newton's first law). CP would fuel this explosive movement, allowing Fox to utilize her muscular power to approach the gate as quickly as possible. As Fox's paddle applies a force on the water, the water would apply an equal and*

*opposite reaction on the paddle (Newton's 3<sup>rd</sup> Law) allowing her to move through the course quickly by using muscular endurance to repeat the paddling motion.*

*Once Fox reaches the gate, she applies a force using her paddle to change the motion of the canoe to slow it down (Newton's first law). In doing so Fox will use her agility, the ability to change direction quickly in control which is important so she does not touch the gate but can complete as quickly as possible.*

*As she leaves the first gate, she would use Newton's second law of motion to apply a force in the water to successfully accelerate towards the next gate. The greater the force Fox can apply, the greater the acceleration of the canoe as  $\text{force} = \text{mass} \times \text{acceleration}$ . This would allow Fox to make use of the fitness component speed, allowing her to get to each gate in the quickest time possible. Fox would utilise glycogen as a fuel as CP stores will start to deplete and make use of her anaerobic capacity which allows her to resynthesize ATP anaerobically, allowing the canoe to move quickly, helping to reduce her time.*

*As the course takes Fox 105.4 seconds to complete, glycogen will be the main fuel used through anaerobic and aerobic pathways, therefore requiring a combination of aerobic power and anaerobic capacity. By using a combination of agility, muscular power, speed and anaerobic capacity, Fox successfully paddles at the fastest pace possible to win the gold medal.*