# 5 Specification Content

These specifications are set out in the form of teaching modules. Each teaching module is assessed by its associated unit of assessment.

## 5.1 Module 2562: The Application of Physiological and Psychological Knowledge to Improve Performance

This Module has two sections:

A - Application of Anatomical and Physiological Knowledge to Improve Performance.

B - Acquiring and Performing Movement Skills.

### 5.1.1 Module 2562: Section A - Application of Anatomical and Physiological Knowledge to Improve Performance.

**C3.1b, C3.2, C3.3**

#### 5.1.1.1 Introduction

Section A of Module 2562 helps build a greater understanding of the structure of the human body and how it responds during the performance of a variety of physical activities. Candidates will have had the opportunity to study anatomy and physiology during Key Stage 4 and GCSE. Module 2562 allows candidates to build on and extend their knowledge, as well as experiencing a greater depth of analysis in terms of their own body's individual response to physical activity, and that of others. The focus of study is on how the structure and mechanics of the body, and the function and control of body systems, all interlink with the physiological make-up of an individual to play a significant role in determining both the standard and effectiveness of the performance. The study of applied anatomy and physiology presents an opportunity to candidates, not only to acquire knowledge and understanding, but also to appreciate the interaction of these concepts with psychological and socio-cultural factors in determining not only standard of performance but also effect on improving the standard. Candidates accumulate knowledge that ultimately enables them to reason effectively, and begin to anticipate responses to new performance situations. This application should consist of synthesis of theory and practice as reflected in the aims and objectives of the specification, together with exemplars to illustrate links between physical performance and theoretical study. This provides a platform to build on in A2 when the candidate explores the long term effects of training and performance on the body. Candidates also have the opportunity to analyse efficient performance in greater detail in Module 2565 Option B1 Biomechanical Analysis of Human Movement.

### 5.1.1.2 Candidate's Learning Experience

Candidates should gain knowledge and understanding as a result of involvement in, and reflection on practical experiences. The tables in Section 5.1.1.5 provide examples of possible learning experiences.

Candidates should use their experiences gained through their performance of practical activities as a basis on which to improve their anatomical and physiological understanding. They can use this understanding to help in the overall process of improving their own practical performance and that of others.

### 5.1.1.3 Unit Assessment

Candidates knowledge and understanding of Module 2562 Section A is assessed in Unit 2562, Section A where a candidate answers two compulsory questions (2 x 15 marks). Each question is structured into a series of short sub-questions. Candidates may be required to interpret and to sketch graphs and diagrams. The use of technical language is expected.

### 5.1.1.4 Module 2562: Section A Content

**The Skeletal System**

General overview of the skeletal system to include the functions of the skeleton, the axial and appendicular skeleton, types of bone and cartilage. This is meant as an introductory section to the course and is **not** directly examined. Candidates should already have prior knowledge of the skeletal system.

**Joints**

The following joints, movement and muscles need to be covered:

- wrist: flexion and extension; wrist flexors and extensors;
- radio-ulnar: pronation and supination; pronator teres and supinator muscle;
- elbow: flexion and extension; biceps brachii and triceps brachii;
- shoulder: abduction, adduction, flexion, extension, rotation, horizontal flexion, horizontal extension, circumduction; deltoid, latissimus dorsi, pectoralis major, subscapularis, infraspinatus, teres major and teres minor; trapezius;
- spine (cartilaginous and gliding); Flexion, extension, lateral flexion; Rectus abdominus, external and internal oblique and the erector spinal group (sacrospinalis);
- hip: abduction, adduction, flexion, extension, rotation; illiopsoas, gluteus maximus, medius and minimus, adductor longus, brevis and magnus;
- knee: flexion and extension; biceps femoris, semi-membranosus and semi-tendinosus, rectus femoris, vastus lateralis, vastus intermedius and vastus medialis;
- ankle: dorsi flexion and plantar flexion; tibialis anterior, soleus and gastrocnemius.

Knowledge of each joint should include the following:

- joint type;
- the bones that articulate at the joint;
- the type and range of movement that can occur at the joint (features of the joint and function of the joint should be discussed here);
- the location and action of individual muscles surrounding the joint (a knowledge of origins and insertions is desirable but will **not** be examined);
- movement analysis of typical sporting actions associated with each joint. Candidates must use their own sporting experiences as a point of reference;
- identification of exercises used to improve the strength of the active muscle or group of muscles surrounding each joint utilised in the production of practical techniques;
- identification of different types of muscular contraction (concentric, eccentric and isometric) used in the performance of practical techniques;
- identification of a movement showing the function of a muscle as either an agonist, antagonist or fixator.

Knowledge of muscle structure and function should be restricted to the following:

- the structure and function of the different muscle fibre types (slow oxidative, fast oxidative, glycolytic and fast glycolytic);
- the effect of a warm up on skeletal muscle tissue in relation to speed and force of contraction.

**Motion and Movement**

This is an introduction to the basic concepts of Biomechanics. Interested candidates will be able to extend their knowledge in Module 2565 (A2).

A practical analysis of the candidate's own choice of activity should refer to the following:

- Newton's Laws of Motion;
- the types of motion produced (linear, angular or general);
- the effect of size of force, direction of the force and the position of application of force on a body;
- centre of mass; the effect of changes in the position of the centre of mass and the area of support when applied to practical techniques.

Candidates have the opportunity to integrate knowledge (already gained at Key Stage 4) of the cardiovascular and respiratory systems, with a more advanced level of study. This leads to a greater understanding of the anatomy and physiology of the body in relation to physical performance. Candidates' knowledge of the structure of the heart and lungs is assumed and will not be examined.

**Resting Heart Rate**

- The cardiac cycle (diastole and systole), linked to the conduction system of the heart (Sinuatrial node, Atrioventricular node, Bundle of His and Purkinje fibres). Definitions and resting values for stroke volume, heart rate and cardiac output.

**Heart Rate Response to Exercise**

- How changes in heart rate are regulated to include neural, hormonal and intrinsic factors. To appreciate the changes in heart rate, stroke volume and cardiac output during sub-maximal and maximal activity.

**Control of Blood Supply (at rest and during exercise)**

- Knowledge of the pulmonary and systemic circulatory networks and the factors linked with venous return. Distribution of cardiac output at rest and during exercise (the vascular shunt mechanism), and the role of the vasomotor centre. Detail should include the involvement of arterioles and pre-capillary sphincters. How carbon dioxide and oxygen are carried within the vascular system. The effects of a warm-up and cool-down period on the vascular system.

**Respiration at Rest**

- The mechanics of breathing and the respiratory muscle involved, to include diaphragm, external intercostals. Respiratory volumes at rest (definitions and values). Gaseous exchange at the lungs and tissue respiration. An awareness of partial pressure is required but candidates will **not** be expected to provide specific respiratory pressures.

**Respiratory Response to Exercise**

- Identification of changes in the mechanics of breathing to include additional muscles involved (sternocleidomastoid and pectoralis minor) and the active nature of expiration (internal intercostals and abdominal muscles). Subsequent changes in lung volumes with typical values for sub-maximal and maximal work. How changes are regulated by the respiratory centre (both neural and chemical control). Changes in gaseous exchange at the lungs and tissue respiration (increased diffusion gradient and accelerated dissociation of oxy-haemoglobin). The effect of altitude on the respiratory system.

### 5.1.1.5 **Module 2562: Section A** - Examples of Learning Experiences

The following tables highlight a progressive approach to the development of knowledge, understanding and application of the Section A content by the candidate.

**Required Knowledge:** The type and range of movement that can occur at the joint (feature of the joint and function of the joint should be discussed here).

| **Theoretical learning experience** | **Practical learning experience** |
|---|---|
| Investigate the different types of movement possible at each joint.<br>*(acquire)* | During the performance of practical techniques, recognise the types of movement produced.<br>*(acquire)* |
| Measure and record the range of movement that can be produced at each joint.<br>*(acquire)* | |
| Explain the differences in range and type of movement that can be produced, with reference to the joint type and prominent features.<br>*(acquire, apply)* | During the performance of practical techniques, analyse the type and range of movement produced by another candidate within the group.<br>*(acquire, apply)* |
| Compare individual results and give possible reasons for the variation in range of movement (requirements of preferred physical activity, eg level of flexibility, training effects, gender, etc).<br>*(acquire, apply, evaluate)* | During the performance of practical techniques, appraise the type and range of movement produced by other candidates within the group.<br>*(acquire, apply, evaluate)* |
| Discuss the importance of joint type and range of movement on the efficient production of practical techniques.<br>*(acquire, apply, evaluate, appreciate)* | By using knowledge of the type and range of movement, show how a practical technique may be improved by increasing flexibility, for example inefficient front crawl arm action due to the need to improve shoulder joint flexibility.<br>*(acquire, apply, evaluate, appreciate)* |

**Required Knowledge:** Heart rate response to exercise

| **Theoretical learning experience** | **Practical learning experience** |
|---|---|
| define the terms and investigate the relationship between heart rate, stroke volume and cardiac output.<br>*(acquire)* | Measure heart rate<br>(a) one hour before a competitive activity.<br>(b) just prior to competing in an activity.<br>(c) during a competitive activity.<br>*(acquire)* |
| Measure heart rate in a prone position, standing and during sub-maximal exercise. Produce a graph of the data collected. Plot each result onto acetate to allow comparison.<br>*(acquire, apply)* | Suggest reasons for the changes in heart rate response.<br>*(acquire, apply)* |
| Explore the reasons why the increase in heart rate occurs from a prone position, to standing and during sub-maximal exercise.<br>*(acquire, apply, evaluate)* | Predict what will happen to a student's heart rate when they perform a handstand. Test and evaluate your prediction.<br>*(acquire, apply, evaluate)* |
| Explain the difference in the range of heart rate recorded for the same activity by students within the same group.<br>*(acquire, apply, evaluate)* | |
| Discuss the long-term benefits of sub-maximal exercise on the efficiency of the heart.<br>*(acquire, apply, evaluate, appreciate)* | What are the benefits of a warm-up activity in relation to the function of the heart?<br>*(acquire, apply, evaluate, appreciate)* |

**Required Knowledge:** Centre of mass (the effect of changes in the position of centre of mass and the area of support when applied to physical activity).

| **Theoretical learning experience** | **Practical learning experience** |
|---|---|
| Identify the different effects of changes in centre of mass and base of support in various practical techniques.<br>*(acquire)* | During the performance of physical techniques, recognise how a change in body position can change the position of the centre of mass.<br>*(acquire)* |
| Using the forward roll as an example, explain the reasons why a body moves from a stable position to an unstable one.<br>*(acquire, apply)* | Explain the importance of unstable positions in gymnastics, looking at the following:<br>(a) dismounts<br>(b) rotations, for example, cartwheels, rolls, headsprings, handsprings, somersaults.<br>*(acquire, apply)* |
| Analyse the phases of a practical demonstration with a view to organising them on a stable/unstable continuum.<br>*(acquire, apply, evaluate)* | Formulate up to three principles that can be used to describe a stable body in a sporting situation.<br>*(acquire, apply, evaluate)* |
| Using your knowledge of the principles affecting stability, outline and the main coaching points which should be followed when an athlete adopts a defensive position in rugby or judo.<br>*(acquire, apply, evaluate, appreciate)* | A novice gymnast finds it hard to gain sufficient rotation to initiate a forward roll. From a biomechanical standpoint, what coaching points could be employed to ensure success?<br>*(acquire, apply, evaluate, appreciate)* |