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 Past Paper
March 2020

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:

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 bones is part of the axial skeleton?** Answer: **D** (Sternum)	**1** **AO1=1**
2	**Which** one **of the following statements best describes the term 'abduction' at a ball and socket joint?** Answer: **A** (The movement of a limb away from the midline of the body)	**1** **AO1=1**
3	**Which** one **of the following statements best describes eccentric muscle contraction?** Answer: **A** (The muscle lengthens as it contracts)	**1** **AO1=1**
4	**Following the pathway of air through the respiratory system, which structure is found after the larynx?** Answer: **D** (Trachea)	**1** **AO1=1**
5	**What type of bones are vertebrae?** Answer: **B** (Irregular)	**1** **AO1=1**
6	**Sebastian has predicted that his maximum heart rate (MHR) is 183.** **What age is Sebastian likely to be?** Answer: **C** (37)	**1** **AO2=1**
7	**Sarah has been carrying out the same training session 3 times a week for 3 months. She has started to miss some of the training sessions due to not being motivated.** **Which** one **of the following principles of training has occurred?** Answer: **D** (Tedium)	**1** **AO2=1**

8	**Which** one **of the following would be in the ideal range of blood pressure?** Answer: **C** (100/70mmhg)	**1** **AO2=1**

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

9 (a)	**Define the term rotation.** Award **one** mark for a correct definition. • Movement where a whole limb or part of the body turns or revolves around its length (1) / where the whole limb or part of the body turns around its long axis (1). Credit other suitable responses.	**1** **AO1=1**

9 (b)	**Give an example of rotation.** Award **one** mark for a correct example of rotation. • Turning the head to the side (1) • Turning the arm so that the palm of the hand points upwards/downwards (1). Credit other suitable responses. Accept sporting examples, however these need to be linked to specific sporting action e.g. when playing a topspin shot in tennis.	**1** **AO2=1**

10	**Synovial joints are a type of joint.** **Identify** two **other types of joint** and **state a location in the body where they are found.** Award **one** mark for each type of joint and **one** mark for each correct location in the body. • Fixed joint (1) – skull/cranium (1), pelvis (1) • Slightly moveable joint (1) – spine/vertebrae (1). Credit other suitable responses.	**4** **AO1=4**

11 (a)	Figure 1 **shows muscles in the human body.** **Identify the muscles labelled** A, B **and** C **in** Figure 1. Award **one** mark for each of the following answers.	**3** **AO1=3**

	A = Deltoid (1) B = Latissimus dorsi (1) C = Soleus (1).	

11 (b)	**Explain how the muscles help bones to produce the movement** A to B **shown 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 arm are attached to bones via tendons (1) • The biceps (agonist) contract (shorten or flex) (1) • The triceps (antagonist) relax (lengthen) (1) • Biceps pull on the radius bone in the lower arm to bend the elbow (1).	**4** **AO2=4**

11 (c)	**Discuss why someone with a high percentage of Type 1 slow-twitch fibres would have an advantage when running a marathon.** Award **one** mark for each discursive point as to why someone with a high percentage of Type 1 slow-twitch fibres would have an advantage when running a marathon. • Marathon running takes place over a number of hours so a large supply of energy is required (1) • Type 1 slow-twitch fibres have a rich supply of oxygen which means energy can be continually produced over a long period of time (1) • Type 1 slow-twitch fibres are resistant to fatigue so allow exercise over long periods of time as is needed when running a marathon (1) • Type 1 slow-twitch fibres are capable of producing repeated slow contractions which are needed when running a marathon over a number of hours (1). Credit other suitable responses.	**4** **AO3=4**

12 (a)	**Identify the structures of the heart labelled** A, B **and** C **in** Figure 3. Award **one mark** for each of the following answers. **A** = Vena cava (1) **B** = Aorta (1) **C** = Left ventricle (1).	**3** **AO1=3**

12 (b)	**Outline the structure of veins,** explaining **how it helps them to 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 • Veins have thin walls (1), large diameter (1), large lumen (1) and have valves inside (1). Function • Thin walls and large diameter allow blood to flow back to the heart with less resistance (1) • Valves ensure blood flows in one direction and returns to the heart (1). Credit other suitable responses. **NB** 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)	**Define inspiration and exhalation.** Award **one** mark for each correct definition. • Inspiration – breathing air in (1) • Exhalation – breathing air out (1).	**2** **AO1=2**

13 (b)	**Explain how the diaphragm** and **intercostal muscles work to help the breathing process.** Award **one** mark for each explanation as to how the diaphragm and intercostal muscles work to help the breathing process. Inspiration • Contraction of the diaphragm causes it to flatten thus enlarging the chest cavity (1) • Contraction of the intercostal muscles causes the ribs to rise, also increasing the size of the chest cavity (1) • Air is passively drawn into the lungs due to the lower pressure inside the lungs (1). Exhalation	**4** **AO2=4**

	• The diaphragm relaxes and returns to its domed shape which decrease the size of the chest cavity (1) • The intercostal muscles relax and the weight of the ribs causes them to descend and reduce chest volume (1) • Increased pressure in the lungs causes it to be expelled (1). Credit other suitable responses.	

13 (c)	**Describe the process of gaseous exchange.** Award up to **four** marks for each description of the gaseous exchange process. • Capillaries carrying blood surround the alveoli (1) • Oxygen in the lungs is taken to the alveoli (1) • Oxygen is transferred from the alveoli to the capillaries (1) • Carbon dioxide is transferred from the capillaries to the alveoli (1). • Oxygen diffuses from an area of high concentration to an area of low concentration (1).	**4** **AO1=4**

14 (a)	Figure 4 **shows a heavy weight being held.** **Identify the type of strength that is needed to hold the weight safely in this position.** **Justify your choice.** Award **one** mark for the identification of the type of strength and up to **two** marks for the justification. • Static strength (1) • Strength needs to be maximal (1) • To hold it in position without moving (1) • Isometric contraction taking place (1). Credit other suitable responses. **NB** If type of strength is incorrect, but justification is correct, 0 marks to be awarded.	**3** **AO2=1** **AO3=2**

14 (b)	**Suggest a health and fitness activity that would be suited to the following energy systems.** • **Aerobic** • **Anaerobic** **Explain your choices.** Award **one** mark for each suitable health and fitness activity identified and **two** marks for justifications of these. Aerobic • Activity – long distance running (1) • Explanation – It is more than a minute long (1) and oxygen dependent (1). Anaerobic • Activity – sprinting (1) • Explanation – It is a short duration activity between 1 and 60 seconds (1) which is non-oxygen dependent (1). Credit other suitable responses. Accept suitable sporting examples where learners provide these.	**4** **AO1=2** **AO2=2**

15	**Identify a health and fitness activity that the following body types may be suitable for:** • **Ectomorph** • **Mesomorph** **Justify your choices.** Award **one** mark for each correct definition and **one** mark for the justification. Ectomorph • Activity – Long distance running (1) • Justification – They have little body weight to carry around so it will make it easier for them to run long distances (1). Mesomorph • Activity – Cross Fit (1) • Justification – They have muscular bodies which will be beneficial when carrying out the whole body exercises in Cross Fit (1). Credit other suitable responses. Accept suitable sporting examples where learners provide these.	**4** **AO2=2** **AO3=2**

16 (a)	**Define heart rate** and **cardiac output.** **Explain how** each **helps an individual when they are performing health and fitness activities.** Award **one** mark for each correct definition and **one** mark for each explanation. Heart rate • Definition – the number of times the heart contracts per minute (1) • Explanation – it increases to supply the working muscles with oxygen (1). Cardiac output • Definition – the amount of blood leaving the heart per minute (1) • Explanation – it increases in response to the increased heart rate to provide enough blood for gaseous exchange to occur (1). Credit other suitable responses.	**4** **AO1=2** **AO3=2**

16 (b)	**At the start of a 6-month health and fitness training programme Jack's resting heart rate was 77 beats per minute (bpm). At the end of the 6-month programme his resting heart rate was 68 beats per minute (bpm).** **Identify what has happened to Jack's resting heart rate** and **suggest a reason why this may have occurred.** Award **one** mark for identifying what has happened to Jack's resting heart rate and **one** mark for a reason why this may have occurred. • Jack's resting heart rate has decreased (1). Reason • His heart has hypertrophied/increased in size (1) • His stroke volume has increased • His heart has become more efficient at pumping blood around his body (1). Credit other suitable responses.	**2** **AO1=1** **AO3=1**

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

17 **As part of a fitness training programme Mia performs a timed sprint drill which requires her to go in and out of cones. To reduce her time, she is trying to improve her power.**

Discuss whether this is the most appropriate skill-related fitness component to improve if Mia wants to be successful in reducing her time.

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

	• Power – is the product of strength and speed - This would help Mia as it would help her push off the floor at the start of the timed run - This would allow a faster start and ultimately a faster time. - However, the start is only one aspect of the timed drill and other skill-related fitness areas may be better to develop • Agility – the ability to move and change direction quickly (at speed) while maintaining control - If Mia was to develop this it would help her to go around the cones as she can change direction - This will improve Mia's time as it would make her more efficient with her movements around the cones • Speed – the maximum rate at which an individual is able to perform a movement or cover a distance in a period of time - If Mia was to try and develop her speed it would mean she would cover the ground quicker - This would reduce the time taken for the timed sprint drill • Co-ordination – the ability to use different (two or more) parts of the body together smoothly and efficiently - Mia has to move many body parts when running so it would be a good idea to try and develop this - If this running action becomes more co-ordinated and smoother it will improve the speed that Mia is able to run at, improving the time for the timed sprint drill • Balance – the maintenance of the centre of mass over the base of support - Balance is important when changing direction so would be beneficial when going around the cones - Mia would improve her time if her balance was improved to enable a smoother movement around the cones • Reaction time – the time taken to respond to a stimulus - At the start of the timed sprint drill this will be important - A faster start could enable Mia to run a faster time - This will only affect the time in a very small way and it may be better to focus on other areas • Trying to improve all of the above areas may be more beneficial rather than focusing on one area • For the timed sprint drill all of the areas above interlink so working on all of these could improve the time. Credit other suitable responses.	

18 **Explain how 'vascular shunt' helps the performance of someone 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 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

- Vascular shunt is when blood is moved to those parts of the body, such as muscles, that have a greater demand for the blood
- The vascular shunt mechanism will direct the flow of blood to those muscles of the body involved in health and fitness activities, such as the legs during running

	• Vasodilation, widening of the arteries, occurs to allow more blood to flow to the muscles that need it • Vasoconstriction, narrowing of the arteries, occurs to restrict blood flow to the parts of the body that do not need it • The extra blood flowing to the working muscles will provide them with more oxygen for energy • Extra energy in the muscles that are working most will enable individuals to maintain high performance levels for longer • If the vascular shunt mechanism did not occur then fatigue could set in earlier in the muscles that are working the most. Credit other suitable responses.	

19	**A reduced resting heart rate, muscle hypertrophy and changing body shape are all long-term effects of exercise on the body.** **Discuss the ways that** other **long-term effects of exercise on the body will improve the performance of an individual taking part in a five-mile run.**	**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

- 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 5-mile run
  - 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 5-mile run 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 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
9 (a)	1			1
9 (b)		1		1
10	4			4
11(a)	3			3
11 (b)		4		4
11 (c)			4	4
12 (a)	3			3
12 (b)	2		2	4
13 (a)	2			2
13 (b)		4		4
13 (c)	4			4
14 (a)		1	2	3
14 (b)	2	2		4
15		2	2	4
16(a)	2		2	4
16(b)	1		1	2
17	2	2	2	6
18	2	2	2	6
19	3	3	3	9
Total	**36**	**24**	**20**	**80**