# Health and Movement Science 11–12 (2023): Sample unit (Stage 6 Year 11)

Sample units are provided by NESA to illustrate teaching, learning and assessment of syllabus outcomes and content. Teachers should seek advice from their schools and sectors about local requirements for units of work, including opportunities for reflection and evaluation, and recording evidence of adjustments to meet the needs of individual students with disability.

Unit title: Energy Systems

Duration**:** 5 hours

Description: This learning sequence guides students through understanding the interplay of energy systems, and the difference between aerobic and anaerobic training for individuals and group sports. Students will develop this understanding through a range of sports and different needs of athletes.

| Outcomes | Subject-specific information |
| --- | --- |
| **HM-11-03** analyses the systems of the body in relation to movement  **HM-11-06** Analysis:analyses the relationships and implications of health and movement concepts  **HM-11-07** Communication: communicates health and movement concepts to audiences and contexts, using a variety of modes  **HM-11-09** Problem-solving:proposes and evaluates solutions to health and movement issues  **HM-11-10** Research:analyses a range of sources to make conclusions about health and movement concepts | This learning sequence integrates selected content points related to energy systems and aerobic and anaerobic training programs, from the content group What Factors Influence Movement and Performance?  This learning sequence could be a standalone unit or could be used to form part of a larger unit of work to complete the study of the focus area The Body and Mind in Motion. |

### Unit information

| Content |
| --- |
| What factors influence movement and performance?  * Analyse the ATP-PCr, Glycolytic (Lactic Acid) and Aerobic energy systems of the body including fuel source and efficiency of ATP production, duration, intensity and rate of recovery and causes of fatigue * Interplay of the energy systems explain the role nutrition plays in enabling the energy systems to function efficiently, including macronutrient and micronutrient requirements of active people * Compare the difference between aerobic and anaerobic training for individuals and group sports, including differentiated training programs and contemporary methods of training |

This sample learning sequence provides examples of teaching, learning and assessment activities for teachers to adapt to meet their school contexts and student needs. A range of opportunities for ongoing assessment are provided to support flexible monitoring of student learning.

| Suggested teaching, learning and assessment | Suggested resources |
| --- | --- |
| **What factors influence movement and performance?**  Students are introduced to the concept of factors that influence movement and performance. They participate in a guided discussion with questions that could include:  What are the different energy systems?  How do different individuals train?  What are macronutrients and micronutrients?  The teacher creates cards with characteristics of the 3 energy systems so that students can complete a matching activity. The cards could include:  fuel source  efficiency of ATP production  duration  intensity  rate of recovery  causes of fatigue  sport-specific examples.  In small groups, students are provided with the set of cards with characteristics of the energy systems and a table (Appendix A). Students match the cards to the correct component in the table.  Teacher leads a discussion to check for understanding of energy systems by answering questions. Questions may include:  What is the fuel source for the glycolytic (lactic acid) system?  What is the duration of the aerobic system?  What is the rate of recovery for the ATP-PCr system?  Students view or listen to information on macronutrients and micronutrients. They could identify the characteristics of macronutrients and micronutrients in a table. Students research additional macronutrients and micronutrients and identify a specific athlete or sport where it would be the most beneficial.  Note: These could include carbohydrate, protein, fat (lipids), iron, magnesium, manganese, phosphorus, calcium, zinc, sodium, vitamin A, vitamin B2, vitamin C, vitamin D, vitamin E and vitamin K.  Teacher leads a discussion to check for understanding on macronutrients and micronutrients. Questions may: include:  What micronutrients would be beneficial for a female netball player?  What micronutrients would be beneficial for ageing individuals?  What macronutrients would be used in the glycolytic (lactic acid) system?  Students engage with a case study involving an elite athlete running a 400 m final in the Olympic games.  Note: This is based on Cathy Freeman in the 2000 Olympics and students may view or listen to the race. This case study could be modified to suit other athletes/events.  “She starts out well in lane 3, keeping up with the 2 leading runners at the 100 m mark. She accelerates towards the 200 m bend. She then increases her speed while maintaining her position. With 100 m to go, her legs become heavy, she works her arms harder and pushes as much as she can. The runners in lanes 1 and 2 overtake her. She appears to be struggling to get oxygen and is losing pace. She pushes through to the finish and places third, finishing in 50.63 seconds, 2 seconds outside her personal best (PB).”  In small groups, students are provided with a line graph (Appendix B) and complete activities based on the 400m running race case study, which could include:  proposing a heading for the graph and labelling the *y*-axis  plotting the 400 m running race onto the line graph  identifying on the graph and justifying which energy system would be most engaged at each of the 100 m intervals during the 400 m running race  justifying which micronutrients would best support the performance of this athlete.  Teachers lead a discussion to draw out the relationship between the distances and the energy systems. |  |
| Students engage with a case study about an Australian 1500 m runner who is training for the upcoming Olympics. The runner was extremely disappointed with his performance in the Olympic Trials for the preceding Olympics because he was beaten by another athlete who overtook him in the last 200 m of the race.  In small groups, students view or listen to a 1500 m running race and complete activities based on the case study. Questions may include:   * Justify the aspects of a 1500 m running race that would engage each of the energy systems. * Compare those aspects of the 1500 m running race to the 400 m running race (previous case study). For each energy system justify how they are similar or different. * If there were high levels of humidity and high temperatures on the day of the race, justify the micronutrient most suitable for this athlete. What would be the impact on this athlete’s performance if there was a limited amount of this micronutrient in his body?   Students engage with a case study on an Australian Female Olympic Triathlon racer. She placed 26th in the individual women’s Triathlon at the previous Olympics and is training for the next Olympics, 4 years later. The race included a 1500 m swim, 43 km bike and 10 km run with various quick stops in transition areas.  Note: This case study is based on Emma Jeffcoat, an Australian Olympic Triathlon racer. This case study could be modified to suit other triathletes.  In small groups, students engage with the case study and answer questions. Questions may include:  Note: students may view or listen to an extract of a triathletes performance and complete activities based on the triathlon case study.  Justify the aspects of the triathlon race that would engage each of the energy systems.  Compare those aspects of the 1500 m running race to the 400 m running race (previous case study).  For each energy system justify how they are similar or different.  Justify which macronutrients would enable the energy systems to function effectively for a triathlon race.  Consider the impact on the triathletes performance if she didn’t carbohydrate-load in the days leading up to the race at the Olympics.  Students graph the contribution of macronutrients for the 3 sports in the case studies (400 m running race, 1500 m race and triathlon).  Teachers present an activity where students investigate the relationship between energy systems and nutrition. Students may present their findings in the style of their choice: verbal, visual or written.  In small groups, students take on the role of a sports coach. Students create a flowchart and model to the class how a player would move through each of the energy systems during a passage of play. |  |
| Teacher leads a discussion on aerobic and anaerobic training. Students answer questions that may include:  What is aerobic and anaerobic training?  What are some types of aerobic training?  Why do some individuals engage in both aerobic and anaerobic training?  Students participate in a ‘think-pair-share’ activity about what type of training is most appropriate for which sports and why.  In small groups, students adopt the role of an exercise physiologist who is presenting on aerobic and anaerobic training to a range of individuals the following week. As the exercise physiologist, students research and prepare the presentation by considering the following questions:  What are the benefits of aerobic and anaerobic training?  What are different aerobic training methods?  What are different anaerobic training methods?  Which type of athlete would you (as an exercise psychologist) recommend contemporary methods of training to?  At the end of the presentation, the physiotherapist has several individuals booked in for appointments to help them understand the differences between the training types. Propose responses for possible questions such as:  A 15-year-old beach volleyball player has been considering High Intensity Interval Training (HIIT). Do you recommend this type of training and what would be some possible exercises that would support their performance?  A 30-year-old Olympic distance triathlete has been undertaking a substantial amount of continuous aerobic training. How might this impact their transitions between legs?  A hockey defender is struggling to keep up with forwards as they break towards the goal. What training methods might help them to improve this?  How might an older person who is starting to improve their fitness use contemporary methods of training? | * Harvard Graduate School of Education <https://pz.harvard.edu/sites/default/files/Think%20Pair%20Share.pdf> |

| Reflection and evaluation (space for teachers to reflect on and evaluate the unit) |
| --- |
|  |

## Appendix A

### Energy systems

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **ATP-PCr** | **Glycolytic (lactic acid)** | **Aerobic** |
| Fuel source |  |  |  |
| Efficiency of ATP production |  |  |  |
| Duration |  |  |  |
| Intensity |  |  |  |
| Rate of recovery |  |  |  |
| Causes of fatigue |  |  |  |
| Sport-specific examples |  |  |  |

### Appendix B