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

March 2019

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

Mark Scheme

V2.1 Post-standardisation

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 relevant 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. 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:

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.

Question Number	Mark scheme	Marks

Section 1 **Total for this section: 8 marks**

1	**What type of bone is a rib?** Answer: **A** (Flat)	**1** **AO1=1**
2	**What is the function of a tendon at a joint?** Answer: **A** (To attach muscles to bones)	**1** **AO1=1**
3	**Which** one **of the following muscles is in the lower leg?** Answer: **D** (Soleus)	**1** **AO1=1**
4	**What is tidal volume?** Answer: **B** (The amount of air that enters the lungs during normal inspiration at rest)	**1** **AO1=1**
5	**Veins are one type of blood vessel in the human body.** **Which** one **of the following statements is** true**?** Answer: **B** (Veins carry blood towards the heart)	**1** **AO1=1**
6	**Chloe is 41 years old.** **Which** one **of the following would be her predicted maximum heart rate (MHR)?** Answer: **C** (179)	**1** **AO2=1**
7	**Which** one **of the following is the calculation for cardiac output (CO)?** Answer: **C** (CO = SV x HR)	**1** **AO1=1**

8	**Which** one **of the following heart chambers receives deoxygenated blood from the vena cava?** Answer: **C** (Right atrium)	**1** **AO2=1**

Question Number	Mark scheme	Marks

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

9	**The human skeleton can be divided into two.** **Name** two **bones that are in the appendicular skeleton.** Award one mark for each bone, up to a maximum of two marks. • Carpals (1) • Clavicle (1) • Femur (1) • Fibula (1) • Humerus (1) • Pelvis (1) • Phalanges (1) • Radius (1) • Scapula (1) • Tarsals (1) • Tibia (1) • Ulna (1) Credit other suitable responses.	**2** **AO1=2**

10 (a)	**Define the term 'joint'.** Award one mark for the correct definition of a joint. • A joint is where two (or more) bones meet (1). Credit other suitable responses.	**1** **AO1=1**

10 (b)	**State** three **different types of synovial joints.** Award one mark for each different type of synovial joint, up to a maximum of three marks. • Ball and socket (1) • Condyloid (1) • Gliding (1) • Hinge (1) • Pivot (1) • Saddle (1)	**3** **AO1=3**

10 (c)	Figure 1 **shows scoliosis of the spine.** **Is this statement true** or **false?** Award one mark for the correct response. • True (1)	**1** **AO3=1**

11 (a)	**Define the term 'agonist'.** Award one mark for a correct definition of agonist. • The agonist is the muscle that contracts/shortens (1). Credit other suitable responses.	**1** **AO1=1**

11 (b)	Figure 2 **shows two movements (**A **and** B**) that occur at the hip.** **Identify the joint action of the** hip **in movement** A and **movement** B**.** Award one mark for each of the following answers. **A** = Abduction (1) **B** = Adduction (1)	**2** **AO2=2**

11 (c)	Figure 3 **shows an individual performing a squat.** **Use** Figure 3 to **complete** Table 1. **Identify the** antagonist muscle **in the movement at the** knee **from position** A **to position** B and **from position** B **to position** C**.** Award one mark for each of the following answers. **Examiner Guidance:** Also credit if Hamstrings (1) is provided for A to B.	**2** **AO2=2**

	A to **B**	**B** to **C**
Antagonist muscle	Quadriceps (1)	Hamstrings (1)

11 (d)	Figure 4 **shows an individual performing a plank.** **Identify the type of muscle contraction occurring in** Figure 4**.** **Justify your choice.** Award one mark for the identification of the type of muscle contraction and one mark for the justification. • Isometric (1) • The muscles are contracting but they are staying the same length (1). Credit other suitable responses. **Examiner Guidance:** If muscle contraction is incorrect, but definition correct, 0 marks to be awarded.	**2** **AO2=1** **AO3=1**

12 (a)	Figure 5 **shows structures in the respiratory system.** **Identify the structures of the respiratory system labelled** A**,** B **and** C **in** Figure 5**.** Award one mark for each of the following answers. **A** = Larynx (1) **B** = Trachea (1) **C** = Bronchi (1)	**3** **AO1=3**

12 (b)	**Outline the structure of alveoli** and **explain how the structure helps them perform their function.** Award **two marks** for an outline of the structure and two marks for an explanation of how the structure helps the function. Structure • Alveoli have very thin walls (one cell thick) (1) and have a moist lining (1). Alveoli has a large surface area (1). Function • Location for Gaseous exchange to occur in the lungs (1) as it allows oxygen and carbon dioxide to be diffused more easily (1). Credit other suitable responses. **Examiner Guidance:** If 0 marks are awarded for responses relating to the structure, 0 marks can be awarded for the function element.	**4** **AO1=2** **AO3=2**

13 (a)	**Identify the type of muscular strength that is needed to perform a standing vertical jump.** **Justify your choice.** Award one mark for identifying the type of strength and one mark for the justification. • Explosive (1) • Strength needs to be exerted at speed to jump higher (1). Credit other suitable responses. **Examiner Guidance:** If type of muscle strength is incorrect, but definition correct, 0 marks to be awarded.	**2** **AO2=1** **AO3=1**

13 (b)	**Define 'balance' and 'agility'** and **give** one **example of when you would use each in a health and fitness activity.** Award one mark for the definition and one mark for an example. • Balance – the maintenance of the centre of mass over the base of support (1) for example, an individual holding a stork stand (1). • Agility – the ability to move and change direction quickly while maintaining control (1) for example, an individual turning quickly when doing shuttle runs (1). Credit other suitable responses.	**4** **AO1=2** **AO2=2**

14 (a)	**Define 'vasodilation' and 'vasoconstriction'.** Award one mark for each correct definition. • Vasodilation – the widening of blood vessels (1). • Vasoconstriction – the narrowing of blood vessels (1). Credit other suitable responses.	**2** **AO1=2**

14 (b) (i)	**Outline the vascular shunt process.** Award up to two marks for outlining the vascular shunt process. • Blood redistribution to the muscles with greater demand (1), while diverting away from areas of lower demand (1). Credit other suitable responses.	**2** **AO1=2**

14 (b) (ii)	**Give** two **ways that the vascular shunt process helps an individual doing health and fitness activities.** Award one mark for each way that the vascular shunt process helps an individual taking part in health and fitness activities. • This extra blood helps warm the muscles up so helps prevent injury (1). • It also provides more oxygen to the working muscles, which can be used for energy (1). Credit other suitable responses.	**2** **AO3=2**

15 (a)	**Smooth muscle is a type of muscle in the body.** **State the other** two **types of muscle** and **describe how their function in the body helps an individual doing health and fitness activities.** Award two marks for each type of muscle correctly stated and two further marks for descriptions of their function in the body when taking part in health and fitness activities. • Cardiac (1) aids blood flow through the heart, which provides the oxygen for the body to exercise (1). • Skeletal (1) contract to move bones in our body during health and fitness activities (1). Credit other suitable responses.	**4** **AO1=2** **AO2=2**

15 (b)	**Identify a health and fitness activity that would be suited to the following muscle fibre types.** • **Type 1 slow twitch fibres** • **Type 2 fast twitch fibres** **Justify your choices.** Award one mark for each suitable health and fitness activity identified and two marks for justifications of these. Type 1 slow twitch fibres • Activity – long distance running (1) • Justification – they are resistant to fatigue and are capable of producing repeated slow contractions, which are needed for long distance running (1). Type 2 fast twitch fibres • Activity – jumping (1) • Justification – they produce fast contractions, which are needed to jump quickly as part of a circuit training session (1). Credit other suitable responses.	**4** **AO2=2** **AO3=2**

16 (a)	**Heart rate, stroke volume and cardiac output all increase during health and fitness activities.** **State** three **other short-term effects of health and fitness activities** and **explain why these occur.** Award one mark for each short-term effect stated and one mark for explaining how each of these could occur (3x3). • Breathing rate increases (1) as the body's muscles need more oxygen (1). • Blood pressure increases (1) as the heart is forcing more blood out to the muscles (1). • Body temperature increases (1) as 70% of the energy that powers muscles during exercise is lost as heat (1). • Hydration levels decrease (1) as the body starts to sweat so bodily fluid is lost (1). • Muscle fatigue occurs (1) as they start to build up lactic acid (1). • Delayed onset of muscle soreness (DOMS) occurs (1) as small muscle fibres are torn as a result of exercise (1). Credit other suitable responses.	**6** **AO1=3** **AO2=3**

16 (b)	**Explain** four **possible long-term effects on the body if an individual does light intensity cardiovascular training over a period of 6 months.** Award one mark for each possible long-term effect on an individual if they undertake light intensity cardiovascular training over a period of six months, up to a maximum of four. The response must include the reason for the change. • Body shape may change and they could become more of an ectomorph (1). • Cardiovascular endurance could increase which means they will be able to run further or longer (1). • Muscular endurance could increase due to the repeated use of the same muscles (1). • Increase in the size of the heart (hypertrophy) due to the heart having to work harder on a regular basis (1). • Lower blood pressure as the regular exercise increases the size of your heart so more blood can be pumped out per beat (1). • Lower resting heart rate (bradycardia) could occur as regular exercise strengthens your heart, trains it to pump more blood per contraction, and ultimately leads to a slower resting heart rate (1). • More red blood cells will be made in the blood in response to the regular exercise (1). Credit other suitable responses.	**4** **AO3=4**

Question Number	Mark scheme	Marks

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

17 **Evaluate the importance of the principles of training in health and fitness activities designed to improve muscular strength.**

6

AO1=2

AO2=2

AO3=2

Level	Marks	Description
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. Application of knowledge and understanding is appropriate, with clear relevance to the context. Analysis and evaluation is 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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors. Analysis and evaluation is 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. Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors. 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

- Specificity – the health and fitness activities need to be specific to the parts of the body where an individual wants to improve muscle strength.
  - Therefore, health and fitness activities need to take into account what muscular strength the individual wants to improve.
  - The health and fitness activities also need to link to which type of strength (dynamic, explosive, static) the individual wants to improve.
- Progression – the health and fitness activities need to gradually progress and become harder.
  - It is important that the activities do not increase too much, too fast. If this happens injury or burn out could occur.
- Overload involves working harder than normal.
  - This can be achieved by:
    - increasing the frequency (how many times a week you train)
    - increasing the intensity (how hard you train)
    - increasing the time (how long you train for).
  - All of these can be increased during health and fitness training activities so that an individual will see increased muscular strength.
  - If the body does not work harder than normal them improvements in muscular strength may not occur.
- Reversibility – if training is stopped then any gains made through health and fitness activities will be lost.
  - There should be no long breaks in the activities otherwise muscle strength will be lost.
  - This will mean that training might not be relevant to the strength of the individual.
- Tedium – the health and fitness activities need to be varied to prevent boredom.
  - The exercises should be changed regularly otherwise the individual may become demotivated due to boredom.
  - This may mean they give up/don't try as hard which will mean that muscle strength will be lost.

- It is important that all principles of training are applied to health and fitness activities to improve muscular strength or it may not improve.
- A suitable level of progression could be applied, but if the activities are not specific to the individual then it is irrelevant.
- The activities could be specific to the individual, but if the overload that is applied is too little or too much then improvements in muscular strength will not be seen.
- Therefore, one principle of training is no more important than another as they are all linked together.

Other suitable responses must be awarded credit.

18	**Lily is completing a 10 km run in 4 months' time. Her personal best for 10 km is 60 minutes and she wants to complete this run in less than 55 minutes.** **Identify the components of** health-related fitness **that Lily will have to develop to try and achieve this. Justify your choices.**	**6** **AO1=2** **AO2=2** **AO3=2**

Level	Marks	Description
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. Application of knowledge and understanding is appropriate, with clear relevance to the context. Analysis and evaluation is 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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors. Analysis and evaluation is 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. Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors. 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
	
	• Cardiovascular endurance – the ability of the heart and lungs to supply oxygen to the working muscles.
	  o If Lily improves this, it will mean that she can perform aerobically for the whole run.
	  o This will mean that she will have a supply of energy.
	  o Therefore, fatigue will be delayed and she will be able to run a faster time.
	• Muscular endurance – the ability of a muscle or muscle group to undergo repeated contractions avoiding fatigue.
	  o If Lily improves her muscular endurance in her legs it will enable them to work for longer without fatigue.
	  o This will result in her time becoming faster as they can work at a higher intensity for longer.
	• Body composition – a comparison of the percentages of bone, fat, water and muscle within the body.
	  o If Lily trains to lose fat and develop muscle this could improve the strength in her legs.
	  o Greater muscle levels will help with muscular endurance.
	  o Lower fat levels will mean that Lily has less weight to carry her around as she runs. This will mean that she will find running easier and could run a faster time.
	• Flexibility – the range of movement possible at a joint.
	  o If Lily increased the range of movement at her hips/knees it could lead to her increasing her stride length.
	  o Increased stride length will mean Lily will cover more ground with each stride and this will reduce her overall time.
	
	Other suitable responses must be awarded credit.	

19	**Jacob is performing a series of runs as part of a health and fitness session. Jacob has to run for 60 seconds on 10 occasions and will have 60 seconds rest in between each run.** **Discuss whether the aerobic** or **anaerobic energy system will be the most important for Jacob when he is doing this series of runs.**	**9** **AO1=3** **AO2=3** **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. Application of knowledge and understanding is appropriate, with clear relevance to the context. Analysis and evaluation is 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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors. Analysis and evaluation is 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. Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors. 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 • The aerobic energy system is when energy is supplied by breaking down food (mainly glucose) using oxygen. • Glucose + oxygen → energy + carbon dioxide + water. • It is used over longer periods of time (1 min +). • This happens at low to moderate levels of exercise such as walking and jogging. • If Jacob completes his runs at a low to moderate intensity then he will be using the aerobic system. • As Jacob will also be working over a period of 20 minutes including rests then his aerobic system will be his main energy source. • The anaerobic energy system is used when the energy needed for exercise is provided without being dependent on oxygen. • Glucose → energy + lactic acid • It is used for activities lasting less than a minute. • This happens during high intensity exercise such as sprinting. • If Jacob works at a high intensity such as sprinting then it may result in his anaerobic system being the main energy source. • As the runs are only 60 seconds then it is possible for the energy to be supplied anaerobically. • However, these high-intensity exercises produce lactic acid as a waste product. • The aerobic energy system becomes important in helping to remove this lactic acid. This will supply the energy when recovering from this strenuous activity during the rest periods allowing the lactic acid to be removed from the body. • This reduces fatigue as the lactic acid is removed from the body. Other suitable responses must be awarded credit.	

Assessment Objective Grid

Question	AO1	AO2	AO3	Total
Section 1				
1	1			1
2	1			1
3	1			1
4	1			1
5	1			1
6		1		1
7	1			1
8		1		1
Total	**6**	**2**	**0**	**8**
Section 2				
9	2			2
10(a)	1			1
10(b)	3			3
10(c)			1	1
11(a)	1			1
11(b)		2		2
11(c)		2		2
11(d)		1	1	2
12(a)	3			3
12(b)	2		2	4
13(a)		1	1	2
13(b)	2	2		4
14(a)	2			2
14(b)(i)	2			2
14(b)(ii)			2	2
15(a)	2	2		4
15(b)		2	2	4
16(a)	3	3		6
16(b)			4	4
Total	**23**	**15**	**13**	**51**
Section 3				
17	2	2	2	6
18	2	2	2	6
19	3	3	3	9
Total	**7**	**7**	**7**	**21**
Paper Total	**36**	**24**	**20**	**80**