| Unit title | Anatomy and Physiology |
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| Guided learning hours | 120 |
| Number of lessons | 60 |
| Duration of lessons | 2 hours |
| **Links to other units** [Note: please check your qualification structure for details of which units are presently available] | |
| This is a mandatory unit and underpins knowledge throughout the qualification. | |

| Key to lesson types | | | |
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| **AW** | Assignment writing | **RS** | Revision session |
| **GS** | Guest speaker | **V** | Visit |
| **IS** | Independent study | **WE** | Work experience |

| Lesson | Topic | Lesson type | Suggested activities | Classroom resources |
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| 1 | **Unit introduction** | IS | • **Introduce the unit:** outline the nature of the topics and the examination that learners are expected to complete for this unit.<br>• **Whole class activity:** learners to work individually, in pairs or in small groups to demonstrate prior knowledge of the subject. Suggestions include getting learners to independently recall prior knowledge before developing knowledge in pairs and finally small groups (using A3 paper as means to record findings). Learners to feed back with directed Q&A. | A3 paper and pens<br>Interactive whiteboard |
| **Topic A: The effects of exercise and sports performance on the skeletal system** | | | | |
| 2 | **A1:** Structure of skeletal system:<br>• major bones<br>• type of bone | IS | • **Individual or paired activity:** ask learners to complete an activity locating different bones on a partner's body (using sticky notes), followed by on a pre-drawn skeletal worksheet. | Sticky notes<br>Paper and pens<br>Model of human skeleton |

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| | • areas of the skeleton. | | • **Tutor presentation:** the location of major bones, types of bones, and the axial and appendicular skeleton.<br>• **Individual task:** learners to create an information sheet illustrating the different types of bones, and how they are used within different sporting techniques and/or actions.<br>• **Whole class activity:** a practical exercise identifying the major bones. Call out the bone name and ask learners to point to the location of the bone on their own body, and state a sporting technique and/or action where it is used.<br>• **Individual activity:** learners to label areas of a skeleton. | |
| 3 | **A1:** Structure of skeletal system (cont.):<br>• curvature of the spine<br>• process of bone growth. | IS | • **Whole group activity:** individual recap sheet to complete on different types of bones and sporting actions. Follow with learners labelling the skeletal system as a group.<br>• **Tutor presentation:** curvature of the spine and the process of bone growth.<br>• **Individual activity:** ask learners to independently research and then create an information sheet about the curvature of the spine and the process of bone growth.<br>• **Whole group activity:** get learners to act as tutors by feeding back information to the rest of the group. | Tutor-prepared recap sheet<br>Internet access<br>Paper and pens |
| 4 | **A2:** Function of skeletal system:<br>• functions of the skeleton<br>• functions of different types of bone. | IS | • **Individual task:** recap curvature of the spine (by labelling pictures) and the process of bone growth (by completing worksheet in the style of a mini quiz).<br>• **Tutor presentation:** the functions of the skeletal system. | Pictures to label for recap activity<br>Internet access<br>Paper and pens |

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| | | | • **Individual and group activity:** individuals are given a different function of the skeletal system to research independently. This can be developed via the snowball technique. This involves learners moving into pairs, taking it in turns to explain their research and make notes, then joining another pair to do the same. Ask learners then to feed back all functions to the rest of the class in their groups. | |
| 5 | **A3:** Joints:<br>• joints of the upper and lower skeleton<br>• classification of joints<br>• types of synovial joints<br>• structure and function. | | • **Small group activity:** instigate learner discussion on 'What are joints?'<br>• **Tutor presentation:** joints, their classification, and their structure and function. Video sharing website has many appropriate clips including www.youtube.com/watch?v=0cYal_hitz4.<br>• **Individual task:** ask learners to label the structure of a synovial joint.<br>• **Small group task:** allocate to groups one or more synovial joints. They can then create a list of sporting actions that incorporate movement at these joints and demonstrate this practically (in front of the class). | Internet access for videos on Video sharing website<br>Synovial joints worksheet |
| 6 | **A3:** Joints (cont.):<br>• range of movement at synovial joints. | | • **Tutor presentation/recap:** ask learners to identify different types of joints (including all synovial joints).<br>• **Small group task:** get learners to discuss and then create an information booklet about the range of movement found at major synovial joints.<br>• **Tutor presentation (including practical element within classroom):** ask learners to take part in a range of sporting actions/activities that include different joint movements.<br>• **Whole group activity:** select learners to demonstrate a joint movement. After they have | Paper and pens |

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| | | | successfully demonstrated the movement, the learner then has the power to move this task on to another learner, then to another learner and so on. | |
| 7 | **Topics A1–A3** | IS | • **Independent study:** learners to work independently to develop subject knowledge in an area within this topic. Ask them to produce handouts, posters, presentations and resources that can be used as tools to aid revision for the examination. Give them ideas, facilitate their work, and support them as necessary. | Paper and pens<br>Internet access |
| 8 | **Topics A1–A3** | RS | • **Revision session:** split learners into small groups to identify what each of the higher order command verbs mean; include 'analyse', 'explain', 'evaluate' etc. On completion, small groups can answer an examination-style question using one of the verbs identified by the tutor. This can then progress to an individual extended answer using higher order verbs. | Paper and pens |
| 9 | **A4:** Responses of the skeletal system to a single sport or exercise session:<br>• mineral uptake. | | • **Individual activity/group discussion:** ask learners to identify as many responses of the skeletal system to a sport or exercise session as possible. Discussion can then follow.<br>• **Tutor presentation:** responses to exercise, focusing on mineral uptake.<br>• **Group task:** ask learners in groups to create a presentation demonstrating the responses of the skeletal system in relation to a single sport or exercise session of their choice. Groups should then present and feed back to their peers. | Computer access<br>Paper and pens |
| 10 | **A5:** Adaptations of the skeletal system to exercise:<br>• skeletal adaptations. | | • **Tutor presentation:** give a recap on skeletal responses to exercise.<br>• **Whole class discussion:** what adaptations occur to the skeletal system from exercise? | Internet access<br>Paper and pens |

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| | | | • **Tutor presentation:** introduce adaptations of the skeletal system.<br>• **Pair activity:** ask learners to create a poster presentation on skeletal adaptation(s). The pairs should then present to the group with time allocated for Q&A from their peers. | |
| 11 | **A6:** Additional factors affecting the skeletal system:<br>• skeletal disease<br>• age. | | • **Individual activity:** ask learners to complete a worksheet you have created that recaps key elements of skeletal adaptations to exercise.<br>• **Whole group activity:** initiate a class discussion on additional factors affecting the skeletal system. Lead and direct questioning, where needed.<br>• **Small group activity:** present case studies identifying different skeletal diseases and the effect of age on the skeletal system. Each scenario will ask learners in groups to consider the cause, treatment and prevention/control, where applicable. This should be followed by whole group discussion. To create the case studies, sources including the NHS website are useful, but ensure they are realistic and vocational.<br>• **Tutor presentation:** additional factors affecting the skeletal system. | Paper and pens<br>Worksheets<br>Case studies |
| 12 | **Topics A4–A6** | RS | • **Revision session:** split learners into small groups and give each group a different specification topic. Ask each group to design revision question cards, posters or booklets for their topic. On completion, photocopy each set of resources and give them to the other groups as revision material.<br>• **Individual activity:** ask learners to complete some examination-style questions to confirm their learning. | Internet access<br>Paper and pens |

| Topic B: The effects of exercise and sports performance on the muscular system | | | | |
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| 13 | **B1:** Characteristics and function of different types of muscles:<br>• cardiac<br>• skeletal<br>• smooth. | | • **Tutor presentation/group discussion:** what is the muscular system? Describe the key characteristics and functions of the different types of muscles in the human body.<br>• **Individual or paired activity:** ask learners to identify and describe muscle types by creating an information leaflet to use as a revision aid.<br>• **Whole class activity:** carry out a quick-fire quiz to check learning.<br>• **Extension activity:** set learners extended open answer questions, in line with examination conditions. There is an opportunity to develop examination skills here. | Internet access<br>Paper and pens<br>Quiz<br>Examination questions |
| 14 | **B2:** Major skeletal muscles of the muscular system:<br>• major muscles. | | • **Individual activity:** recap on types of muscles. You could complete a mix-and-match task, followed by several tutor-created questions.<br>• **Individual or paired activity:** ask learners to complete an activity locating different types of muscles. Examples include a 'pin the muscle on the body' game (using reusable adhesive instead of pins) as an adaptation of 'pin the tail on the donkey'. The muscles should be stuck on the appropriate places of an A3 outline of a human body.<br>• **Individual activity:** learners to complete a tutor-created worksheet labelling the muscles of the muscular system.<br>• **Individual or paired activity:** ask learners to come up with methods to remember the names of difficult muscles (e.g., erector spinae = erect = to stand tall = back muscle). | Internet access<br>Paper and pens<br>Reusable adhesive<br>Outline of human body<br>Tutor created worksheet |

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| | | | • **Tutor presentation:** to embed key points from previous activity.<br>• **Whole class activity:** carry out a practical exercise identifying major muscles and their sporting actions. Using a random name selector, call out a bone name and joint. Learners must point to and identify the location of the bone and joint on their own body, the muscles attached, and the movements enabled at the joint. | |
| 15 | **B3:** Antagonistic muscle pairs:<br>• agonist<br>• antagonist<br>• synergist<br>• fixator. | | • **Tutor presentation:** recap on the major muscles. Ask learners to complete a worksheet, using a mixture of identification and examination-style questions.<br>• **Tutor presentation:** antagonistic muscle pairs.<br>• **Small group activity:** allocate each group a different sporting action. Their task is to identify the muscle(s) of the agonist, antagonist, synergist and fixator. On completion, ask the groups to feed back to the rest of the class. As an extension activity, ask groups to come up with a different sporting action for revision/further stretch and challenge.<br>• **Tutor presentation:** explain the link between antagonistic pairs – use video to aid explanation and use tutor-directed Q&A. Suggestions include www.youtube.com/watch?v=I80Xx7pA9hQ, with numerous other appropriate videos online for support. | Tutor-created worksheet<br>Practical space for exercises and sporting actions<br>Internet access for video-sharing websites |
| 16 | **Topics B1–B3** | IS | • **Independent study:** get learners to work independently to develop their subject knowledge in an area within this topic. Ask them to produce handouts, posters, presentations and resources to use as tools to aid revision for the examination. Give ideas, facilitate their work and support as necessary. | Internet access |

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| 17 | **B4:** Types of skeletal muscle contraction:<br>• isometric<br>• concentric<br>• eccentric. | | • **Tutor presentation:** recap antagonist pairs. Give learners a worksheet with questions to answer, and ask them to write down two further questions to test the rest of the group. Q&A and discussion to follow.<br>• **Tutor presentation:** the different types of muscle contractions.<br>• **Individual/paired activity:** give learners different types of exercises and ask them to identify the different types of muscle contraction taking place at each phase of movement. Do this activity in the classroom if possible, or the sports hall if needed.<br>• **Tutor presentation:** explain the link between antagonist pairs. For example, when a bicep brachii contracts concentrically, the tricep brachii has to contract eccentrically.<br>• **Individual plenary activity:** ask learners to create a rhyme, poem or dance to help them remember the differences between the types of muscular contraction. | Tutor-created worksheet<br>Practical space for exercises |
| 18 | **B5:** Fibre types:<br>• characteristics of type I<br>• characteristics of type IIa<br>• characteristics of type IIb<br>• nervous control of muscle contraction. | | • **Group activity:** as a recap, get learners to create a short presentation on one of the muscle types to feed back to the group.<br>• **Tutor presentation:** the three types of muscle fibres: type I, type IIa and type IIb.<br>• **Individual or paired activity:** ask learners to describe the characteristics of muscle fibres, with reference to athletes and sporting application.<br>• **Tutor presentation:** nervous control of muscular contraction and the 'all or none law'.<br>• **Whole class activity:** get learners to take part in a practical to demonstrate recruitment of muscle fibres depending on effort, e.g. light, medium and heavy weights. | Internet access<br>Paper and pens<br>Practical space for exercise<br>Range of weights |

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| | | | • **Individual task:** quiz/Question of Sport-style game to check for learning. | |
| 19 | **Topics B3–B5** | | • **Practical session:** get learners to take part in a range of movements/activities (within classroom or, if available, sports hall) that include aspects of B1–B5. Hand out a worksheet for individuals to complete, before working in small groups to check understanding, e.g., by incorporating learner-devised quizzes/questioning. | Practical space for exercise<br>Tutor-created worksheet |
| 20 | **Topics B1–B5** | RS | • **Revision session:** split learners into small groups and give each group a different specification topic. Ask each group to design revision question cards, posters, booklets etc for their topic. On completion, each set of resources can be photocopied and given to the other groups as revision material.<br>• **Individual activity:** ask learners to complete some examination-style questions to confirm their learning. | Internet access<br>Paper and pens |
| 21 | **B6:** Responses of the muscular system to a single sport or exercise session:<br>• increased blood supply<br>• increased muscle temperature<br>• increased muscle pliability<br>• lactate<br>• microtears. | | • **Tutor presentation/class discussion:** how does the muscular system respond to a single sport or exercise session?<br>• **Tutor presentation:** responses of the muscular system to a single sport or exercise session.<br>• **Small group activity:** in groups, ask learners to produce a presentation with supplemented demonstrations to show the responses of the muscular system.<br>• **Individual task:** give a mini test to check for learning. Use extended questioning as an extension. | Mini test |
| 22 | **B7:** Adaptations of the muscular system to exercise: | | • **Small group activity:** ask learners to carry out a 'knowledge relay' to recap the responses of the muscular system to sport and exercise. Learners | Information packs on key adaptations (journals, websites and books can |

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| | • the impact of adaptation of the system on exercise and sports performance. | | should work in teams to relay knowledge via flipchart paper on either side of the classroom, passing the pen as a 'baton'.<br>• **Individual/small group/whole class activity:** create four information packs, each representing a key adaptation. Give learners a pack each and allow them time to read and annotate the packs, and gain a sound understanding of the field. On completion, learners become the tutor to create a 'knowledge cafe', where learners teach among themselves.<br>• **Tutor presentation:** adaptations of the muscular system to exercise.<br>• **Small group activity:** Question of Sport-style recap quiz. | be used to create this – see resources section in this unit's Delivery Guide for ideas)<br>Paper and pens<br>Flipchart paper |
| 23 | **B8:** Additional factors affecting the muscular system:<br>• age – effect of the aging process on loss of muscle mass<br>• cramp – involuntary sustained skeletal muscle contraction. | | • **Tutor presentation:** recap on adaptations of the muscular system.<br>• **Individual worksheet:** set questions to test learners' understanding in line with the sample assessment materials (SAMs).<br>• **Whole group activity:** show a video considering additional factors affecting the muscular system (age/muscle loss and cramp). Suggestions include www.youtube.com/watch?v=ymcFS1tQrsk but there are numerous appropriate videos online. Learners complete a question sheet.<br>• **Pair work:** learners to carry out research to gain further understanding of the additional factors affecting the muscular system, and then produce an information sheet. Facilitate learning, supporting as necessary. Use tablets or laptops to aid.<br>• **Tutor presentation:** additional factors affecting the muscular system. | Tutor-created worksheet<br>Video (accessed from video-sharing website)<br>Tablets/laptops |

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| 24 | **Topics B1–B8** | GS | • **Guest speaker – personal training:** arrange for a guest speaker to discuss all aspects of their role, incorporating the importance of understanding anatomy. As prior homework, ask learners to come up with questions for the speaker. | Paper and pens |
| 25 | **Topics B6–B8** | | • **Revision session:** use individual worksheets mirroring questions aimed at 1–5 marks answers from the SAMs. When complete, split learners into small groups. The groups must answer a higher order extended examination-style question (make sure content and verbs are identified). This can then progress to an individual extended answer using higher order verbs (6–8 marks). | Worksheets<br>Examination-style questions<br>Paper and pens |
| **Topic C: The effects of exercise and sports performance on the respiratory system** | | | | |
| 26 | **C1:** Structure of the respiratory system:<br>• nasal cavity<br>• epiglottis<br>• pharynx<br>• larynx<br>• trachea<br>• bronchus<br>• bronchioles<br>• lungs<br>• alveoli<br>• diaphragm<br>• thoracic cavity | | • **Tutor presentation:** the structure of the respiratory system.<br>• **Individual activity:** ask learners to label the structures of the respiratory system. Create a jigsaw puzzle from the structure of the entire respiratory system and ask them to solve it, while identifying each structure.<br>• **Tutor presentation:** the different structures and their function within the respiratory system.<br>• **Paired activity:** get learners to create a quiz for their partner to complete on the structures and their function within the respiratory system.<br>• **Individual activity:** examination-style questions as a recap on the structure of the respiratory system. | Paper and pens<br>Jigsaw<br>Quiz |

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| | • intercostal muscles (external and internal). | | | |
| 27 | **C2:** Function:<br>• mechanisms of breathing (inspiration and expiration) at rest and during exercise<br>• gaseous exchange. | IS | • **Individual task:** get learners to recap the structure of the respiratory system by holding a competition to label the structures.<br>• **Tutor-led discussion:** what are the functions of the respiratory system?<br>• **Independent study:** ask learners to individually research the mechanics of breathing and to apply them to rest and exercise.<br>• **Tutor presentation:** the mechanisms of breathing and gaseous exchange to confirm knowledge.<br>• **Group activity:** get groups to devise a poem/rap or demonstration to explain the process of gaseous exchange. Peer review followed by Q&A. | Internet access<br>Paper and pens |
| 28 | **C3:** Lung volumes:<br>• tidal volume<br>• vital capacity<br>• residual volume<br>• total lung volume<br>• pulmonary ventilation (VE). | | • **Tutor presentation:** recap functions of the respiratory system.<br>• **Pair activity:** using peak flow and a spirometer, get learners to measure lung volumes and capacity, noting their partner's results.<br>• **Tutor presentation:** lung volumes applied to the sporting context.<br>• **Tutor presentation/practical session:** get learners to take part in a range of movements/ activities that include aspects of C1–C3. Hand out a worksheet for them to complete individually, before working in small groups to check for understanding.<br>• **Practical application:** learners to measure vital capacity using the balloon method. Go online and watch the YouTube video before performing the task: '*How to Measure Vital Capacity Using a Balloon*.' | Practical space for exercise<br>Tutor-created worksheet<br>Paper and pens<br>YouTube video - '*How to Measure Vital Capacity Using a Balloon'* by XoletteScience |

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| | | | • **Individual task:** learners to write down two or three questions each. You can then pull these questions together to form a mini quiz/Q&A session to recap, ensuring there is no/little repetition among the questions. | |
| 29 | **C4:** Control of breathing:<br>• neural<br>• chemical. | IS | • **Tutor presentation:** devise a game with key terms or phrases in the format of bingo to check learning to date. Call out definitions of the key terms and/or give examples alluding to the key terms or phrases.<br>• **Independent study:** give learners articles (from journals or other credible sources) and ask them to answer questions on neural and chemical control of breathing. When complete, use the snowball method to work in pairs, then in small groups, and finally as a class to discuss.<br>• **Tutor presentation:** the control of breathing.<br>• **Individual task:** carry out extended questioning in line with examination expectations. | Journal articles<br>Internet access<br>Paper and pens |
| 30 | **Topics C1–C4** | | • **Practical session:** learners to take part in a range of movements/activities (in classroom, or sports hall, if available) that demonstrate/include aspects of C1–C4. Give them a worksheet recapping the topic area to complete individually, working in small groups to check for understanding. | Practical space for exercise<br>Tutor-created worksheet<br>Paper and pens |
| 31 | **Topics C1–C4** | RS | • **Revision session:** split learners into small groups and give each group a different specification topic. Ask each group to design revision question cards, posters, booklets etc for their topic. On completion, photocopy each set of resources and distribute to the other groups as revision material.<br>• **Individual activity:** learners complete examination-style questions to confirm their learning. | Internet access<br>Paper and pens |

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| 32 | **C5:** Responses of the respiratory system to a single sport or exercise session:<br>• increase in breathing rate<br>• increased tidal volume. | | • **Whole class activity:** 'learner as tutor' game. Ask learners to use their class notes to devise questions to ask the rest of the class, recapping lung volumes and control of breathing.<br>• **Small group activity:** allocate groups one response and get them to create a presentation to deliver to the rest of the class.<br>• **Tutor presentation:** recap responses of the respiratory system, followed by a directed Q&A. | Paper and pens<br>Internet access<br>Interactive whiteboard |
| 33 | **C6:** Adaptations of the respiratory system to exercise:<br>• increased vital capacity<br>• increased strength of the respiratory muscles<br>• increase in oxygen and carbon dioxide diffusion rate. | | • **Tutor presentation:** recap responses of the respiratory system.<br>• **Group activity:** give learners a workbook and one key adaptation to individually work through. On completion, individuals should get together with others to form small groups and teach each other so they all have notes on all key adaptations.<br>• **Tutor presentation:** adaptations of the respiratory system.<br>• **Whole class activity:** Q&A on adaptations. | Internet access<br>Paper and pens<br>Tutor-created workbook |
| 34 | **Topics C5–C6** | | • **Tutor presentation/practical session:** learners take part in a range of movements/activities (in classroom, or sports hall, if available) that demonstrate/include aspects of C5–C6. Hand out a worksheet for learners to complete individually, before working in small groups to check for understanding. | Practical space for exercise<br>Tutor-created worksheet |
| 35 | **C7:** Additional factors affecting the respiratory system:<br>• Asthma | | • **Tutor presentation:** recap on the adaptations of the respiratory system to exercise.<br>• **Small group activity:** give learners case studies on the effects of asthma and altitude on the respiratory system, together with questions. On completion, they should feed back to the rest of the group, which | Case studies<br>Paper and pens<br>Internet access |

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| | • effects of altitude/partial pressure on the respiratory system. | | can be followed by a group discussion. You may need to prompt learners with questions. Suggestions for sourcing case studies include the altitude.org website and NHS sources. Make the case studies realistic and vocational.<br>• **Pair poster presentation/picture board:** illustrate additional factors affecting the respiratory system. | |
| 36 | **Topics C5–C7** | RS | • **Revision session:** hand out an individual worksheet mirroring questions aimed at 1–5 marks answers from the SAMs. Following completion, split learners into small groups. The groups must answer a higher-order extended examination style (using tutor-identified content and verbs). This can then progress to an individual extended answer using higher-order verbs (6–8 marks). | Paper and pens<br>Worksheet<br>Examination-style questions |
| **Topic D: The effects of sport and exercise performance on the cardiovascular system** | | | | |
| 37 | **D1:** Structure of the cardiovascular system:<br>• structure of the cardiovascular system<br>• structure of blood vessels. | | • **Tutor presentation:** the structure of the heart.<br>• **Individual activity:** get learners to label the structure of the heart or complete a jigsaw puzzle.<br>• **Paired activity:** ask learners to test each other on the structure of the heart.<br>• **Tutor presentation:** go through the functions of each component.<br>• **Pair or small group activity:** groups illustrate the different blood vessels and describe their structure. You can use e-learning to aid learner research.<br>• **Tutor presentation:** directed Q&A on the structure of blood vessels. | Internet access<br>Computer access<br>Paper and pens<br>Jigsaw puzzle of the heart/diagram of the heart without labels |
| 38 | **D1:** Structure of the cardiovascular system (cont.): | IS | • **Tutor presentation:** recap the structure of the cardiovascular system. | Internet access<br>Paper and pens |

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| | • composition of blood. | | • **Individual activity:** as a further recap activity, get learners to race to see who can label the system the quickest.<br>• **Independent research task:** ask learners to research the composition of blood.<br>• **Tutor presentation:** the composition of blood.<br>• **Quiz:** learners make a quiz/game to test learning and understanding. | |
| 39 | **D2:** Function of the cardiovascular system:<br>• delivery of oxygen and nutrients<br>• removal of waste products – carbon dioxide and lactate<br>• fight infection<br>• clot blood. | | • **Tutor presentation:** recap on composition and function of blood. Recap worksheet followed by Q&A.<br>• **Individual/pair/group activity:** marketplace learning – research using worksheets to increase knowledge in the field. Set up stalls to represent a different topic area. Learners will walk among the different 'stalls' to share learning and content.<br>• **Tutor presentation:** the functions of the cardiovascular system. Hold directed Q&A to check for learning. | Internet access<br>Tutor-created worksheet<br>Paper and pens<br>Poster paper/A3/flipchart for stall signs and info |
| 40 | **D2:** Function of the cardiovascular system (cont.):<br>• thermoregulation – vasoconstriction, vasodilation of blood vessels. | | • **Tutor presentation:** recap functions of the cardiovascular system.<br>• **Small group activity:** learner discussion – what do they think thermoregulation is?<br>• **Practical pair task:** using additional clothing and sweat vests, oversee activities and a worksheet to demonstrate what the body does to maintain homeostasis.<br>• **Tutor presentation:** thermoregulation.<br>• **Individual task:** examination-style questions on thermoregulation. Open questions to match 6–8 marks. | Space for practical activity<br>Sweat vests<br>Paper and pens |

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| 41 | **Topics D1–D2** | IS | • **Independent study:** get learners to work independently to develop their subject knowledge in an area within this topic. Ask them to produce handouts, posters, presentations and other resources to aid revision for the examination. Give them ideas, facilitate their work and support them as necessary. | Internet access<br>Computer access<br>Paper and pens |
| 42 | **D3:** Nervous control of the cardiac cycle:<br>• sinoatrial node (SAN)<br>• atrioventricular node (AVN)<br>• bundle of His<br>• Purkinje fibres<br>• effect of the sympathetic and parasympathetic nervous system. | | • **Whole class game:** recap all aspects of the cardiovascular system by playing a word association game. Ask learners to associate/link words around the cardiovascular system before moving on. They must state a word/phrase and define or describe it.<br>• **Tutor presentation:** nervous control.<br>• **Pair/small group activity:** ask learners to create a storyboard of pictures to explain the cardiac cycle. Get them to present back to the class and save the storyboard to aid later revision. | Internet access<br>Paper and pens<br>Interactive whiteboard access for presentation |
| 43 | **Topics D1–D3** | RS | • **Revision session:** split learners into small groups, each with a different topic. Ask each group to design revision question cards, posters and booklets for their topic. On completion, photocopy each set of resources and give to the other groups as revision material. | Internet access<br>Paper and pens |
| 44 | **D4:** Responses of the cardiovascular system to a single sport or exercise session:<br>• anticipatory increase in heart rate prior to exercise<br>• increased heart rate | | • **Pair activity:** as a race in pairs, learners must identify the correct definition for each element making up the cardiac cycle.<br>• **Tutor presentation:** responses of the cardiovascular system.<br>• **Small group activity:** present case studies demonstrating a number of responses following a single sport or exercise session. Ask learners to | Case studies – heart.org and livestrong.com may be useful to create these. There are also several journals available on Google Scholar.<br>Paper and pens |

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| | • increased cardiac output<br>• increased blood pressure<br>• redirection of blood flow. | | depict the responses and explain why they are occurring. They should then feed back to the class.<br>• **Individual activity:** extended answer examination-style question to test for learning. | |
| 45 | **Topic D4** | | • **Practical session:** to demonstrate the responses of the cardiovascular system to a single sport or exercise session (worksheet to complete individually). | Practical space for exercise<br>Worksheet |
| 46 | **D5:** Adaptations of the cardiovascular system to exercise:<br>• cardiac hypertrophy<br>• increase in resting and exercising stroke volume<br>• decrease in resting heart rate<br>• capillarisation of skeletal muscle and alveoli<br>• reduction in resting blood pressure<br>• decreased heart rate recovery time<br>• increase in blood volume. | | • **Tutor presentation:** recap responses of the cardiovascular system.<br>• **Whole group activity:** speed teaching – give small groups/pairs a content area and time to increase knowledge in the field. Groups rotate round to teach each other the content in the format of speed dating. Ask individuals to collate a workbook of content and score each other's teaching.<br>• **Tutor presentation:** adaptations of the cardiovascular system.<br>• **Individual activity:** mini quiz to check for learning. | Internet access<br>Resources on cardiovascular adaptations<br>Mini quiz |
| 47 | **D6:** Additional factors affecting the cardiovascular system:<br>• sudden arrhythmic death syndrome (SADS)<br>• high blood pressure/low blood pressure | | • **Small group activity:** conduct a 'knowledge relay', allowing learners to recap Topics D1–D5.<br>• **Individual task:** 'Easy as A, B, C' – a task where each key additional factor is labelled A, B or C. Give learners a letter and get them to carry out independent research to form an information booklet. On completion, they should merge their | Internet access<br>Paper and pens |

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| | • hyperthermia/ hypothermia. | | work with others working on the same aspect, then teach the rest of the class.<br>• **Tutor presentation:** on additional factors affecting the cardiovascular system.<br>• **Individual activity:** examination-style questions on each factor to check for learning. | |
| 48 | Museum trip | V | • Use a museum or educational trip to combine and reinforce all prior knowledge within the unit. Give learners a tutor-devised worksheet to complete during the trip. Visit recommendations include (although there will be other options in your local area):<br>○ Royal College of Surgeons Wellcome Museum of Anatomy and Pathology (www.rcseng.ac.uk/museums/wellcome)<br>○ Science Museum – the sport section specifically (www.sciencemuseum.org.uk)<br>○ Museum of Medicine and Health (www.mms.manchester.ac.uk/museum). | Paper and pens<br>Worksheets |
| 49 | **Topics D4–D6** | RS | • **Revision session:** individual worksheet mirroring questions aimed at 1–5 marks answers from SAMs. Following completion, split learners into small groups to answer a higher order extended examination style (using tutor-identified content and verbs). This can then progress to an individual extended answer using higher order verbs (6–8 marks). | Internet access<br>Paper and pens |
| **Topic E: The effects of exercise and sports performance on the energy systems** | | | | |
| 50 | **E1:** The role of ATP in exercise:<br>• immediately accessible form of energy for exercise | IS<br>AW | • **Tutor-led discussion:** what is adenosine triphosphate (ATP)?<br>• **Tutor presentation:** the role of ATP in exercise.<br>• **Pair activity:** using five balloons, demonstrate how energy is created and recreated. One balloon | Balloons<br>Paper and pens |

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| | • breakdown and resynthesis of ATP for muscle contraction. | | represents the adenosine molecule, with a further four balloons available to represent the role of phosphate molecules in the creation and recreation of energy. Encourage discovery learning here.<br>• **Individual activity:** extended writing task looking at the role of ATP in sport.<br>• **Tutor presentation/whole group activity:** quiz to check for understanding. | |
| 51 | **E2:** The ATP-PC (alactic) system in exercise and sports performance:<br>• anaerobic<br>• chemical source (phosphate and creatine)<br>• resynthesis of ATP<br>• recovery time<br>• contribution to energy for exercise and sports performance. | IS | • **Tutor presentation:** recap the role of ATP in exercise.<br>• **Independent study:** get learners to research the ATP-PC system in exercise and sports performance.<br>• **Pair, small group and class activity:** following the independent study, pair up individuals to share knowledge. This will then develop into small groups before feeding back to the rest of the class. Discussions and directed Q&A should follow.<br>• **Tutor presentation:** play video clips of several sports and activities. Ask learners to make notes, applying the system to the actions they can see. Any relevant sporting clip showing anaerobic activity will be appropriate.<br>• **Individual activity:** mini quiz to check for learning. | Video clips of sports activities<br>Internet access<br>Paper and pens |
| 52 | **E3:** The lactate system in exercise and sports performance:<br>• anaerobic<br>• process of anaerobic glycolysis<br>• recovery time | | • **Pair activity:** get learners to test each other on the ATP-PC system as a recap activity.<br>• **Tutor presentation:** the lactate system in exercise and sports performance. Follow your presentation with practical elements to demonstrate lactate build up (suggestions include one-minute press up and squat challenges). | Space for practical activity<br>Paper and pens<br>Internet access |

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| | • contribution to energy for exercise and sports performance. | | • **Pair activity:** get learners to create an information leaflet that explains the lactate system in sport and exercise. These can be used as tools for revision.<br>• **Tutor presentation:** Who Wants to be a Millionaire/The Million Pound Drop-style recap quiz. | |
| 53 | **Topics E1–E3** | | • **Practical session:** the anaerobic systems in action. Ask a local sports coach to run a session exemplifying each system in action, followed by a worksheet for learners to complete individually or in pairs. | Practical space for exercise<br>Tutor-created worksheet |
| 54 | **E4:** The aerobic system in exercise and sports performance:<br>• aerobic site of reaction<br>• food fuel source<br>• process of aerobic glycolysis, Krebs cycle, electron transport chain<br>• recovery time<br>• contribution to energy for exercise and sports performance. | | • **Tutor presentation:** hold a quiz as a recap on ATP and the anaerobic energy systems in action.<br>• **Tutor presentation:** the aerobic system.<br>• **Small group task:** allocate groups to cover aerobic glycolysis, the Krebs cycle and the electron transport chain. Ask groups to create a presentation to explain the processes to their peers.<br>• **Tutor presentation:** the processes of aerobic glycolysis, the Krebs cycle and electron transport chain, including recovery time. Use video to supplement a Q&A.<br>• **Individual task:** open questioning relating to the aerobic system's contribution to energy for exercise and sports performance.<br>• **Whole-group activity:** Question of Sport-style picture round quiz. Divide the class into groups to buzz in and explain what the picture is showing. | Internet access<br>Video related to sports performance<br>Pictures showing sport activities<br>Paper and pens |
| 55 | **Topics E1–E4** | | • **Practical session:** the aerobic system in action (suggestion: a long-distance challenge, e.g., rowing the English Channel as a group). Provide a Q&A session while learners complete the task. | Practical space for exercise |

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| 56 | **Topics E1–E4** | RS | • **Revision session:** split the learners into small groups and give each group a different specification topic. Ask each group to design revision question cards for their topic. On completion, photocopy each set of resources and give to the other groups as revision material. | Internet access<br>Paper and pens |
| 57 | **E5:** Adaptations of the energy system to exercise:<br>• ATP-PC<br>• increased creatine stores<br>• lactate system<br>• increase tolerance to lactate<br>• aerobic energy system<br>• increased use of fats as an energy source<br>• increased storage of glycogen<br>• increased numbers of mitochondria. | | • **Whole-group activity:** recap on the aerobic system. Ask learners to produce two questions each (with answers) to ask each other.<br>• **Tutor presentation:** on adaptations of the energy systems to exercise.<br>• **Group activity:** get learners in groups to produce a presentation on the adaptations of the energy systems.<br>• **Whole class activity:** guided debate to encompass all aspects of ATP and the energy systems during sport and exercise performance.<br>• **Individual task:** ask learners to identify key facts surrounding the topic area to aid revision. | Paper and pens |
| 58 | **E6:** Additional factors affecting the energy systems:<br>• diabetes (hypoglycaemic attack)<br>• children's lack of lactate system. | | • **Tutor presentation:** recap adaptations of the energy systems to exercise.<br>• **Independent activity:** give the learners articles and get them to extract information to answer questions on additional factors affecting the energy systems.<br>• **Tutor presentation:** additional factors affecting the energy systems.<br>• **Whole class activity:** quiz/game/competition to check for learning. | Paper and pens<br>Articles on topic area |

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| 59 | **Topics E1–E6** | V | • **Laboratory trip:** a visit to a local university to investigate effects of ATP and energy systems further. Recommendations include the Wingate tests and $VO_2$ max test. Learners to record data and make notes during the visit. | Worksheet |
| 60 | **Topics E5–E6** | | • **Revision session:** ask learners to complete an individual worksheet mirroring questions aimed at 1–5 marks answers from the SAMs. Following completion, split learners into small groups. The groups must answer a higher-order extended examination-style question (using tutor-identified content and verbs). This can then progress to an individual extended answer using higher-order verbs (6–8 marks). | Internet access<br>Paper and pens |

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