Specification

Level 3 Diploma in Personal Training

Qualification Number: 603/3503/8

CIMSPA® Endorsed | Professional Standards

Innovate Awarding is an Ofqual regulated awarding organisation with an innovative and dynamic approach. We develop off-the-shelf, customised and fully bespoke qualifications across a growing number of sectors – all on the Regulated Qualifications Framework (RQF).

Our portfolio is always growing, and we currently have qualifications in the following sectors:

Active Leisure	**Health and Social Care**
Business and Management	**Hospitality and Catering**
Childcare	**IT**
Employability	**Logistics**
Retail	**Education and Training**

We currently offer over 100 qualifications and we're continuously developing and diversifying our portfolio. Please visit our website regularly to keep up to date www.innovateawarding.org

This document will be updated if there are any changes, so it is important to make sure you are working from the most up-to-date version, which is available to download from our website.

This specification also provides details on administration, quality assurance policies and the requirements as well as responsibilities that are associated with the delivery of vocational qualifications.

Innovate Awarding is recognised as an awarding organisation by the following qualifications regulators – Ofqual (England).

If you have any questions regarding qualifications in general, aspects of specific qualifications or our quality assurance policies and procedures, visit our website where more information is available.

If you cannot find what you are looking for on our website, please call or email our customer support team:

Telephone: 0117 314 2800
Email: contactus@innovateawarding.org

"We work with a wide variety of organisations such as employers, training providers, FE colleges and Sector Skills Councils and develop off-the-shelf, customised and bespoke qualifications."

Qualification summary

Qualification Accreditation Number (QAN)	603/3503/8
Qualification review date	31st August 2026
Guided Learning Hours (GLH)	Minimum 232 hours
Total Qualification Time (TQT)	361 hours
RQF level	Level 3
Qualification credit value	37 credits
Minimum credits at/above level	37 credits
Assessment requirements	Portfolio of Evidence, Multiple Choice Examination. The unit "Y/617/1186 Applied Anatomy and Physiology" is assessed by externally assessed Multiple Choice Question (MCQ) examination. Centres will find documentation on how to deliver MCQ examinations on the QuartzWeb portal. The MCQ test consists of 40 questions. The learner must achieve a score of 24/40 to achieve a pass. This equates to 60%. The learner will have 60 minutes to complete the test. This qualification is internally assessed and internally quality assured by Centre staff and externally quality assured by Innovate Awarding External Quality Advisors (EQAs).
Aims and objectives of the qualification	The objective of this qualification is to develop learners' knowledge and skills to pursue a career as a personal trainer. Focusing on key areas such as coaching clients towards their health and fitness goals through the planning and delivery of creative and personalised exercise programmes and instruction, nutritional advice and overall lifestyle management.
Entry guidance	This qualification is suitable for those who work or wish to work within the active leisure sector. Some experience of gym-based exercises would be beneficial.

Progression opportunities	This RQF qualification is designed for individuals aged 16 over who want to complete an industry-recognised qualification and pursue a career within the sector. This qualification outlines the role and scope of a Personal Trainer and the essential knowledge and skills that are needed to meet the requirements of Practitioner membership with CIMSPA. Learners who achieve this qualification could progress into employment as a personal trainer either on a self-employed basis or within a gym or leisure organisation. On completion of this qualification, learners can develop their knowledge and skills further with additional qualifications.
Professional recognition	The agreed industry prerequisite to becoming a Personal Trainer is to have achieved a CIMSPA endorsed educational product that meets the requirements for a Practitioner membership of CIMSPA. Learners should have gained a suitable Level 2 Gym Instructing qualification in gym-based exercise prior to commencing this course.
Funding	For details on eligibility for government funding please refer to the following websites: http://www.education.gov.uk/section96/ https://www.gov.uk/government/organisations/education-and- skills-funding-agency

Innovate Awarding

When you work with Innovate Awarding, you're working with an awarding organisation that sets itself apart – a dynamic company with a collaborative approach to doing business. We're consultative and innovative…everything that our customers say they want an awarding organisation to be.

We're easy to work with, committed and passionate about exceeding our customers' expectations. We're not tied down by bureaucracy and red tape and can think outside the box and respond quickly to our customers' needs.

We have a Performance Pledge that details guaranteed response times. Copies of these can be found on our website www.innovateawarding.org.

Feedback

Your feedback is very important to us. We're always open to suggestions when it comes to enhancing and improving our services, products and systems. Email us at contactus@innovateawarding.org or call us on 0117 314 2800.

Complaints

If we do get things wrong, we will make every effort to resolve your issues quickly and efficiently. If you'd like to raise a formal complaint, then we recommend you read our Complaints Procedure, which can be found on our website.

Fees

Our fee structure is transparent and straightforward. Our fees are published on our website in a clear format with no hidden charges. Unlike other awarding organisations, we do not charge an annual centre fee. Visit our website to compare our fees.

Enquiries and appeals

We recognise that sometimes decisions are made that a centre (or learner) may wish to appeal. We have an Enquiries and Appeals Policy and Process on our website that sets out guidelines on grounds for appeal and the process.

Data Protection

Innovate Awarding takes the protection of data seriously; we have a Data Protection statement outlining how we and our centres, comply with the current legislation on data protection. This statement can be found on our website.

Equality and Diversity

Innovate Awarding is committed to giving everyone who wants to gain one of our qualifications an equal opportunity of achieving it in line with current UK legislation (Equality Act 2010) and EU directives.

Centres are required, as conditions of approval, to use an equality and diversity policy that works together with ours and maintain an effective complaint and appeals process. We expect centres to tell learners how to find and use their own equality and diversity and appeals processes. For more information, please visit our website.

Reasonable Adjustment and Special Consideration

All learners must be treated fairly and equally and be given every opportunity to achieve our/the qualifications. A copy of our policy on Reasonable Adjustments and Special Considerations, and the application form, can be found on our website.

Malpractice and Maladministration

Innovate Awarding has a responsibility to do everything it can to prevent any malpractice or maladministration from occurring, and where it has already occurred, ensuring action is taken proportionate to the gravity and scope of the occurrence.

A copy of our policy and procedure on Malpractice and Maladministration is available on our website.

Recognition of Prior Learning (RPL)

RPL recognises how the contribution of a learner's previous experience could contribute to a qualification or unit. Innovate Awarding has produced guidance on RPL and this can be found within our Information and Guidance for Centres on our website.

NB. Please note the above is not a comprehensive guide to running IAO qualifications. Once approved centres must adhere to the Centre Agreement and Information and Guidance for Centres.

The Regulated Qualifications Framework (RQF)

What is the RQF?

The Regulated Qualifications Framework (RQF) is an Ofqual regulated system of cataloguing qualifications. Qualifications on the RQF can be found by their size or level. Qualifications at a given level can differ depending on their content and purpose.

All Innovate Awarding's qualifications are on the RQF.

Qualification Level

The level reflects the challenge or difficulty of the qualification. There are eight levels of qualification from 1 to 8, supported by three "Entry" levels.

Qualification Size

The size of a qualification reflects the estimated total amount of time it would take the average learner to study and be assessed. The size of a qualification is expressed in terms of Total Qualification Time (TQT). The time spent being taught or supervised, rather than studying alone, is Guided Learning Hours (GLH).

Qualifications can sit at different levels but require similar amounts of study and assessment. Similarly, qualifications at the same level can take different amounts of time to complete.

Credit values

Every unit and qualification on the RQF has been given a credit value, which denotes the number of credits that will be awarded to each candidate who successfully completes the unit or qualification.

- **1** credit represents **10** notional learning hours

Notional learning hours represent the amount of time a learner is expected to take, on average, to complete the learning outcomes of the unit to the standard required within the assessment criteria. It is important to note that "notional learning hours are not the same as guided learning hours (GLH). GLH represents the hours during which a tutor or trainer is present and contributing to the learning process. Notional learning hours represent the hours which are needed to successfully cover all the learning required to achieve the unit, either guided or independently.

RQF terminology

Whilst the evidence outcomes required from RQF and NVQ units are the same, the RQF units use different terminology to the NVQ units. The assessment criteria for NVQ units are 'what you must do' and 'what you must know' whereas the RQF units are all 'the Learner can' or 'the Learner is able to'.

Rules of Combination (RoC)

Every qualification on the RQF is structured through Rules of Combination. Rules of Combination are important because they define the number of credits which need to be achieved and where these credits must come from for a Learner to achieve the qualification. Rules of Combination also state what the potential is for Learners who wish to transfer credits between qualifications and awarding bodies.

Assessment Strategy

This qualification has been developed in line with CIMSPA's Professional Standards (https://www.cimspa.co.uk/standards-home/professional-standards-library) and covers the knowledge, skills and behaviours contained therein to confer occupational competence to the learner upon successful completion.

The qualification comprises both internal and external assessment as outlined in the table below. Internal assessment should be portfolio based and include practical observation records alongside other methods such as (not exhaustive) workbooks, case studies, professional discussions, witness statements and consultation documents.

Unit title	Level	Assessment
Y/617/1186 Applied Anatomy and Physiology	3	External: Multiple Choice Question Examination (MCQ)
D/617/1187 Lifestyle Management and Motivation for Personal Training	3	Internally assessed
K/617/1189 Consultation, Assessment and Programme Design for Personal Training	3	Internally assessed
D/617/1190 Planning and Delivering Personal Training Programmes	3	Internally assessed
M/617/1193 Nutrition for Physical Activity	3	Internally assessed
T/617/1194 Business Acumen for Personal Trainers	3	Internally assessed

Planning and delivery guidance

This section of the assessment strategy contains content and guidance for the delivery of this qualification.

Training Providers must take steps to ensure their curriculum plans reflect the coverage of Innovate Awarding's syllabus in full, and that they have implemented strategies to ensure their learners have acquired the knowledge, skills and behaviours across the whole qualification, to the standard described, prior to assessment. Innovate Awarding's External Quality Assurance team will undertake verification activities to ensure that these requirements have been met.

For the role of Personal Trainer, sufficient time between engaging a client and final assessment needs to be allowed to show improvements in the client's lifestyle, health, and fitness. Learners must provide evidence that they have planned a progressive

programme for a client ensuring effective integration of all exercises and physical activities to allow clients to achieve short, medium and long-term goals. For example, to cover a 12-week period of delivery with evidence of a minimum of six sessions of 30 minutes duration.

Learners should demonstrate their ability to review client progress and make any necessary adaptations to the programme where goals are not being achieved or new goals are identified.

Providers should ensure that learners are supported to engage participants and plan delivery to cover the full requirements of the role as outlined within this specification.

Assessment requirements

This section of the assessment strategy explains what must be covered within the learner's final submitted evidence. All elements should be scheduled to occur when the learner has reached the required standard to maximise their chances of a successful outcome and reflect their achievement. All work must be the learner's own and evidence its authenticity.

Learners who do not meet the required standard for assessment should be allowed to retake their assessments and given feedback and further learning to support subsequent attempts. Further information on retakes for externally assessed is available in Innovate Awarding's Retakes and Resits policy.

Theory-based elements

Learners must provide evidence that they have the knowledge and understanding specified by the theory-based elements of the specification.

This evidence may be in the form of the following examples:

- Written workbooks
- Digital voice recording (DVR)
- Viva/professional discussion/question and answer
- Exam (MCQ)
- Case studies
- Filmed presentation

The method/s that are selected must be appropriate for the criteria being assessed and meet learner needs.

Workbooks must include questions that are written in such a way as to make clear to learners and assessors the length and breadth of answer required, based on the wording of the assessment criteria. This may be by using verb descriptors (i.e. if the

assessment criteria asks for an 'explanation', the question asked must make clear that an explanation is the minimum expected requirement), or by ascribing marks to each question.

Viva/professional discussion/question and answer must still produce evidence that can be submitted for IQA and EQA. This evidence may be DVR, filmed or a written transcript. A tick sheet will not be sufficient as evidence that the learner has met the assessment criteria requirements.

It may be possible that some assessment criteria and/or specific units can be assessed by means of a long or short answer test or Multiple-Choice Questions. This approach must be created in conjunction with Innovate Awarding Organisation and approved by them before use. Further guidance is available to centres who wish to devise these types of assessments internally. Training Providers should note that these will not be permitted as an alternative to Innovate Awarding's external assessments. Mock assessments for these components will be available to help learners prepare.

Competence-based assessments

Assessment decisions for competence-based elements must be made by an occupationally competent assessor who meets the qualification requirements outlined in the next section of this document. Practical assessment must be conducted where practicably possible in a real-world environment ideally, 'on the job'/at work. This could include; a gym, studio, sports hall, outdoors, client's home or other confined space. Where possible practical observations should be conducted with 'real clients'.

Competence based assessments must include:

- Client programme and observation
- Relevant screening and baseline tests

Some competence-based assessment criteria will generate written evidence and may be included within the learner's portfolio, for example:

- programme and session plans
- health and fitness testing results
- evaluations

These will be submitted as evidence for assessment and must be available for IQA and EQA as requested.

Other elements of learning will produce practically based evidence and may be included within the learner's portfolio, for example:

- customer service

- professional conduct
- cleaning and maintenance
- client consultation
- session delivery

Practical evidence may take the form of:

- filmed evidence
- DVR
- witness testimony
- confirmation of achievement

Use of filmed evidence or DVRs

Any filmed evidence requires the learner to introduce themselves on camera at the start of the clip, as well as give the date of recording. Footage must have reasonable sound and picture quality to enable others (assessor, IQA, EQA) to see and hear what is taking place.
The footage produced must provide evidence of the achievement of identified assessment criteria and an accompanying reference sheet may need to be provided.

A DVR made by the assessor or a witness can be submitted as evidence. Their spoken commentary must include the name of the learner and date of recording, be of reasonable sound quality and only reference relevant criteria. Commentary should not be a verbal narrative of everything the learner does if aspects included are not required by assessment criteria (e.g. do not include descriptions of the learner's every move if these elements are not in the specification as required as evidence).

It may be necessary to produce a reference sheet to accompany the DVR for ease of assessing and quality assurance.

Witness Testimony

Witness testimony must be provided by an appropriately qualified and experienced professional. Evidence of their level of qualification and experience should be available to Innovate Awarding on request. Their written testimony must be personalised to the learner and should include a brief description of what was seen and/or heard that proves the learner met the identified assessment criteria.

The testimony provided by a witness will provide evidence against which the assessor will make their assessment decision. If insufficient evidence is produced by the witness, it may not be possible for the assessor to make a valid and reliable assessment decision.

Simulation

Simulation may only be used as an assessment method where it is impractical to collect evidence in the workplace within an acceptable time frame, or within exceptional circumstances. These circumstances are restricted to situations where evidence cannot be generated through normal work activity and does not present naturally, such as dealing with an emergency.

Should simulation be used, it must be undertaken in a Realistic Working Environment (RWE); this must "provide an environment that replicates the key characteristics of the workplace in which the skill to be assessed is normally employed". The conditions of assessment must be the same as those found in the normal working environment, with similar demands, pressures and requirements.

Should simulation be used as an assessment method, the Centre concerned must seek, prior to its use, advice from the external verifier of the relevant awarding organisation regarding the validity of the method.

Holistic assessment

Innovate Awarding encourages centres to take a holistic approach to assessment where possible. A holistic approach to assessment is one that:

- acknowledges that there is some element of repetition and overlap between units
- serves to reduce burden on learners and assessors by 'grouping' like assessment criteria together
- allows for assessment and evidence gathering across units in a 'horizontal' fashion rather than keeping assessment in a per-unit 'vertical' format
- enables a single piece of evidence to be submitted to meet multiple assessment criteria (sometimes from different units) in the one document or assessment method
- is led by the means of assessing, producing and documenting evidence rather than being driven by the content and format of each unit
- may adopt a 'project-based approach' which enables learners to complete a set sequence of events (e.g. carry out client consultation, plan sessions, deliver sessions, show appropriate delivery techniques, review session) in an appropriate order, whilst producing and gathering evidence to be assessed, rather than working through units individually

Occupational competence requirements

Tutors, Assessors and Quality Assurance Staff

Required Criteria

All Tutors, Assessors and Quality Assurance Staff must:

- Possess a Fitness or Gym Instructing and/or Personal Training specific qualification equivalent to the qualification or units being taught / assessed or quality assured
- Have relevant industry experience
- Have knowledge of and a commitment to the Exercise and Fitness Code of Ethical Practice
- Demonstrate active involvement in a process of industry relevant Continued Professional Development during the last two years (this may be discipline/ context specific or relevant to tutoring assessing or quality assurance)

Tutors

Tutors must hold or be working towards a teaching

qualification. The following are acceptable:

- Level 3 Award, Level 4 Certificate or Level 5 in Education and Training
- Level 3 Award in Preparing to Teach in the Lifelong Learning Sector (PTTLS)

- Level 4 Award in Preparing to Teach in the Lifelong Learning Sector (PTTLS)
- Level 4 Certificate in Teaching in the Lifelong Learning Sector (CTTLS)
- Level 5 Diploma in Teaching in the Lifelong Learning Sector

(DTTLS) Relevant predecessor NQF tutor qualifications

Assessors

Assessors must hold or be working towards any of the following:

- Level 3 Award in Assessing Vocationally Related Achievement
- Level 3 Award in Assessing Competence in the Work Environment
- Level 3 Certificate in Assessing Vocational Achievement
- A1 (previously D32, D33) or
- Relevant predecessor NQF assessor qualifications

Assessors holding historical qualifications such as unit A1, unit A2, and/or unit D32, and/or unit D33, are required to demonstrate that they meet the same standards of assessment practice as set out in the Learning and Development National Occupational Standard – Standard 9 Assess Learner Achievement. Suggested evidence that demonstrates this requirement may include CPD records, a Personal Development Plan (PDP) and/or records of work completed.

Internal Quality Assurers

Internal quality assurers must hold or be working towards any of the following:

- Level 4 Award in the Internal Quality Assurance of Assessment Processes and Practice
- Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice
- V1 (previously D34)
- Relevant predecessor NQF internal quality assurance qualifications

Internal verifiers holding historical qualifications such as unit V1 – Conduct internal quality assurance of the assessment process and/or unit D34, are required to demonstrate that they meet the same standards for monitoring assessment processes and decisions as set out in the Learning and Development National Occupational Standard – Standard 11 Internally monitor and maintain the quality of assessment (Appendix 2). Suggested evidence that demonstrates this requirement may include CPD records, a Personal Development Plan (PDP) and/or records of work completed.

It is recommended that internal quality assurance staff also hold a relevant assessing qualification as detailed above.

External Quality Assurers

External quality assurers must hold or be working towards any of the following:

- Level 4 Award in the External Quality Assurance of Assessment Processes and Practice
- Level 4 Certificate in Leading the External Quality Assurance of Assessment Processes and Practice
- V2 (previously D35)

External verifiers holding historical qualifications such as unit V2 – Conduct external quality assurance of the assessment process and/or unit D35, are required to demonstrate that they meet the same standards for monitoring assessment processes and decisions as set out in the Learning and Development National Occupational Standard – Standard 12 Externally monitor and maintain the quality of assessment *(Appendix 3)*. Suggested evidence that demonstrates this requirement may include CPD records, a Personal Development Plan (PDP) and/or records of work completed.

It is recommended that external quality assurance staff also hold a relevant assessing and internal quality assurance qualifications as detailed above.

All new assessors and quality assurance staff must be given a clear action plan for achieving the appropriate qualification(s) and should be countersigned by an appropriately qualified individual until the qualification(s) are achieved.

Desirable Criteria

It is desirable that all Assessors and Quality Assurers should hold professional registration.

Qualification Structure

Learners must complete all the mandatory units to gain the required 37 credits.

The Minimum Guided Learning Hours (GLH) for this qualification is 232 hours.

The Total Qualification Time (TQT) for this qualification is 361 hours.

Unit Structures

All units are listed below.

Those units denoted with * are externally assessed via multiple choice examinations.

Mandatory units

Unit ref	Unit title	Level	Credits	GLH
*Y/617/1186	Applied Anatomy and Physiology	3	5	35
D/617/1187	Lifestyle Management and Motivation for Personal Training	3	5	29
K/617/1189	Consultation, Assessment and Programme Design for Personal Training	3	9	62
D/617/1190	Planning and Delivering Personal Training Programmes	3	8	44
M/617/1193	Nutrition for Physical Activity	3	5	33
T/617/1194	Business Acumen for Personal Trainers	3	5	29

Title:	**Applied Anatomy and Physiology**
Level:	**3**
Credit Value:	**5**
GLH:	**35**

Learning Outcomes The learner will:	Assessment Criteria The learner can:
1. Understand the cardio-respiratory systemand its relation to exercise and health	1.1 Explain the following terms in relation to short- and long-term exercise and the efficiency of the heart: • cardiac cycle • stroke volume • cardiac output 1.2 Explain the effect of disease processeson the structure and function of blood vessels 1.3 Describe health risks associated with systolic and diastolic blood pressure classifications 1.4 Explain the short- and long-term effects of cardiorespiratory exercise on: • blood pressure • respiration • venous return • implications of blood pooling
2. Understand the skeletal system and its relation to exercise	2.1 Explain how bones and bone density are affected by: • the role of osteoblasts and osteoclasts • hormonal contribution • body weight • dietary influences • weight bearing and non-weight bearing exercise • high and low impact exercise 2.2 Explain factors that affect the stability of joints 2.3 Explain potential risks resulting from unstable and dysfunctional joints 2.4 Explain how the structure of joints enables them to act as shock absorbers 2.5 Explain the bone modelling and remodeling processes

3. Understand the muscular system and itsrelation to exercise	3.1 Describe the actions of the major muscles of the body 3.2 Identify the muscle attachment sites (origins and insertions) for the major muscles of the body 3.3 Describe joint actions brought about by contraction of specific muscle groups 3.4 Describe the role of contributory muscles as: • agonist • antagonist • synergist • fixators 3.5 Describe the significance of anatomical axes and planes of movement to muscle balance and function 3.6 Explain the effect of the following exercise variables on biomechanics and kinesiology: • first, second and third class levers • centre of gravity • momentum • force • length-tension relationships • open and closed kinetic chain movements 3.7 Explain the following principles of muscle contraction in relation to exercise: • concentric and eccentric (isotonic) • isometric and isokinetic • stretch and reverse stretch reflexes • sliding filament theory • size principle of motor unit recruitment 3.8 Explain the short and long-term effects of exercise on muscles including: • delayed onset muscle soreness (DOMS) • muscle fatigue • hypertrophy • metabolic benefits 3.9 Describe the response of muscles to: • overuse • underuse • misuse
4. Understand postural and core stability	4.1 Describe the structure and function of: • 'core' muscles • stabilising ligaments of the spine 4.2 Explain the classification of coremuscles including if they are: • 'local/deep'

	• 'global/superficial' 4.3 Describe the structure and function of intervertebral discs 4.4 Explain the effects of abdominal adiposity and poor posture on movement efficiency 4.5 Describe abnormal degrees of curvature of the spine and their implications for physical activity 4.6 Explain the impact of core stabilisation exercise including the potential for injury and aggravation of problems
5. Understand the nervous system and itsrelation to exercise	5.1 Explain the function, in relation toexercise, of: • the central nervous system (CNS) • the Peripheral Nervous System(PNS) including somatic and autonomic systems 5.2 Describe nervous control and transmission of a nervous impulse 5.3 Explain the process of motor unit recruitment including the: • significance of a motor unit's size • number of muscle fibres 5.4 Explain the function of muscle proprioceptors including muscle spindlesand Golgi tendon organs 5.5 Describe the relevance of proprioceptors to exercise, to include: • the stretch reflex • reciprocal inhibition (inversestretch reflex) • the 'stretch-shortening cycle' andits application to plyometric training 5.6 Explain the neuromuscular adaptations associated with training, to include: • more efficient motor unit recruitment • improved inter-muscular coordination • improved intramuscular coordination 5.7 Explain the benefits of improved neuromuscular coordination to exercise performance

6. Understand the endocrine system and itsrelation to exercise and health	6.1 Describe the structure of the endocrine system, including both glands and hormones 6.2 Explain the main functions of thefollowing hormones: • Human Growth Hormone (HGH) • Thyroxine • Parathyroid hormone • Corticosteroids • Adrenaline and noradrenaline (catecholamines) Insulin • Glucagon • Oestrogen • Testosterone 6.3 Explain typical hormonal responses to: • training • overtraining 6.4 Describe signs and symptoms of overtraining
7. Understand energy systems and theirrelation to exercise	7.1 Explain how the energy systems function independently and interact with one another 7.2 Describe ATP re-synthesis 7.3 Explain aerobic and anaerobic thresholds and their significance in the planning of training programmes 7.4 Explain the effects of different training methods on energy systems

Additional information

Learning Outcome 1: Understand the cardio-respiratory system and its relation to exercise and health

The following terms in relation to short- and long-term exercise and the efficiency of the heart, to include:

- Cardiac cycle – the start of a heartbeat through to the beginning of the next, diastole (relaxation) and systole (contraction)

- Stroke volume (SV)
  - Effect of short-term exercise: Increase
  - Effect of long-term exercise: Increase
- Cardiac output (Q)
  - Effect of short-term exercise: Increase
  - Effect of long-term exercise: Increase

- Long term effects of exercise and efficiency of the heart, to include:
  - Enhanced efficiency

- Decreased resting heart rate (HR)
- Increased size of the heart / increased cardiac hypertrophy
- Increase in heart strength

The effect of disease processes on the structure and function of blood vessels, to include:

- Arteriosclerosis
  - Hardened artery walls
  - Reduced elasticity of arteries

- Atherosclerosis
- A specific type of arteriosclerosis
  - Plaque buildup in arteries (caused by deposits of LDL cholesterol and fats)
  - Narrowed artery walls
  - Reduced blood flow
  - Increased risk of heart attack and stroke

- Hypertension (high blood pressure)
  - Blood vessels thicken and stiffen
  - Increased risk of stroke and heart failure

- Diabetes
  - High blood sugar causes damaged blood vessel linings
  - Increased risk of peripheral artery disease

- Inflammatory diseases (including vasculitis)
  - Inflamed blood vessels
  - Increased blood vessel permeability
  - Narrowed or blocked blood vessels
  - Increased risk of damage to tissues and organs

- Venous diseases (including deep vein thrombosis, varicose veins, chronic venous insufficiency)
  - Enlarged veins
  - Twisted veins
  - Formation of blood clots in veins
  - Poor blood return from the limbs
  - Increased risk of swelling and pain

Blood pressure classifications:

- Hypotension – lower than 90/60 mmHg
- Normal – 120/80 mmHg
- Prehypertension – 120/85 to 139/89 mmHg
- Hypertension – 140/90 mmHg
- Stage 1 hypertension – 140/90 mmHg
- Stage 2 hypertension – 160/100 mmHg

Health risks associated with:

- Hypotension
  - Blurred vision
  - Dizziness
  - Fainting
  - Fatigue
  - Increased risk of the condition 'shock'

- Hypertension
  - Headache
  - Blurred vision
  - Chest pain
- Increased risk of nerve damage to the eyes, kidney and heart damage
- Increased risk of stroke and heart failure

The short- and long-term effects of cardiorespiratory exercise, to include:

- Blood pressure
  - Effect of short-term exercise
    - Diastolic – no change
    - Systolic – increases
    - Increased resting blood pressure
  - Effect of long-term exercise
    - Diastolic – decreases
    - Systolic – decreases
    - Decreased resting blood pressure

- Respiration
  - Effect of short-term exercise
    - Increased breathing rate
  - Effect of long-term exercise:
    - Decreased breathing rate (improved gaseous exchange)
    - Increased number of functioning alveoli
    - Increased strength of the respiratory muscles (intercostals and diaphragm)

- Venous return
  - Effect of short-term exercise
    - Increase in tidal volume (TV or VT)
    - Increase in minute ventilation (VE)
  - Effect of long-term exercise
    - Increased tidal volume (TV or VT)
    - Increased minute ventilation (VE)
    - Increased vital capacity (VC)

- Implications of blood pooling
  - Effect of short-term exercise
    - Blood gathers in the lower limbs

- Effect of long-term exercise
  - Increased muscle pumping
  - Improved circulation
  - Increased blood vessel function

Learning Outcome 2: Understand the skeletal system and its relation to exercise

How bones and bone density are affected by:

- **The role of osteoblasts**
  - Formation of new bone tissue during bone modelling and remodelling
  - Build and replace bone
  - Crucial for improving bone density

- **The role of osteoclasts**
  - Absorb bone tissue during the growth and repair process during bone modelling and remodelling
  - Break down and clear away bone tissue
  - Increased osteoblast activity can lead to decreased bone density and increased risk of bone fractures and osteoporosis

Note - Osteocytes: cells which maintain the bone matrix, communication with osteoblasts and osteoclasts to regulate bone remodelling

- **Hormonal contribution** (Regulation of bone modelling and remodelling)
  - Parathyroid hormone (PTH)
    - Regulates calcium
    - Stimulates osteoclast activity (leading to increased calcium in the bloodstream)
    - Stimulates osteoblasts and bone formation (leading to decreased calcium in the bloodstream)
  - Calcitonin
    - Controls calcium levels in the blood
    - Calcitonin releases calcium from bones if calcium levels drop in the bloodstream
    - Bone density can reduce if calcium is frequently taken from bones
  - Oestrogen
    - Helps control bone formation and bone breakdown
    - Decreases when women go through menopause
    - Low oestrogen can lead to decreased bone density
  - Testosterone
    - Promotes bone formation and reduces bone breakdown
    - Decreases with age in men
    - Can lead to bone loss and decreased bone density
  - Growth Hormone
    - Helps bones grow during childhood and maintains bone density in adults

- Low levels can lead to decreased bone density

- **Dietary influences:**
  - Diets high in vitamin C and D and calcium can increase bone density
  - Increased body fat impacts hormone levels which can lead to decreased bone and decreased bone density

- **Weight bearing and non-weight bearing exercise**
  - Weight bearing promotes new bone cell production
  - Weight bearing and resistance exercises enhance bone density and bone strength

- **High and low impact exercise**
  - High impact exercise eg running, promotes osteoblast activity, increasing bone and bone density
  - Low impact exercise eg swimming, can build muscular strength and increase joint stability which maintains bone density

Factors that affect the stability of joints, to include:

- Passive structures (tensile strength and laxity of ligaments)
  - Limit excessive motion
    - Bone shape / size
    - Fit of the joint eg ball and socket
    - Ligaments
    - Joint capsules

- Active structures (control and strength of stabilising muscles crossing the joint)
  - Dynamically control joint movement
    - Muscles
    - Tendons

- Neuromuscular Control (motor control of joint movements in response to external forces)
  - Proprioception (awareness of joint position)
    - Motor neurons
    -
    -

The potential risks resulting from unstable and dysfunctional joints, to include:

- Lack of biomechanical efficiency
  - Joints are misaligned
  - Excessive movement
  - Increased risk of dislocation and osteoarthritis

- Reduction in transmission of stress
  - Type of joints
    - Fixed joints: no movement, transmit stress directly
    - Hinge joints: movement in one direction, distribute stress along the joint
    - Ball and socket joints: multi-directional movement, manage stress through a wide range of motion
  - Stress transmission
    - Load distribution: across connected bones, reducing localised stress
    - Flexibility and mobility: flexible joints can absorb and dissipate stress, preventing damage
    - Joint structure properties: synovial fluid, cartilage, ligaments, bone influence how stress is transmitted and absorbed
  - Movement patterns
    - Different activities apply different stress levels on joints

- Increased risk of injury
  - Joints can degrade over time
  - Limited movement ability
  - Altered ability to transmit stress effectively
  - Increased risk of dislocation, inflammation, stress fractures and osteoarthritis

- Reduced shock absorption
  - Increased wear and tear on joints
  - Damaged cartilage, ligaments, bursae, menisci, synovial membrane (joint structures)
  - Decreased overall mobility and ability to perform physical activities
  - Increased risk of inflammation, stiffness, sprains, tears and osteoarthritis

- Poor posture
  - Forward head posture (excessively kyphotic thoracic spine)
    - Strain on the neck and upper back
    - Affects cervical joints
  - Rounded shoulders
    - Leads to shoulder joint and rotator cuff discomfort
  - Swayback posture (exaggerated spine curves)
    - Increased pressure on the lower back and hips
  - Decreased flexibility of muscles
  - Decreased range of movement in joints / reduced mobility
  - Increased stress on joints
  - Increased misalignment of joints eg spine, hips, and knees

The structure of joints and how this enables them to act as shock absorbers, to include:

- The structure of joints:
  - Shape and range of movement

- Joints of the spine form curves which absorb shock due to dissipating force

- Joint structures:
  - Synovial fluid
    - Lubricates and cushions joints
    - Exercise increases secretion of synovial fluid
  - Cartilage
    - Articular cartilage covers the ends of bones
    - Acts as a cushion between bones
    - Absorbs shock and reduces friction
  - Menisci (in the knee)
    - Crescent-shaped cartilage
    - Distributes weight and absorbs shock
  - Bursa
    - Fluid-filled sacs
    - Reduces friction and absorbs shock
    - Increases joint mobility

Stages of bone growth, to include:

- Bone modelling
  - Bone formation or bone resorption occurs on bone surface
  - Bone growth and shaping
  - Occurs in youth

- Bone remodelling
  - A sequence of bone resorption and formation on the same bone surface
  - Renews the skeleton
  - Maintains and repairs bones
  - Occurs throughout life

- Bone modelling and remodelling
  - Formation of bone by osteoblasts and reabsorption of bone by osteoclasts
  - Allow bones to adapt to stress

Learning Outcome 3: Understand the muscular system and its relation to exercise

The actions of the major muscles of the body, to include:

- Shoulder and chest
  - Anterior deltoid, pectoralis major - Flexes the shoulder
  - Posterior deltoid, latissimus dorsi, teres major - Extends the shoulder
  - Latissimus dorsi, pectoralis major, teres major, teres minor - Adducts shoulder
  - Medial deltoid, supraspinatus - Abducts shoulder

  - Pectoralis major, anterior deltoid - Horizontal adduction
  - Posterior deltoid, trapezius, rhomboids, latissimus dorsi - Horizontal abduction
  - Levator scapulae – stretches along each side of the spine, over the upper back and neck
  - Pectoralis minor - in the upper chest
  - Serratus anterior – attaches to the ribs and scapula

- Rotator cuff: SITS (including muscle actions)
  - S: supraspinatus
  - I: infraspinatus
  - T: teres minor
  - S: subscapularis

- Spinal flexors (trunk flexors)
  - Rectus abdominus, internal and external obliques - Flexes the spine

- Spinal extensors (trunk extensors)
  - Erector spinae, iliocostalis, longissimus, spinalis, multifidus, quadratus lumborum - Extends the spine

- Spinal lateral flexors (trunk lateral flexion - frontal)
  - Internal obliques, rectus abdominus, erector spinae, quadratus lumborum

- Spinal rotators (trunk rotation - horizontal)
  - External obliques, rectus abdominus, erector spinae

- Hip flexors
  - Iliopsoas, iliacus, psoas major - Flexes the hip

- Hip extensors
  - Gluteus maximus, biceps femoris, semimembranosus, semitendinosus, gluteus medius - Extends the hip

- Hip adductors
  - Magnus, brevis, longus, pectineus, gracilis, sartorius – Adducts the hip

- Hip abductors
  - Gluteus medius, gluteus minimus, piriformis, tensor fascia latae – Abducts the hip

- Abdominals
  - Internal and external obliques - Rotates and laterally flexes the spine
  - Transversus abdominus - Stabilises the core and pelvis and supports internal organ
  - Rectus abdominus - Flexes the spine and stabilises the pelvis

- Rib cage muscles (to enable the mechanism of breathing)

- Intercostals
- Diaphragm

- 'Core' muscles (to provide core stability)
  - Rectus abdominus, internal and external obliques, transverse abdominals, erector spinae, quadratus lumborum, multifidus, diaphragm, hip flexors, and pelvic floor muscles - levator ani and coccygeus

- Upper arm
  - Biceps brachii and brachialis - Flexes the elbow and supinates the forearm
  - Triceps brachii - Extends the elbow and assists in shoulder extension

- Upper leg
  - Hamstrings (biceps femoris, semimembranosus, semitendinosus) - Flex the knee and extend the hip
  - Quadriceps (rectus femoris, vastus lateralis, vastus medialis, vastus intermedius) - Extend the knee and assist in hip flexion

- Lower leg
  - Soleus - Plantar flexes the ankle
  - Gastrocnemius - Plantar flexes the ankle and assists in knee flexion
  - Tibialis anterior – Dorsi flexes the ankle

- Wrist
  - Wrist extensors – Extends the wrist
  - Wrist flexors – Flexes the wrist

The muscle attachment sites (origins and insertions) for the major muscles of the body, to include and not limited to:

- **Origin**: fixed attachment point of a muscle, usually located close to the body's centre

- **Insertion**: movable attachment point of a muscle, usually located further from the centre of the body

- **Biceps brachii**
  - Origin: Scapula
  - Insertion**:** Radius

- **Triceps brachii**
  - Origin**:** Scapula and humerus
  - Insertion**:** Ulna

- **Quadriceps femoris**
  - Origin**:** Ilium and femur
  - Insertion**:** Tibia (via the patellar tendon)

- **Hamstrings**
  - Origin**:** Ischium and femur
  - Insertion: Tibia and fibula

- **Pectoralis major**
  - Origin: Clavicle, sternum, and ribs
  - Insertion: Humerus

Joint actions brought about by contraction of specific muscle groups, to include:

- Flexion (horizontal and lateral flexion)
- Extension
- Abduction and horizontal abduction
- Adduction and horizontal adduction
- Rotation (lateral and medial)
- Plantar flexion
- Dorsi flexion
- Circumduction
- Supination
- Pronation
- Elevation
- Depression
- Protraction
- Retraction
- Inversion
- Eversion

The role of contributory muscles, to include:

- Agonist (prime mover)
  - Directly responsible for the movement
  - Contracts and shortens
- Antagonist
  - Facilitates movement
  - Relaxes and lengthens

- Synergist
  - Enhances the efficiency of the agonist
  - Prevents undesired movements

- Fixator
  - Stabilises the bones to allow effective movement to occur

- Stabilises the origin of the agonist to enable the agonist to contract

The significance of anatomical axes and planes of movement to muscle balance and function:

- Anatomical axes of movement:
  - Frontal axis eg performing a jumping jack
  - Sagittal (antero-posterior) axis eg performing a bicep curl
  - Vertical axis eg twisting your trunk to perform a spinal rotation or turning your head to look over your shoulder

- Anatomical planes of movement:
  - Frontal (coronal or lateral) eg adduction and abduction
  - Sagittal (median) eg flexion and extension
  - Transverse (horizontal) eg rotation

- Significance of anatomical axes and planes of movement to muscle balance and function:
  - Performing movements correctly
  - The ability to use the full range of movement at a joint whilst applying load
  - Reducing stress on joints and muscles
  - Reducing the risk of injuries to joints and muscles

The effect of exercise variables on biomechanics and kinesiology, to include:

- First class levers
  - The fulcrum or joint is in the middle of the effort and the load
  - The joints in your neck are the fulcrum which allow you to nod your head up and down, the load is the weight of the head

- Second class levers
  - The load is in the middle between the fulcrum or joint and the effort
  - The ball of the foot in the ankle joint is the fulcrum when standing on tip toes, the load is the weight of the body

- Third class levers
  - The effort is in the middle between the fulcrum or joint and the load
  - Performing a bicep curl, the elbow joint is the fulcrum, the load is the weight the hand is holding

- Centre of gravity
  - Depends on the distribution of load along the lever arm

- It can move depending on changes in load, when loads are added or removed
- Knowing where the centre of gravity is in relation to the lever arm and load enables balance to be maintained

- Momentum
  - The speed a load is moved
  - Increasing momentum can increase the risk of injury if the muscles and joint are unstable

- Force
  - Force acting on a muscle produces a turning movement
  - Levers amplify force, allowing a smaller force to move a larger load
  - Increasing force increases the lever's ability to lift heavier loads
  - Higher force can allow a shorter lever arm (the lever arm refers to the distance from the fulcrum / joint) to be used to achieve the same lifting effect
  - An increased risk of injury can occur from excessive force used to exceed the lever's limit

- Length-tension relationships
  - The lever's arm length affects the force needed to lift the load
  - Levers where the effort arm is longer than its load arm can move large loads with a smaller amount of effort
  - Second class levers have a lever effort arm which is longer than its load arm
  - First class levers have a lever effort arm which is longer than its load arm, if the fulcrum is close to the load

- Kinetic chain movements – a term used to describe human movements
  - Open kinetic chain movements
    - The part furthest away from the body (eg a foot or hand) moves freely and isn't fixed to an object
    - Enables specific muscles to be isolated
    - Allows targeted muscle training eg bench press or bicep curl

  - Closed kinetic chain movements
    - The part furthest away from the body (eg a foot or hand) is fixed to an object
    - Improves balance and lowers the risk of injury
    - Promotes stability and is used in rehabilitation eg leg press and squats

The principles of muscle contraction in relation to exercise, to include:

- Concentric and eccentric (isotonic)

- Muscle tension remains constant as the muscle contracts by shortening or lengthening

- Isometric
  - There is no shortening or lengthening of the muscle, muscle length remains static as the muscle contracts

- Isokinetic
  - The speed of muscle shortening remains constant over the entire range of movement
  - Maximum force can be exerted at all angles of the joint

- Stretch reflex
  - The muscle contracts in response to the muscle stretching
  - A rapid and automatic response

- Reverse stretch reflex or Golgi Tendon Reflex
  - When muscle tension increases, sensory receptors called the Golgi tendon organ, send signals via motor neurons to inhibit the movement
  - The muscle relaxes to prevent injury

- Sliding filament theory
  - Muscle fibres are made up of smaller myofibrils
  - Sarcomeres are the smallest unit of skeletal muscle that contract
  - Sarcomeres are along the length of myofibrils
  - Myofibrils contain smaller structures actin and myosin filaments
  - Actin and myosin filaments slide in and out between each other to form a muscle contraction

- Size principle of motor unit recruitment
  - A motor unit is a muscle fibre and a single motor neuron
  - Motor units are recruited in an order from smallest to largest
  - Slow motor units are smaller in size, they have the lowest activation threshold, they are recruited first during muscle movement.
  - Large motor units are activated when slow motor units are unable to produce enough force, they contract with more force and fatigue sooner
  - The strength and power exerted by a muscle relies on the number of motor units recruited the rate they contract, and the amount of contractable muscle mass

The short and long-term effects of exercise on muscles, to include:

- Short-term effects:
  - Delayed onset muscle soreness (DOMS)
    - Muscles experience pain for 24-48 hours after intense exercise

- Due to microscopic tears in the muscle fibres
- Often due to a change in training or performance intensity

- Muscle fatigue
- Often experienced in the days after training
- Physical tiredness

- Long-term effects:
  - Hypertrophy
    - An increase in skeletal muscle mass
  - Metabolic benefits
    - Lower fat mass
    - Improved regulation of glucose
    - Decreased liver fat content

The response of muscles, to include:

- Overuse
  - Increased risk of injury
  - Inflammation, joint / muscle stiffness
  - Fatigue
  - Decreased strength, decreased performance

- Underuse
  - Increased risk of injury
  - Muscle weakness, fatigue
  - Muscle atrophy, decreased muscle strength

- Misuse
  - Increased risk of injury
  - Pain, inflammation
  - Reduced range of movement
  - Muscle weakness, fatigue

Learning Outcome 4: Understand postural and core stability

The structure and function of:

- 'Core' muscles
  - Rectus abdominus, internal and external obliques, transverse abdominals, erector spinae, quadratus lumborum, multifidus, diaphragm, hip flexors, and pelvic floor muscles - levator ani and coccygeus

- Structure of core muscles
  - Skeletal muscles

- Located around the spine and pelvis

- Function of core muscles
  - Rectus Abdominis: Flexes the spine and stabilises the pelvis
  - Transverse Abdominis: Acts like a corset, provides stability to the spine and pelvis
  - Obliques (Internal and External): Trunk rotation and lateral flexion
  - Erector Spinae: Extends and stabilises the back
  - Multifidus: Stability and posture
  - Pelvic Floor Muscles: Supports the pelvic organs, and core stability and control

- Stabilising ligaments of the spine
- Ligaments in the vertebral column, tendons and muscles, act like a corset to protect the spine from injury
- Ligaments strengthen and stabilise the articulating bones / joints of the spine

The classification of core muscles, to include:

- Local or deep
  - Small, deep muscles
    - Transversus abdominis (stabilizes the core), Multifidus (supports the spine), Rotator cuff muscles (stabilize the shoulder)
  - Stabilise joints and support posture
  - Maintaining balance and allow functional movements
  - Found close to joints, particularly in the spine and pelvis.
  - Reduce the risk of injuries by ensuring correct alignment and function

- Global or superficial
  - Large muscle groups
  - Leg, core, back and shoulder muscles
  - Provide body movement and stability
  - Maintaining posture, balance, and functional movement
  - Provide support for the spine and joints during dynamic movements

The structure and function of intervertebral discs, to include:

- Structure of intervertebral discs
  - Inner gel-like core - nucleus pulposus, composed of collagen and water
  - Outer layer surrounding the nucleus pulposus - annulus fibrosus, composed of concentric rings of collagen fibres

- Function of intervertebral discs
  - Facilitate movement between vertebrae
  - Act as shock absorbers, allow movement and flexibility
  - Maintain the height of the vertebral column

The effects of abdominal adiposity and poor posture on movement efficiency, to include:

- Abdominal adiposity on movement efficiency
  - Increased load on the musculoskeletal system
  - Altered centre of gravity which can affect balance and stability
  - Reduced flexibility decreasing the range of motion in the joints, particularly hips and lower back
  - Increased risk of injury due to altered biomechanics, particularly in weight-bearing joints - knees and ankles

- Poor posture on movement efficiency
  - Muscle imbalance**,** can affect movement patterns and efficiency
  - Reduced lung capacity**,** can affect endurance and performance
  - Increased risk of injury by placing abnormal stress on muscles, joints, and ligaments
  - Increased fatigue

Abnormal degrees of curvature of the spine and their implications for physical activity, to include:

- Kyphosis
  - Excessive forward rounding of the upper back
  - Avoid high-impact activities that may cause pain
  - Focus on low-impact, controlled movements
  - Strengthen core muscles to improve posture
  - Stretching to increase flexibility

- Lordosis
  - Abnormal inward curvature of the lumbar spine
  - Focus on correct form to reduce the risk of injury
  - Strengthen core muscles to improve posture
  - Stretching to increase flexibility

- Scoliosis
  - Side-to-side curve of the spine
  - Avoid high-impact or twisting movements
  - Stretching to increase spinal flexibility
  - Strengthening core muscles to support the spine
  - Focus on low-impact activities eg swimming, walking, and cycling

The impact of core stabilisation exercise, to include the potential for injury and aggravation of problems:

- Core stabilisation exercises

- Potential for injury if carried out incorrectly, too frequently, too much load added, progressed too quickly
- Can aggravate existing injuries
- Can prevent or delay healing of existing injuries

Learning Outcome 5: Understand the nervous system and its relation to exercise

The function of the CNS and PNS in relation to exercise, to include:

- The central nervous system (CNS)
  - The brain and the spinal cord
  - Controls and coordinates responses between *receptors* (sensitive to different stimuli) and *effectors (*muscle or gland which produce a response)
  - Via nerves the brain or spinal cord decide whether or not to respond to the stimulus

- The CNS in relation to exercise:
  - Exercise stimulates neurogenesis (formation of new neurons)
  - Improved balance and coordination
  - Improved efficiency in motor control and coordination
  - Enhanced neural pathways, muscle recruitment and performance

- The Peripheral Nervous System (PNS)
  - Connects the brain and spinal cord to the rest of the body
  - Made up of nerves, spinal nerves and cranial nerves
  - Transmits motor and sensory information between the CNS and peripheral body tissues
  - Peripheral nerves carry information towards the CNS are called afferent or sensory neurons, nerves transmitting impulses from the CNS are called efferent or motor neurons

  - Somatic nervous system (SNS)
    - Voluntary, we have conscious control over it
    - Provides sensory and motor innervation to skin, muscles and sensory organs

  - Autonomic nervous system (ANS)
    - Involuntary, we have no conscious control over it
    - Provides sensory and motor innervation to smooth muscle, blood vessels, glands, and internal organs

- The PNS in relation to exercise:
  - Promotes relaxation and recovery
  - Increased blood flow to the digestive organs
  - Promotes deeper and slower breathing.
  - Increased heart rate and energy expenditure during physical activity

- Enhanced return to pre-exercise homeostasis, lower heart rate and blood pressure
- Quicker recovery times
- Improved heart rate variability (HRV)

Nervous control and transmission of a nervous impulse, to include:

- Nervous control - the regulation of bodily functions through the nervous system
  - Transmission of a nervous impulse: How signals are sent between neurons
  - Neurons: Basic units of the nervous system, transmit impulses, made up of a cell body, dendrites (receive signals), and an axon (send signals)
  - Nerve impulses, electrical signals, travel along the axon
  - Sensory Impulses: Carry information from sensory receptors to the CNS
  - Motor Impulses: Transmit commands from the CNS to muscles and glands

The process of motor unit recruitment, to include:

- Significance of a motor unit's size
  - Motor units are recruited in order of their size, smallest to largest

- Number of muscle fibres
  - Depends on the type of exercise, intensity, and individual fitness levels

The function of muscle proprioceptors, to include:

- Proprioception: The body's ability to sense its position and movements

- Muscle spindles (stretch receptors)
  - Specialised sensory receptors within muscles, detect changes in muscle length and the rate of stretch
  - Found between muscle fibres
  - Most important proprioceptors
  - Produce muscle contractions
  - Prevent muscles from over-stretching

- Golgi tendon organ (GTO)
  - Skeletal muscle stretch receptors, proprioceptors
  - Found at the attachment of muscle and tendon fibres
  - Sense muscle tension and force
  - Regulate muscle contraction and tension
  - Prevents damage to muscles and tendons
  -

The relevance of proprioceptors to exercise, to include:

- The stretch reflex
  - The muscle contracts in response to the muscle stretching
  - A rapid response stabilises joints and maintains balance during physical activity
  - Reduces the risk of injury by preventing overstretching and potential injuries during dynamic movements
  - Enables explosive movements, by allowing fast muscle contractions
  - Regular training can improve efficiency of the stretch reflex

- Reciprocal inhibition (inverse stretch reflex) or Reverse stretch reflex or Golgi Tendon Reflex
  - When muscle tension increases sensory receptors (Golgi tendon organ) motor neurons send signals via motor neurons to inhibit the movement
  - The muscle relaxes to prevent injury
  - This allows muscle relaxation during exercise
  - Helps to prevent muscle damage by inhibiting excessive contraction

- The 'stretch-shortening cycle' (SSC) and its application to plyometric training
  - Spring-like action of muscles: an eccentric contraction is followed by a concentric contraction
  - Plyometrics use the SSC to enhance explosive movements, to increase strength, speed, and agility

Neuromuscular adaptations associated with training, to include:

- More efficient motor unit recruitment
  - Increased synchronisation of motor unit firing
  - Improved ability to recruit larger motor units more quickly
  - Enhanced neuromuscular coordination

- Improved inter-muscular coordination
  - Produce force more quickly
  - Sustain power output
  - Execute complex movements

- Improved intramuscular coordination
  - Increased strength and coordination
  - Enhanced skill acquisition
  - Reduced injury risk
  - Greater endurance with less fatigue

The benefits of improved neuromuscular coordination to exercise performance, to include:

- Increased efficiency

- Improved coordination
- Better stability and balance
- Faster reaction time
- More precise muscle recruitment, leading to increased strength and power
- Injury prevention, allows the use of correct form and technique

Learning Outcome 6: Understand the endocrine system and its relation to exercise and health

The structure of the endocrine system, including glands and hormones:

- Structure of the endocrine system
  - Collection of glands throughout the body
  - Secrete hormones

- Glands or endocrine organs
  - Hypothalamus - the main control centre for the endocrine system, located in the brain
  - Pineal gland
  - Thyroid gland
  - Parathyroid glands
  - Pancreas
    - Adrenal glands
    - Gonads (ovaries and testes)

- Hormones
  - Chemical messengers
  - Travel to specific organs via the bloodstream
  - They carry messages to regulate body functions

The main functions of the following hormones:

- Human growth hormone (HGH)
  - Stimulates growth, cell reproduction, and cell regeneration
  - Impacts metabolism
  - Affects how food is used for energy
  - Instructs cells in your bones and cartilage to multiply

- Thyroxine
  - Controls metabolism, heart and muscle function
  - Controls brain development
  - Maintains bones

- Parathyroid hormone
  - Regulates blood calcium and phosphate levels
  - Acts on bones, kidneys and small intestine

- Corticosteroids
  - Reduce inflammation and control overactive immune system responses
  - Assist with hormonal imbalances

- Adrenaline and noradrenaline (catecholamines)
  - Work together to manage stress responses
  - Regulates physiological responses in response to environmental changes

- Adrenaline
  - Increases heart rate and blood pressure
  - Prepares the body for rapid action, fight or flight mechanism
  - Provides energy quickly by simulating the breakdown of glycogen to glucose in the liver
  - Dilates air passages in the lungs to increase oxygen intake
  - Increases blood flow to skeletal muscles and decreases blood flow to non-essential areas

- Noradrenaline
  - Increases blood pressure
  - Increases attention and focus
  - Prepares the body for stress

- Insulin
  - Regulates glucose
  - Facilitates uptake of glucose by cells
  - Promotes storage of excess glucose as glycogen in the liver and muscles
  - Promotes conversion of glucose into fat for long-term energy storage
  - Promotes protein synthesis and muscle growth

- Glucagon
  - Increases blood sugar
  - Promotes conversion of glycogen in the liver into glucose
  - Stimulates the liver to produce glucose from non-carbohydrate sources (gluconeogenesis)
  - Opposes insulin, which lowers blood sugar levels

- Oestrogen
  - Regulates the menstrual cycle
  - Develops female secondary sexual characteristics (breasts, menstrual cycle)
  - Contributes to bone density
  - Protects the cardiovascular system by influencing cholesterol levels and blood vessel function
  - Regulates mood

- Testosterone

- Development of male characteristics (hair, deep voice, and muscle growth)
- Regulates libido, mood and energy
- Maintains bone density and muscle mass

Typical hormonal responses, to include:

- Training
  - Undertaking regular exercise to improve physical fitness

- Overtraining
  - Also known as unexplained underperformance syndrome (UUPS) and over training syndrome (OTS)
  - Training without enough recovery time between sessions
  - An unknown cause of decreased performance

The signs and symptoms of overtraining, to include:

- Decreased appetite
- Weight loss
- Depression, anxiety, mood swings, irritability
- Increased recurrence of injuries
- Headaches
- Insomnia
- Trouble concentrating
- Irregular heart rate
- Fatigue
- Decreased enjoyment from training / competing
- Low immunity
- Mild muscle / joint soreness
- Reduced ability to train / decreased performance
-

Learning Outcome 7: Describe ATP re-synthesis

Understand energy systems and their relation to exercise

How energy systems function independently and interact with one another, to include:

- ATP-PC (alactic) system - Anaerobic
  - Suits high intensity exercise for short periods up to 10 seconds
  - Immediate energy system

- ATP-PC and muscle glycogen – Anaerobic
  - Suits high intensity exercise for short periods up to 10 – 45 seconds

- Short term energy system

- Lactate system (lactic acid system), muscle glycogen - Anaerobic
  - Suits higher intensity over longer periods, around 45 – 120 seconds
  - Short term energy system

- Lactic acid and muscle glycogen – Anaerobic and aerobic
  - Suits medium to high intensity over longer periods, around 120 - 240 seconds
  - Short term energy system

- Muscle glycogen and fatty acids - Aerobic System
  - Suits long continuous and moderate intensity periods 240 seconds – 90 minutes

ATP re-synthesis, to include:

- ATP (or adenosine triphosphate) releases energy becoming ADP (or adenosine diphosphate), a phosphate is removed
- ATP is re-synthesised by adding a phosphate to the ADP molecule
  - 1 glucose molecule resynthesises 30-38 ATP
  - 1 fatty acid chain resynthesises approx. 100 ATP
  - 1 amino acid resynthesises 15 – 18 ATP

Aerobic and anaerobic thresholds and their significance in the planning of training programmes, to include:

- Aerobic threshold
  - The limit of exercise before energy production becomes dominated by anaerobic glycolysis instead of aerobic oxidation of fatty acids
  - Around 60-70% of maximal heart rate

- Anaerobic threshold
  - The limit of exercise intensity before lactate substantially builds up in your blood from using the anaerobic lactate system to produce energy
  - Around 80-90% of maximal heart rate

- Significance in the planning of training programmes
  - Maximum heart rate = 220 – age
  - Enables the identification of aerobic and anaerobic training zones

The effects of different training methods on energy systems, to include:

- CV continuous training
- CV interval training
- CV fartlek training

• HIIT training • Resistance strength training • Resistance endurance training	
Unit aim (s)	This unit will enable learners to show that they understand the main body systems, the effect that physical activity and exercise has on them and the ways in which these systems influence our health, fitness and performance.
Assessment requirements	This unit is assessed by externally set Multiple Choice Examination

Title:	**D/617/1187 Lifestyle Management and Motivation for Personal Training**
Level:	**3**
Credit Value:	**5**
GLH:	**29**

Learning Outcomes The learner will:	Assessment Criteria The learner can:
1. Understand the components of a healthy lifestyle and factors that affect health and wellbeing	1.1 Explain factors that affect health and wellbeing 1.2 Explain how to educate clients on a healthy lifestyle
2. Understand psychological factors influencing behaviour change	2.1 Describe psychological factors that can influence change 2.2 Explain the importance of psychological questionnaires in influencing behaviour change
3. Understand strategies to encourage long-term adherence to positive lifestyle practices	3.1 Describe different theories and approaches that can motivate positive behaviour change 3.2 Outline interventions and strategies to use at each stage of change 3.3 Describe how technological advancements can be used to support the client to increase: • physical activity levels • motivation • focus
4. Be able to implement strategies to encourage long term adherence to positive lifestyle practices	4.1 Use strategies to establish the client's readiness to change their behaviour 4.2 Use evidence-based strategies and techniques to create a positive environment 4.3 Recognise individual's barriers to exercise 4.4 Implement strategies to support clients to overcome barriers to participation 4.5 Monitor individual's goals and adapt accordingly 4.6 Use strategies to maintain contact and motivate clients between sessions

5. Understand health conditions and medically controlled diseases	5.1 Describe a range of common health conditions and medically controlled diseases including the: • features • signs • symptoms • Explain professional role boundaries and scope of practice when: • working with clients with common health conditions • working with clients with medically controlled diseases • offering health and wellbeing advice 5.2 Outline how to seek evidence-based health and wellbeing advice

Additional information/Amplification

Factors:
- smoking
- alcohol
- nutrition
- physical activity levels and preferences
- weight management
- rest, relaxation and relaxation training
- stress (signs, symptoms, effects and management)
- work patterns/job
- relevant personal circumstances,
- posture

Psychological factors:
- self-efficacy
- Intrinsic and extrinsic motivation
- social support and peer pressure
- Individual client needs and differences: (e.g. experienced, inexperienced, active and inactive)
- barriers to change: perceived and actual, self-recognition of own barriers
- positive reinforcement

Positive behaviour change:
- arousal theories
- motivational interviewing techniques
- trans-theoretical model (stages of change)

Interventions and strategies:

- decisional balance sheet/cost benefit analysis
- fitness testing
- strategies to overcome barriers
- SMART goal setting
- behavioural modification techniques
- planning for relapse/contingency planning
- rewards
- focusing and self-monitoring
- support systems and reinforcement strategies

Technological advancements:

- wearable technology
- pedometers
- mobile phone applications

Health conditions:

- obesity
- osteoporosis
- mental health problems (stress/depression/anxiety)
- lower back pain
- hypertension
- angina
- coronary heart disease (CHD)
- stroke
- pre-diabetes and diabetes
- prevalent forms of arthritis
- cancer
- asthma
- chronic obstructive pulmonary disease (COPD)
- chronic fatigue
- eating disorders (anorexia nervosa and bulimia nervosa)

Evidence based health and wellbeing advice:

- Where to signpost clients
- Recommended physical activity guidelines
- Health benefits of physical activity
- Researching of unfamiliar medical conditions

Unit aim (s)	This unit will give learners the opportunity to explore the factors that influence a healthy lifestyle, to consider the ways in which clients may be persuaded to adopt and maintain a healthier and more active lifestyle and the relationship between lifestyle and health.
Assessment requirements specified by a sector or regulatory body (if appropriate)	N/A
Details of the relationship of the unit and relevant National Occupational Standards	N/A

Title:	**K/617/1189 Consultation, Assessment and Programme Design for Personal Training**
Level:	**3**
Credit Value:	**9**
GLH:	**62**

Learning Outcomes The learner will:	Assessment Criteria The learner can:
1. Understand how to obtain client information to inform programme planning	1.1 Explain the benefits of a professional membership for personal trainers 1.2 Describe industry codes of professional and ethical conduct related to own role 1.3 Explain guidelines for physical contact with clients 1.4 Explain how to conduct a professional one to one consultation with clients 1.5 Explain the importance of obtaining client's consent 1.6 Explain factors that influence the selection of client consultation methods 1.7 Explain how to use a range of health and fitness assessments, considering their suitability for the client 1.8 Explain factors that would influence the selection of client fitness assessment activities 1.9 Describe the principles of postural assessment 1.10 Describe how to use regular assessments to monitor client progression towards goal achievement
2. Be able to conduct client consultations to collect and analyse information	2.1 Interact professionally with clients and other relevant individuals 2.2 Obtain informed consent 2.3 Collect the information required to design, tailor and deliver an effective exercise programme 2.4 Risk-stratify clients using recognised risk stratification tools 2.5 Seek information from, or signpost clients, to other specialists or medical professionals where

	relevant 2.6 Support the client to recognise and develop their intrinsic and extrinsic motivation to exercise
3. Be able to conduct health and fitness assessments appropriate to individual clients	3.1 Plan an assessment appropriate to the: • individual client • assessment conditions • equipment • time available 3.2 Prior to commencing any physical assessments, advise the client of the: • purpose of the assessment • correct procedures • protocols • risks 3.3 Carry out a client's pre-exercise health and fitness assessment using evidence-based protocols 3.4 Interpret results using accepted criteria and 'norm' ranges where appropriate 3.5 Develop a profile of the client to assist in the design of a safe and effective programme tailored to their specific needs 3.6 Inform clients of analysis outcomes 3.7 Agree actions and goals using appropriate language 3.8 Undertake regular re-assessments to monitor client progress and goal achievement 3.9 Use appropriate products and IT to support and manage effective personal training
4. Understand key principles and guidelines for programming exercise for a range of clients	4.1 Describe the key principles of designing short, medium and long-term exercise programmes 4.2 Explain how to tailor exercise programmes for a range of clients 4.3 State current international guidelines for developing the different components of fitness 4.4 Describe a range of protocols and tools for monitoring exercise intensity 4.5 Identify effective repetition and resistance ranges to develop: • strength • power • endurance • muscle hypertrophy

	4.6 Identify heart rate training zone models for developing aerobic and anaerobic capacity 4.7 Explain the purpose and principles of progressive programming and periodisation
5. Understand how to manipulate training variables to meet different programming goals	5.1 Explain the principles and variables of fitness training 5.2 Explain how to manipulate the FITT principles to tailor exercise programmes 5.3 Explain how to manipulate the principles of training to tailor exercise programmes to support goal achievement 5.4 Describe the typical signs and symptoms of overtraining
6. Understand how to deliver different modes of exercise in different environments	6.1 Explain how to design and deliver programmes for environments that are not specifically designed for exercise/physical activity including: • outdoors • home-based 6.2 Identify a range of resources and exercise modes suitable for training clients in different environments
7. Understand how to design small group training sessions	7.1 Explain how to adapt the design and delivery of sessions for use with small groups 7.2 Describe how to balance the needs of the individual and the group 7.3 Explain how to ensure the safety of all clients at all times
8. Understand a range of fitness training techniques and methods	8.1 Describe **cardiovascular training techniques and methods** 8.2 Describe **resistance training techniques and methods** 8.3 Describe **functional skill training methods and techniques** 8.4 Describe **flexibility training techniques and methods** to facilitate increased range of motion 8.5 Identify the suitability of training techniques and methods for different clients, including: • sedentary clients • experienced clients • high-level performers

Additional information/Amplification

Range of clients:

- sedentary (untrained)
- experienced (trained)
- high-level performer (well-trained)
- recovering from injury
- over-trained
- sport-specific performer
- clients with low-risk health conditions

Current International Guidelines:

- ACSM

Principles and variables of fitness training:

- FITT principles (frequency, intensity, time and type)
- adaptation
- modification and progression for each component of FITT
- implications of specificity
- progressive overload
- reversibility
- adaptability
- individuality
- recovery time

Training variables:

- choice of exercises
- sequence of exercise
- resistance and repetitions
- number of sets
- rest between sets (short-term recovery)
- speed of movement
- type of muscle contraction
- duration of session
- volume of training
- split routines
- rest between sessions (long-term recovery and the importance of adequate rest periods between training loads)

Evidence-based protocols:

- PAR-Q
- PAR-Q+
- health commitment statement

- organisation/employer devised methods

Risk stratification tools:
- Irwin and Morgan
- ACSM
- national/locally agreed protocols
- referral/care pathways

Assessments:
- Height, weight and BMI
- Resting heart rate
- Blood pressure
- Cardiorespiratory fitness (cooper run, YMCA step test, CV machine pre-programmed tests, etc.)
- Muscular strength (1RM, grip strength, etc.)
- Muscular endurance (press ups, sit ups, abdominal curl, etc.)
- Flexibility (sit and reach, visual assessments, etc.)
- Body composition (bioelectrical impedance, skinfold callipers)
- Basic postural analysis

Cardiovascular training techniques and methods may include:
- Interval training
- Fartlek
- Continuous

Resistance training techniques and methods may include:
- super-sets
- tri-sets
- giant sets
- pre/post exhaust
- pyramid systems
- drop sets
- German volume training
- negatives/eccentric training
- circuit resistance training

Flexibility training techniques and methods may include:
- mobilisation of joints
- static stretching
- dynamic stretching
- proprioceptive neuromuscular facilitation

Functional skill training methods and techniques:
- A range of functional equipment

• movement patterns • muscle actions • components of fitness required for daily living

Unit aim (s)	This unit allows the learner to show that they understand the factors and processes involved in consulting with clients and are able to use collected information to design fitness programmes that are appropriate to the clients' needs and wants.
Assessment requirements specified by a sector or regulatory body (if appropriate)	N/A
Details of the relationship of the unit and relevant National Occupational Standards	N/A

Title:	**D/617/1190 Planning and Delivering Personal Training Programmes**
Level:	**3**
Credit Value:	**8**
GLH:	**44**

Learning Outcomes The learner will:	Assessment Criteria The learner can:
1. Be able to plan sessions and programmes for a range of clients	1.1 Apply exercise science, methods and techniques to programme design 1.2 Plan session and programme content to achieve client's short, medium and long- term goals 1.3 Set SMART goals linked to a client's individual needs, wants and motivators 1.4 Plan appropriate timings, sequences and intensity of exercises 1.5 Prepare equipment and resources as required 1.6 Plan warm-up and cool down activities appropriate to the session and individual client 1.7 Plan sessions for different environments: • gym • studio/sports hall • outdoors • client's home or other confined space 1.8 Plan sessions for both individuals and small groups
2. Understand how to observe and adapt exercise technique	2.1 Explain communication techniques that can be used when instructing clients including verbal and non-verbal 2.2 Explain how to observe and monitor clients during sessions 2.3 Describe teaching strategies that can be used to correct and enhance client performance, including: • one-to-one sessions • small group training 2.4 Describe methods of maintaining clients' motivation

	2.5 Explain why it is necessary to modify, adapt, regress or progress exercise programmes 2.6 Explain why it is important to monitor individual performance during small group training
3. Be able to demonstrate professional conduct when delivering personal training sessions	3.1 Introduce self, build rapport and help clients feel at ease in the exercise environment 3.2 Explain to clients: • planned objectives of the session • exercises involved including their physical and technical demand • how objectives and exercises support their goals 3.3 Assess clients' readiness and motivation to take part in the planned exercises 3.4 Agree with clients any changes to the planned exercises or physical activities that: • meet their goals and preferences • enable them to maintain progress 3.5 Record changes to client's plans 3.6 Work within boundaries of own role 3.7 Maintain a professional duty of care to ensure client safety and wellbeing 3.8 Comply with legal responsibilities
4. Be able to instruct and adapt personal training sessions to meet the needs of different clients	4.1 Deliver personal training sessions to individuals and small groups 4.2 Meet client needs by delivering a range of: • cardiovascular training techniques and methods • resistance training techniques and methods • flexibility training techniques and methods 4.3 Deliver a range of functional and skill training techniques and methods to meet client needs, including: • functional equipment • appropriate movement patterns
	4.4 Use motivational techniques to support the client 4.5 Provide a warm up and cool down appropriate to the client(s), the planned exercise and the environment 4.6 Adapt verbal and non-verbal communication methods to make sure clients understand what is

	required 4.7 Throughout the session, provide the client with specific: • instruction • feedback • encouragement • positive reinforcement 4.8 Observe, monitor and analyse the client's performance throughout the session 4.9 Correct the client's technique at appropriate points to ensure safe and effective alignment, execution and use of equipment 4.10 Progress or regress exercises according to client's performance 4.11 Offer modifications, adaptations or alternative exercises when required
5. Be able to review sessions and programmes	5.1 Evaluate sessions and programmes 5.2 Review client goals based on outcomes and revise sessions and programme accordingly 5.3 Amend future session plans and own performance based on evaluation and feedback from the client 5.4 Give feedback to clients based on review

Additional information/Amplification

Exercise science, methods and techniques:

- the musculoskeletal system
- kinesiology and balanced muscular development
- the cardiorespiratory system
- the energy systems
- physiological responses to exercise
- measuring exercise intensity/response
- exercise safety and contraindications

Cardiovascular training techniques and methods may include:

- Interval training
- Fartlek
- Continuous

Resistance training techniques and methods may include:

- super-sets
- tri-sets
- giant sets

- pre/post exhaust
- pyramid systems
- drop sets
- German volume training
- negatives/eccentric training
- circuit resistance training

Flexibility training techniques and methods may include:

- mobilisation of joints
- static stretching
- dynamic stretching
- proprioceptive neuromuscular facilitation

Legal responsibilities:

- health and safety at work
- equality and diversity
- safeguarding
- data protection
- hazard identification
- safe working practices
- ethics and professional conduct

Evaluate sessions and programmes:

- session/programme aims
- SMART goals
- session content
- participant performance
- own performance (preparation, delivery)
- health and safety

Unit aim (s)	This unit will give learners to opportunity to show that they understand fitness training methods and techniques and that they can deliver relevant and appropriate fitness session in a professional manner.
Assessment requirements specified by a sector or regulatory body (if appropriate)	N/A
Details of the relationship of the unit and relevant National Occupational Standards	N/A

Title:	**M/617/1193 Nutrition for Physical Activity**
Level:	**3**
Credit Value:	**5**
GLH:	**33**

Learning Outcomes The learner will:	Assessment Criteria The learner can:
1. Understand the principles of nutrition	1.1 Explain the functions of: • macronutrients • micronutrients • hydration 1.2 Describe the main nutrient groups and their food sources 1.3 Explain the impact of nutrition on health
2. Understand key nutritional strategies and guidelines	2.1 Describe the principles and key features of current government healthy eating guidelines 2.2 Distinguish between credible and non- credible sources of nutritional information and guidance to advise clients 2.3 Explain how current government health eating advice can be used to support clients with: • weight management • hypertrophy • sports performance 2.4 Explain how to educate clients to make good food choices
3. Understand how to use nutritional assessment tools	3.1 Describe tools that can be used to collect client's nutritional information 3.2 Explain how to analyse information so that clients' needs and nutritional goals can be identified 3.3 Explain how to estimate resting metabolic rate and energy requirements to support the achievement of client goals 3.4 Explain how to feedback results of nutritional assessments to clients 3.5 Explain the circumstances in which a client should be referred to another professional before commencing an exercise programme

4. Be able to collect and analyse nutritional information	4.1 Use nutritional assessment tools to collect information about client's dietary habits 4.2 Record information from nutritional assessments 4.3 Analyse collected information and identify areas for improvement within own scope of practice
5. Be able to apply the principles of nutrition	5.1 Use appropriate strategies to educate clients about healthy eating within: • scope of own practice • current government guidelines 5.2 Provide clients with information according to their individual health and nutrition needs 5.3 Agree review points with the clients 5.4 Monitor, evaluate and review the clients' progress towards their nutritional goals

Additional information/Amplification

Main nutrient groups:

- proteins
- fats (saturated, unsaturated and essential fatty acids)
- carbohydrates
- vitamins
- minerals
- water

Nutritional assessment tools:

- food diary
- food recall log
- food frequency questionnaire body composition assessment

Unit aim (s)	This unit will enable the learner to demonstrate that they can apply the principles of nutrition to support client goals as part of an exercise and physical activity programme.
Assessment requirements specified by a sector or regulatory body (if appropriate)	N/A
Details of the relationship of the unit and relevant National Occupational Standards	N/A

Title:	**T/617/1194 Business Acumen for Personal Trainers**
Level:	**3**
Credit Value:	**5**
GLH:	**29**

Learning Outcomes The learner will:	Assessment Criteria The learner can:
1. Understand how to create business and marketing plans to support a successful personal training business	1.1 Describe marketing strategies and techniques that could help to support a personal training business 1.2 Explain how to conduct market research 1.3 Explain the purpose of developing a: • marketing plan • business plan 1.4 Explain the importance of developing a: • business plan • marketing plan 1.5 Explain how to produce a business plan 1.6 Describe how IT systems can be used to: • support marketing and sales • monitor and interpret data 1.7 Explain current legislation and ethical practice that affects the use of technology
2. Understand how to manage finances related to a personal training business	2.1 Explain the principles of business financials including: • financial forecasting • planned income and expenditure • sales • targets 2.2 Describe accounting methods for recording financial performance 2.3 Identify current tax and insurance legislation 2.4 Explain UK tax requirements, including: • Income tax (PAYE) • national insurance contributions • self-assessment 2.5 Identify where to find information and support regarding UK tax 2.6 Explain how IT systems can be used to support record keeping, finance and accounting

3. Be able to create a business and marketing plan to support a successful personal training business	3.1 Conduct market research relevant to their prospective personal training business 3.2 Describe the profiles of prospective clients 3.3 Create a mission statement for a personal training business 3.4 Develop a marketing plan for a personal training business 3.5 Create a business plan for a personal training business 3.6 Use IT products to support and manage a personal training business 3.7 Present a financial forecast for a personal training business

Additional information/Amplification

Marketing strategies and techniques:

- Brand awareness
- Self-promotion
- Use of social media

Market research:

- SWOT analysis (strengths, weaknesses, opportunities, threats)
- PEST analysis (political, economic, social, technological)
- On-line research
- Review of competitors
- Industry reports

Current legislation:

- General Data Protection Regulation (GDPR, 2018)
- intellectual property (IP) law
- patents
- copyright law

Accounting methods:

- Profit and loss (include differences between gross and net profit)
- Balance sheet

Unit aim (s)	This unit will enable the learner to show they know and understand the principles of setting up and running a personal training business from the creation of a business plan.
Assessment requirements specified by a sector or regulatory body (if appropriate)	N/A
Details of the relationship of the unit and relevant National Occupational Standards	N/A

Additional Information:

Test Specification for Y/617/1186 Level 3 Applied Anatomy and Physiology

The unit "Y/617/1186 Applied Anatomy and Physiology" is assessed by externally assessed Multiple Choice Question (MCQ) examination. The test rules for this MCQ test are as follows:

- Total number of questions: 40
- Pass mark: 24/40 this equates to 60%
- Test duration: 60 minutes

Additional notes:

- Learners should attempt all questions within each section of the test.
- The MCQ test will be taken on Surpass.
- The questions are written against the assessment criteria which is set out within the qualification.
- The table below show the split of the questions against the assessment criteria and their learning objectives.
-

Learning Outcome	Assessment Criteria	Number of Questions per test
1. Understand the cardio-respiratory system and its relation to exercise and health	1.1 Explain the following terms in relation to short and long term exercise and the efficiency of the heart: • cardiac cycle • stroke volume • cardiac output	**4**
	1.2 Explain the effect of disease processes on the structure and function of blood vessels	
	1.3 Describe health risks associated with systolic and diastolic blood pressure classifications	
	1.4 Explain the short and long term effects of cardiorespiratory exercise on: • blood pressure • respiration • venous return • implications of blood pooling	

2. Understand the skeletal system and its relation to exercise	2.1 Explain how bones and bone density are affected by: • the role of osteoblasts and osteoclasts • hormonal contribution • body weight • dietary influences • weight bearing and non-weight bearing exercise • high and low-impact exercise	**5**
	2.2 Explain factors that affect the stability of joints	
	2.3 Explain potential risks resulting from unstable and dysfunctional joints	
	2.4 Explain how the structure of joints enables them to act as shock absorbers	
	2.5 Explain the bone modelling and remodelling processes	
3. Understand the muscular system and its relation to exercise	3.1 Describe the actions of the major muscles of the body	**10**
	3.2 Identify the muscle attachment sites (origins and insertions) for the major muscles of the body	
	3.3 Describe joint actions brought about by contraction of specific muscle groups	
	3.4 Describe the role of contributory muscles as: • agonist • antagonist • synergist • fixators	
	3.5 Describe the significance of anatomical axes and planes of movement to muscle balance and function	
	3.6 Explain the effect of the following exercise variables on biomechanics and kinesiology: • first, second and third class levers • centre of gravity • momentum • force • length-tension relationships • open and closed kinetic chain movements	
	3.7 Explain the following principles of muscle contraction in relation to exercise: • concentric and eccentric (isotonic) • isometric and isokinetic • stretch and reverse stretch reflexes • sliding filament theory • size principle of motor unit recruitment	
	3.8 Explain the short and long-term effects of exercise on muscles including: • delayed onset muscle soreness (DOMS) • muscle fatigue • hypertrophy • metabolic benefits	

	3.9 Describe the response of muscles to: • overuse • underuse • misuse	
4. Understand postural and core stability	4.1 Describe the structure and function of: • 'core' muscles • stabilising ligaments of the spine	**6**
	4.2 Explain the classification of core muscles including if they are: • 'local/deep' • 'global/superficial'	
	4.3 Describe the structure and function of intervertebral discs	
	4.4 Explain the effects of abdominal adiposity and poor posture on movement efficiency	
	4.5 Describe abnormal degrees of curvature of the spine and their implications for physical activity	
	4.6 Explain the impact of core stabilisation exercise including the potential for injury and aggravation of problems	
5. Understand the nervous system and its relation to exercise	5.1 Explain the function, in relation to exercise, of: • the central nervous system (CNS) • the Peripheral Nervous System (PNS) including somatic and autonomic systems	**7**
	5.2 Describe nervous control and transmission of a nervous impulse	
	5.3 Explain the process of motor unit recruitment including the: • significance of a motor unit's size • number of muscle fibres	
	5.4 Explain the function of muscle proprioceptors including muscle spindles and Golgi tendon organs	
	5.5 Describe the relevance of proprioceptors to exercise, to include: • the stretch reflex • reciprocal inhibition (inverse stretch reflex) • the 'stretch-shortening cycle' and its application to plyometric training	
	5.6 Explain the neuromuscular adaptations associated with training, to include: • more efficient motor unit recruitment • improved inter-muscular coordination • improved intramuscular coordination	
	5.7 Explain the benefits of improved neuromuscular coordination to exercise performance	
6. Understand	6.1 Describe the structure of the endocrine system, including both glands and hormones	**4**

the endocrine system and its relation to exercise and health	6.2 Explain the main functions of the following hormones: • Human Growth Hormone (HGH) • Thyroxine • Parathyroid hormone • Corticosteroids • Adrenaline and noradrenaline (catecholamines) • Insulin • Glucagon • Oestrogen • Testosterone	
	6.3 Explain typical hormonal responses to: • training • overtraining	
	6.4 Describe signs and symptoms of overtraining	
7. Understand energy systems and their relation to exercise	7.1 Explain how the energy systems function independently and interact with one another	**4**
	7.2 Describe ATP re-synthesis	
	7.3 Explain aerobic and anaerobic thresholds and their significance in the planning of training programmes	
	7.4 Explain the effects of different training methods on energy systems	