Learner workbook

NCFE Active IQ Level 3 Diploma in Gym Instructing and Personal Training
QN: 603/4388/6

Learner name:	
Centre number:	
Centre name:	
Tutor name:	
Start date:	
Signatures	
Learner:	
Assessor:	
Internal quality assurer (IQA*)	
External quality assurer (EQA*)	

* for completion if part, or all, of the evidence has been sampled by the internal and/or external quality assurer

Unit 07

Applied anatomy and physiology for activity, health and fitness

(D/617/1707)

Overview

The unit covers the knowledge a Personal Trainer needs around anatomy, physiology, biomechanics and kinesiology to enable effective exercise/activity programming for a range of clients.

This booklet allows opportunities to provide evidence for assessment criteria 1.1 to 7.6. To support your evidence, the following websites may support you with some important information to complete the tasks:

- www.acsm.org
- www.fitnessindustryeducation.com
- www.bases.org.uk

Supporting evidence

Ensure that all the evidence is available for viewing by the internal and external quality assurer.

Unit 07 Workbook

After completing your assessment, please return it to your tutor.

Advice to all learners

- please complete your personal details and learner declaration below
- complete all questions in this assessment
- write your answers in the spaces provided
- add any additional work for any of the questions on plain paper and attach to this assessment
- if you need guidance or assistance, please contact your tutor

Learner declaration

I have completed all sections of this assessment and I confirm that this is my own work.

Signature: .....

Date: .....

Assessor: .....

IQA: .....

Achieved: ☐

Not yet achieved: ☐

Learning outcome 1

Understand the structure and function of bones

Task 1: Name the 5 different categories of bone and provide an example of each (1.1)

1.	2.	3.	4.	5.
eg	eg	eg	eg	eg

Task 2: Below, describe compact and cancellous bone (1.1)

Compact
Cancellous

Task 3: In the space below, draw a long bone and label it with the following structures: articular cartilage, epiphysis, diaphysis, periosteum, epiphyseal plates and bone marrow. (1.3)

Task 4: Explain each part of the bone you have labelled: the articular cartilage, epiphysis, diaphysis, periosteum, epiphyseal plates and bone marrow (1.3)

Bone structure	Explanation of structure
Articular cartilage	
Epiphysis	

Diaphysis	
Periosteum	
Epiphyseal plates	
Bone marrow	

Task 5: The skeletal system has a number of key functions. Below, describe 6 functions of bone tissue (1.2)

1.
2.
3.
4.
5.

6.

Task 6: The spine is divided into 5 different sections (1.4)

i) Label the following diagram and state how many vertebrae make up each section.

ii) Describe the movements available at each section.



Movements available at each section:

iii) Describe 4 functions of the vertebral column.

1.
2.
3.

4.

Task 7: Describe the lifecycle of a bone from birth to ageing (1.5)

Task 8a: Describe the process of bone remodeling when there has been an injury, or the bone is adapted due to stresses placed on it (1.6)

Task 8b: Explain the impact of acute and chronic exercise on the bones (1.8)

Task 9: Bone density can be impacted by a number of factors. Use the table below to describe the factors that impact on bone density (1.7)

Factor	How does each factor impact on bone density?
Weight and non-weight bearing exercises	
Hormones	
Calcium and Vitamin D	

Gender	
Age	
Race and family history	
Lifestyle factors	
Medication	
Nutrition	

Osteoblasts and Osteoclasts	

Evidence sheet

Assessment criteria	Assessor comments
1.1	
1.2	
1.3	
1.4	
1.5	
1.6	
1.7	
1.8	

Assessor signature:	
IQA signature:	
Date:	

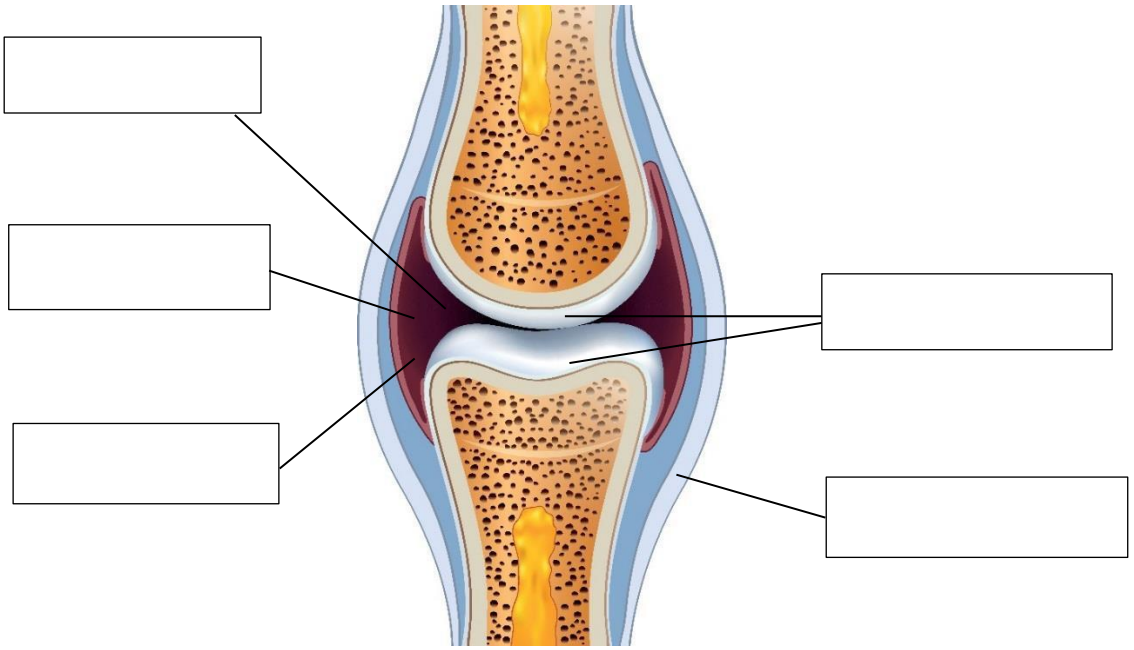
Learning outcome 2

Understand the structure and function of joints and their relation to exercise

Task 1: There are 3 categories of bone in the body. Name them and describe the structure and function of each one (2.1)

1.
2.
3.

Task 2: Label the synovial joint below and describe the structure and function of the joint in the following table (2.2)



Feature	Structure	Function
Articular/hyaline cartilage		
Two-layered joint capsule		
Synovial fluid		
Ligament		

Synovial membrane		

Task 3: Describe the types of joint and types of movement at each major joint in the body (2.3)

Ankle:
Knee:
Hip:
Pelvis:

Elbow:
Wrist:

Task 4: Identify below the 3 planes of movement and the movements available in each (2.4)

Plane of movement	Movements available

Task 5: Below, define the location of the following anatomical parts using appropriate anatomical language (2.5)

Anatomical part	Description of location
eg 5th Metatarsal	Lateral aspect of the foot, Distal to calcaneus, superficial
Rectus Abdominis	
Patella	
Vastus Medialis	
Tricep Brachii	
Coccyx Bone	

Task 6: Describe the planes of movement in the concentric phase of contraction for the following exercises: (2.5)

Exercise	Concentric phase movements
Lateral pulldown	
Bicep curl	
Back squat	
Press up	

Task 7: Most joints in the body are generally stable. The shoulder joint is considered an unstable joint that can be easily dislocated. Below, explain the factors that contribute to joint stability (2.6)

Task 8: In the table below, describe the short-term and long-term effects of exercise on joints (2.7)

Short-term responses	Long-term adaptations

Evidence sheet

Assessment criteria	Assessor comments
2.1	
2.2	
2.3	
2.4	
2.5	
2.6	
2.7	

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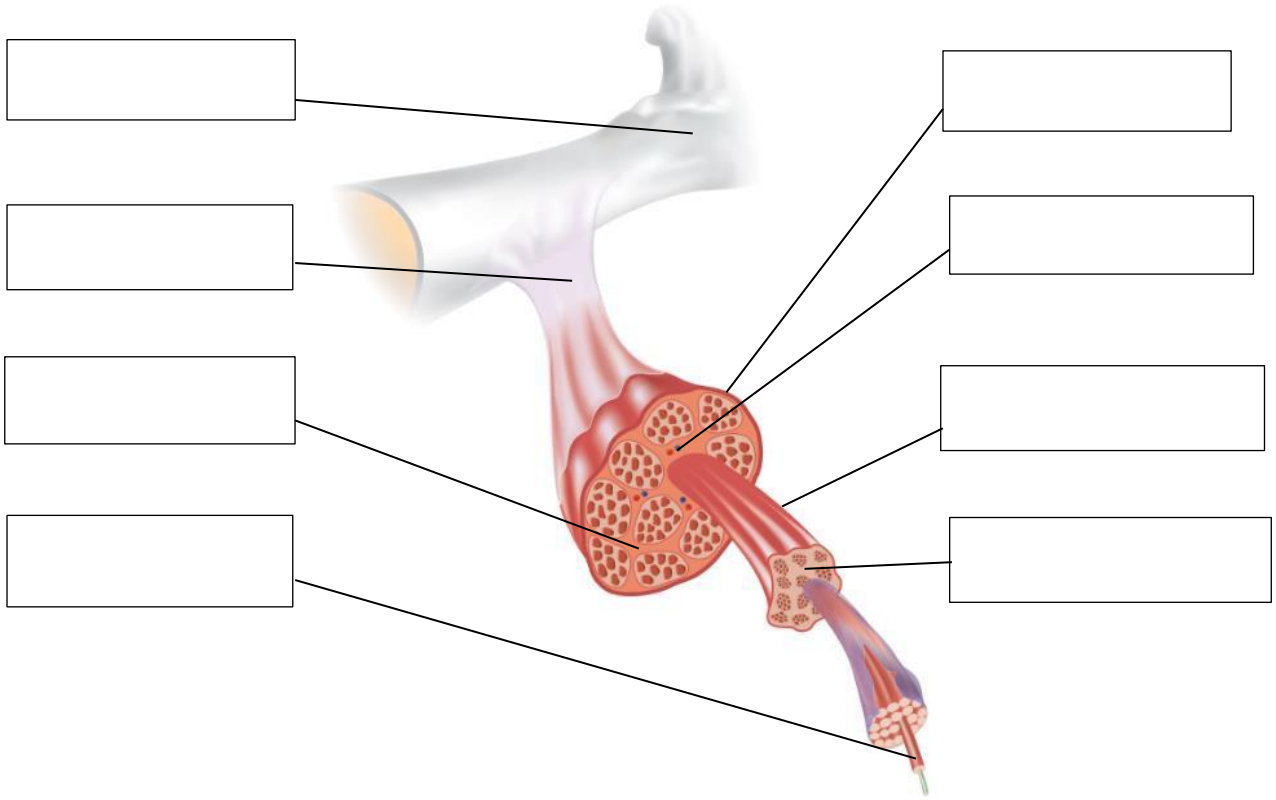
Learning outcome 3

Understand the muscular system and its relation to exercise

Task 1: Below, describe the structure and function of the 3 types of muscle found in the body (3.1)

Cardiac:
Smooth:
Skeletal:

Task 2a: Use the following labels to help label the picture below: (3.1) Bone, Tendon, Epimysium, Perimysium, Fascicle, Muscle Fibre, Endomysium, Blood Vessel



Task 2b: Describe the following different types of muscle fibres, identifying their characteristics: (3.1)

Epimysium:
Perimysium:

Endomysium:

Task 3: Complete the table below, comparing the characteristics of various muscle fibres and providing examples of exercises where these would be required (3.2)

Types of muscle fibre	Characteristics	Give 2 examples where these are used in exercise
Type 1		
Type 2a		

Type 2b		

Task 4: Describe the roles muscles can play during contraction (3.3)

Agonist:
Antagonist:
Synergist:

Fixator:

Task 5: Muscles have an origin and insertion. Define below what the terms origin and insertion mean and how they enable joint movement to occur (3.4)

Task 6: Using the table below, write down the origin, insertion and muscle action(s) of the following muscles: (3.4)

Rotator Cuff

Muscle name	Origin	Insertion	Muscle action(s)
Supraspinatus			
Infraspinatus			
Subscapularis			
Teres Minor			

Core and Abdominal Muscles

Muscle name	Origin	Insertion	Muscle action(s)
Pelvic Floor			
Transverse Abdominis			
Multifidus			
Internal Obliques			
External Obliques			
Rectus Abdominus			
Diaphragm			

Shoulder Girdle and Spine

Muscle name	Origin	Insertion	Muscle action(s)
Levator Scapulae			
Illiocostalis			
Longissimus			
Spinalis			

Multifidus			
Quadratus Lumborum			
Pectoralis Minor			
Serratus Anterior			
Trapezius			
Rhomboid Major			
Rhomboid Minor			
Teres Major			

Hip Flexors, Adductors and Abductors

Muscle name	Origin	Insertion	Muscle action(s)
Rectus Femoris			
Iliacus			
Psoas Major			

Adductor Magnus			
Adductor Bervis			
Adductor Longus			
Pectineus			
Gracilis			
Sartorius			
Gluteus Medius			
Gluteus Minimus			
Piriformis			
Tensor Fascia Latae			

Task 7: Explain the different types of muscle contractions and give examples (3.5)

Types of muscle contraction	Explain this type of contraction	Provide 2 examples in sport and exercise
Isokinetic		
Isometric		
Isotonic (Concentric, Eccentric)		

Task 8: In the table, describe how levers work in the body and give examples (3.6)

Lever type	Location and description	Examples in exercise
Type 1		
Type 2		
Type 3		

Task 9: In the space below, explain the principles of muscle contraction (3.7)

All or Nothing Principle:

Sliding Filament Theory:

Stretch Reflex:

Inverse Stretch Reflex:

Principle of Motor Unit Recruitment:

Task 10: Below, explain the long-term and short-term responses to exercise on the muscular system (3.8)

Short-term responses:

Long-term responses:

Task 11: Describe both short term and long-term responses to exercise (3.8)

Factor	Explanation of impacts
Short term	
Long-term	

Evidence sheet

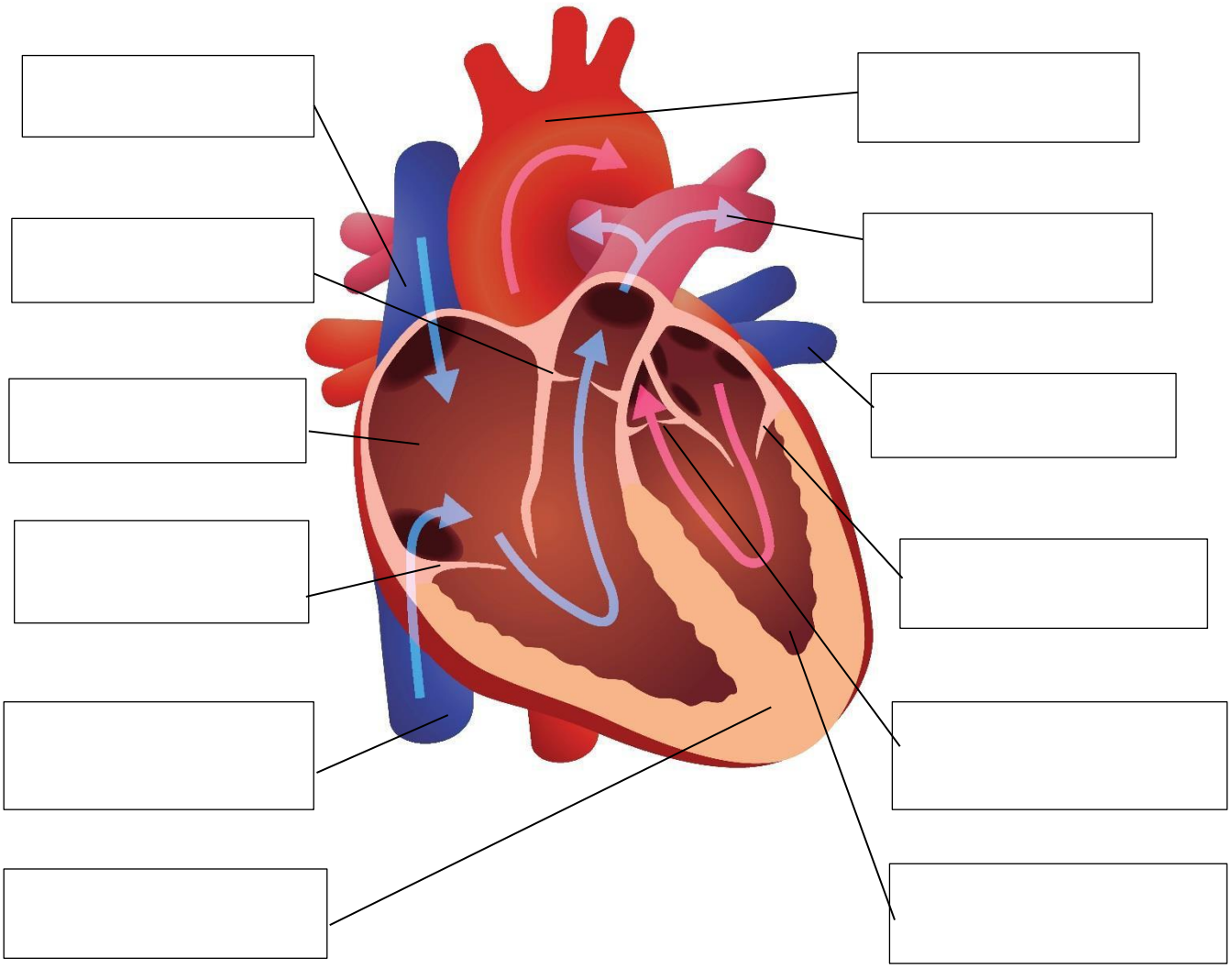
Assessment criteria	Assessor comments
3.1	
3.2	
3.3	
3.4	
3.5	
3.6	
3.7	
3.8	

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Learning outcome 4

Understand the structure and function of biological systems

Task 1: Label the diagram of the heart below to show the features named in the following table, and describe their functions in the table (4.1)



Heart structure	Function
Left and Right Atria	
Left and Right Ventricles	
Septum	
Tricuspid Valve	
Mitral (Bicuspid Valve)	
Semi-lunar Valves	
Aorta	
Vena Cava	
Pulmonary Artery	

Pulmonary Veins	

Task 2: The heart is made up of 3 layers. Describe each layer and its function (4.1)

Layer 1:
Layer 2:
Layer 3:

Task 3: Describe the following terms, using diagrams where necessary: (4.1)

Term	Description	Diagram
Cardiac cycle		

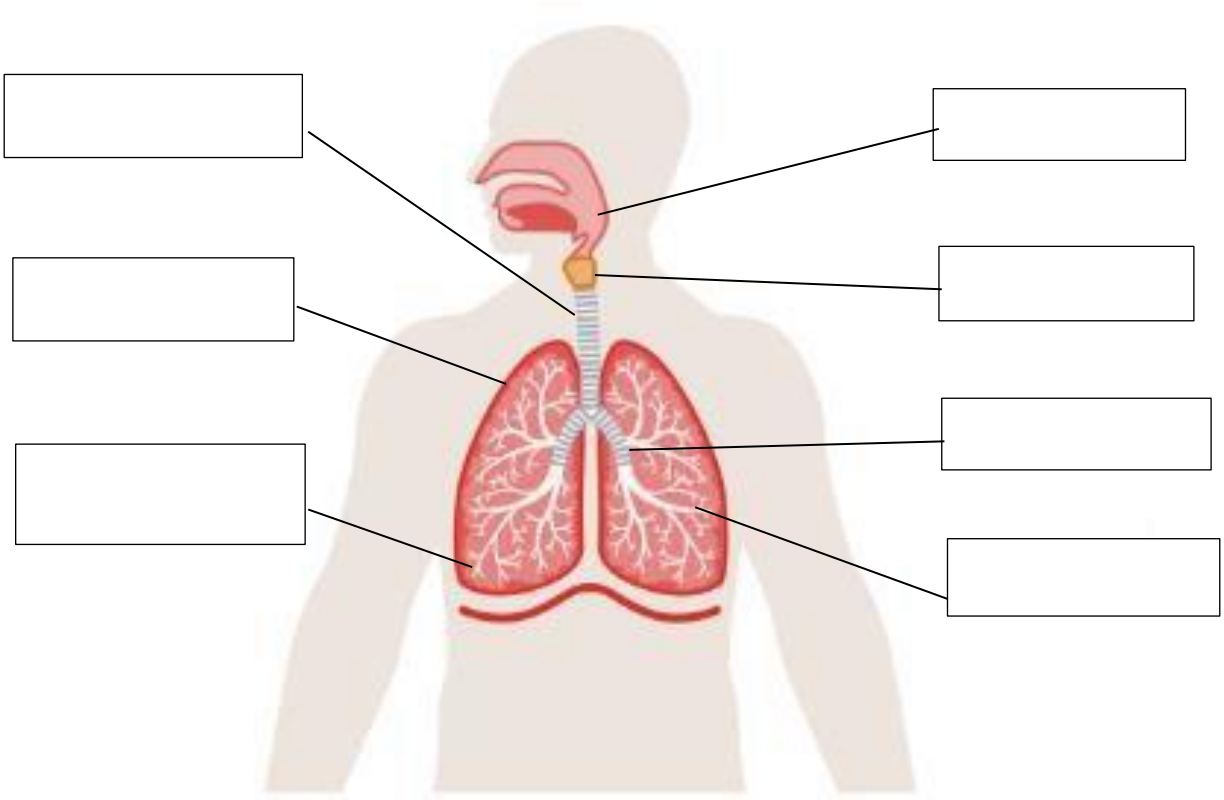
Cardiac conduction		

Task 4: Describe the 4 main functions of the cardiovascular system in the table below (4.1)

Function 1:
Function 2:

Function 3:
Function 4:

Task 5: Label the diagram of the respiratory system to show the features named in the following table and describe their functions in the table (4.2)



Area of respiratory system	Function
Lungs	
Pharynx	
Larynx	
Trachea	
Bronchi	
Bronchioles	
Alveoli	

Task 6: Describe the 4 main functions of the respiratory system in the table below (4.2)

Function 1:
Function 2:
Function 3:

Function 4:

Task 7: In the nervous system, there are different methods of sending and receiving messages within the body. Describe the following terms and how they relate to the nervous system: (4.3)

Central Nervous System:
Peripheral Nervous System:
Somatic:

Autonomic Sympathetic:
Autonomic Parasympathetic:
Motor Unit:
Golgi Tendon Organ:
Muscle Spindles:

Intero and Exteroceptors:
Nerve Cells:

Task 8: Describe below the role of hormones in the body, including information on hormones and glands that play a key role in exercise and fitness (4.4)

Task 9: In the tables below, explain the immediate and long-term effects of exercise on each of the following biological systems: (4.5)

Cardiovascular System

Short-term effects on the cardiovascular system	Explanation

Long-term effects on the cardiovascular system	Explanation

Respiratory System

Short-term effects on the respiratory system	Explanation

Long-term effects on the respiratory system	Explanation

Nervous system

Short-term effects on the nervous system	Explanation

Long-term effects on the nervous system	Explanation

Endocrine System

Short-term effects on the endocrine system	Explanation

Long-term effects on the endocrine system	Explanation

Evidence sheet

Assessment criteria	Assessor comments
4.1	
4.2	
4.3	
4.4	
4.5	

Assessor signature:	
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Learning outcome 5

Understand the energy systems and their relation to exercise

Task 1: Depending on the activity being undertaken, the body produces energy in different ways. Describe below the 3 methods of energy production in the body (5.1, 5.2, 5.3)

	Aerobic energy	Lactic acid energy system	Phosphocreatine energy system
Exercise duration			
Exercise intensity			
Units of ATP generated			

Fuels used			
Waste products produced			
Example of activities that use these systems			
How is ATP re-synthesised in each system			

Impacts of exercise on each system			

Evidence sheet

Assessment criteria	Assessor comments
5.1	
5.2	
5.3	

Assessor signature:	
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Learning outcome 6

Understand the effect of exercise variables on human movement

Task 1: In terms of exercise and functional movement, describe below what the following factors are and how they can influence or impact on exercise: (6.1)

Centre of gravity:
Momentum:
Force:

Planes of motion:
Length-tension relationships:
Levers:

Task 2: In the table below, define what open and closed chain exercises are, provide examples of them and list advantages and disadvantages of both (6.2, 6.3)

Definition of open chain exercise	Examples of open chain exercise
Advantages of open chain exercise	**Disadvantages of open chain exercise**
Definition of closed chain exercise	**Examples of closed chain exercise**

Advantages of closed chain exercise	Disadvantages of closed chain exercise

Evidence sheet

Assessment criteria	Assessor comments
6.1	
6.2	
6.3	

Assessor signature:	
IQA signature:	
Date:	

Learning outcome 7

Understand the effect of exercise on posture and core stability

Task 1: Below, explain 3 benefits of core stability training (7.1, 7.3)

1.
2.
3.

Task 2a: Describe the roles of local and global muscles in body stabilisation and how this can reduce the risk of injury (7.2)

Must include:
- deep/local (transverse abdominis, pelvic floor muscles, lumbar multifidius and diaphragm)
- superficial/global (rectus abdominis and erector spinae)

Task 2b: Give examples of core stabilisation exercises (7.3)

Task 3: In the table below, describe common postural conditions (7.4, 7.5)

Postural condition	Image	Describe how it is caused	Describe the issues and problems caused by this postural condition
Kyphosis			
Lordosis			
Scoliosis			
Flat back			

Sway back			

Task 4: Explain the positive and negative impacts of exercise on posture (7.3, 7.5)

Positive impacts of exercise	Negative impacts of exercise

Task 5: Using the table below, describe the following medical conditions associated with poor or dysfunctional stabilisation, and provide possible causes: (7.6)

	Description	Cause/pathology
General lower back pain		
Prolapsed disc		
Sciatica		
Osteoarthritis		
Knee pain		

Evidence sheet

Assessment criteria	Assessor comments
7.1	
7.2	
7.3	
7.4	
7.5	
7.6	

Assessor signature:	
IQA signature:	
Date:	

Well done!

You have completed all the tasks. Hand them in to your tutor for feedback.

Feedback form

Assessment decision

Achieved ☐ **Not yet achieved** ☐

Comments/feedback

Assessor signature:		**Date:**
Learner signature:		**Date:**
IQA signature:		**Date:**
EQA signature:		**Date:**

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