

2020 VCE Physical Education examination report

General comments

In 2020 the Victorian Curriculum and Assessment Authority (VCAA) produced an examination based on the *VCE Physical Education Adjusted Study Design for 2020 only*. The examination provided students with the opportunity to demonstrate and apply a range of knowledge and skills.

Students who expressed knowledge clearly and concisely, connecting it – as directed in the question – to specific situations scored highly. This was evident in the two extended responses for energy system interplay Questions 6a and 10a. While students demonstrated a general understanding of how energy system interplay takes place, many were not able to then reference the particular scenarios shown in the question stem.

Students able to use correct command words when answering questions also scored highly. Students were required to critique or analyse a training program on two occasions (Questions 6c. and 7c.). Students should consider how they construct their responses to these types of questions. They should read the questions carefully to ensure they respond to everything the question is asking. An exposure to practical classes was also advantageous in a number of questions in the examination.

Students demonstrated a basic understanding of the biomechanical and skill acquisition principles required. Many students did not fully show an understanding of the function of third-class levers in the body. Students should also consolidate their understanding of constraints-based coaching as opposed to direct instruction. This may lend itself well to practical class exposure on these methods.

Finally, it is important that students be aware of appropriate nutritional recovery strategies and the reason for the use of carbohydrates and proteins in the recovery period.

Specific 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

Question	% A	% B	% C	%D
1	98	1	0	1
2	2	11	79	9
3	86	1	1	11
4	12	24	57	7
5	3	75	12	9
6	3	16	1	79
7	55	5	15	25
8	14	7	69	10
9	2	3	91	4
10	8	83	2	7
11	4	8	3	85
12	5	81	12	1
13	1	1	2	96
14	6	92	1	1
15	29	12	52	6

Section B

Question 1ai.

Marks	0	1	Average
%	55	45	0.4

Aerobic power

No other response was accepted, as High Intensity Interval Training (HIIT) targets aerobic power.

Question 1aii.

Marks	0	1	Average
%	73	27	0.3

Acceptable responses included any one of:

- less time commitment as opposed to long interval training
- speed of improvement faster than long interval training
- more enjoyable/variable and keeps motivation higher than long interval training.

The benefits of HIIT were outlined in VCAA support material.

Question 1bi.

Marks	0	1	2	Average
%	68	27	5	0.4

Acceptable responses included any two of:

- increased VO₂ maximum
- increased capillarisation
- reduced systolic and diastolic blood pressure
- an increase in mitochondrial mass
- an increase in muscle oxidative capacity or oxidative enzymes
- an increase in muscle buffering capacity
- an increase in resting muscle glycogen content
- a decrease in rate of glycogen use
- a decrease in lactate production
- improved lactate tolerance
- a reduced reliance on carbohydrate as a fuel source during exercise.

Adaptations of HIIT were listed in the VCAA support material. Many students used general adaptations of aerobic training but these responses were not accepted, as adaptations to HIIT are specific.

Question 1bii.

Marks	0	1	2	Average
%	85	5	10	0.3

The following is a sample response.

Running performance is improved by increased mitochondrial mass, which allows more sites for aerobic energy production, which allows you to work at higher intensity, aerobically delaying the use of the anaerobic systems and the fatiguing factors associated with them.

Question 2a.

Marks	0	1	2	Average
%	30	38	32	1.0

Students who scored highly clearly defined flexibility as the range of motion around a joint and then referenced the shoulder joint specifically as requiring a high range of motion.

The following is a sample response.

Flexibility is range of motion around a joint. In the image, the hammer thrower has to swing their arms around their head, demonstrating the requirement to have the range of movement in their shoulders and wrists to be able to propel the hammer out of the circle with maximum velocity.

Question 2b.

Marks	0	1	2	3	Average
%	46	24	16	14	1.0

Students who scored highly demonstrated their knowledge of the lever system by specifying the type of lever or the increased length of the resistance arm giving a speed advantage.

Students who did not score well did not show knowledge of lever type or gave a vague response (such as straight arms make the hammer go further) without justification.

The following is a sample response.

Releasing the hammer with straight arms will lengthen the resistance arm of the third-class lever. This provides an advantage for speed as there will be a greater velocity at the end of the lever. As a result of this, the hammer can be potentially projected further than with a bent or short arm.

Question 2ci.

Marks	0	1	2	3	4	Average
%	20	17	28	15	20	2.0

Students who scored highly explained a warm-up containing a short aerobic component and/or dynamic stretches; two clear plyometric conditioning exercises with correct sets (1–6) and reps (3–10); a cool-down describing passive stretches, aerobic cool-down or use of TheraBands or foam rollers.

Students who did not score highly described exercises that were not plyometric in nature, sets and reps that were inappropriate for plyometrics, or inappropriate warm-ups or cool-downs.

The following is a sample response.

Warm up

- 5 minutes of skipping, alternating slow for 30 seconds, medium for 30 seconds; dynamic stretching for shoulders and hips.

Conditioning

- 1. 3 sets of 6 reps of box jumps
- 2. 3 x 6 medicine ball slams from above head (heavy weight); cool down

Cool down

- Very slow jog for 3 minutes.
- Static stretching of shoulders and legs and use of foam roller on lower body and TheraBand to stretch shoulders.

Question 2cii.

Marks	0	1	Average
%	74	26	0.3

Possible responses, depending on the example chosen, included:

- add one repetition to any of the exercises
- if using a medicine ball go up to the next kilogram ball
- clap push-ups on a slight decline
- increase height of box
- add 2–10 per cent to weight.

Many students did not provide a progression in the correct range or their progression did not match their example from 2ci)

The following is a possible response that links to 2c.

From example above, 3 x 7 medicine ball slams.

Question 3a.

Marks	0	1	Average
%	38	62	0.6

Aerobic system

No other response was accepted, including aerobic glycolysis system.

Question 3b.

Marks	0	1	2	3	4	Average
%	35	15	17	21	12	1.6

Students who scored highly identified that Sarah was correct and explained, using data, that the type of training identified would improve LIP and not lactate tolerance, which would be improved by using anaerobic training.

The following is a sample response.

Sarah is correct, as long interval training as shown in the session (i.e. running at 80% max, which is aerobic) improves aerobic adaptations and may improve LIP to a higher relative percentage. To train to improve lactate tolerance, the training would need to be more anaerobic, with percentage of HR max above 85% to encourage the improvement of lactate tolerance.

Question 3c.

Marks	0	1	2	Average
%	11	23	66	1.6

Possible responses (with suitable outline) may have included:

- keeps heart rate elevated to promote blood flow
- to assist with thermoregulation/reduce core temperature
- replenishes oxygen levels to myoglobin
- provides a muscle pump for blood flow back to the heart (reduction of DOMS)
- decreases venous pooling
- increases oxygen to help break down metabolic byproducts.

The following is a sample response.

Active recovery – this will most effectively remove any metabolic byproducts that may have accumulated by increasing circulation of blood.

Question 4

Marks	0	1	2	3	4	5	6	7	8	9	Average
%	17	14	17	17	13	10	6	4	2	0.3	2.8

Students who scored highly were able to discuss the concept of augmented feedback provided by the coach, which was knowledge of performance. They were then able to precisely detail the three biomechanical principles required and how they could be used to improve performance.

Students who did not score well showed a basic understanding of the purpose of feedback and provided little correct information about the relevant biomechanical principles.

The following is a sample response.

Having completed the qualitative analysis, the coach would apply augmented feedback, which in this case is specific to knowledge of performance. The aim of this feedback would be to increase the players' kicking power, as good accuracy has already been achieved.

In her feedback the coach would be talking about the principle of summation of momentum. To produce maximal force in the kick, the players must combine the movements of their body parts into a coordinated movement, as many body parts as possible are used (as well as the run up) with larger parts (gluteals, thighs) used first and smaller body parts (foot, toes) at the end. Body parts need to be stabilised, making the step of the planting foot very important. This coordinated movement ensures maximum power can be exerted into the kick.

She would explain that the kicking leg is a third-class lever, which has a mechanical advantage of less than one. This makes it a speed magnifier. As long as the leg is swung quickly there is the potential for increasing kicking power.

All this knowledge of performance given by the coach could be feedback used to increase kicking power.

Question 5a.

Marks	0	1	2	3	Average
%	7	14	37	42	2.2

Students who scored highly were able to reference specific aspects of the data to show how practice opportunities are affected. They gave clear examples and explained how they influenced practice opportunities.

The following is a sample response.

Decreasing the number of players from 11 to 8 per team increases the opportunities for skill practice and potential skill improvement, as shown by each player getting an increase of total passes (from 9.73 to 11). It also shows an increase in skills performed under high pressure (1.82 to 2.64).

Question 5b.

Marks	0	1	Average
%	31	69	0.7

Task constraint

Question 5c.

Marks	0	1	2	Average
%	56	26	18	0.6

Possible advantages of a constraints-based approach included any one of:

- practice is more game-like (practice specificity/representativeness)
- practising skills in the game environment
- tactical development
- autonomous learning
- adaptable/functional skill
- more challenging
- more practice variability
- couples perception and action.

Possible disadvantages of a constraints-based approach included any one of:

- slower skill acquisition
- challenging for cognitive learners
- less structured
- coach has less direct control
- more knowledge required by the coach
- harder to monitor workload.

The following is a possible response for disadvantages of a constraints-based approach:

This training could be too challenging for a beginner who has not yet learned the basic skills.

Question 5d.

Marks	0	1	2	3	4	Average
%	34	22	21	17	6	1.4

Students who scored well showed a clear understanding of both principles and were able to explain them with reference to the hockey push pass.

Students who did not score well included a general description of both principles but were unable to show how they may affect the hockey push velocity. Some students explained impulse only without further linking to momentum.

The following is a sample response.

Impulse is the change in momentum of an object (force x time). Given momentum is the amount of motion an object possesses ($p = m \times v$), the larger the impulse applied to an object, the greater the change in momentum.

In the push pass the hockey player increases the time over which the force is applied, increasing the impulse to the ball. Increasing the force applied through the stick (using greater summation of momentum) will further increase the impulse and lead to a faster pass.

Question 6a.

Marks	0	1	2	3	4	5	6	Average
%	7	8	18	27	23	14	3	3.0

Students who did not score well showed limited understanding of energy system interplay and provided little, if any, information about fatigue and recovery of energy systems.

Students who did not score well provided a general answer of energy system interplay and were not able to provide information on fatigue and recovery of energy systems.

The following is a sample response.

As the player swims off explosively to gain possession, they are using all three energy systems, with the ATP-CP system most relied on due to its ability to provide energy at the fastest rate. After the players complete the swim off and move to a scoring position, the anaerobic glycolysis system will increase its role to maintain the high intensity. This is due to the low yield of the ATP-CP system where CP depletion will be the fatiguing factor. There will be limited opportunity for restoration of this until the quarter breaks. The anaerobic glycolysis systems will also play a key role in the repeat sprint efforts.

The anaerobic glycolysis system has a finite capacity, and the aerobic system will increase its contribution throughout the quarter and it will be the most relied on system because of the seven-minute duration and its high yield.

Question 6b.

Marks	0	1	2	Average
%	41	34	25	0.8

Students who scored well were able to explain that records can help the athlete gather information about physiological, psychological or sociological influences on training.

Examples could include discussion about training loads, sleep, resting heart rate, motivation, RPM and goal setting.

The following is a sample response.

By monitoring motivation levels at each training session, the athlete may prevent overtraining.

Question 6c.

Marks	0	1	2	3	4	Average
%	34	27	23	13	3	1.3

Students who scored well on this question were able to give a strength of the program, such as correct application of reps and sets on Tuesday and Thursday. They were able to give a weakness of the program, such as incorrect application of reps on Mondays and Fridays, as well as stating a relevant improvement in this area. Students should have stated that the program was not fully effective, or was somewhat effective without these improvements.

The following is a sample response.

This program would not be fully appropriate to develop muscular endurance. A strength of the program is the correct application of reps and sets on Tuesday and Thursday (at least 20 reps with 1-3 sets). A weakness of the program is the relatively low reps on Monday (5) and Friday (5) which is more focused towards strength. To improve the program more repetitions on these other days (15+) to make the focus of muscular endurance.

Question 7a.

Marks	0	1	Average
%	33	67	0.7

Possible responses included any one of:

- gender/sex
- fibre arrangement
- muscle length/tension/angle
- fibre length: muscle length ratio
- training status
- injury status
- speed/type of contraction.

Because age, fibre type and cross-sectional areas were factors shown in the graph, these were not awarded marks.

Question 7b.

Marks	0	1	2	3	4	Average
%	12	12	24	32	20	2.4

Students who scored well on this question were able to identify the trends shown in both graphs by specifically referencing data. They were also able to give a link between one of the factors and how it affects strength (e.g. direct relationship between muscle size and strength).

The following is a sample response.

As graph 1 shows, muscle sectional area decreases with age. That is, it is reduced from 70 at age 20 to 30 at age 80. Graph 2 shows a decline in Type 2 muscle fibre diameter from 50 at age 65 to 20 at age 85. Either of these factors will lead to a decrease in strength as fibre size and cross sectional area are directly proportional to strength.

Question 7c.

Marks	0	1	2	3	4	5	Average
%	25	27	29	15	3	0.3	1.4

Students who scored highly on this question were able to evaluate the program in terms of each of the FITT principles and provide an overall judgement that its effectiveness was not high.

The following is a sample response.

This program would not be effective in promoting muscular strength. The frequency if the program is not applied correctly as there is no rest day in between resistance training sessions. In terms of time, the 10 second rest period between sets is too short to promote muscular strength. A much longer period would be required. However, the type of training shown is correct with resistance training being the predominant type shown. The intensity of the training is correct in the resistance areas with 85 per cent of 1RM being appropriate for muscular strength improvements.

Question 8a.

Marks	0	1	2	3	4	Average
%	35	25	20	16	4	1.3

Students who scored highly in this question were able to state that fuel depletion (glycogen) would be the most likely cause of fatigue, as well as discuss the fuels used as being a combination of fats and glycogen. They were also able to explain that the greater use of fats would come at a greater oxygen cost and therefore cause fatigue.

The following is a sample response.

Fuel depletion of glycogen stores is the most likely cause of fatigue in this ultra-endurance event.

Because the event lasted approximately eight hours, the energy system contributing most of the ATP required throughout the event would be the aerobic energy system where both carbohydrates and fats would be used to fuel the system. Because the duration of the event is long, fats may become the most relied upon fuel source (especially if glycogen stores were not replenished). Using fats requires greater oxidation and the rate of ATP production is decreased, therefore the athlete's intensity would drop, causing a decrease in running speed/performance.

Question 8b.

Marks	0	1	2	Average
%	22	21	57	1.4

Possible responses (with appropriate description) included any one of increased:

- heart rate
- respiratory rate
- tidal volume
- stroke volume
- pulmonary diffusion
- a-vO₂ difference
- ventilation
- tidal volume.

The following is a sample response.

Increased heart rate enables more oxygen to be directed to working muscles for energy production.

Question 8c.

Marks	0	1	2	3	4	Average
%	25	23	22	20	10	1.7

Students who scored highly were able to explain that the body would need to initiate thermoregulation mechanisms to try and keep the body at a normal temperature. These would include redirection of oxygenated blood to the skin's surface. This in turn would lead to less oxygen available to working muscles to create energy, causing the athlete to slow their speed. Many students also stated that dehydration could result, making the blood more viscous, which would also inhibit blood circulation.

The following is a sample response.

As the body tries to cool itself, blood flow is redirected to skin and away from working muscle. This redistribution assists with thermoregulation but affects muscular energy production, as less oxygenated blood is available to the muscles. As a result of sweating, there is potential for blood to become more viscous, further decreasing oxygen availability. The result would be that the athlete slows down because of a slower rate of energy production.

Question 8d.

Marks	0	1	2	Average
%	51	30	20	0.7

Students who scored highly were able to specify why it was important to ingest the carbohydrates in the first 30 minutes and not just state the reason for carbohydrate ingestion generally.

The following is a sample response.

Ingesting carbohydrates within the first 30 minutes will restore muscle glycogen quicker, enabling a faster recovery to pre-training state. This means that they will be able to train again sooner.

Question 8e.

Marks	0	1	2	Average
%	32	51	16	0.8

Students who scored highly were able to explain why co-ingestion of proteins and carbohydrates was beneficial to the athlete's recovery.

The following is a sample response.

Consuming proteins assists with muscle growth and repair, and combining proteins and carbohydrates assists with faster absorption of the carbohydrates.

Question 9a.

Marks	0	1	2	Average
%	14	48	38	1.2

Students who scored highly were able to clearly explain what is meant by balance and how it was able to assist the athlete. A definition of balance supported students to explain this question.

The following is a sample response.

Balance (maintaining equilibrium while stationary or moving) would allow the skateboarder to complete the complicated tricks (such as sliding board along a rail) while maintaining control of the board and their body.

Question 9b.

Marks	0	1	2	3	Average
%	18	20	36	26	1.7

Students who scored highly were able to explain how all three principles mentioned would assist the athlete in maintaining stability with specific reference to the image.

The following is a sample response.

In this instance the athlete could lower their centre of gravity by bending their knees. They could also widen the placement of their feet on the board to increase the size of their base of support. Finally, they should ensure their line of gravity is in the centre of their base of support. All of these things would help to maintain stability of the board rider.

Question 9c.

Marks	0	1	2	Average
%	41	20	39	1.0

Possible responses (with appropriate description) included any one of:

- increased motor unit recruitment
- decreased energy substrates
- increased muscular temperature
- increased blood flow to muscles
- increased metabolic by products
- increased a-vO₂ difference.

Students who did not score highly confused an acute muscular response with a chronic adaptation (e.g. increased muscle size).

The following is a sample response.

Increased motor unit recruitment – more motor units recruited to generate the force for performing skills and tricks.

Question 9d.

Marks	0	1	2	3	Average
%	27	20	33	20	1.5

Possible responses (with appropriate explanation) included any one of:

- stress inoculation training
- simulation
- mental imagery
- meditation
- breathing control
- progressive muscle relaxation
- biofeedback.

Students who scored highly were able to explain how their chosen strategy would assist the athlete in the training period leading up to the Olympics and not during the Olympic performance itself.

The following is a sample response.

The athlete could use stress inoculation training. They could play loud music along with other noise distractions during their training so they become used to the pressures of the environment they would face in the Olympic Games. This could help them be ready and prepared for their performance.

Question 9e.

Marks	0	1	2	3	4	Average
%	27	25	28	15	4	1.5

Students who scored highly were able to explain the rate of energy production of the anaerobic systems as being faster than the aerobic system. They then referenced this information when describing aspects of the event as detailed in the question stem.

Students who did not score highly gave a general description of the anaerobic systems and didn't link to the specific requirements of the event.

The following is a sample response.

Because ATP-CP produces energy at the fastest rate, the main role of the system will be to provide energy at the start of the event to perform explosive movements, such as pushing off, gaining speed and beginning to perform complicated tricks due to its fast rate of production. However, as CP stores have a small, finite capacity, it will be quickly depleted.

The anaerobic glycolysis system will increase its contribution as the run progresses to its duration (45 seconds). This enables the high intensity to be maintained, as it is able to produce ATP at a fast rate, allowing the athlete to sustain high-intensity, complicated tricks.

Question 10a.

Marks	0	1	2	3	4	5	6	Average
%	13	12	23	27	17	7	0.8	2.5

Students who scored highly were able to explain the energy system interplay with reference to the aspects of the floor routine. They were able to reference aspects of the routine as well as speak about the intensity and duration of the event.

The following is a sample response.

Throughout the routine, the gymnast uses all three energy systems at all times in varying amounts. High-intensity moves lasting a few seconds, such as a handstand and leap, would be fuelled initially by ATP-CP to provide energy, as this system resynthesises ATP at the fastest rate. Repeated combinations of high-intensity skills in succession will rely on a larger contribution from the anaerobic glycolysis system, as the CP would be depleted and there would be little chance for this to be replenished, as the rest periods are very short. Throughout the 90-second effort the aerobic system will increase its contribution and is likely to be the most relied upon energy system in the routine overall.

Question 10b.

Marks	0	1	2	Average
%	13	28	59	1.5

Students who scored highly could either describe controlled breathing and a way it can benefit an athlete, or simply explain why controlled breathing will help performance.

The following is a sample response.

An athlete may use controlled breathing if they are over-aroused; the controlled breathing will allow them to reduce their arousal levels.

Question 10c.

Marks	0	1	2	3	Average
%	16	6	37	42	2.0

Students who scored highly on this question were able to classify the performance as a closed skill. They were also able to give two clear reasons as to why it was classified in this way.

The following is a sample response.

Closed skill. The skill is performed in an indoor environment on the same floor shape and size. Also, the performance is internally paced, so the athlete can initiate the routine and does not have to react to the movements of others.

Characteristics of a closed skill may include:

- predictable environment (e.g. floor size, time, indoors, same floor)
- internally paced (timing is in the control of performer)
- limited inter-trial variability.

Question 10d.

Marks	0	1	2	Average
%	22	30	49	1.3

Students who scored highly were able to explain Newton's Third Law and give a direct reference to how it can be used to help performers take off in the somersault.

The following is a sample response.

Because the athlete exerts force into the floor, an equal and opposite force is exerted to the gymnast to assist with their somersault.