Physical Education

Sixth Form Examination 2016

Mark Scheme
16 + Specimen paper for Physical Education
Duration: 1 Hour

Section 1: Applied Anatomy and Physiology

1a) Identify Four functions of the Skeleton (5)
1. Protection  
2. Shape  
3. Support  
4. Movement  
5. Blood production

1b) Identify the major muscles, bones and joints involved in a Javelin throw (5)
Answers can be directed at the preparatory phase or the Throwing phase, (see table below).
Most actions are rotational in the transverse plane and longitudinal axis and the two joints primarily involved are the elbow and shoulder. The elbow is a hinge joint formed by the humerus and ulna. The shoulder is a ball and socket joint formed between the humerus and the scapula.

<table>
<thead>
<tr>
<th>Joints involved</th>
<th>Articulating bones</th>
<th>Agonist Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>Humerus &amp; scapula</td>
<td>Posterior deltoids and latissimus dorsi</td>
</tr>
<tr>
<td>Elbow</td>
<td>Humerus &amp; ulna</td>
<td>Triceps brachii</td>
</tr>
</tbody>
</table>

Preparatory phase

Throwing phase

<table>
<thead>
<tr>
<th>Shoulder</th>
<th>Humerus &amp; scapula</th>
<th>Anterior deltoids and Pectoralis major</th>
</tr>
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1c) Explain the mechanics of breathing in an 800 metres race (5)

NB A candidate’s answer will be rewarded if the contents are correct and relate to the 800 metre race even though their points are fully included in the mark scheme. (Eg key terms, Tidal Volume, residual volume, vital capacity, Aerobic capacity, Oxygen debt, VO2 Max ) The answer should however demonstrate the fundamentals of the mechanics of breathing in this race context.

The action of breathing in and out is due to changes of pressure within the thorax, in comparison with the outside. This action is also known as external respiration. When the Athlete inhales the intercostal muscles (between the ribs) and diaphragm contract to expand the chest cavity. The diaphragm flattens and moves downwards and the intercostal muscles move the rib cage upwards and out. This increase in size decreases the internal air pressure and so air from the outside (at a now higher pressure that inside the thorax) rushes into the lungs to equalise the pressures. When the athlete exhales the diaphragm and intercostal muscles relax and return to their resting positions. This reduces the size of the thoracic cavity, thereby increasing the pressure and forcing air out of the lungs.
Breathing Rate
The rate at which the athlete inhales and exhales is controlled by the respiratory centre, within the Medulla Oblongata in the brain. Inspiration occurs due to increased firing of inspiratory nerves and so the increased recruitment of motor units within the intercostals and diaphragm. Exhalation occurs due to a sudden stop in impulses along the inspiratory nerves.

The athlete’s lungs are prevented from excess inspiration due to stretch receptors within the bronchi and bronchioles which send impulses to the Medulla Oblongata when stimulated. Breathing rate is all controlled by chemoreceptors within the main arteries which monitor the levels of Oxygen and Carbon Dioxide within the blood. If oxygen saturation falls, ventilation accelerates to increase the volume of Oxygen inspired. If levels of Carbon Dioxide increase a substance known as carbonic acid is released into the blood which causes Hydrogen ions (H+) to be formed. An increased concentration of H+ in the blood stimulates increased ventilation rates. This also occurs when lactic acid is released into the blood following high intensity exercise.

Breathing During Exercise
During the 800 metre race, more muscles are involved as air needs to be forced in and out of the lungs much more quickly. The extra inspiratory muscles are the sternocleidomastoid which lifts the sternum, and the scalenes and pectoralis minor which help to lift the ribs. The extra expiratory muscles are the internal intercostals which pull the ribs down and in and the abdominal muscles which push the diaphragm up.

The race itself
The 800 metre race is the kind of event where an athlete’s muscles lose the ability to move the runner forward. Even a moderate effort over the first lap (400 metres) will cause enough fatigue to ensure a slower second lap. Athletes’ muscles will fire at great intensity right from the start of the race, using up oxygen at a increased rate. Aerobic respiration will be effective for about 300 metres but the runner’s muscles demand more energy than available oxygen could process, so the body turns to anaerobic respiration to burn fuel. The by-product of anaerobic respiration is lactic acid, a substance which, in excess, is toxic. Lactic acid changes the pH levels in muscles, causing cramp. Since the runners continue to ask their muscles to contract for two laps, the process compounds, creating a cellular environment that impairs muscles' ability to contract as effectively.

1d) The risk of injury is always present when taking part in Physical Activity and Sport. With reference to a named activity / sport of your choice, Explain the possible outcome if a performer does not warm up properly. Discuss the possible outcome, (injury) and the physiological effects upon the body. (6)

Named Sport / activity
Possible outcomes & Physiological effects
- Possible injury to muscles, tendons, and ligaments.
- Body not prepared for specific exercises.
- Decreased blood flow and temperature of working muscles will be reduced.
- Reduction in the range of movement of joints.
- Psychologically not prepared for exercise / competition

Possible injuries as a result of a poor warm up
- Muscle sprains and strains
- Tears of the ligaments that hold joints together
- Tears of the tendons that support joints and allow them to move
- Dislocated joints
- Fractured bones, including vertebrae.
- If no injury is sustained, the possibility of stiffness and immobility are likely following exercise

Section 2: Health, Fitness & Well Being

2a) Define ‘Health related’ and ‘Skill related’ fitness (4)
i) Health Related Fitness (x2)
The definition of health-related fitness involves exercise activities that you do in order to try to improve your physical health and stay healthy, particularly in the categories of cardiovascular endurance, muscular strength, flexibility, muscular endurance and body composition.

Skill related fitness is the ability to do well in everyday life activities and sports. An example of skill related fitness is good balance. Skill related fitness is often divided into several other components which form our overall health status: Speed, reaction time, Agility, Balance, co-ordination & power.

2b) For a named team sport of your choice, describe the positive and negative effects of motivation upon team members.

Positive Sport
Positive and Negative effects of motivation
A positive mental factor will increase the level of arousal to an optimal state allowing the performer to produce their best performance, handling the stress of the event, remaining calm while making the appropriate decision.

A negative influence will lead to an ineffective, erratic and unconfident performance. This could be caused by apprehension, anxiety or the feeling of defeat before the event has begun.

Motivation focuses the performer or improves concentration/ which allows the performer to perform more accurately. Motivation makes the performer try harder/ are more likely to succeed.

2c) Identify the components of a balanced diet. Explain how one of these components can improve the health and performance of a teenage boy or girl who is participating in Sport.

Carbohydrates
Provides quick energy. 60% of our diet should comprise 'carbs'. Running. Athletes in training will eat more 'carbs'. Marathon runners will 'load' before the event. Pasta, cereals and potatoes

Fats
Provides slow energy. 25% of our diet should be fat. Walking and low impact exercise - it produces energy too slowly to be used when working hard. Oils, dairy products, nuts and fish NB Unsaturated fats are healthy. Too much saturated fat from animal products can lead to heart disease.

Protein
Builds and repairs muscle. We only need 15% of our diet to be protein. When training hard and recovering from injury. ‘Power’ athletes such as weight lifters will eat more protein. Meat, pulses and fish.

Vitamins (A – D )
Helps the body work. Helps concentration. Staying calm, making quick decisions Fresh fruit and vegetables.

Minerals
Spinach, Calcium - to strengthen bones, Iodine - for energy production, Iron - prevents fatigue. Helps release energy from food. Helps decision making When training hard and competing, Fruit, vegetables and fish.
Fibre
Can't be digested. Fills you up and keeps you 'regular' Healthy digestion, (no constipation) helps in sport. Also helps with weight control. Fresh fruit, vegetables and wholegrain cereals.

Water
Water: Maintains fluid levels whenever you sweat. It prevents dehydration, it’s all you need most of the time.

2d) There are several training principles, each influencing the training of the performer in a different way. Identify the principles of training, (either F.I.T.T. or S.P.O.R.T.) and for a named sport of your choice, explain how a knowledge of the principles of training would help an individual improve their performance. (6)

Named Sport (x1)

Knowledge and application ( Either FITT or SPORRT can be used) (x5)

The FITT acronym to help remember the key things to consider when tailoring programmes for individual sporting goals. It stands for; Frequency, Intensity, Time and Type. Calculating the target zone also helps assess how much aerobic or anaerobic training you need to do to improve fitness.

The best training programmes are built on principles of Specificity, Progression, Overload, Reversibility, Rest and Tedium (acronym SPORRT).

Training should be matched to an individual’s needs. By using the principles of training as a framework an athlete or coach can plan a personal training programme that uses scientific principles to improve performance, skill, game ability and physical fitness. A successful training programme will meet individual needs which are personal fitness needs based on age, gender, fitness level and the sport for which we are training.

Social Cultural Issues of Sport on society
3a) The pursuit of sporting excellence in the UK follows a hierarchical structure. Identify the four stages in the diagram below. (4)

4  Excellence / elitism
3  Performance
2  Participation
1  Foundation

3b) Name any ‘special interest group’ that is involved in promoting both participation and excellence in sport. Describe how it has promoted both aspects and whether it has been successful. Give reasons for your answer. (5)

Special interest group (x1)

Information relating to Promotion and Excellence (x3)

Success explanation (x1)

These special interest groups include:

- the elderly and active retired groups
- Women and Girls in Sport
- people with disabilities
- mothers and toddlers
- ethnic minority groups
- the unemployed
- Youth groups
Answers should form the basis of the two examples below and all special interest groups will be credited.

**Women’s sports foundation**

**Aim:** to improve and promote opportunities for Women and Girls in sport at every level by influencing change in Sports policy, practice and culture.

In excellence: Raises the profile by working closely with the media and other organisations to promote both team and individual sports: (eg, Womens Rugby & Cricket teams) High levels of success: increasing number of female role models in sport, Increased access to more sports in schools. In Mass participation: promotes the benefits of an active lifestyle‘. Campaigns for changes in policy to increase opportunity. Creates models of best practice.

**Disability sport UK**

**Aims**

1. To raise the profile of disability in sport.
2. To ensure that plans for sport included people with disabilities
3. To provide sporting opportunities for people with disabilities.
4. To improve access to sport.
5. To encourage people with disabilities in international sports.
6. To ensure the best use of resources and increase finance.
7. To make sure that the sporting needs of people with disabilities are met.

The profile and success of sport for the disabled is rising with increased coverage of disabled sport including the Paralympics, Swimming, wheelchair basketball and the media coverage of the Paralympics. Local authorities have targeted certain user groups by offering them concessions, such as special opening times, reduced fees and organised classes - to encourage participation.

**3c)** The media and television in particular, has a profound influence on sport. Explain how a named sport of your choice has adapted to meet the increased demands of the viewing public over recent years. (5)

**Named Sport: EG: Association Football (Soccer)**

Adaptations for the viewing public (x4)

The media and television in particular, has a profound influence on sport. It allow all forms of media to be possible, but it also allows features like photo finishes, instant replays, split times etc to increase the accuracy, excitement of the game. It can also ensure correct decisions based upon evidence.

**Adaptations:**

- Internet broadcasting via laptops, smart phones, tablets
- Smart TV’s : Different camera angles, Red button, ‘freeze live TV’
- Teams and major athletes have their own websites where you can find all kinds of information about the team/athlete/matches
- **Cable and Satellite TV** - These show events on a pay-per-view basis
- KO Times are now regulated by the sponsors : Kick off times chosen to maximise viewing figures and achieve the greatest sponsorship deals
- Sponsorship deals often won by major broadcasting companies eg Sky TV ( Multiple sports channels to cover several games at the same time)
- Formation of a ‘Premier league’ to ensure maximum publicity for the top teams
- Live updates via ‘smart phone apps’,

**3d)** Despite the advancements in technology and Sport Science, some performers are still prepared to take prohibited substances to enhance their performance. With reference to one prohibited category of banned substance outlined by WADA, (World Anti-Doping Agency) critically evaluate the physiological and psychological effects it has upon the human body. (6)
Categories of Banned substances

Stimulants
Make athletes more alert and mask fatigue
Can cause heart failure, addictive

Anabolic agents - steroids
Help athletes to train harder and build muscle Increased aggression and kidney damage

Diuretics
Remove fluid from the body. Used: to reduce weight, also to hide / ‘mask’ other drug use.
Causes severe dehydration

Narcotic analgesics
Mask pain caused by injury or fatigue which can make the injury worse Addictive

Peptides and hormones
EPO (Erythropoietin) red blood cells - gives more energy
HGH (Human Growth Hormone) - build muscle
EPO - risk of stroke or heart problems.
HGH - abnormal growth, heart disease, diabetes, arthritis etc

Blood doping
Blood is injected that has been removed from the body a few days earlier, enabling the blood to carry more oxygen. It is banned as it's a form of cheating. It can cause kidney and heart failure.

Beta blockers
Keep the heart rate low and reduce tremble in the hands (Banned in archery and shooting)

Corticosteroids
These are used to reduce pain and inflammation from injuries and also in inflammatory conditions like asthma . They can side-effects including diabetes and brittle bones

Alcohol
Alcohol is sometimes used by athletes to calm nerves. It can however reduce coordination, judgment and reactions. Long term use has more serious side-effects such as liver, kidney and heart failure

Psychological effect
All drugs have side effects. Some categories of drugs are addictive. Some athletes take drugs to improve performance, or encouraged to do so by their coaches. The temptation to do this is great as the rewards of success can be high. The belief that without drugs athletes cannot perform to their best; they become psychologically reliant / dependent on drugs whatever the side effects may be.