

THE
DUSTON
SCHOOL

TDS
4-19

Knowledge

Organiser

BTEC Sport Unit 4



Enquiry Question:

How the body of a sports performer
Functions in action

Big questions that will help you answer this enquiry question:

Do you know about the short-term responses and long-term adaptations of the body systems to exercise ?

For learning aim A, you'll look at the musculoskeletal and cardiorespiratory systems and how they function normally (before a training programme, taking part in exercise/sport regularly) and how they can function as a result of taking part in training/exercise/sport over a length of time.

Do you know about the different energy systems used during sports performance?

For learning aim B, you'll look at the energy systems for different sporting activities. So, if a performer needs energy quickly, they'll rely on energy already stored within the body. For a longer-term period of sport or exercise the body struggles to store a lot of energy, but it can make energy from resources inside and outside the body. By understanding how your body works and how it can be trained, as a sports performer or as a coach, you can help to make the necessary adaptations in order to produce improved sports performance.

Knowledge of the physiology of the body is useful for many careers in sport including roles in the fitness industry, which involve giving advice on training and lifestyle to clients.

Assignments

Learning Aim A—Assignment 1 (word document):

Design four posters containing information on what happens to the body during exercise and the benefits of regular exercise

- **Poster 1**—Describe ways in which the **musculoskeletal system** responds to **short-term** exercise.
- **Poster 2**— Describe ways in which the **cardiorespiratory system** responds to **short-term** exercise.
- **Poster 3**— Summarise, using relevant examples, **long-term adaptations** of the **musculoskeletal system** to exercise.
- **Poster 4**—Summarise, using relevant examples, long-term adaptations of the cardiorespiratory system to exercise.

Additional: compare and contrast how the **musculoskeletal** and **cardiorespiratory** systems respond and adapt to exercise

Learning Aim B—Assignment 2 (word document):

Design a poster or website that informs the reader of the differences between aerobic and anaerobic activities.

- Describe the function of **three energy systems** in the production and release of energy for sports performance

Assessment Criteria

Assessment criteria

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
Learning aim A: Know about the short-term responses and long-term adaptations of the body systems to exercise			
1A.1 Outline two ways in which the musculoskeletal system responds to short-term exercise.	2A.P1 Describe ways in which the musculoskeletal system responds to short-term exercise.	2A.M1 Explain responses of the musculoskeletal system to short-term exercise.	2A.D1 Using three different sports activities, compare and contrast how the musculoskeletal and cardiorespiratory systems respond and adapt to exercise. *
1A.2 Outline ways in which the cardiorespiratory system responds to short-term exercise. *	2A.P2 Describe ways in which the cardiorespiratory system responds to short-term exercise. *	2A.M2 Explain responses of the cardiorespiratory system to short-term exercise. *	
1A.3 Summarise two long-term adaptations of the musculoskeletal system resulting from exercise.	2A.P3 Summarise, using relevant examples, long-term adaptations of the musculoskeletal system to exercise.	2A.M3 Explain long-term adaptations of the musculoskeletal system to exercise.	
1A.4 Summarise two long-term adaptations of the cardiorespiratory system resulting from exercise. *	2A.P4 Summarise, using relevant examples, long-term adaptations of the cardiorespiratory system to exercise. *	2A.M4 Explain long-term adaptations of the cardiorespiratory system to exercise. *	

UNIT 4: THE SPORTS PERFORMER IN ACTION

Level 1	Level 2 Pass	Level 2 Merit	Level 2 Distinction
Learning aim B: Know about the different energy systems used during sports performance			
1B.5 Describe the two main energy systems, including examples of sports that use each system.	2B.P5 Describe the function of the three energy systems in the production and release of energy for sports performance.	2B.M5 Using two selected sports, explain how the body uses both the anaerobic and aerobic energy systems.	2B.D2 Compare and contrast how the energy systems are used in sports with different demands.

*Opportunity to assess mathematical skills

#Opportunity to assess English skills

Homework

Homework will be set twice per week. Homework tasks will be dependent upon the stage reached within individual assignments.

Likely tasks will include:

- Researching for assignment content
- Production of assignment content / notes
- Extension work in order to attain higher grades

Key content

To be evidenced within this assignment

What needs to be learnt

Learning aim A: Know about the short-term responses and long-term adaptations of the body systems to exercise

Topic A.1 Short-term effects of exercise on the musculoskeletal system:

- increased production of synovial fluid for joint lubrication and nourishment
- increased joint range of movement due to increase in blood flow and increased muscle temperature
- § micro tears in muscle fibres, causing the muscle to rebuild itself and become slightly bigger and stronger
- § exercise (high-impact activity) encourages new bone formation
- § increased metabolic activity.

Topic A.2 Short-term effects of exercise on the cardiorespiratory system:

- increased heart rate due to the heart having to work harder to pump oxygenated blood around the body
- increased breathing rate, in order to supply more oxygen to working muscles and remove carbon dioxide
- increased blood flow
- sweat production and skin reddening
- § re-distribution of blood flow via the vasoconstriction (narrowing) of arterioles supplying inactive parts of the body and vasodilation (opening) of arterioles supplying skeletal muscles with more blood and nutrients
- § increased build-up of lactic acid in the blood
- § increased cardiac output to get oxygenated blood to working muscles (due to increased heart rate and stroke volume)
- § increased blood pressure – as the cardiovascular system works to deliver more oxygen and glucose to the muscles (systolic pressure rises and diastolic pressure remains unchanged)
- § as muscular activity increases, the production of carbon dioxide increases resulting in an increase in Tidal Volume (TV) (TV is the amount of air inhaled and exhaled with each breath).

Topic A.3 Long-term adaptations of the musculoskeletal system:

- hypertrophy (increased muscle size)
- increase in bone density (bone strength) due to increase in calcium production
- § stronger connective tissues (ligaments and tendons), so more resistant to injury
- § increased stability of joints
- § increased thickness of hyaline cartilage
- § skeletal muscles adapt to using more oxygen, the muscles and their capillaries become more efficient and can therefore work for a longer period of time
- § increased number of mitochondria
- § decreased risk of osteoporosis
- § improved posture.

Key content

To be evidenced within this assignment

What needs to be learnt

Topic A.4 Long-term adaptations of the cardiorespiratory system:

- decrease in resting heart rate: resting heart rate is able to slow down because the heart is trained to pump a larger quantity of blood with every beat
- increase in heart size and strength
- § increase in stroke volume
- § the heart can pump more blood per beat, so resting heart rate decreases (bradycardia); heart becomes more efficient and does not need to beat as quickly to supply the body with oxygenated blood
- § decreased risk of hypertension (high blood pressure)
- § increased Vital Capacity (VC) – due to improved lung function (Vital Capacity is the amount of air that can be forcibly expelled from the lungs after breathing in as deeply as possible)
- § increased efficiency to deliver oxygen and remove waste products
- § increased lung efficiency and gaseous exchange
- § increased maximum oxygen uptake (VO_2 max).

Learning aim B: Know about the different energy systems used during sports performance

Topic B.1 The anaerobic energy system – not using oxygen:

Sports that use this system to provide energy are very high intensity and explosive. That is, they use short bursts of exercise lasting a few seconds, for example, javelin throw, weightlifting, sprinting, high jump.

§ Topic B.2 ATP-CP/lactic acid anaerobic system:

- § reliance on stored adenosine triphosphate (ATP) (the molecule that produces the energy in all living things), energy supplied by ATP (up to four seconds)
- § another stored molecule, creatine phosphate (CP) helps restore ATP
- § CP is restored aerobically (with oxygen)
- § energy is supplied by ATP and CP (four to 20 seconds)
- § when this system runs out of ATP-PC stores, glycolysis takes place.

§ Topic B.3 Glycolysis/lactic acid anaerobic system:

- § ATP is made from glucose stored in the liver and muscles
- § energy is supplied by ATP, CP and muscle glycogen (20 to 45 seconds)
- § energy is supplied by muscle glycogen (45 to 240 seconds)
- § waste product is lactic acid
- § when this system is unable to maintain energy requirements, the aerobic system starts to produce energy
- § sports that use this system to provide energy are moderate to high intensity, i.e. short bursts of exercise lasting a few minutes, e.g. running 400 m, 800 m, and 1500 m distances.

continued

Key content

To be evidenced within this assignment

What needs to be learnt

Topic B.4 The aerobic energy system – using oxygen:

For example during longer periods of exercise/activity; sustained energy relies on this system.

Sports that mainly use this system to provide energy used for sustained activity are long-distance events such as marathon running, long-distance swimming, long-distance cycling.

- § energy supplied by muscle glycogen and fatty acids (240 to 600 seconds)
- § uses oxygen as a means of making energy (re-synthesising ATP)
- § low to moderate intensity (beyond 90 seconds).

Key Content

Wider reading

Textbooks

Adams, M., Armstrong, R., Gledhill, A., Hancock, J., Harris, B., Phillippo, P. and Sergison, A., (2012) *BTEC First Sport Student Book*, Pearson Education (ISBN 978 1 44690 161 8)

Commons, R., Rizzo, G. and Swales, M. (2010) *Level 2 BTEC Firsts in Sport Student's Book*, Oxford, (ISBN 978 1 85008 515 7)

BTEC First Sport Level 2 Assessment Guide: Fitness for Sport and exercise Unit 1 and Practical Sports Performance Unit 2 (BTEC Sport Assessment Guide), Hodder, 2013

Jennifer Stafford-Brown, Simon Rea, Katherine Howard and Andrew Bardsley

Websites

www.britishswimming.org

Amateur Swimming Association

<http://www.teamgb.com/>

The British Olympic Association

www.thefa.com

The Football Association

www.rfu.com

The Rugby Football Union

www.sportsleaders.org

Sports Leaders UK

www.sportsofficialsuk.com

Sports Officials UK

www.ukathletics.net

UK Athletics

www.uksport.gov.uk

UK Sport

Key Content

Terminology

PASS CRITERIA.

Describe Give a detail account of something; think of it as painting a picture with words

Define To give a brief meaning of something

Outline A brief description of something that concentrates on the main topic or item

Illustrate Give examples or diagrams to help show what you mean

Identify Point out (choose the right one) or give a list of the main features or prove something as being certain

Interpret Give the meaning of something

Plan Write a plan of how you intend to carry out the activity

State Give a full account

Summarise Give the main points or essential features of an idea or a discussion; do not include unnecessary details that could confuse the main topic of concern

List A record that includes an item-by-item record of relevant information

MERIT CRITERIA.

Explain Give a detailed account to give the meaning of something with reasons; include the 'how' and 'why' of the topic of interest

Compare/Contrast Show the similarities between the two areas of interest and also the differences between the two, or the advantages and disadvantages

Discuss Examine the advantages and disadvantages of the subject of interest and then try to complete the discussion with a conclusion

Account for Explain the process or give a reason to explain the reason for something being the way it is

Demonstrate Give a number of related examples or details from a variety of sources to support the argument you are making; in a practical situation, this means that you must practically carry out the activity or skill while being observed

Distinguish Explain the differences

Examine Inspect something closely

DISTINCTION CRITERIA

Analyse Explore the main ideas of the subject, stating how they are related, why they are important and how each one contributes to the main area of interest

Critically analyse Give your opinion of the subject of interest, both the advantages and disadvantages, after having considered all the evidence

Conclude After having given evidence to support your opinion or argument give a reasoned judgement

Assess Give your judgement on the importance of something

Criticise Analyse a topic or issues objectively – give both the advantages and disadvantages and then make a decision based upon the evidence you present

Evaluate Give evidence to support the good and bad points of the topic and then give your opinion based upon the evidence

Justify Give supported reasons for your view to explain how you have arrived at these conclusions