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

P002030

June 2022

Mark Scheme

v1.2 Pre-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 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 regions of the spine is positioned directly** above **the lumbar region?** Answer: D (Thoracic)	**1** **AO1=1**
2	**In the pathway of air through the respiratory system, which structure comes after the pharynx when breathing in?** Answer: A (Larynx)	**1** **AO1=1**
3	**What is tidal volume?** Answer: B (The amount of air that enters the lungs during normal inspiration at rest)	**1** **AO1=1**
4	**Which** one **of the following is associated with a thin body shape?** Answer: A (Ectomorph)	**1** **AO1=1**
5	**Which** one **of the following is a by-product of the body using the anaerobic energy system?** Answer: B (Lactic acid)	**1** **AO1=1**
6	**Which** one **of the following occurs when breathing in?** Answer: B (The chest expands and the diaphragm contracts)	**1** **AO1=1**

7	**Which** one **of the following is a characteristic of Type 2 muscle fibres?** Answer: A (They produce fast contractions)	**1** **AO1=1**

8	**Which** one **of the following receives deoxygenated blood from the right ventricle?** Answer: C (Pulmonary artery)	**1** **AO2=1**

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

9 (a)	**Name** one **bone in the axial skeleton.** Award one mark for a correct response. • Cranium (1). • Sternum (1). • Ribs (1). • Vertebrae (1). Accept any other responses referring to bones of the axial skeleton.	**1** **AO1=1**

9 (b)	**Irregular bones are a type of bone.** **Identify** two other **types of bone** and **state their primary function.** Award one mark for each type of bone and one further mark for their primary function. • Long (1) - produce movement (1)/support the weight of the body (1). • Flat (1) - protection of organs (1). • Short (1) - provide support and stability with little movement (1). • Sesamoid (1) - reinforce and decrease stress on tendons (1). Credit other suitable responses.	**4** **AO1=4**

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

10 (b)	**Fixed joints are a type of joint.** **Identify** two other **types of joint** and **state a location in the body where** each **is found.** Award one mark for each type of joint and one mark for each correct location in the body. • Slightly moveable joint (1) - spine/vertebrae (1). • Synovial joint (1) - hip (1)/knee (1). • Different types of synovial joints are also an acceptable response e.g. Ball and socket joint (1) – hip(1)/knee(1). Credit other suitable responses.	**4** **AO1=4**

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

11	Figure 2 **shows muscles in the human body.** **Identify the muscles labelled** A, B, C, **and** D**.** Award one mark for each of the following answers: A= Biceps (1) B= Triceps (1) C= Rectus Abdominus (1) (*NB Abdominals is also accepted.)* D= Latissimus Dorsi (1).	**4** **AO1=4**

12

Figure 3 **shows an individual doing a wall sit.**

Use Figure 3 **to complete** Table 1**.**

Identify the type of muscle contraction during the wall sit (AO2)	**State** two **muscles contracting (AO2)**	**Give** two **justifications for the type of muscle contraction identified (AO3**)
Isometric (1)	Quadriceps (1) Gluteus Maximus (1) Gastrocnemius (1) Soleus (1) Credit any other suitable responses.	The muscles are contracting but they are staying the same length (1) Static position (1) Credit any other suitable responses.

NB1 – If 0 marks are awarded in column 1, 2 marks can still be achieved in column 2. However 0 marks can be awarded in column 3.

NB2 - If no accurate muscles which are contracting have been stated (middle column), up to 2 marks can still be awarded for the justification (right hand column), as long as the muscle contraction (left hand column) is correct.

5

AO2=3

AO3=2

13

State two **types of muscle** and **explain how** each **type helps an individual doing health and fitness activities.**

Award two marks for each type of muscle correctly stated and two further marks for explanations of how each type helps an individual doing health and fitness activities.

- Cardiac (1) - aids blood flow through the heart, which provides the oxygen for the body to exercise (1).
- Smooth (1) - aids with digestion so that there is a supply of energy for exercise (1).
- Skeletal (1) - contract to move bones in our body during health and fitness activities (1).

4

AO1=2

AO2=2

	Credit other suitable responses. **NB AO2 marks should only be awarded if a link to health and fitness activities is explained.** **NB2 - If the muscle type is not stated (e.g. cardiac), then 0 marks can be awarded for an accurate explanation.**	

14	**Explain how the structure of capillaries 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 them perform their function. Structure • Capillaries are very narrow (1) and have very thin walls (one cell thick) (1). Function • This allows oxygen and carbon dioxide to be diffused more easily in the lungs (1) and nutrients and waste products to be diffused more easily within tissues (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**

15	**Analyse how the vascular shunt helps an individual taking part in health and fitness activities.** Award one mark for each correct point relating to how the vascular shunt helps an individual taking part in health and fitness activities, up to a maximum of four marks. • The vascular shunt mechanism will direct the flow of blood to the muscles of the body involved in health and fitness activities, such as the legs during running (1). • Vasodilation, widening of the arteries, occurs to allow more blood to flow to the muscles that need it (1). • Vasoconstriction, narrowing of the arteries, occurs to restrict blood flow to the parts of the body that do not need it (1). • The extra blood flowing to the working muscles will provide them with more oxygen for energy (1). • Extra energy in the muscles that are working most will enable individuals to maintain high performance levels for longer (1).	**4** **AO3=4**

	• If the vascular shunt mechanism did not occur, then fatigue could set in earlier in the muscles that are working the most (1). Credit other suitable responses.	

16	**Describe the relationship between stroke volume, heart rate, and cardiac output during exercise.** Award one mark for each correct point relating to the relationship between stroke volume, heart rate and cardiac output, up to a maximum of four marks. • An increase in heart rate caused by exercise (1). • Increases the number of times the stroke volume of the heart is released (1). • This can be caused by the heart contracting with more force and more blood is pumped out with each beat (1). • This leads to an increase in cardiac output as the volume of blood being pumped out each minute has increased (1). Credit other suitable responses. **NB: Do not credit CO (Cardiac Output) = SV (Stroke Volume) x HR (Heart Rate) as this is not a description.**	**4** **AO2=4**

17 (a)	**Marco has blood pressure of 140/100mmHg.** **State Marco's systolic and diastolic blood pressures.** Award one mark for each correct response. • Systolic - 140 (1). • Diastolic - 100 (1).	**2** **AO2=2**

17 (b)	**Identify where Marco's blood pressure is in relation to the ideal range.** Award one mark for a correct response. • Higher/greater/above the ideal range (1).	**1** **AO2=1**

17 (c)	**Identify** and **explain** two **factors that could have affected Marco's blood pressure.** Award one mark for each factor (AO1) and one mark for how it could have affected Marco's blood pressure (AO2).	**4** **AO1=2** **AO2=2**

- Low physical activity levels (1)
  - This tends to cause a higher resting heart rate which means Marco's heart would have to work harder with each contraction putting more pressure on his arteries (1).
- Diet (1)
  - Too much fat in Marco's diet could cause narrowing of his arteries so thinner vessels will have more pressure on them as blood is pumped through them (1)/Too much salt (sodium) in Marco's diet could cause his body to retain fluid, which increases blood pressure (1)/A poor diet could have caused Marco to be overweight or obese, so more blood is needed to supply oxygen and nutrients to his tissues (1).
- Stress (1)
  - High levels of stress could have led to a temporary increase in Marco's blood pressure (1).

- Age (1)
  - If Marco is older his blood pressure could have increased due to less elasticity in his arteries (1).

Credit other suitable responses.

18 (a) **Exercise affects breathing rate and hydration levels.**

Complete Table 2 **by identifying the short-term effects.**

Explain why these effects occur.

4

AO1=2

AO2=2

	Short-term effect of exercise	Why this short-term effect occurs.
Breathing rate	Increases (1)	As the body's muscles need more oxygen (1). Credit other suitable responses.
Hydration levels	Decrease (1)	As the body starts to sweat bodily fluid is lost (1). Credit other suitable responses.

	NB: If 0 marks are awarded for responses relating to short-term effect of exercise, 0 marks can be awarded for the explanation.	

18 (b)	**Explain** four **possible long-term effects on the body if an individual jogs two miles five times per week for a period of three months.** Award one mark for each possible long-term effect on an individual if they jog two miles five times per week over a period of three months, up to a maximum of four marks. • 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**

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

19 **Jessica has been set a task to run as far as she can in 30 minutes.**

Explain how Jessica can use the principles of training to improve her fitness for this task.

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

I**ndicative content**

- Specificity - the training needs to be specific to the type of fitness Jessica wants to improve:
  - activities should focus on improving cardiovascular and muscular endurance which will need to improve if Jessica wants to increase the distance she can run
  - as Jessica's task involves running the training should be based around this.
- Progression - the training needs 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 Jessica trains)
  - increasing the intensity (how hard Jessica trains)
  - increasing the time (how long Jessica trains for)
  - all of these can be increased during health and fitness training activities so that Jessica will see increased fitness
  - if Jessica's body does not work harder than normal, then improvements in muscular strength may not occur.
- Reversibility - if Jessica stops training, then any gains made through training will be lost:
  - there should be no long breaks in the activities otherwise muscle strength will be lost.
- Tedium - the training needs to be varied to prevent boredom:
  - the exercises should be changed regularly, otherwise Jessica may become demotivated due to boredom. E.g., long distance cycling instead of running
  - this may mean Jessica gives up/doesn't try as hard which will mean that fitness could be lost, or she is unable to run as far.
- It is important that all principles of training are applied to Jessica's training, or her fitness may not improve.
- A suitable level of progression could be applied, but if the activities are not specific to Jessica, then it is irrelevant.
- The activities could be specific to Jessica, but if the overload that is applied is too little or too much then improvements in fitness will not be seen.

Credit any other suitable response.

20	Figure 4 **shows an individual completing a star jump.**	**6**

AO1=2

AO2=2

AO3=2

Analyse the different joint actions that enable the individual to complete the star jump effectively.

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

- Preparing to jump phase
  - Flexion (bending at the knee) will occur as an individual prepares to jump. This will enable an individual to get higher in the air and give more time for the star jump than if they took off from straight legs.
  - Flexion (bending at the hips) will occur as an individual keeps their balance when bending slightly. This allows them to be in more control of the jump when they take-off.
- Jumping phase
  - Extension (straightening of the knees and hips) occurs as the individual jumps upwards which is where they get their height from to complete the star jump.
  - Abduction (arms moving out from side and legs moving out from hips) allows the body to create the star shape in the air.
  - Adduction (arms moving to the side of body and legs moving in from hips) allows the body to prepare to land in the correct position.
- Landing phase
  - Flexion (bending at the knee) occurs as the individual touches the ground which allows for a soft and safe landing. This works as a shock absorber to protect the rest of the body.
  - Flexion (bending at the hips) occurs as the body helps to provide balance.
  - Extension (straightening of the knees and hips) occurs as the individual stands up straight to finish the jump.

Credit any other suitable response.

21 Figure 5 **is a diagram of a fitness test. The aim of the test is to get in and around the square based cones in the quickest time possible.**

Evaluate the importance of the components of skill-related fitness to complete this test successfully.

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

- Power - is the product of strength and speed:
  - this would help as it would help push off the floor at the start of the test
  - this would allow a faster start and ultimately a faster time.
- Agility - the ability to move and change direction quickly at speed while maintaining control:
  - this would help to go around the cones and change direction
  - this will improve the time as it would help make more efficient 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:
  - this would help cover the ground quicker

	- this would reduce the time taken for the test. • Co-ordination - the ability to use different (two or more) parts of the body together smoothly and efficiently: - there is movement of 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 running speed, 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 - time would decrease if balance was improved to enable 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 someone 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. Credit other suitable response.	

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	1			1
9b	4			4
10a	1			1
10b	4			4
10c			1	1
11	4			4
12		3	2	5
13	2	2		4
14	2		2	4
15			4	4
16		4		4
17a		2		2
17b		1		1
17c	2	2		4
18a	2	2		4
18b			4	4
19	2	2	2	6
20	2	2	2	6
21	3	3	3	9
Total	**36**	**24**	**20**	**80**