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

P001716

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Mark Scheme

v1.2 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 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 at the end 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:

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

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

1	**Which** one **of the following regions of the spine is positioned** directly above **the thoracic region?** Answer: **A** (Cervical)	**1** **AO1=1**
2	**Which** one **of the following occurs during exhalation?** Answer: **C** (The diaphragm relaxes and the chest cavity contracts)	**1** **AO1=1**
3	**Which** one **of the following muscles is closest to the foot in the human body?** Answer: **D** (Soleus)	**1** **AO1=1**
4	**Which** one **of the following blood vessels surround the alveoli in the lungs?** Answer: **B** (Capillaries)	**1** **AO1=1**
5	**Which** one **of the following comes** before **the larynx in the pathway of air through the respiratory system during inspiration?** Answer: **C** (Pharynx)	**1** **AO1=1**
6	**Which** one **of the following occurs during vasodilation?** Answer: **C** (Widening of the blood vessels)	**1** **AO1=1**
7	**Which** one **of the following is in the** ideal **range of blood pressure?** Answer: **B** (110/80mmhg)	**1** **AO1=1**
8	**Lily has predicted that her maximum heart rate (MHR) is 179.** **What age is Lily?** Answer: **C** (41)	**1** **AO2=1**

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

9 (a)	**Name** two **bones that are in the appendicular skeleton.** Award one mark for each correct response. • Clavicle (1). • Scapula (1). • Humerus (1). • Radius (1). • Ulna (1). • Carpals (1). • Tarsals (1). • Pelvis (1). • Femur (1). • Tibia (1). • Fibula (1). • Phalanges (1). Credit other suitable responses.	**2** **AO1=2**

9 (b)	**Long bones are one type of bone in the body.** **State** three other **types of bones.** Award one mark for each correct response. • Flat (1). • Irregular (1). • Short (1). • Sesamoid (1).	**3** **AO1=3**

9 (c)	Figure 1 **shows a diagram of the spine.** **State the postural condition shown.** Award one mark for the correct response. • Scoliosis (1).	**1** **AO3=1**

10 (a)	**Identify a location in the body where** each **of the following types of joints are found:** **1. gliding** **2. saddle** **3. ball and socket.**	**3** **AO1=3**

	Award one mark for each correct response. • 1. Gliding – clavicle (1). • 2. Saddle – thumb (1). • 3. Ball and socket – shoulder (1) / hip (1). Credit other suitable responses.	

10 (b)	**Identify the joint action taking place at the knee from position** A **to** B **in** Figure 2. Award one mark for the correct response. • Flexion (1).	**1** **AO2=1**

10 (c)	**Explain how the muscles help bones to produce the movement** A **to** B **in** Figure 2**.** Award one mark for each explanation as to how the muscles and bones work together to produce the movement. • Muscles in the leg are attached to bones (via tendons) (1). • The hamstrings (agonist) contract (shorten or flex) (1). • The quadriceps (antagonist) relax (lengthen) (1). • Hamstrings pull on the bones in the lower leg to bend the knee (1). Credit other suitable responses.	**3** **AO2=3**

11 (a)	**State** one **factor that can affect blood pressure** and **explain how the factor could affect the performance of an individual in health and fitness activities.** Award one mark for each factor and one mark for an explanation of how it could affect their performance in health and fitness activities. • Low physical activity levels (1) - this tends to cause higher resting heart rate which means an individual's heart would have to work harder with each contraction which may lead to earlier fatigue. • Diet (1) - too much fat in an individual's diet could cause narrowing of the arteries which means less oxygen is getting to the working muscles so they may have to stop due to fatigue (1).	**2** **AO1=1** **AO2=1**

	• Stress (1) - high levels of stress could lead to a temporary increase in blood pressure which may make high intensity exercise difficult or even dangerous (1). • Age (1) – blood pressure increases with age so an individual may find their performance levels drop as they get older due to not being able to withstand the same intensity of exercise (1). Credit other suitable responses.	

11 (b)	Table 1 **shows a type of muscle contraction.** **Complete the table to show** two other **types of muscle contraction.** **Give an example** and **justification for each.** Award one mark for each correct response. Table 1 (see table below) Credit other suitable responses. **NB** If 0 marks are awarded in column 1 (muscle contraction), 0 marks can be awarded for the other columns.	**6** **AO1=2** **AO2=2** **AO3=2**

Muscle contraction.	Example of physical action when this occurs.	Justification.
• Eccentric (1)	Downward phase of a press up (1)	The triceps are lengthening whilst contracting to slow the movement down (1).
• Isometric (1)	Plank (1)	Many of the body's muscles are contracting but they remain the same length / aren't moving (1).

12 (a)	**Identify the type of muscle strength a performer would need to row on a rowing machine for 10 minutes?**	**3** **AO2=1**

	Justify your choice. Award one mark for identifying the type of muscular strength and up to two marks for the justification. • Dynamic (1). • Repeated contractions (applied to propel the body) (1). • Moving for a prolonged period of time (1). Credit other suitable responses. **NB** If 0 marks are awarded for the type of muscular strength provided, 0 marks can be awarded for the justification.	**AO3=2**

12 (b)	**Define** each **of the following components of skill-related fitness** and **give** one **example of when you would use each in a health and fitness activity:** **1. agility** **2. coordination** **3. speed.** Award one mark for each correct definition and one mark for each example. • 1. agility – the ability to move and change direction quickly (at speed) while maintaining control (1) for example, an individual turning quickly when doing shuttle runs (1). • 2. coordination – the ability to use different (two or more) parts of the body together smoothly and efficiently (1) for example, an individual performing a star jump (1). • 3. 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 as part of a fitness circuit (1). Credit other suitable responses.	**6** **AO1=3** **AO2=3**

13	**Identify a health and fitness activity that would be suitable for Type 1 slow twitch muscle fibres.** **Justify your choice.** Award one mark for the identification of a suitable health and fitness activity and two marks for justifications of this activity. • Activity – long distance running (1). • Resistant to fatigue so are able to be used over a long period of time (1). • Capable of producing repeated slow contractions (1). • Oxygen rich so can provide energy over a long period of time (1). Credit other suitable responses. **NB** If 0 marks are awarded for the activity choice, 0 marks can be awarded for the justification.	**3** **AO2=1** **AO3=2**

14 (a)	**Define heart rate** and **stroke volume.** Award one mark for each correct definition. • Heart rate – the number of times a heart beats in a minute (1). • Stroke volume – the volume of blood that leaves the heart during each contraction (1). Credit other suitable responses.	**2** **AO1=2**

14 (b)	**Name** three **structures of the heart where oxygenated blood can be found.** Award one mark for each correct response. • Pulmonary vein (1). • Left atrium (1). • Left ventricle (1). • Aorta (1).	**3** **AO1=3**

15	**Reversibility is a principle of training.** **State** three other **principles of training** and **explain how** each **of these can be applied in health-related fitness activities.** Award one mark for each correct principle of training and one mark for each explanation. • Specificity (1) – an individual could ensure that the health and fitness activities they choose to do will work on the type of fitness they want to improve (1). • Progression (1) - an individual should gradually increase their workload so that the body adapts and gets fitter without causing injury (1). • Overload (1) – an individual should work harder than normal so that the body adapts to this and fitness levels increase (1). • Tedium (1) - an individual will vary the type of health and fitness activities they do so that they do not become bored and stop participating (1). Credit other suitable responses. **NB If correct principles of training are not stated then application cannot be credited.**	**6** **AO1=3** **AO2=3**

16	**State which energy system will be the main energy provider when sprinting 100m.** **Justify your choice.** Award one mark for the correct energy system and up to two marks for the justification. • Anaerobic (1). • It is a short duration activity between 1 and 60 seconds (1). • It is not dependent on oxygen (1). • High intensity exercise (1). Credit other suitable responses. **NB** If 0 marks are awarded for the energy system, 0 marks can be awarded for the justification.	**3** **AO2=1** **AO3=2**

17	**It is essential to be in good health if you want to take part in health and fitness activities.** **Discuss whether you think this statement is true or false.** Award one mark for each discursive point as to whether the statement is true or false up to a maximum of four marks. • Being in good physical health will mean that individuals can physically cope with participating in health and fitness activities (1). • It is possible to be unhealthy (suffer from a mental illness) but still be able to participate in health and fitness activities (1). • If a person suffers from poor social health, they will not be able to join in with health and fitness activities where they must mix with others (1). • A person who suffers from poor social health, however, could still take part in activities such as jogging where they do not have to mix with others (1). Credit other suitable responses.	**4** **AO3=4**

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

18	**Explain how the different types of muscles in the human body help an individual taking part in health and fitness activities.**	**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 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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors. 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. Application of knowledge and understanding is inappropriate, with any attempts showing fundamental errors. Analysis and evaluation, if present, are of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant.
		0	No creditworthy material.

Indicative content

- The different types of muscle are:
  - cardiac
  - smooth
  - skeletal.
- Cardiac muscle is found in the heart:
  - its role is to aid blood flow through the heart which pumps blood around the body
  - the blood then carries oxygen around the body to the working muscles in health and fitness activities
  - oxygen is needed to provide energy during health and fitness activities
  - therefore, without the cardiac muscle, participation in physical activity would not be possible.
- Smooth muscle is found in multiple locations including the digestive tract, blood vessels and lungs:

	- it aids with digestion and helps distribute blood around the body - to provide energy for exercise, food that is eaten needs to be broken down - smooth muscle in the digestive system carries this out so that there is a supply of energy in the body - blood vessels aid the flow of blood around the body. As with the cardiac muscle this provides oxygen to the muscles so that physical activity can take place. • Skeletal muscle is found around the body: - its role is to aid with movement - muscles are attached to bones by tendons and when they contract, they move the skeletal system - this movement is what allows an individual to physically move and participate in health and fitness activities. Credit other suitable responses.	

19	**Muhammad is trying to improve his time in the 60 metre sprint.** **Evaluate the importance of power** and **reaction time when performing a sprint over 60 metres.**	**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 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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors.

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

Indicative content

Power

- Is the product of strength and speed.
- Muhammad's speed will be generated by the ability to move his arms and legs with great force.
- More strength in the arms and legs will allow Muhammad to cover the 60 metre sprint more quickly as more power will be generated from them.

Reaction time

- The time taken to initiate a response to a stimulus.
- This is only important for Muhammad at the beginning of a race.
- It is essential Muhammad reacts quickly to the sound of the gun.
- This allows him to get out of the blocks as quickly as possible and potentially get a head start over his rivals.
- If he is slow out of the blocks it proves very difficult to make up this time as a 60 metre sprint is only 10 seconds long.

	For a 60 metre sprint both power and reaction time are essential for a good performance.	

20 **Discuss how the long-term effects of exercise on the body may help the performance of an individual taking part in a marathon.**

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 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. Application of knowledge and understanding is mostly appropriate, but sometimes lacks clarity, and there may be a few errors. 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. Application of knowledge and understanding is inappropriate, with any attempt showing fundamental errors. Analysis and evaluation, if present, are of limited effectiveness. Attempts to draw conclusions are seldom successful and likely to be irrelevant.

	0	No creditworthy material.

Indicative content

- Cardiovascular endurance – the ability of the heart and lungs to supply oxygen to the working muscles:
  - if developed it will mean that they can perform aerobically for the whole marathon
  - this will mean that they will have a supply of energy
  - therefore, fatigue will be delayed and they will be able to run a faster time.
- Efficiency to use oxygen – regular exercise increases the strength and function of muscles:
  - this makes the muscles more efficient which means they require less oxygen
  - therefore, breathing will not increase as much so the onset of fatigue will be delayed.
- Blood pressure – the pressure of blood in the arteries:
  - regular physical activity makes your heart stronger. A stronger heart can pump more blood with less effort. If your heart can work less to pump, the force on your arteries decreases, lowering your blood pressure
  - this would reduce the onset of fatigue as the heart is not having to work as hard.
- Muscular endurance – the ability of a muscle or muscle group to undergo repeated contractions avoiding fatigue:
  - if developed in the legs it will enable them to work for longer without fatigue
  - this will result in their time becoming faster as they can work at a higher intensity for longer.
- Red blood cell production:
  - regular exercise causes an increase in red blood cell production
  - this increases the oxygen carrying capacity of the blood and enables someone to work harder for longer due to the increased oxygen, and in doing so offsetting fatigue, allowing the marathon time to become faster.
- Flexibility – the range of movement possible at a joint:
  - if the range of movement at the hips / knees increases, it could lead to an increased stride length
  - an increased stride length will mean they will cover more ground with each stride and this will reduce their overall time

	- an increase in flexibility may reduce the risk of injury during training. This would mean training would not be disrupted and fitness levels affected. • Reduced resting heart rate: - this will be associated with a stronger heart muscle which allows more blood to be pumped around the body in each beat - this will allow more oxygen to be supplied to the muscles allowing them to have enough energy for the marathon. • Muscle hypertrophy: - growth of muscle fibres will allow more space for glycogen storage - this provides more energy for the individual that they will be able to use over the course of the marathon. • Changing body shape: - if the individual loses a lot of body weight due to training they could develop more of an ectomorph body shape - this body shape will be lighter so will mean the individual will have less weight to carry around allowing them to run a faster time. Credit other suitable responses. **NB It is not necessary for learners to discuss all of the long-term effects of exercise on the body.**	

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	2			2
9b	3			3
9c			1	1
10a	3			3
10b		1		1
10c		3		3
11a	1	1		2
11b	2	2	2	6
12a		1	2	3
12b	3	3		6
13		1	2	3
14a	2			2
14b	3			3
15	3	3		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**