

Assessor Marking Guide

Programme Name	Health and Fitness Coach Level 4 (Personal Trainer) (Online)	
Assessment Number	01A1	
Assessment Title	Structure and Function of Human Body Systems	
Course Number	Course 1	Version 2
Course Title	Anatomy & Physiology	Level 4 Credit 10

Internal feedback related to design of assessment tools should be submitted via the online Continuous Improvement Form (eCIF).

This assessment leads to the following graduate profile and learning outcomes.

NZQA GPO	Learning Outcome	Assessment Standard	Task #
Apply knowledge of anatomy and physiology to adapt and deliver safe and effective exercise programmes to individuals. (15 credits)	1.1 Identify and describe the structure and function of major systems of the human body and their physiological responses (acute and chronic) to exercise. <i>Contributes 4 GPO credits</i>	Demonstrate a clear understanding of key body organ systems and their functions	All questions

NZQF Level 4 Descriptors	
Knowledge	<ul style="list-style-type: none"> Broad operational and theoretical knowledge in a field of work or study
Skills	<ul style="list-style-type: none"> Select and apply solutions to familiar and sometimes unfamiliar problems. Select and apply a range of standard and nonstandard processes relevant to the field of work or study.
Application	<ul style="list-style-type: none"> Self-management of learning and performance under broad guidance. Some responsibility for performance of others.

ADMINISTRATION

Assessors are required to provide feedback to students:

- Constructive feedback to the student must be documented within assessment evidence. Including where resubmission is required.
- Notes on demonstrated performance and application of skills, knowledge, attributes; future improvement/development planning e.g., task management, study skills; relationship to other programme content and use in career.

Student evidence must be assessed against all specified criteria to meet learning outcomes.

- Any adaption in assessment methods must be documented and attached to the assessment by the assessor (where deemed necessary to be fair and transparent in relation to student's specified needs).
- Assessment Pack Cover should be dated and signed by assessor when the student has received the final result.
- Assessment opportunities must be indicated accurately.
Where any practical criteria are not achieved, an additional practical sheet must be used for reassessment for all practical outcomes and attached to this assessment pack. Refer to Assessment opportunities policy for additional detail.
- The student must sign the post-assessment agreement after receiving final result.

- It is the Assessors responsibility to ensure all relevant documentation is included in the assessment prior to reporting and filing.
- Samples of assessments will be forwarded to internal and/or external parties for moderation as required.

Where appropriate **sample answers and or exemplars** may be included: Sample answers are a guide only providing an example of the sufficiency of quantitative and qualitative evidence the assessor could expect to see.

ASSESSMENT SCHEDULE	
<i>Give feedback to student on successes, for N add a note to the student on here or on their assessment evidence (e.g. in Turnitin) about how to improve for resubmission.</i>	
Task Evidence	Achievement Criteria / Judgement
1	Learner has correctly described: a) The synovial joint type b) Anatomical movements Three bones making up the shoulder joint
2	Learner has correctly identified and described a) Two pivot joints and the bones that make up the pivot joints The effect of the structure of pivot joints on its function
3	Correct movements and joint type identified
4	Correct movements identified
5	Two sports/exercises high in strain frequency identified
6	Correct divisions of nervous system identified
7	Identification of function not belonging to nervous system
8	Learner has described and provided an example of muscle spindle (minimum 50 words)
9	Learner has described and provided an example of Golgi tendon organ (minimum 50 words)
10	Correct structure identified
11	Correct structure identified
12	Correct location identified
13	Correct sequence identified
14	Learner has provided an accurate description of blood pressure and identified a normal reading in mmHg
15	Correct sequence identified
16	Correct structure identified
17	Learner has accurately described gas exchange process (minimum 80 words) including: a) Structures where gas exchange occurs b) Gasses being exchanged and conditions of gas exchange Role of haemoglobin described
18	Learner has described two (2) points to explain breathing rate increase with exercise
19	Four functions of muscles correctly identified
20	Descriptions for each role is provided (minimum 50 words)
21	Four muscles/muscle groups are identified relating to muscle roles and bent-over row
22	Four muscles/muscle groups are identified relating to muscle roles and barbell overhead press

IMPORTANT NOTE: Learners must achieve 20 out of 22 questions to pass this assessment.

If they get 20, 21, or 22, this will be graded as "100" in the LMS, if they get 19 or below, this will be graded as "0" in the LMS and then they just need to resubmit the questions to get them to at least 20/22.

Assessment Outline

This open book assessment is designed to assess your knowledge of the skeletal, nervous, cardiovascular and respiratory systems in relation to their structure and function.

Assessment Instructions

This test is comprised of twenty (22) multi-choice, short-answer, or multi-select questions. You must correctly answer 20 out of 22 questions to achieve this assessment.

Skeletal and joints

1) Describe the structure of the shoulder joint including the following details:

- Which kind of synovial joint it is
- The anatomical movements it can perform
- The three main bones that make up the joint

a) Ball and socket

b) The ball and socket joint can perform flexion, extension, rotation, circumduction, abduction, adduction (optional – horizontal adduction/abduction)

c) Humerus, clavicle, scapula

2) Pivot joints are another type of synovial joints found in in the body. In the space below, describe this type of joint with the following details:

- Identify the two (2) pivot joints in the body and name the two (2) articulating bones that make up each pivot joint.
- Briefly describe how the structure of the pivot joint affects the anatomical movements it can perform

a) The 2 pivot joints in the body: the one in the neck (in between C1 and C2) – students may call this the atlanto-axial joint. The other one is the radioulnar joint in the lower arm (students may note that there is a proximal and distal joint – either end of the arm) – this is between the radius and ulna

b) The way the pivot joint is made up constricts movement to one plane of motion (uni-planar). This is because one bone moves around in a rotational pattern, while the other remains stationary and acts as an axis. One bone sits inside the other.

3) The metacarpophalangeal joints (knuckles) are synovial joints - correctly identify the anatomical movements that can be performed by this type of joint as well as the synovial joint name. Select the best answer from the list below:

- abduction, adduction, extension, flexion, circumduction – Condylloid
- abduction, adduction, extension, flexion, circumduction – Hinge
- extension and flexion – Saddle
- abduction, adduction, extension, flexion – Condylloid

4) From the list below, correctly identify the anatomical movements that can be performed by a saddle joint:

- abduction, adduction, extension, flexion, circumduction
- abduction, adduction, extension, flexion, circumduction, rotation
- extension and flexion
- abduction, adduction, extension, flexion

5) Select two (2) sports/exercises from the list below that are high in strain frequency:

- a) Running
- b) Cycling
- c) Olympic weightlifting (5 sets of 3 repetitions)
- d) Set of 5 box jumps
- e) Water aerobics
- f) Basketball

Nervous system

6) Select the two (2) primary divisions of the nervous system according to the “hierarchy of the nervous system”:

- a) Sympathetic and Parasympathetic
- b) Sensory and Motor
- c) Central and Peripheral
- d) Brain and Spinal Cord

7) Which of the following functions is NOT a function of the nervous system:

- a) Protection (Reflexes)
- b) Structural Support
- c) Memory/Learning
- d) Control of the Internal Environment

8) Describe the role of the muscle spindle and provide an example of when this is used in an exercise context. (Minimum 50 words)

The muscle spindle is a receptor in the muscle that detects changes in length of the muscle. If the muscle changes in length (i.e stretched out) too quickly, it will send an impulse to the spinal cord, and this will cause the same muscle to contract. This is a reflex to avoid tearing of the muscle during sudden or unexpected stretching of a muscle, or even hyperextension of a joint.

Examples may include:

- Performing stretching movements such as cooling down at the end of a workout
- Performing sporting activities involving external force such as mixed martial arts
- Walking on uneven ground
- Changing direction quickly

9) Describe the role of the Golgi tendon organ and provide an example of when this is used in an exercise context. (Minimum 50 words)

The golgi tendon organ is another receptor in the muscle/tendon junction that detects changes in tension when force is produced. In an exercise context this acts as a reflex when too much tension is applied on a muscle to prevent tearing such as lifting heavy loads in exercises like bench presses and squatting. It is more likely to activate for newer lifters as their nervous and muscular systems have not adapted to lifting heavy loads.

Cardiovascular system

10) From the list below, identify the structure that de-oxygenated blood first enters when returning to the heart?

- a) Right ventricle
- b) Right pulmonary artery
- c) Left atrium
- d) Right atrium

11) Identify the vessel where blood flows away from the heart to the lungs

- a) Aorta
- b) Pulmonary arteries
- c) Pulmonary veins
- d) Pulmonary capillaries

12) Identify the location of the aortic valve from the descriptions below:

- a) Between the Right Ventricle and the Aorta
- b) Between the Aorta and the Coronary Arteries
- c) Between the Left Ventricle and the Aorta
- d) Between the Atrium and Ventricles

13) Correctly identify the sequence of systemic circulation

- a) Left ventricle → Aorta → arteries → veins → capillaries → vena cavae
- b) Left ventricle → Aorta → arteries → capillaries → veins → vena cavae
- c) Right ventricle → pulmonary trunk → arteries → pulmonary capillaries → veins → pulmonary veins
- d) Right ventricle → Aorta → arteries → capillaries → veins → vena cavae

14) Describe blood pressure:

- a) Provide a definition of blood pressure in your own words (minimum 20 words)
- b) Identify a normal reading for blood pressure at rest (systolic/diastolic mmHg)

Students may describe blood pressure using the following definition though it should be in their own words:

Blood pressure is the pressure of the circulatory blood against the walls of blood vessels. Systolic arterial pressure is the maximum pressure reached in the arteries during the ventricular contraction of the heartbeat. Diastolic pressure is the minimum pressure recorded just prior to ventricular contraction (resting phase) – systolic BP measured when the heart contracts, diastolic measured when heart is at rest.

A normal reading for blood pressure at rest is around 120/80mmHG in adults (120/75mmHg acceptable)

Respiratory system

15) From the list below, correctly identify the sequence of structures that air flows through when inhaling.

- a) Nasal cavity → Pharynx → Larynx → Trachea → Bronchus → Bronchioles → Alveoli
- b) Nasal cavity → Larynx → Pharynx → Trachea → Bronchus → Bronchioles → Alveoli
- c) Nasal cavity → Pharynx → Larynx → Trachea → Bronchioles → Bronchus → Alveoli
- d) Nasal cavity → Larynx → Pharynx → Trachea → Bronchioles → Bronchus → Alveoli

16) Which of the following structures are involved in pulmonary diffusion?

- a) Pulmonary arteries and alveoli
- b) Pulmonary capillaries and alveoli
- c) Carbon dioxide and capillaries
- d) Carbon dioxide and oxygen

17) Describe the process of gas exchange in the lungs including the following (minimum 120 words):

- a) Identify the structures where gas exchange occurs
- b) Identify which gasses are being exchanged and briefly describe how both gasses are exchanged at the structures you listed in (a). in your answer include the term partial pressure.
- c) Briefly describe the role of haemoglobin in this process

- a) Gas exchange in the lungs occurs between the alveoli (or alveolar sacs) and the pulmonary capillaries (capillaries is acceptable).
- b) The gasses that are being exchanged are oxygen (coming into the body) and carbon dioxide (leaving the body through exhalation). For oxygen to enter the capillaries, the partial pressure of oxygen must be higher in the alveoli than it is in the capillaries – this allows for simple diffusion to occur from the area of high to low pressure. The opposite occurs with carbon dioxide where carbon dioxide concentrations are higher in the capillaries and lower in the alveoli, this allows for carbon dioxide to cross the membrane into the alveoli and then get exhaled
- c) Haemoglobin is a large protein molecule that oxygen and carbon dioxide can bind to. Haemoglobin shuttles these gases around the body so they can reach their appropriate destination (oxygen to tissues/cells and the carbon dioxide is taken to the lungs for removal)

18) Provide two (2) points two explain why our breathing rate goes up when we start running. (Minimum 30 words)

- Point 1: When we start running our muscles demand more oxygen to perform aerobic respiration – to produce energy from the breakdown of glucose and fat.
- Point 2: During this process the cells produce carbon dioxide, this must be released through exhalation. To compensate our breathing rate goes up so we can consume more oxygen and release more CO₂

Muscular system

19) Identify the FOUR functions of muscles from the list below:

- a) Detoxification of metal
- b) Protection
- c) Waste removal
- d) Posture
- e) Movement
- f) Heat production
- g) Mineral storage

20) Provide a brief description of the following four muscle roles (minimum 50 words total):

- a) Agonist
- b) Antagonist
- c) Fixator
- d) Synergist

Muscles can play one or more of these four roles depending on the movement being performed. Sometimes there is not clear distinction between muscle roles and some overlap occurs.

- a) The agonist is the prime mover – the majority of force production is coming from this muscle.
- b) The antagonist is the opposition to the agonist – students may include the following in their answer:
 - it is the muscle lengthening or relaxing in a movement.
 - The antagonist also controls rapid movement – i.e puts on the brakes
 - If the antagonist muscle is very tight it can impair movement/range of motion able to be performed by the agonist around the main joint.
- c) The fixator is a stabiliser muscle – students may include one of the following points (in their own words):
 - it stabilises around the joint that is stationary in the movement
 - they are usually small muscles that stabilise around the shoulder and hip.
 - It stabilises the origin of the agonist.
 - They help the agonist by keeping the joint stable
- d) The synergist muscle assists the prime mover in producing force to help with the movement being performed.

21) Your client is performing a bent-over row in the gym – identify the muscles/muscle groups that perform each of these roles during this movement?

- a) Agonist
- b) Antagonist
- c) Fixator
- d) Synergist

Answers may slightly vary – tutors' discretion may be applied

- a) Agonist – trapezius, latissimus dorsi, rhomboids
- b) Antagonist – pectoralis major, anterior deltoid
- c) Fixator – rotator cuff group, rear deltoids, erector spinae
- d) Synergist – rear deltoid, biceps

22) Your client is performing a barbell overhead press in the gym – identify the muscles/muscle groups that perform each of these roles during this movement?

- a) Agonist
- b) Antagonist
- c) Fixator
- d) Synergist

Answers may slightly vary – tutors' discretion may be applied

- a) Agonist – deltoid group (anterior and medial deltoid), upper fibres of pectoralis major
- b) Biceps, rear deltoids
- c) Rotator cuff group
- d) Triceps