# NCFE Level 1/2 Technical Award in Health and Fitness (603/2650/5)

Unit 01 Introduction to body systems and principles of training in health and fitness

Paper number: P001401

March 2022

## Mark Scheme

This mark scheme has been written by the Assessment Writer and refined, alongside the relevant questions, by a panel of subject experts through the external assessment writing process and at standardisation meetings.

The purpose of this mark scheme is to give you:

- examples and criteria of the types of response expected from a learner
- information on how individual marks are to be awarded
- the allocated assessment objective(s) and total mark for each question.

# Marking guidelines

*General guidelines*

You must apply the following marking guidelines to all marking undertaken throughout the marking period. This is to ensure fairness to all learners, who must receive the same treatment. You must mark the first learner in exactly the same way as you mark the last.

- The mark scheme must be referred to throughout the marking period and applied consistently. Do not change your approach to marking once you have been standardised.
- Reward learners positively giving credit for what they have shown, rather than what they might have omitted.
- Utilise the whole mark range and always award full marks when the response merits them.
- Be prepared to award zero marks if the learner's response has no creditworthy material.
- Do not credit irrelevant material that does not answer the question, no matter how impressive the response might be.
- The marks awarded for each response should be clearly and legibly recorded in the grid on the front of the question paper.
- If you are in any doubt about the application of the mark scheme, you must consult with your Team Leader or the Chief Examiner.

*Guidelines for using extended response marking grids*

Extended response marking grids have been designed to award a learner's response holistically and should follow a best-fit approach. The grids are broken down into levels, with each level having an associated descriptor indicating the performance at that level. You should determine the level before determining the mark.

When determining a level, you should use a bottom up approach. If the response meets all the descriptors in the lowest level, you should move to the next one, and so on, until the response matches the level descriptor. Remember to look at the overall quality of the response and reward learners positively, rather than focussing on small omissions. If the response covers aspects at different levels, you should use a best-fit approach at this stage and use the available marks within the level to credit the response appropriately.

When determining a mark, your decision should be based on the quality of the response in relation to the descriptors. You must also consider the relative weightings of the assessment objectives, so as not to over/under credit a response. Standardisation materials, marked by the Chief Examiner, will help you with determining a mark. You will be able to use exemplar learner responses to compare to live responses, to decide if it is the same, better or worse.

You are reminded that the indicative content provided under the marking grid is there as a guide, and therefore you must credit any other suitable responses a learner may produce. It is not a requirement either, that learners must cover all of the indicative content to be awarded full marks.

# Assessment objectives

This unit requires learners to:

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| **AO1** | Recall knowledge and show understanding. |
| **AO2** | Apply knowledge and understanding. |
| **AO3** | Analyse and evaluate knowledge and understanding. |

The weightings of each assessment objective can be found in the qualification specification.

| Qu | Mark scheme | Total marks |
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**Section 1** **Total for this section: 8 marks**

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| **1** | **Which** one **of the following muscles is located on the upper back and neck?**<br><br>Answer: D (Trapezius) | **1**<br><br>**AO1=1** |
| **2** | **Which** one **of the following regions of the spine is positioned** directly **below the thoracic region?**<br><br>Answer: C (Lumbar) | **1**<br><br>**AO1=1** |
| **3** | **Which** one **of the following is a health-related component of fitness?**<br><br>Answer: B (Flexibility) | **1**<br><br>**AO1=1** |
| **4** | **Which** one **of the following is a short-term effect of exercise?**<br><br>Answer: A (Increased muscle fatigue) | **1**<br><br>**AO1=1** |
| **5** | **Which** one **of the following is a fixed joint?**<br><br>Answer: C (Pelvis) | **1**<br><br>**AO1=1** |
| **6** | **Which** one **of the following is the calculation for cardiac output (CO)?**<br><br>Answer: C (CO = SV x HR) | **1**<br><br>**AO1=1** |

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| **7** | **Which** one **of the following heart chambers receives oxygenated blood from the left atrium?**<br><br>Answer: A (Left ventricle) | **1**<br><br>**AO2=1** |

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| **8** | **Which** one **of the following activities would be suited to Type 1 slow twitch muscle fibres?**<br><br>Answer: C (Jogging for one mile) | **1**<br><br>**AO2=1** |

**Section 2** **Total for this section: 51 marks**

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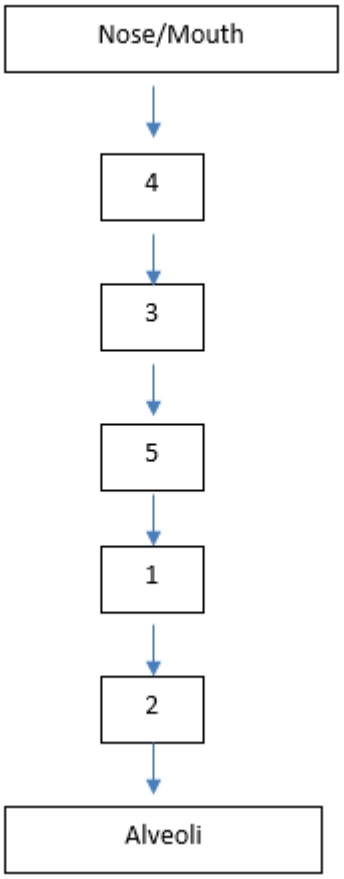
| **9 (a)** | **Complete** Figure 1 **to show the pathway of air through the respiratory system.**<br><br>**Write the numbers from the list below in the boxes to show the correct order of the pathway.**<br><br>**1. Bronchi**<br>**2. Bronchioles**<br>**3. Larynx**<br>**4. Pharynx**<br>**5. Trachea**<br><br>Award one mark for correct placement of positions 1-5, up to a maximum of five marks.<br><br>**Figure 1**<br>  <br> | **5**<br><br>**AO1=5** |

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| **9 (b)** | **Explain the process of diffusion during gaseous exchange at the alveoli.**<br><br>Award up to four marks for explaining the process of diffusion and gaseous exchange at the alveoli.<br><br>• High concentration levels of oxygen in the alveoli diffuse into the blood capillaries (1) where there is a lower concentration of oxygen (1)<br>• High concentration levels of carbon dioxide in the blood capillaries diffuse into the alveoli (1) where there is a lower concentration of carbon dioxide (1).<br><br>Credit other suitable responses. | **4**<br><br>**AO2=4** |

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| **9 (c)** | **State what happens to tidal volume during exercise.**<br><br>**Give** two **reasons for this.**<br><br>Award one mark for what happens to tidal volume during exercise.<br><br>• It increases (1)<br><br>Award up to two further marks for reasons for this.<br><br>• The depth of breathing increases (1)<br>• The rate of breathing increases (1).<br><br>Credit other suitable responses.<br><br>**NB** If 0 marks are awarded for the first part of the response, 0 marks can be awarded for the justification. | **3**<br><br>**AO1=1**<br><br>**AO2=2** |

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| **10 (a)** | **State the** main **function of skeletal muscle.**<br><br>Award one mark for stating the main function of skeletal muscle.<br><br>• Posture (1)<br>• Balance (1)<br>• Movement (1)<br><br>Credit other suitable responses. | **1**<br><br>**AO1=1** |

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| **10 (b)** | **Describe the role of an antagonist muscle.**<br><br>Award one mark for describing the role of an antagonist muscle.<br><br>• It relaxes (to allow the agonist muscle to contract) (1). | **1**<br><br>**AO1=1** |

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| **10 (c)** | **Complete** Table 1 **by identifying the antagonist muscle for the different body actions.**<br><br>Award one mark for each of the following answers.<br><br>Table 1<br><br>| Body action | Antagonist muscle |<br>\|---\|---\|<br>\| **Extension of knee** \| • **Hamstrings (1)** \|<br>\| **Flexion of elbow** \| • **Triceps (1)** \| | **2**<br><br>**AO2=2** |

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| **11** | Figure 2 **shows a knee joint with two of its structures identified.**<br><br>**Identify** three other **structures of the knee joint** and **explain how** each **structure could improve performance in health and fitness activities.**<br><br>Award one mark for each structure identified and one mark for each explanation.<br><br>• Articulating cartilage (1) prevents the bones rubbing together which allows movement and participation in activities pain free (1)<br>• Ligaments (1) join bone to bone which strengthen joints which allows individuals to turn/change direction quickly with a strong base (1)<br>• Tendons (1) join muscle to bone so helps produce movement at the knee that enables individuals to run/jump and travel in many ways (1)<br>• Synovial fluid (1) lubricates the joint reducing friction and wear which enables an individual to move freely (1).<br><br>Credit other suitable responses. | **6**<br><br>**AO1=3**<br><br>**AO3=3** |

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| **12 (a)** | **Identify the type of strength needed for the individual to get from** Position A **to** Position B **in** Figure 3.<br><br>**Justify your answer.**<br><br>Award one mark for the identification of the type of strength and two marks for the justification.<br><br>• Explosive (1)<br>• Strength is being exerted at speed (1)<br>• Strength is being exerted at maximal force (1). | **3**<br><br>**AO2=1**<br><br>**AO3=2** |

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| | **NB** If 0 marks are awarded for the identification of the type of strength, 0 marks can be awarded for the justification. | |

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| **12 (b)** | **Identify the type of strength that is needed for the individual to hold** Position B **in** Figure 3**.**<br><br>**Justify your answer.**<br><br>Award one mark for the identification of the type of strength and two marks for the justification.<br><br>• Static (1)<br>• Length of the muscle is not changing (1)<br>• No visible movement at a joint (1).<br><br>**NB** If 0 marks are awarded for the identification of the type of strength, 0 marks can be awarded for the justification. | **3**<br><br>**AO2=1**<br><br>**AO3=2** |

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| **13** | **Define muscular endurance** and **speed** and **give** one **example of when you would use** each **in a health and fitness activity.**<br><br>Award one mark for the definition and one mark for an example.<br><br>• Muscular endurance- the ability of a muscle (or muscle groups) to undergo repeated contractions avoiding fatigue (1) for example an individual completing 30 press ups (1)<br>• Speed- the maximum rate at which an individual is able to perform a movement or cover a distance in a period of time (1) for example an individual sprinting 100m (1).<br><br>Credit other suitable responses.<br><br>**NB –** if a sporting example is provided, it must be a specific example that is relevant. Identifying a sport e.g. gymnastics should not be awarded. Only health and fitness activities suitable for muscular endurance and speed should be credited**.** | **4**<br><br>**AO1=2**<br><br>**AO2=2** |

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| **14** | **Aerobic and anaerobic energy systems provide us with energy to participate in health and fitness activities.**<br><br>**Complete** Table 2 **to identify** one **activity suitable for** each **energy system.**<br><br>**Give** two **justifications how the activity you have identified is suitable for the energy system.**<br><br>Award one mark for the identification of a suitable health and fitness activity and two marks for reasons for these. | **6**<br><br>**AO2=2**<br><br>**AO3=4** |

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| | <table><tr><th>Energy system</th><th>Activity suitable for the energy system</th><th>Justification</th></tr><tr><td>Aerobic</td><td>Long distance running (1)</td><td>1. It is more than a minute long (1)<br>2. It is oxygen dependent (1)</td></tr><tr><td>Anaerobic</td><td>Sprinting (1)</td><td>1. It is a short duration activity between 1 and 60 seconds (1)<br>2. It is not dependent on oxygen (1)</td></tr></table><br>Credit other suitable responses. Accept suitable sporting examples where learners provide these.<br><br>**NB** If 0 marks are awarded for the activity, 0 marks can be awarded for the justification. | |

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| **15** | **Muscle attachment is a major function of bones in the skeleton. Below are three different types of bones:**<br><br>• **Long bone**<br>• **Sesamoid bone**<br>• **Irregular bone**<br><br>**Identify** one **example of** each **bone** and **describe a function of that bone** other **than muscle attachment.**<br><br>Award one mark for each example identified and one mark for the function.<br><br>Long bone<br>• Femur, humerus, tibia (1)<br>• Produce large body movement, support the weight of the body (1)<br>Sesamoid<br>• Patella (1)<br>• Reinforce and decrease the stress on a tendon, protection of the knee joint (1)<br>Irregular bones<br>• Vertebrae (1)<br>• Protect vital organs (1)<br><br>Credit other suitable responses. | **6**<br><br>**AO1=6** |

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| **16** | **Identify** one **example of an eccentric muscle action from a health and fitness activity.** | **3**<br><br>**AO2=1** |

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| | **Justify your answer.**<br><br>Award one mark for the identification of an example of an eccentric muscle action and two marks for the justification.<br><br>• Downward phase of a bicep curl (1)<br>• The agonist (biceps) is contracting and lengthening (1)<br>• The force (weight) applied to the muscle exceeds the force produced by the muscle itself (1).<br><br>Credit other suitable responses.<br><br>**NB** If 0 marks are awarded for the identification of an example of an eccentric muscle action, 0 marks can be awarded for the justification. | **AO3=2** |

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| **17** | **Describe the following principles of training:**<br><br>• **Progression**<br>• **Reversibility.**<br><br>Award up to two marks for each description. *One mark should be awarded for the correct **description** of the principle of training, One mark should be awarded for the **output/impact**.*<br><br>Progression<br>• Gradually increase the intensity of training *(description)* (1) to allow the body to adapt and improve fitness slowly *(output/impact)* (1)<br><br>Reversibility<br>• Do not stop or reduce training levels *(description)* (1) to avoid a drop in fitness or performance levels *(output/impact)* (1). | **4**<br><br>**AO1=4** |

**Section 3** **Total for this section: 21 marks**

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| **18** | **Analyse how an individual could use the FITT (Frequency, Intensity, Time, and Type) principles to improve their performance in a 5km run.**<br><br>**Level** \| **Marks** \| **Description**<br>3 \| 5–6 \| A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout. | **6**<br><br>**AO1=2**<br><br>**AO2=2**<br><br>**AO3=2** |

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| | | | Application of knowledge and understanding is appropriate, with clear relevance to the context.<br><br>Analysis and evaluation are present and very effective. The conclusions drawn are fully supported by judgements. |
| | 2 | 3–4 | A range of relevant knowledge and understanding is shown, but may be lacking in sufficient detail, with a few errors. Subject specific terminology is used, but not always consistently.<br><br>Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors.<br><br>Analysis and evaluation are present and effective but may be lacking appropriate development. There are attempts to draw conclusions, which are supported by judgements, but it is likely that some will be irrelevant. |
| | 1 | 1–2 | A limited range of relevant knowledge and understanding is shown but is often fragmented. Subject specific terminology, if used, is often inappropriate and a lack of understanding is evident.<br><br>Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors.<br><br>Analysis and evaluation, if present, is of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant. |
| | | 0 | No relevant material |

**Indicative content**

Frequency - refers to how often someone trains

- To help improve fitness an individual could increase the number of times per week that they train, for example, from 3 times to 4 times per week
- As the individual's fitness improves their body will be able to cope with more training sessions per week
- This increased level of fitness could result in a faster time in the 5km run as their body can cope with running faster.

Intensity - refers to how hard someone trains

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| | • To help improve fitness an individual could increase the intensity of the training sessions<br>• This could involve running at a faster pace/running further distances throughout sessions to develop aerobic fitness<br>• Training at faster paces could lead to an individual being able to then repeat this and run a faster time in a 5km run<br>• Training at greater distances would then mean that an individual would have no problem in coping with a 5km run so their time could improve.<br>Time - refers to how long someone trains for<br>• To help improve fitness an individual could increase the length of their training sessions, for example, 30 minutes to 45 minutes<br>• This will allow an individual's fitness to develop and cope with exercising for longer periods of time.<br>Type - refers to the type of training used<br>• The training being carried out must be suitable to gain specific fitness benefits that are required<br>• The individual could focus their training on continuous running, fartlek training, interval training or circuit training which focussed on aerobic fitness<br>• By developing aerobic fitness then an individual's time at a 5km run could be reduced.<br><br>Other suitable responses must be awarded credit. | |

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| **19** | **Explain how the structure and function of arteries and veins help an individual taking part in health and fitness activities.**<br><br>**Level** / **Marks** / **Description**<br>3 / 5–6 / A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout.<br><br>Application of knowledge and understanding is appropriate, with clear relevance to the context.<br><br>Analysis and evaluation are present and very effective. The conclusions drawn are fully supported by judgements.<br>2 / 3–4 / A range of relevant knowledge and understanding is shown, but may be lacking in sufficient detail, with a few errors. Subject specific terminology is used, but not always consistently. | **6**<br><br>**AO1=2**<br><br>**AO2=2**<br><br>**AO3=2** |

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| | | Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors.<br><br>Analysis and evaluation are present and effective but may be lacking appropriate development. There are attempts to draw conclusions, which are supported by judgements, but it is likely that some will be irrelevant. |
| 1 | 1–2 | A limited range of relevant knowledge and understanding is shown but is often fragmented. Subject specific terminology, if used, is often inappropriate and a lack of understanding is evident.<br><br>Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors.<br><br>Analysis and evaluation, if present, are of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant. |
| | 0 | No relevant material |

**Indicative content**

Arteries

- Thick, muscular walls
- Carry blood away from the heart to the body
- Carry oxygenated blood
- Carry blood under high pressure
- Their main role is to pump oxygenated blood around the body to the parts of the body that need it most
- When taking part in health and fitness activities the arteries transport blood to the muscles that are exercising
- Small arteries can widen (vasodilation) to allow more blood to flow to these working muscles
- At the same time, less blood will be directed to other parts of the body where demand is not great. This is called the vascular shunt mechanism
- This allows the body to move and exercise in health and fitness activities and if the oxygenated blood was not getting to the muscles the individual would have to stop exercising.

Veins

- Thin walls
- Contain valves to ensure blood flows in one direction
- Carry blood to the heart
- Carry deoxygenated blood

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| | • Carry blood under low pressure<br>• The veins help with exercise as they carry carbon dioxide and waste products to the lungs so they can be breathed out of the body<br>• If carbon dioxide was not removed, then an individual would not be able to exercise.<br><br>Other suitable responses must be awarded credit. | |

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| **20** | **Analyse how the functions of the skeletal system help an individual when they are participating in health and fitness activities.** | **9**<br><br>**AO1=3**<br><br>**AO2=3**<br><br>**AO3=3** |

| Level | Marks | Description |
|---|---|---|
| 3 | 7–9 | A wide range of relevant knowledge and understanding is shown, which is accurate and detailed. Subject specific terminology is used consistently throughout.<br><br>Application of knowledge and understanding is appropriate, with clear relevance to the context.<br><br>Analysis and evaluation are present and very effective. The conclusions drawn are fully supported by judgements. |
| 2 | 4–6 | A range of relevant knowledge and understanding is shown, but may be lacking in sufficient detail, with a few errors. Subject specific terminology is used, but not always consistently.<br><br>Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors.<br><br>Analysis and evaluation are present and effective but may be lacking appropriate development. There are attempts to draw conclusions, which are supported by judgements, but it is likely that some will be irrelevant. |
| 1 | 1–3 | A limited range of relevant knowledge and understanding is shown but is often fragmented. Subject specific terminology, if used, is often inappropriate and a lack of understanding is evident. |

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| | | Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors.<br><br>Analysis and evaluation, if present, are of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant. |
| | 0 | No relevant material |

**Indicative content**

Support

- Bones are solid and rigid
- They keep us upright and hold the rest of the body, muscles, and organs, in place
- This helps us with our posture
- Good posture allows the muscles to work efficiently so technique of an action will be of a high standard
- Good posture places the body in a position where the stress on supporting ligaments, tendons, and muscles is limited
- Poor posture means the muscles are unable to work properly which means an individual may develop an injury
- Good posture allows the muscles to work efficiently so they fatigue less quickly.

Shape

- The skeleton gives us our general shape, such as height and build
- Tall people have longer bones, and larger vertebrae
- People with a heavy build have larger clavicles and bigger pelvises
- Your shape could affect the type of somatotype an individual is
- Somatotype could affect which activities an individual participates in, for example, mesomorph may be suited to CrossFit
- Shape or somatotype may help an individual to perform better in a particular activity, for example, ectomorph may perform better at long-distance running.

Protection of vital organs

- Certain parts of the skeleton surround and protect the body's organs from external forces, for example, the brain is protected by the cranium and the heart and lungs are protected by the ribs
- This helps individuals when they are taking part in contact activities, for example boxing/rugby
- Prevents serious injury which allows an individual to participate in these type of activities.

Storage of minerals

- Bone stores several minerals including calcium

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| | • Calcium helps to keep bones strong which helps the body to keep its structure<br>• Strong bones allow the body to take part in vigorous and contact activities without the fear of breaking easily<br>Blood cell production<br>• The inner marrow of bones produces red and white blood cells<br>• Red blood cells are important in activities because they carry oxygen to the working muscles<br>• This allows the body to take part in health and fitness activities for long periods of time<br>• White blood cells are important to fight off infections in order to keep the body healthy<br>• If an individual is free from illness, then they are able to participate in health and fitness activities more easily.<br>Movement<br>• The skeleton allows movement of the whole body, or individual parts.<br>• The bones form joints to act as levers, enabling movement as muscles pull on the bones to produce movement.<br>• Bones within the skeleton provide an attachment site for muscles.<br>• Movement allows for participation in health and fitness activities.<br><br>Other suitable responses must be awarded credit. | |

## Assessment Objective Grid

| Question | AO1 | AO2 | AO3 | Total |
|---|---|---|---|---|
| 1 | 1 | | | 1 |
| 2 | 1 | | | 1 |
| 3 | 1 | | | 1 |
| 4 | 1 | | | 1 |
| 5 | 1 | | | 1 |
| 6 | 1 | | | 1 |
| 7 | | 1 | | 1 |
| 8 | | 1 | | 1 |
| 9a | 5 | | | 5 |
| 9b | | 4 | | 4 |
| 9c | 1 | 2 | | 3 |
| 10a | 1 | | | 1 |
| 10b | 1 | | | 1 |
| 10c | | 2 | | 2 |
| 11 | 3 | | 3 | 6 |
| 12a | | 1 | 2 | 3 |
| 12b | | 1 | 2 | 3 |
| 13 | 2 | 2 | | 4 |
| 14 | | 2 | 4 | 6 |
| 15 | 6 | | | 6 |
| 16 | | 1 | 2 | 3 |
| 17 | 4 | | | 4 |
| 18 | 2 | 2 | 2 | 6 |
| 19 | 2 | 2 | 2 | 6 |
| 20 | 3 | 3 | 3 | 9 |
| **Total** | **36** | **24** | **20** | **80** |