Year 12 - AS

SGS -PE

Section A : Revision Booklet

Name .....

Form.....

Staff.....

Model Answers

Anatomy and physiology

1: The skeletal and muscular systems

Taking part in physical activity is considered essential to maintaining a healthy lifestyle. However, taking part in some activities can result in injury and a reduction in activity levels.

Discuss **both** the positive and negative impact of participating in different types of physical activity on the joints and muscles of the body. (10 marks)

Student Answer:

Type of Activity	Positive Impact	Negative Impact
low impact / endurance	*builds strong, healthy bones – reduces risk of osteoporosis esp child, teens* *can increase health of joints: manage weight therefore less strain therefore reduced risk of osteoarthritis* *improve joint stability – strengthen surrounding muscles – ligaments – tendons – increased muscle tone e.g rotator cuff/knee* *improve posture/alignment = max eff/min injury: multifidis & transverse abdominis – increased muscle tone/core stability = reduced risk of lower back pain (Swiss ball training)*	*wear & tear on art cartilage = e.g. osteoarthritis*
high impact	*also good for osteoporosis – increases peak bone density*	*dangerous for osteoporosis sufferers = fracture* *stress fractures* *risk of sprains /dislocation esp less stable joints e.g. knee, ankle shoulder* *growth plate injuries* *strains / muscle tears = plyometrics*
contact sports		*growth plate injuries*
repetitive movements		*growth plate injuries* *wear & tear on art cartilage = osteoarthritis esp knee, hip & ankle*

Examiner Comment:

Great Plan!

There are many benefits to being active but certain types if physical activity can be a risk to the bones, joints and muscles. Low impact, endurance based activities seem to have the most positive effects on the skeletal and muscular systems, while high impact, contact sports cause the most potential risks.

Concise introduction to set the scene on where the answer is heading and already shows me you know what is meant by different types of physical activity.

Regular aerobic exercise helps to build strong and healthy bones, which reduces the risk of osteoporosis in later life. This is especially the case if weight-bearing work is carried out during childhood and the early teens. However, high impact activities have a part to play here, as they can also increase the strength of bones. Endurance work also helps to manage weight, meaning that less strain is put on the joints during activity and this reduces the risk of contracting osteoarthritis. The fact that regular light exercise strengthens the skeletal muscles, ligaments and tendons, means that joint stability is increased as muscle tone has increased. This is particularly important in joints that rely on the surrounding muscles and ligaments to make them more stable, such as the shoulder joint relying on the rotator cuff muscles and the knee joint relying on the four ligaments that surround it. Performers who are at risk of injury to their shoulders and knees e.g. rugby and football players, would especially benefit from an increased joint stability in these areas. Another advantage of regular aerobic exercise is the positive effect it will have on posture and alignment. Performers with good posture can carry out sporting techniques with the maximum efficiency and the minimum risk of injury. This would be particularly important for weight lifters or performers who rely on good core stability such as gymnasts. Good posture also limits the risk of lower back pain and poor alignment of the lumbar vertebrae. Two muscles that play a major part in maintaining good core stability are the multifidis and transverse abdominis, which can be exercised using a Swiss ball.

Good use of sporting examples, which is just what you need to score in the top band.

On the other hand, performers who chose to take part regularly in high impact or contact sports are at greater risk of injury. Sudden impacts can cause fractures, sprains and dislocations. The less stable joints such as the shoulder, knee and the ankle are particularly at risk. The shoulder, being a shallow ball and socket joint, is relatively easy to dislocate while sprains at the knee and ankle joints are also common. High impact sports are especially risky in young players, whose bones are not fully matured, as there is a big risk of damage to the growth plate, which is very delicate while the bone is still growing. Performers who also carry out a lot of eccentric muscular contractions are at greater risk of muscle strains and tears, such as hurdlers and gymnasts. Another type of activity that can have a negative effect on joints is activity involving repetitive movements, which can also cause damage to the growth plate in children but will also cause wear and tear to the articular cartilage. When the articular cartilage is damaged, there is risk of contracting osteoarthritis. This is especially the case in the hip, knee and ankle joints that tend to take most of the force in all weight-bearing activities. Many old hockey and rugby players end up with osteoarthritis in one or more of their leg joints, while tennis players are more like to get this condition in their shoulder and elbow joints.

Great use of analysis – another important aspect if achieving max.
I like the way you have bought in types of muscular contractions – it's certainly relevant here.
Some more excellent examples

Having weighed up the positive and negative effects of different types of physical activity on joints and muscles, it seems that the positives outweigh the negatives and an active lifestyle should be encouraged.

A quick and simple way to finish.

General Examiner Comment –

Overall this is a well structured answer. It has a brief introduction and conclusion (you need both for a discussion) and there is a paragraph related to the positive effects of exercise linked to low impact work and a paragraph related to the negative effects of exercise linked to high impact/contact and repetitive work. There is good quality of written communication throughout: an A grade answer.

2: Basic concepts of biomechanics

Centre of mass is an important basic concept of Biomechanics.

What do you understand by the term centre of mass? Using appropriate examples from sporting techniques, explain how changes in the position of a body's centre of mass can affect its stability.

(5 marks)

Centre of mass is the point at which the body is balanced in all directions. In uniform objects, such as shot put it is found in the very middle.

Simple, accurate and concise definition – well done!

Centre of mass is important in sport as its position can cause a performer to be very stable or very unstable. A low centre of mass makes a person more stable, while a high centre of mass makes them less stable. The more stable a person is, the harder they are to push over and the bigger the force required to make them unstable. An example of this is the position that rugby forwards take up in a scrum. They want to make themselves as stable as possible so that it requires a very large force from their opponents to move them backwards. To do this, they make their centre of mass as low as possible and their area of support as wide as possible. If their line of gravity is close to the centre of their base of support, they will also increase their stability. Other examples of stable positions in sport are the "on your marks" position in a sprint start and the stance taken up by sumo wrestlers!

You have shown a good understanding of the theory being asked here and have got straight to the point without waffle – excellent!

Good use of sporting examples, which is what the question is asking you to do.

Great use of analysis and application of knowledge.

Unstable positions come about by having a higher centre of mass, a smaller area of support and a line of gravity that is close to or falls outside the area of the base of support. There are lots of times in sport when a performer wants to adopt an unstable position as it allows them to move off quickly. For example, the "set" position in a sprint start, where the centre of mass is raised and the line of gravity has moved to the very front of the base of support. Swerving, side-stepping and dodging are other examples of when a performer would benefit from being unstable.

Some more practical examples and good analysis here.

General Examiner Comment

This is a thorough, accurate and concise answer with plenty of sporting examples – an A grade answer.

3a: The cardiovascular and respiratory systems

Explain how neural control of the heart helps to maintain the supply of oxygenated blood during exercise. (5 marks)

Neural stimuli control the supply of oxygenated blood to the muscles during exercise. This stimulates the brain which in turn stimulates the SA node which increases heart rate.

You have initially just repeated the question but the answer is too superficial and brief for a 5 mark question. You've identified the SA node structure that results in an increases heart rate for 2 marks, but missed the factors affecting the control centre involved. This lack of structure means the answer was directed immediately to the end of the explanation which discounted 8 of the available marks. This is a common error which you can avoid by either logically planning out your answer or by questioning your initial starting point in reverse, e.g. How does the brain stimulate the SA node? What stimulates the brain to initiate the stimulus of the SA Node? Why do neural factors stimulate the brain?

'A' Grade Student Answer

Neural factors controlling the heart are proprioreceptors which detect motor movement in the muscles, chempreceptors which pick up an increase in CO_2/lactic acid and baroreceptors in blood vessels that blood pressure is increasing. These stimuli stimulate the cardiac control centre in the medulla oblongata which responds by increasing the activity of the sympathetic accelerator nerve to the SA node. At the same time the activity of the parasympathetic vagus nerve is decreased and in turn this increases heart rate which increases the supply of oxygenated blood during exercise.

Logical start point, Control centre, Control mechanisms, Good conclusion & link back to Q

3b: The cardiovascular and respiratory systems

The skeletal pump mechanism is one way of helping to maintain venous return.

Describe three other mechanisms involved in venous return.

Explain the importance of the skeletal pump mechanism during an active cool-down. (5 marks)

Respiratory pump, valves, smooth muscle and gravity help maintain venous return. An active cool-down keeps the muscles working helping pump blood back to the heart and this helps speed up recovery.

The candidate has initially just listed the VR mechanisms when the command word was 'describe'! The answer therefore lacks depth/detail required to merit the marks available. The candidate has gained a mark for describing the muscle-pump action but fell short of explaining why this is so important – hence they have not applied! The candidate's answer reflected that they had not read the question fully and rushed the answer; and a poor understanding of command words. Similarly, the candidate should have acknowledged that 3 marks were available for describing three other mechanisms and that listing four would not be sufficient to merit the marks available.

'A' Grade Student Answer

Three other VR mechanisms are; 1 – Pocket valves in veins prevent the back flow of blood directing it back to the heart, 2 – Smooth muscle in veins veno-constricts to help squeeze blood back towards the heart, 3 – Gravity also helps VR for body parts above the heart.

Logical start point, Good link to Q ensuring answer specific to Q, Ordered answer

The active cool-down is important because it keeps the skeletal muscle pump working so muscles help squeeze blood back towards the heart. This stops blood pooling in the pocket valves and also helps the removal of CO_2 and lactic acid from the muscles.

Good application to function

3c: The cardiovascular and respiratory systems

Altitude (height in Metres)	Atmospheric pressure (mmHg)	Partial pressure oxygen (mmHg)
Sea level	760	159.2
2000	596	124.9
4000	462	96.9

Table 7

Use the information in Table 7 to help explain the difficulties that an endurance performer might experience when performing at altitude, without a period of acclimatisation. (5 marks)

Table 7 shows that PPO_2 decreases as altitude increases and this results in less O_2 transport to the working muscles so the athlete will not be able to work as hard or as long as they could at sea level. This is because they have not had time to adapt and increased their red blood cell production which increases their O_2 transport and which would increase their aerobic performance.

A reasonable structured answer but which just lacked further depth/detail. The candidate correctly identified that PPO_2 decreases as altitude increases (1 mark) and that this will decrease O_2 transport (1 mark) but did not identify why/how this occurs. The candidate identified performance decreased (1 mark) but linked this to adaptations to altitude training which was irrelevant to this question as it stated no acclimatisation had occurred. It is a common error in this area to jump to altitude adaptations and often to those which are vascular not respiratory adaptations. Good exam technique always starts with the PPO_2 at altitude and the knock-on effects to the normal respiratory exchange processes that they have already studied, before applying this to the net effect on performance.

'A' Grade Student Answer

The PP of O_2 at altitude decreases so when they inspire the PP of O_2 is lower in the air in the alveoli than that at sea level. This means the diffusion gradient is reduced so less O_2 is diffused into the alveoli capillaries. This reduces O_2 transport so the O_2 supplied to the working muscles is also reduced. The net effect is that aerobic performance is reduced. The athlete will have to increase their rate and depth of breathing to compensate but overall they will either have to slow down or are likely to fatigue earlier than they would at sea level.

Logical start point, Knock-on effects in order, Good application to performance, Good application to performer / individual.

Examiners Tips

Read the question, then read it again and pay attention to the command word. Make sure you answer the question given, not a similar question you have seen on a past paper.

Try not to hurry your answer. Take time to plan your answer, organise your thoughts and, when you have finished, proofread your work.

Make sure your answer is clear and accurate. In the science-based questions make your first response factual, relevant to the question and concise. Use specialist vocabulary whenever you can.

Learn key specific language and definitions.

Physiological scientific language nearly always follows a logical order which can be learnt as a story or via a diagram.

Make up works or terms to help chunk information, for example, each letter of the acronym SLAPPER provides the first letter of the 7 functions of the skeleton.

Create revision summaries or memory maps for each of the topic units: 1. Musculo-skeletal, 2. Motion and Movement, 3. Heart, 4. Vascular system, 5. Respiratory system.

Read questions fully, focus on the topic area and then to the specific area.

Develop revision sheets for each area of work which summarises the key heading for each area.

Collate and use past exam paper questions to learn exam practice.

Apply! Apply! Apply! whenever possible.

On larger questions offering 4-to-6 marks, which often end by asking for the 'effect on performance', D/C grade students often jump straight to the 'effect' and miss theory marks. Learn to ask yourself WHY does this effect take place? By answering 'because' this leads you backwards, into the marking scheme.

'Four marks' means four points.

'Use an example' means you MUST use an example – it is not optional.

Revision Checklist:

1. The skeletal and muscular systems

You should be able to describe and explain:

The Skeleton

- An overview of the skeleton.

Joints

- The different types of joint found in the body.

Movements of synovial joints

- The anatomical position.
- Movements that relate to the following joints: wrist, elbow, radio-ulnar, shoulder, spine, hip, knee, ankle.

Muscles

- The terms: origin, insertion, agonist, antagonist, antagonistic muscle action.
- The major muscles associated with the main joints of the human body and explain their role as an agonist or an antagonist with reference to specific movements in physical activity.
- Full movement analysis of different types of sporting techniques.
- The three types of muscular contraction: concentric, eccentric, isometric.
- The three types of muscle fibre found in skeletal muscle: slow twitch, fast oxidative glycolytic and fast glycolytic.
- The physiological benefits to skeletal muscle of a warm up and a cool down.

Bone and Muscle Health

- Factors affecting the efficiency of the musculo-skeletal system.
- The positive and negative impact of different types of physical activity on the above conditions.

Revision Checklist:

2. Basic concepts of biomechanics

You should be able to describe, explain and give sporting examples of:

- Linear, angular and general motion.
- The effect of size, direction and position of application of force on a body.
- Newton's laws of Motion.
- The term centre of mass and its relationship to stability and type of motion produced.
- A practical analysis of physical actions using your knowledge of the above.

3. The cardiovascular and respiratory systems

Cardiovascular system - heart: Part I

You should now be able to describe and explain:

- The cardiac cycle (diastole and systole).
- The conduction system of the heart.
- The link between the cardiac cycle and the conduction system of the heart.
- The relationship between stroke volume, heart rate and cardiac output: definitions and resting values for each.
- The changes that take place to stroke volume, heart rate and cardiac output during different intensities of physical activity.
- The regulation of heart rate during physical activity – to include neural, hormonal and intrinsic factors.

Revision Checklist:

3. The cardiovascular and respiratory systems

Cardiovascular system - vascular: Part II

You should now be able to describe and explain:

- The distribution of cardiac output at rest and during exercise (the vascular shunt mechanism).
- The role of the vasomotor centre and the involvement of arterioles and pre-capillary sphincters.
- How carbon dioxide and oxygen are carried within the vascular system; how effective transportation of carbon dioxide and oxygen within the vascular system aids participation in physical activity; how smoking impacts on transportation of oxygen.
- Blood pressure and identifying resting values.
- Changes that occur during physical activity and hypertension.
- How venous return is maintained.
- Effects that a warm-up and cool-down period has on the cardiovascular system; how venous return impacts on the quality of performance.
- Lifelong involvement in an active lifestyle, how to critically evaluate different physical activities, and the impact these have on the cardiovascular system: coronary heart disease (CHD); arteriosclerosis, atherosclerosis; angina, and heart attack.

Revision Checklist:

3. The cardiovascular and respiratory systems

Cardiovascular system - respiratory: Part III

You should now be able to describe, explain and evaluate the points below.

- Describe the mechanics of breathing at rest and the respiratory muscles involved.
- Explain the changes in the mechanics of breathing during physical activity (to include reference to additional muscles involved & the active nature of expiration).
- Explain how changes in the mechanics of breathing during physical activity are regulated by the respiratory centre.
- Describe the process of gaseous exchange that takes place between the alveoli and blood, and between the blood and tissue cells.
- Explain the changes in gaseous exchange that takes place between the alveoli and blood and between the blood and the tissue cells, as a direct result of participation in physical activity.
- Explain the effect of altitude on the respiratory system and how this influences the performance of different types of physical activity.
- Evaluate critically the impact of different types of physical activity on the respiratory system with reference to lifelong involvement in an active lifestyle.

Glossary of key terms

Chapter 1

Skeleton
The bony framework upon which the rest of the body is built. It provides attachments for the muscular system and carries and protects the cardiovascular and respiratory systems.

Skeletal muscle
This attaches to and moves the skeleton. It is often termed striated muscle because it has obvious stripes on it caused by the long muscle fibres of which it is composed. It is also called voluntary muscle because it is the only type of muscle under our conscious control.

Joint
A place on the body where two or more bones meet.

Appendicular skeleton
The bones of the upper and lower limbs and their girdles that join to the axial skeleton.

Axial skeleton
This forms the long axis of the body and includes the bones of the skull, spine and rib cage.

Ligament
A tough band of fibrous, slightly elastic connective tissue that attaches one bone to another. It binds the ends of bones together to prevent dislocation.

Tendon
A very strong connective tissue that attaches skeletal muscle to bone.

Bursa (pl. bursae)
A flattened fibrous sac lines with synovial fluid that contains a thin film of synovial fluid. Its function is to prevent friction at sites in the body where ligaments, muscles, tendons or bones might rub together.

Meniscus (pl menisci)
A wedge of white fibrocartilage that improves the fit between adjacent bone ends, making the joint more stable and reducing wear and tear on joint surfaces.

Pad of fat
A fatty pad that provides cushioning between the fibrous capsule and a bone or muscle.

Anatomical position
An upright standing position with head, shoulders, chest, palms of hands, hips, knees and toes facing forwards.

Anterior
Towards the front of the body.

Posterior
Towards the back of the body.

Superior
Towards the head or upper part of the body.

Inferior
Towards the feet or the lower part of the body.

Medial
Towards the middle of the body.

Lateral
Towards the outside of the body.

Origin
Point of attachment of a muscle that remains relatively fixed during muscular contraction.

Insertion
Point of attachment of a muscle that tends to move toward the origin during muscular contraction.

Antagonistic muscle action
As one muscle shortens to produce movement; another muscle lengthens to allow that movement to take place.

Agonist muscle
The muscle that is directly responsible for the movement at a joint.

Antagonist muscle
The muscle that has an action opposite to that of the agonist and helps in the production of a coordinated movement.

Core stability
The ability of your trunk to support the forces from your arms and legs during different types of physical activity. It enables joints and muscles to work in their safest and most efficient positions, therefore reducing the risk of injury.

Isotonic contraction
Tension is produced in the muscle while there is a change in muscle length. It is a dynamic contraction because the joint will move.

Isometric contraction
Tension is produced in the muscle but there is no change in muscle length. It is a static contraction because the joint will stay in the same position.

Concentric contraction
A type of isotonic contraction that involves the muscle shortening while producing tension.

Eccentric contraction
A type of isotonic contraction that involves the muscle lengthening while producing tension.

Slow twitch muscle fibre
A type of muscle fibre associated with aerobic work. It produces a small force over a long period of time: high resistance to fatigue. It is suited to endurance based activities, e.g. marathon running.

Fast twitch muscle fibre
A type of muscle fibre associated with anaerobic work. It produces a large force over a short period of time: low resistance to fatigue. It is suited to power-based activities, e.g. sprinting, power lifting. There are two types: fast oxidative glycolytic (Types 2a/FOG) and fast glycolytic (type 2b/FG). FOG fibres have a slightly greater resistance to fatigue than FG fibres.

Aerobic exercise
Is performed in the presence of oxygen at a submaximal intensity over a prolonged period of time, e.g. rowing.

Anaerobic exercise
Is performed in the absence of oxygen at a maximal intensity that can only be sustained for a short period of time due to the build up of lactic acid, e.g. sprinting.

Warm up
Light aerobic exercise that takes place prior to physical activity, normally including some light exercise to elevate the heart rate, muscle and core body temperature, some mobilising exercises for the joints, some stretching exercises for the muscles and connective tissue and some easy rehearsal of the skills to follow.

Cool down
Low intensity aerobic exercise that takes place after physical activity and facilitates the recovery process.

Osteoporosis
Weakening of bones caused by a reduction in bone density making them prone to fracture.

Sedentary
an inactive lifestyle with little or no exercise.

Osteoarthritis
A degenerative joint disease caused by a loss of articular cartilage at the ends of long bones in a joint. It causes pain, swelling and reduced motion in your joints.

Bone spurs
Are small projections of bone that form around joints due to damage to the joint's surface, most commonly caused from the onset of osteoarthritis. They limit movement and cause pain in the joint.

Joint stability
This refers to the resistance offered by various musculo-skeletal tissues that surround a joint.

Muscle tone
The continual state of partial contraction of a muscle that helps to maintain posture.

Chapter 2

Linear motion

When a body moves in a straight or curved line, with all its parts moving the same distance, in the same direction and at the same speed.

Angular motion

When a body or part of a body moves in a circle or part of a circle about a particular point called the axis of rotation.

General motion

A combination of linear and angular motion.

Inertia

The reluctance of a body to change its state of motion.

Acceleration

The rate of change of velocity.

Stability

Relates to how difficult it is to disturb a body from a balanced position.

Line of gravity

A line extending from the centre of mass vertically down to the ground.

Direct force

A force whose line of application passes through the centre of mass of a body causing the resulting motion to be linear.

Eccentric force

A force whose line of application passes outside the centre of mass of a body causing the resulting motion to be angular.

Chapter 3

Bradycardia

A resting heart rate (HR) below 60.

Hypertrophy

Increase in size of heart muscle wall.

Venous return

Blood returning to the heart.

Ventricular contractility

Capacity of heart ventricles to contract.

Motor nerves

Nerves which stimulate muscle tissue causing motor movement.

Sensory nerves

Nerves which transmit information to Central Nervous System, e.g. from receptors to the CCC (cardiac control centre).

Receptors

Sense organs that pick up stimuli, which are relayed to the brain (medulla oblongata).

Smooth muscle

Involuntary muscle found in blood vessel walls.

Vasodilate

Widening of arterial blood vessels.

Vasoconstrict

Narrowing of arterial blood vessel walls.

Venodilate

Widening of venous blood vessels.

Venoconstrict

Narrowing of venous blood vessel walls.

Chemoreceptors

A sensory receptor that is selective for a chemical substance.

Baroreceptors

A sensory receptor that responds to pressure or stretch. Refers to the blood pressure receptors of the carotid artery and aorta.

pH level

A measure of acidity. A low pH = high acidity, and vice versa.

OBLA

Onset of blood lactate accumulation. The point at which the body produces lactic acid quicker than it can remove it, causing an increase in lactic acid levels which eventually cause muscle fatigue.

Enzyme

Protein that acts as a catalyst for bodily reactions.

Blood viscosity

Resistance to blood flow.

CHD

A generic term for summarising Coronary Heart Diseases.

Sedentary

Physically inactive lifestyle.

VO_2 max

Maximal oxygen consumption

Lactate threshold

Start of anaerobic work

Multiple Choice Questions

1. Which of the following statement describes concentric muscular contraction?
   a. It controls joint movement
   b. It causes joint movement
   c. It stops joint movement
   d. It hinders joint movement

2. Which of the following is the name given to the fiberous tissue that connects bones to other bones?
   a. Bursa
   b. Ligament
   c. Meniscus
   d. Joint Capsule

3. Which of the following are not characteristics of fast glycolytic (FG) fibres?
   a. High force of contraction
   b. Fatigue resistance
   c. Large fibre size
   d. Low mitochondria density

4. Which of the following statements are not true?
   a. The femur and tibia make up the hinge joint at the knee
   b. The atlas, axis joint at the top of the spine and the radio-ulnar joint are both pivot joints
   c. The tibia, fibula and tarsals make up the hinge joint at the ankle
   d. The femur and pelvis make up the ball and socket joint at the hip, which is the most stable joint in the body

5. Which group of muscles make up the rotator cuff of the shoulder?
   a. Suprascapularis, infra minor, teres magnus and subspinatus
   b. Anterior, middle and posterior deltoid
   c. Transverse abdominis and multifidis
   d. Supraspinatus, infraspinatus, teres minor and subscapularis

6. Which of the following are not movements at the shoulder joint?
   a. Flexion and extension
   b. Abduction and adduction
   c. Dorsiflexion and plantar flexion
   d. Horizontal flexion and horizontal extension

7. Which of the following muscles is NOT responsible for flexion of a joint?
   a. Biceps brachii
   b. Vastus lateralis
   c. Iliopsoas
   d. Semitendinosus

8. Which of the following pairs of muscles is NOT an antagonistic pair?
   a. Iliopsoas and rectus abdominis
   b. Pronator teres and supinator
   c. Rectus femoris and biceps femoris
   d. Middle deltoid and latissimus dorsi

9. Which of the following is NOT a feature of a long bone?
   a. Diaphysis
   b. Growth plate
   c. Bone marrow
   d. Ligament

10. Which of these bones are found in the axial skeleton?
    a. Femur, pelvis
    b. Radius, ulna, humerus
    c. Skull, vertebral column, ribs
    d. Talus, sternum, tibia

11. Which of the following is an example of general motion/
    a. An athlete during a 100m sprint
    b. The arm action of a swimmer in back stroke
    c. A winter Olympian competing in the luge event
    d. A male gymnast completing a full circle on the high bar

12. Which of the following sporting examples is an application of Newton's Third Law of Motion?
    a. In the sprint start, when the sprinter pushes down and back on the blocks the blocks apply and equal and opposite force (up and forwards) on the sprinter
    b. In the 1500m race, the athlete will continue to run with constant velocity unless acted upon by an external force
    c. The large force exerted by a golf club on the golf ball during a drive from the tee will cause the ball to accelerate quickly towards the hole
    d. When an apple falls on the head of a famous footballer

13. Which of the following statements about a force is false?
    a. A force can cause a moving body to accelerate
    b. A force can cause a body at rest to move
    c. A force will always act through a body's centre of mass
    d. A force can cause a moving body to change direction

14. Which of the following statements does not apply to a body's centre of mass?
    a. It is the point at which the body is balanced in all directions
    b. It determines the weight of the body
    c. Its position in the body can change
    d. It can lie on a point outside the body

15. Which of the following resting blood pressure values would be classified as hypertension?
    a. 120 / 80
    b. 60 /40
    c. 140 / 90
    d. 50 / 35

16. Which of the following values are representative of resting, submaximal and maximal cardiac output?

a.	Resting 5L/min	sub-max Up to 20L/min	maximal 40-60L/min
b.	Resting 5L/min	sub-max Up to 20L/min	maximal 40-60L/min
c.	Resting 3L/min	sub-max Up to 10L/min	maximal 20-40L/min
d.	Resting 5L/min	sub-max Up to 10L/min	maximal 20-40L/min

17. Which of the following is not an example of a venous return mechanism?
    a. Muscle pump
    b. Smooth muscle
    c. Pre-capillary sphincter
    d. Pocket valves

18. Modifying which of the following risk factors, will have the single most effect on reducing the risk of developing CHD?
    a. Physical inactivity
    b. Hypertension
    c. Obesity
    d. High cholesterol and blood lipids

19. Which of the following best describes atherosclerosis?
    a. More severe/sudden or total restriction in O_2/blood supply to a part of the heart muscle wall usually causing permanent damage
    b. A loss of elasticity, thickening/hardening of the arteries
    c. Cholesterol and fat deposits accumulate within arterial walls forming fatty plaque, leading to a progressive narrowing (diameter) of the lumen
    d. Partial blockage of the coronary artery causing intense chest pain

20. Which of the following is the most recommended form of altitude training?
    a. Live high train low (LHTL)
    b. Live high train high (LHTH)
    c. Live low train low
    d. Live low train high

21. Which of the following are structures involved in the neural control of heart rate?
    a. Adrenalin
    b. Proprioreceptors
    c. Venous return
    d. Temperature increase resulting in an increase in the speed of nerve impulses

Answers – 1.b 2.b 3.b 4.c 5.d 6.c 7.b 8.a 9.d 10.c 11.a 12.a 13.c 14.b 15.c 16.d 17.c 18.a 19.c 20.a 21.b

OCR Jan 2008

Section A – Application of Anatomy and Physiology Knowledge to Improve Performance

1. (a) Fig. 1 shows an athlete in a 110m hurdles race.

Fig. 1

(i) Complete the joint analysis table below for the athlete's left (trailing) leg. [5]

Joint	Joint type	Articulating bones	Movement	Agonist	Antagonist
Left Knee (trailing)		Femur and Tibia			Rectus Femoris
Left Ankle (trailing)	Hinge		Dorsi Flexion	Tibialis Anterior	

(ii) Give **one** exercise that could be used to strengthen the rectus femoris and **one** exercise to strengthen the tibialis anterior.

Rectus Femoris

Exercise.....

.....[1]

Tibialis Anterior

Exercise.....

.....[1]

OCR Jan 2008

(iii) Identify **two** structures of a synovial joint and describe the role of **one** of these structures during physical performance

Structure 1 .....

Structure 2 .....

Role.....

.....[3]

(b) It is recommended that an athlete completes a cool down after exercise.

Describe **three** ways in which an active cool down affects the vascular system of the athlete.

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(c) Explain, using a practical example, how size or direction of force can affect performance in PE and sport.

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[Total:15]

OCR Jan 2008

2. (a) Fig. 2 shows the lung volume of a performer at rest.

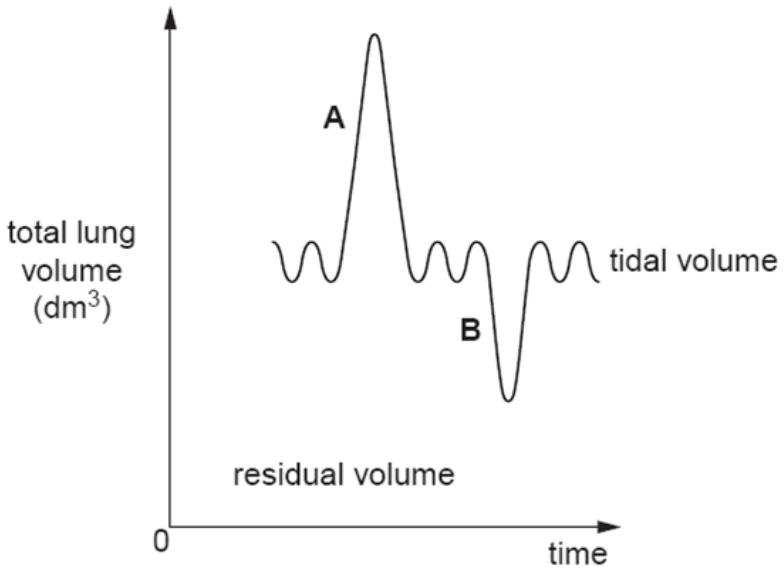

Fig. 2

(i) Name the **two** lung volumes marked **A** and **B**.

A.....

B.....[2]

(ii) Describe tidal volume. What would you expect to happen to tidal volume during exercise?

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OCR Jan 2008

(b) Fig. 3 shows the dissociation curve. During exercise this curve moves to the right.

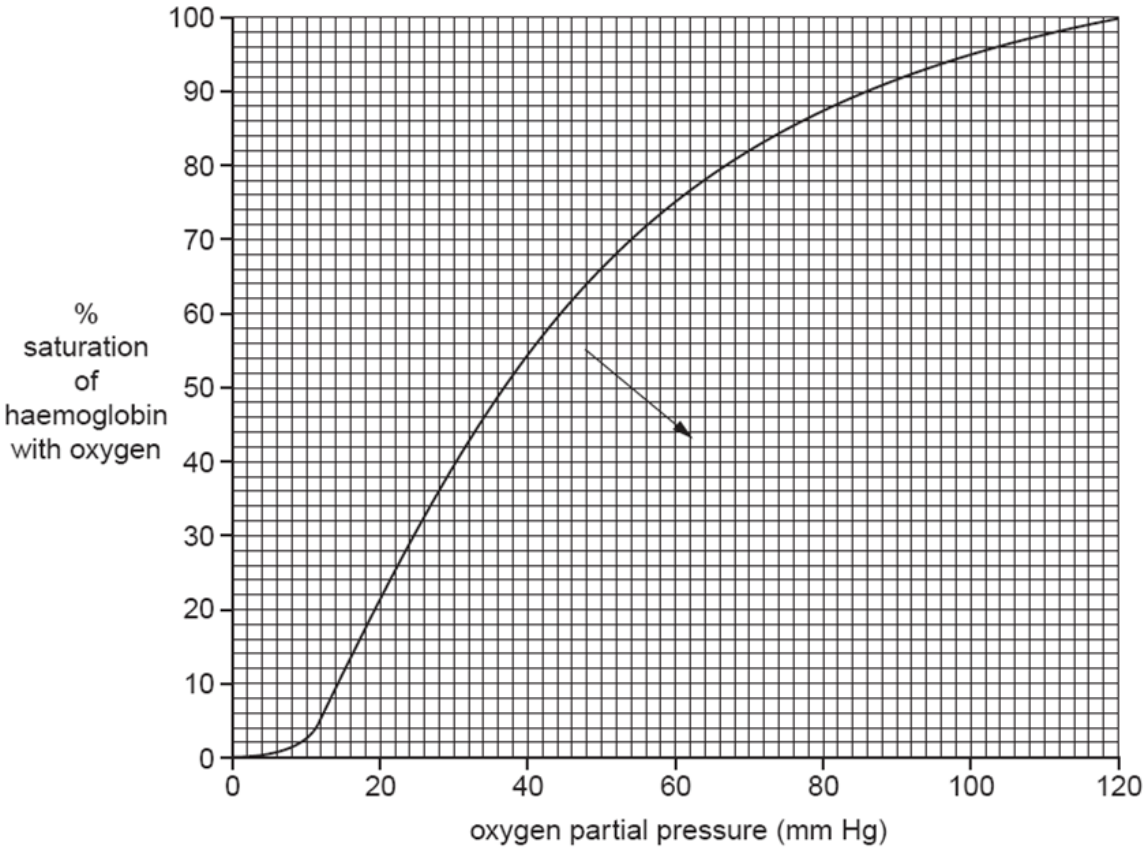

Fig. 3

Explain what physiological factors cause the curve in Fig. 3 to move.

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OCR Jan 2008

(c) Describe how intrinsic control affects the cardiac output of a performer during exercise.

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(d) Describe how the conduction system of the heart controls the cardiac cycle.

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[Total: 15]

OCR May 2006

Section A – Application of Anatomy and Physiology Knowledge to Improve Performance

1. (a) Figure 1 below shows an athlete during the take off phase of the long jump.

Fig. 1

(i) Complete the joint analysis below.

Knee joint during extension:

Type of joint: .....

Articulating bones: .....

Agonist: .....

Ankle joint during plantar flexion:

Type of joint: .....

Agonist: .....[5]

(ii) The long jumper would use fast glycolytic fibre type (IIb) during the take off phase. Identify **two** reasons why this fibre type would be used.

Reason 1 .....

Reason 2 .....[2]

OCR May 2006

(b) Complete the table below, giving an exercise which could be used to strengthen each of the muscles.

Muscle	Exercise
Pectoralis Major	1.
Rectus Abdominus	2.
Bicep Brachii	3.

[3]

(c) Figure 2 below shows the position of the centre of mass whilst holding a balance. Describe how the position of the centre of mass can affect balance.

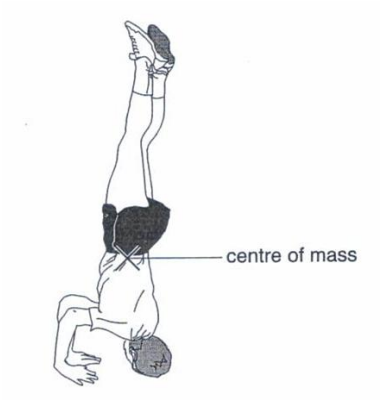

Fig. 2

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(d) One change to the vascular system during warm up is the ability of the haemoglobin to release oxygen quicker. Identify **two** other changes to the vascular system during warm up.

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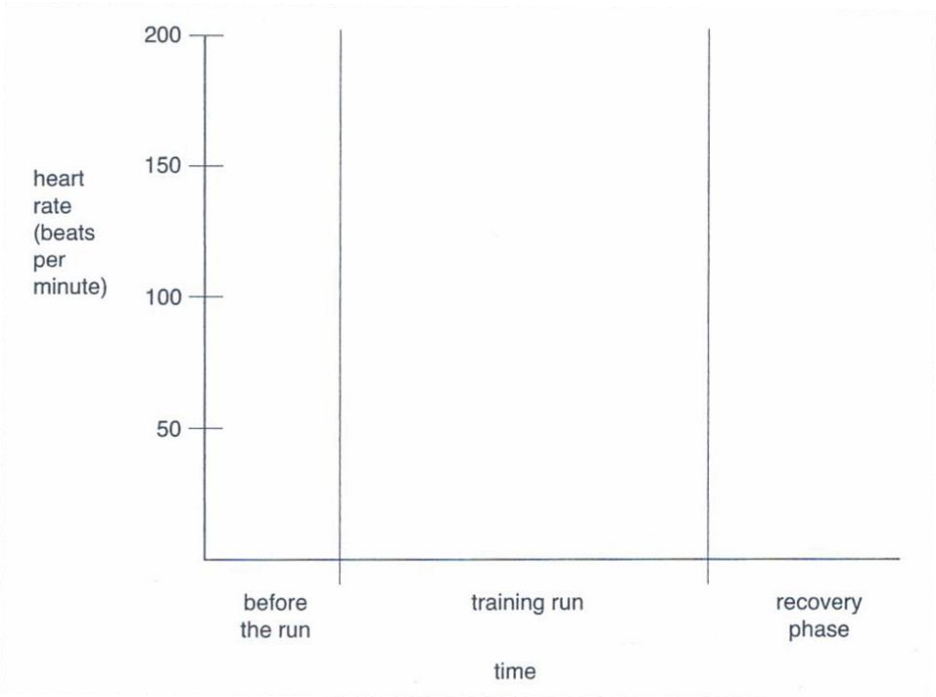
[Total: 15]

OCR May 2006

2. (a) A long distance runner completes a 60min sub-maximal training run.

(i) Complete the graph below to show the changes in heart rate in the following three stages

- Before the run
- During the run
- For a ten minutes recovery phase. [4]



(ii) Explain how the cardiac control centre (neural control) increases the heart rate.

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OCR May 2006

(iii) During the training run blood needs to be diverted away from non-essential organs to the working muscles. Explain how the vasomotor centre controls this distribution.

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(iv) Describe the mechanisms of breathing which allow the runner to breathe in (inspiration) greater volumes of oxygen during a run.

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(v) Explain how the respiratory centre uses neural control to produce changes in the mechanics of breathing.

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[Total: 15]

OCR Jan 2006

Section A – Application of Anatomy and Physiology Knowledge to Improve Performance

1. (a) Figure 1 shows a tennis player completing a service (execution phase).

Fig. 1

(i) Use the diagram to help you complete the following joint analysis.

Shoulder joint during extension

Type of joint: .....

Articulating bones: .....

Agonist: .....

Type of contraction at agonist: .....

Wrist joint during flexion

Agonist: .....

Antagonist: .....[6]

(ii) Tennis players need to develop strength in their leg muscles. Identify one exercise which would develop strength in each of the following muscles.

Gastrocnemius .....

Rectus Femoris .....[2]

OCR Jan 2006

(b) A cool down has a number of effects on the vascular system which aid the performer. One effect is the prevention of blood pooling. Identify **two** other effects.

Effect 1

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Effect 2

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.....[2]

(c) During sub-maximal (aerobic) exercise the predominant muscle fibre type would be slow oxidative (type 1). Give one structural and one functional characteristic of this fibre type.

Structural characteristic .....

Functional characteristic .....[2]

OCR Jan 2006

(d) Figure 2 shows a spirometer trace of lung volumes of a performer at rest.

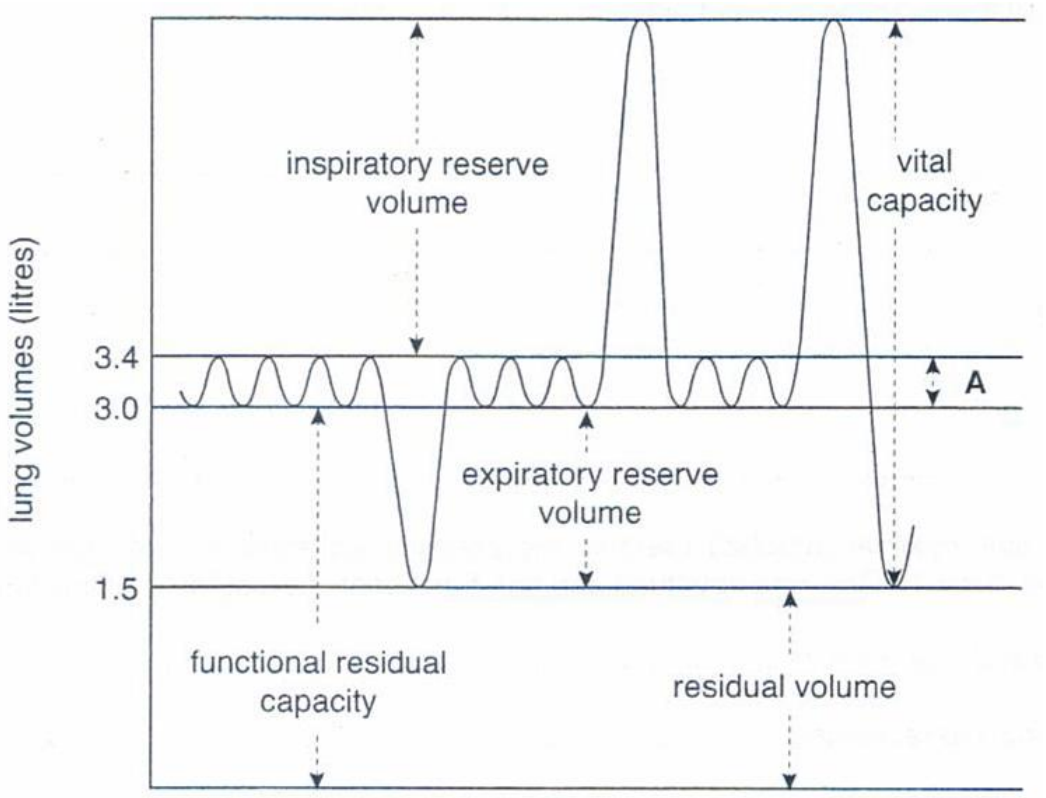

Fig. 2

(i) Name and define the lung volume labelled A.

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(ii) What changes would you expect in lung volume A as the performer starts to exercise?

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.....[1]

[Total: 15]

OCR Jan 2006

2. (a) Large amounts of blood need to circulate around the body during prolonged aerobic exercise.

(i) Identify the mechanisms of venous return that ensure a sufficient supply of blood is returned to the heart during exercise.

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(.ii) An increase in venous return leads to an increase in heart rate. Explain how this is achieved by intrinsic control.

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(iii) Describe how the blood travels through the heart in the following stages of the cardiac cycle.

Diastole:.....

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Artial Systole: .....

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Ventricular Systole:.....

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OCR Jan 2006

(iv) While exercising a greater volume of blood is ejected during ventricular systole. Why is this beneficial to performance?

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.....[1]

(b) Figure 3 shows oxygen diffusing into the blood stream and being transported in the blood to the working muscles.

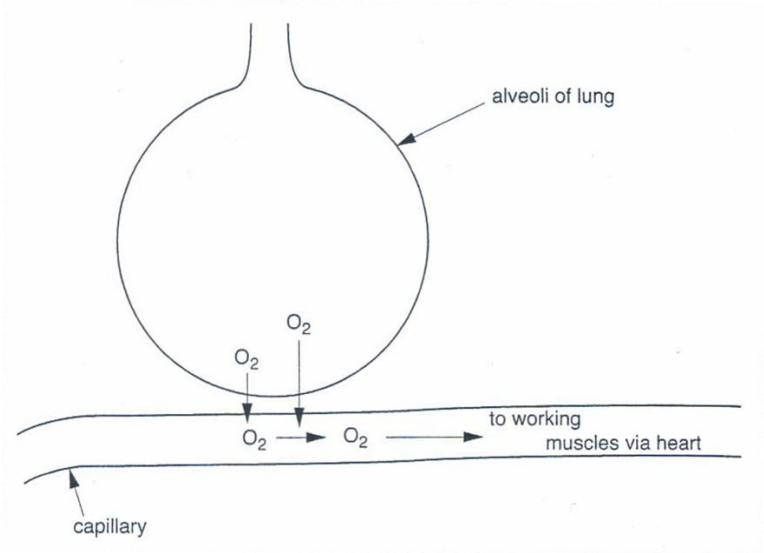

Fig. 3

(i) Explain how gas exchange is increased at the lungs to ensure that a greater amount of oxygen is diffused into the blood during exercise.

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OCR Jan 2006

(ii) How is oxygen transported in the blood to the working muscles?

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[Total: 15]

OCR May 2005

Section A – Application of Anatomy and Physiology Knowledge to Improve Performance

1. (a) (i) Fig. 1 shows a diagram of a gymnast performing a tuck jump.

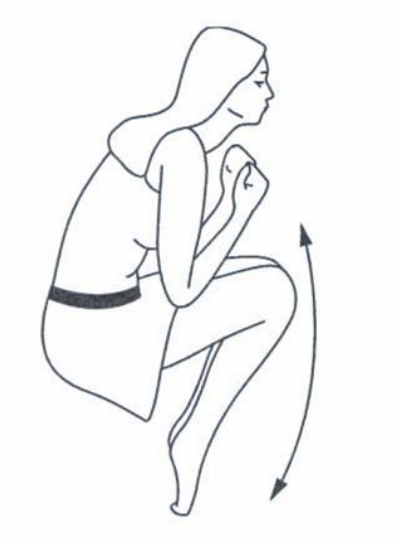

Fig. 1

Apply your knowledge to complete the following movement analysis table. [3]

Joint	Joint type	Articulating bones	Movement occurring	Agonist	Antagonist
Hip					

(ii) Identify **two** structures of the hip joint and describe the role of each structure during physical performance.

Structure.....

Role.....

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Structure.....

Role.....

.....[4]

OCR May 2005

(b) When hitting a ball in tennis an understanding of force and direction is important.

Explain how force can cause the ball to:

(i) Move Straight .....

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(ii) Spin .....

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.....[2]

(c) It is recommended that a performer completes a warm up prior to exercise.

Give **two** effects of a warm up on the vascular system.

Effect 1 .....

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Effect 2 .....

.....[2]

(d) During endurance activities at altitude there may be a reduction in performance.

Why do the changes in air pressure at altitude reduce performance?

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[Total: 15]

OCR May 2005

2 (a) During exercise more oxygen must be supplied to the working muscles.

Describe the passage of oxygenated blood through the pulmonary and systemic networks from the lungs to the working muscles

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(b) Cardiac output is a determining factor during endurance activities.

Describe how cardiac output is increased during endurance activities.

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OCR May 2005

(c) Explain the conduction system of the heart.

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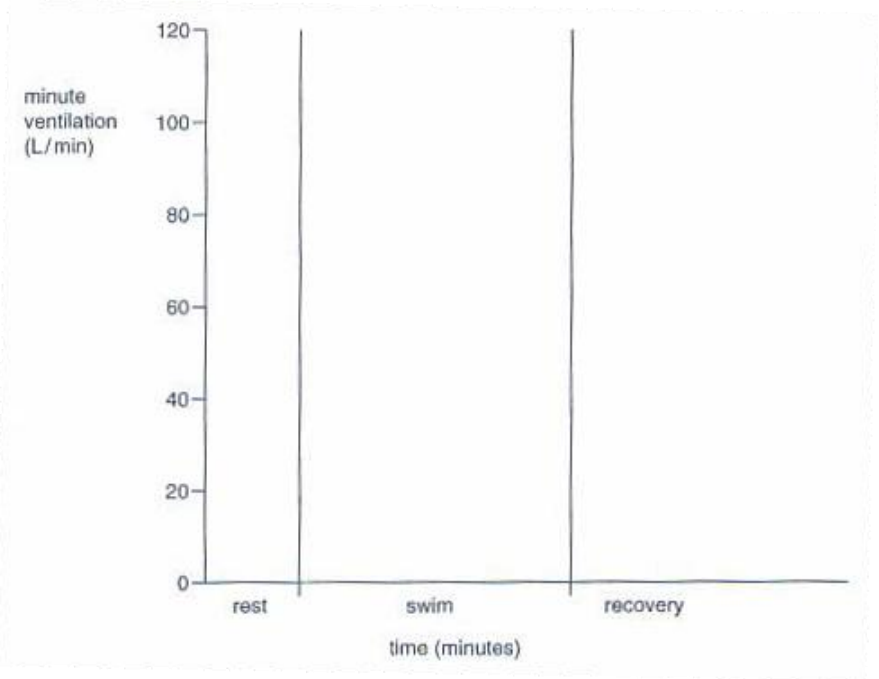
(d) Minute ventilation is defined as the volume of air inspired or expired in one minute.

Sketch a graph below to show the minute ventilation of a swimmer completing 20 minute sub maximal swim. Show minute ventilation:

- Prior to the swim
- During the swim
- For a ten minute recovery period [4]



[Total: 15]

OCR Jan 2005

Section A – Application of Anatomy and Physiology Knowledge to Improve Performance

1 (a) Fig. 1 shows a netball player using the elbow joint during the execution phase of a shot.

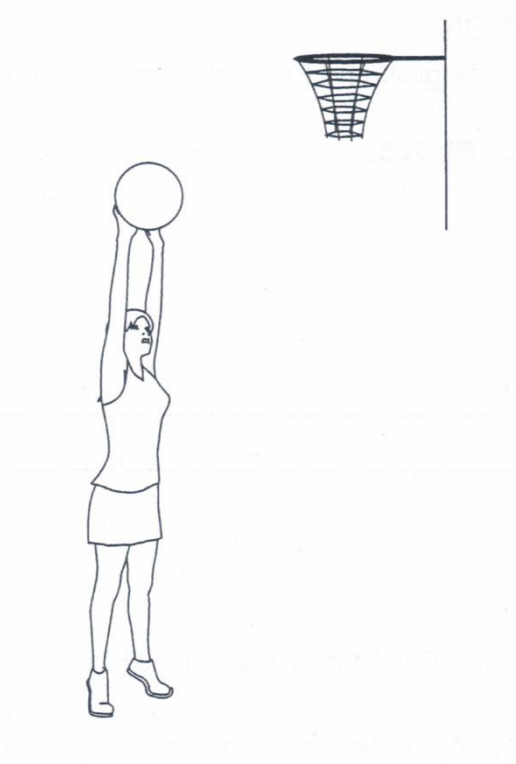


Fig. 1

(i) Identify the type of joint, articulating bones, agonist and antagonist during extension of the elbow during the execution phase of the shot, shown in Fig. 1 above.

Type of joint: .....

Articulating bones: .....

Agonist muscle: .....

Antagonist muscle: .....[4]

(ii) Name the type of contraction occurring at the agonist and give one exercise that could be used to improve strength in that muscle.

Type of contraction: .....

Strength exercise: .....[2]

OCR Jan 2005

(iii) How would a warm up benefit the strength of muscle contractions when performing the strengthening exercise?

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(b) Following a training session a coach will require the performer to complete a cool down.

How would a cool down aid the vascular system?

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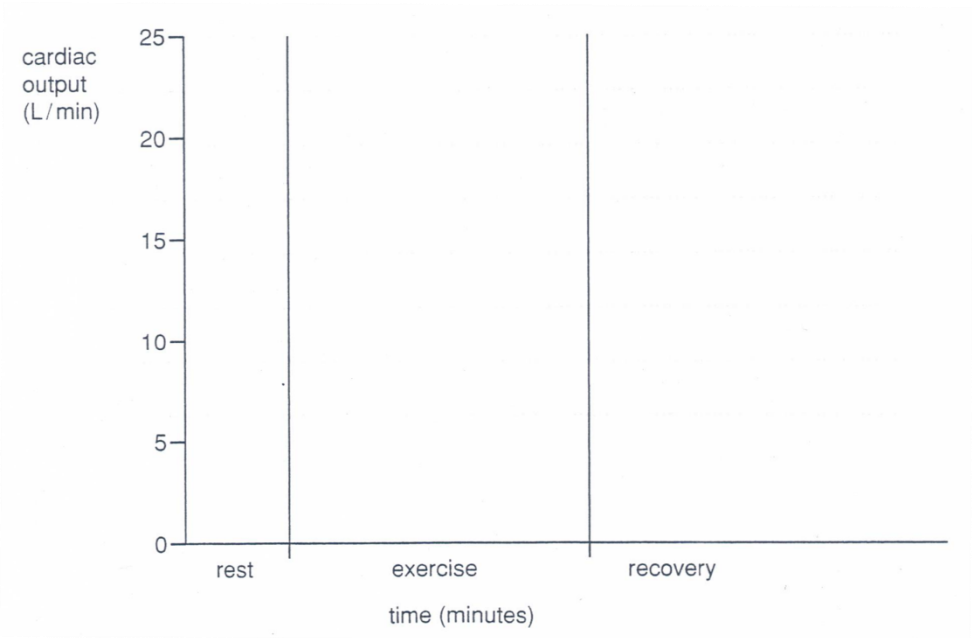
.....[2]

(c) Sketch a graph showing the changes you would expect in **Cardiac output**:

- At rest,
- During a 30 minute submaximal training run,
- For a ten minute recovery period. [4]



[Total: 15]

OCR Jan 2005

2 (a) During aerobic performance a large amount of carbon dioxide is produced at the muscles.

(i) How is carbon dioxide diffused from the muscle tissue into the blood during exercise?

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(ii) Describe the passage of deoxygenated blood through the systemic and pulmonary networks which allows carbon dioxide to be removed during aerobic performance.

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(iii) Identify **two** ways in which carbon dioxide is carried in the blood during aerobic performance.

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OCR Jan 2005

(iv) Why does an increase in carbon dioxide during exercise increase heart rate? How does this happen?

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(v) Describe how the mechanics of breathing alter during exercise to **expire** greater volumes of carbon dioxide.

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[Total: 15]