

CHAPTER 11: Preparation and training methods

Practice questions - text book pages 158 - 160

- 1) When conducting field and laboratory testing it is important to collect accurate results for analysis. Which one of the following key terms does not support this process?
- improves speed of movement.
 - qualitative analysis assessment.
 - validity of test.
 - objective analysis assessment.

Answer: b.

Explanation:

- *Qualitative analysis assessment is a statement of quality, goodness, merit or worthiness. The other choices are relevant to systematic processes required for accurate data collection.*

- 2) Which one of the following is a good reason for performing a cool-down?
- improves speed of movement.
 - raises the pulse rate.
 - rehydrates the body.
 - prevents muscle soreness.

Answer: d.

Explanation:

- *The main benefit of a cool-down is to keep muscle active and capillaries open for longer to enable oxygenated blood flowing to muscles to flush out lactic acid and help oxidise lactic acid thereby preventing muscle soreness.*

- 3) A young person has decided to take up cross country running. Which type of training would be most suitable for this activity?
- circuit training.
 - weight training.
 - continuous training.
 - flexibility training.

Answer: c.

Explanation:

- *Cross country running requires cardiovascular and muscular endurance and so continuous training is the most suitable form of training for this activity.*

- 4) Which one of the following best describes the frequency element of the FITT principle of training?
- how hard you exercise for.
 - the type of exercise you choose.
 - how much time you take to exercise.
 - how many times a week you exercise.

Answer: d.

Explanation:

- *Frequency means how often do we train and so the correct answer is d.*

- 5) Which one of the following best describes the fartlek training method?
- a circuit training method that improves strength and flexibility.
 - a continuous training method that improves speed and endurance.
 - a weight training method that improves strength and power.
 - a flexibility training method that improves stretching.

Answer: b.

Explanation:

- *Fartlek training is a continuous activity that develops both aerobic and anaerobic capacities, thus improving speed and endurance.*

- 6) Within the periodised year which from the following phases describes a mesocycle?
- a phase lasting 2 to 4 weeks.
 - a phase lasting 1 week or less.
 - a phase lasting between 4 and 26 weeks.
 - a phase lasting a day.

Answer: a.

Explanation:

- Answer a. represents a mesocycle . b. is a microcycle, c. is a macrocycle and d. is a daily cycle.

- 7) For acutely increasing maximum range of motion, PNF stretching has often been found to be superior to static and ballistic stretching. PNF's superiority is most likely due to PNF producing:
- the smallest stretch reflex response.
 - the largest Golgi tendon organ reflex response.
 - a larger decrease in muscle-tendon unit stiffness.
 - a greater increase in stretch tolerance.

Answer: d.

Explanation:

- PNF's superiority is most likely due to PNF producing a greater stretch tolerance.

- 8) Define the term validity and explain how it relates to a standardised testing method.

2 marks

Answer:

- **Validity** is defined as the extent to which a test measures what it has been **designed to measure**.
- When applied to laboratory and field tests, it refers to the selection of **the most suitable test** to identify a component to be investigated.

- 9) A group of students perform the Cooper's 12 minute run-walk test on their school outdoor track on three consecutive days. The total distance each student travelled from each test produced very different results.
What could be the problem and how may it be overcome?

4 marks

Answer:

What could be the problem?

2 marks from 2 of:

- A major problem with field testing is the **environment**, particularly the **variability** of weather conditions.
- For example, wind and temperature are two variables that have a significant effect on physical performances and so **weather conditions** may have **changed** on test days.

Other problems affecting test results could be due to:

- Possible **fatigue** from three consecutive days of testing.
- **Time of day** may have changed.
- **Personal factors** (health, mood and diet).
- **Personality** of the tester.
- **Inaccurate measuring** of total distance run.

How may it be overcome?

2 marks from 2 of:

- Use of an **indoor facility** providing a **stable environment**.
- **Rest days** in between repeated tests.
- Have **same time** of day.
- Get students and tester in same **mind set**.
- Ensure that **accurate total distance** is measured – use of cones marking end point of run, a tape measure and stop watch.

10) Critically evaluate the validity and reliability of the multi-stage fitness test as a measure of aerobic capacity?

6 marks

Answer:

3 marks for 3 of:

- Test **validity** depends on the extent to which a test measures what it has been **designed to measure**.
- The multi-stage fitness test is a **standardised maximal test** of cardiovascular endurance that gives a predicted $\dot{V}O_{2max}$.
- Since a subject's **maximum oxygen uptake** ($\dot{V}O_{2max}$) can be determined from the published tables by using the level and shuttle achieved.

3 marks for 3 of:

- Test **reliability** refers to the degree to which a test is **consistent** and **stable** in measuring what it is intended to measure.

Reliability depends on factors such as:

- **Surface** on which the test is conducted.
- The subject's **prior test knowledge/experience**
- **Accuracy** of measurements (times, distances etc.).
- The test is **maximal** and to exhaustion and therefore relies, to a certain extent, on subject's level of **motivation**.
- **Inappropriate warm-up**.
- **Audience** present.
- The **personality, knowledge and skill of the tester**.
- Subject's **clothing/footwear**.
- **Environmental conditions** such as wind and rain, if held outdoors.

11) From a physiological standpoint, explain why warm-up and cool-down are important within an exercise programme.

8 marks

Answer:

4 marks for 4 of:

Warm-up:

- Gradually **elevates** heart rate and ventilation rates.
 - Increases core temperature enabling **greater blood flow** to working muscle.
- **Sport specific** skill practice.
 - This works the **neuromuscular** systems related to the chosen activity.

4 marks for 4 of:

Cool down:

- Continued low level exercise and stretching keeps the **capillary beds open** within active (muscle) tissue.
- This avoids **blood pooling** (blood is stored in the venous system as a reservoir until muscle contractions force it back towards the heart).
- This enables the **flushing out of waste products** such as lactic acid from the metabolic processes.
- Enabling the body's systems to gradually return to its resting state.
- Which limits muscle soreness (**DOMS**).
- And enhances recovery from the exercise period.

12) Describe the following types of flexibility, stretching methods:

4 marks

a) Static.

Answer:

- *Static stretching refers to stretching exercises that are performed **without movement**.*

b) Dynamic.

Answer:

- *Dynamic stretching refers to stretching exercises that are performed with **gentle motion**.*

c) Ballistic.

Answer:

- *Ballistic stretching uses aggressive, dynamic or **rapid bouncing** or **swinging** movements to increase the range of motion of the stretch.*

d) Proprioceptive neuromuscular facilitation (PNF).

Answer:

- *Proprioceptive neuromuscular facilitation (PNF) refers to a stretch that achieves a range of motion which is then held in a **isometric** contraction held between **6-10 seconds**.*
- *The joint is then **actively pushed** beyond the initial range of motion by an external force applied by a partner.*

13) Define the following principles of training:

3 marks

a) Progressive overload.

Answer:

- *Progressive overload is defined as training activities which get harder, more intense and/or lengthier.*

b) Specificity.

Answer:

- *Specificity is defined as the relevance of choice of exercise to the activity to be improved.*

c) Reversibility

Answer:

- *Reversibility is defined as when training loads are reduced or removed completely, the state of fitness or performance returns to its normal untrained state.*

14) What is meant by the FITT principles of training? Use examples to illustrate your answer.

8 marks

Answer:

- *The acronym **FITT** outlines the key components of an effective exercise programme, and the initials FITT stand for: Frequency, Intensity, Time and Type.*
 - ***Frequency** ...refers to the frequency of exercise undertaken or how often you exercise.*
 - ***Intensity** ...refers to the intensity of exercise undertaken or how hard you exercise.*
 - ***Time** ...refers to the time you spend exercising or how long you exercise for.*
 - ***Type** ...refers to the type of exercise undertaken or what kind of exercise you do.*
- *Example for general fitness: Frequency - 3 days of aerobic running (type) activity per week, working for as long as you can at a moderate intensity, a 20 minute run on a Monday and a 30 minute runs on Wednesday and Friday (time).*

- 15) Explain why you would use the principles of training, shown in figure 11.12 on page 151, when developing a training programme to improve the fitness of 16+ physical education students. 8 marks

Answer:

Specificity

- The need to make movements and energy system demands the same as the activity.
- For example, hockey players would benefit from back-to-back stick shuttle sprints (stressing the fitness components speed and agility and developing the anaerobic lactic acid energy system).
- This skill is sport specific because the players are replicating the movement patterns they use in their hockey game.

Progressive overload

- Describes training activities which get harder, more intense or longer.
- Overload is achieved by increasing the **intensity** and **or time** or duration of training – these two overload principles form part of what is commonly referred to as the **FITT principles**.
- In the example above, progression made from session one to session three demonstrates the increase in anaerobic exercise as shuttle reps increase and recovery between sets decreases (**intensity**) and duration (**time**) of the exercise period increases.

Reversibility

- ‘**Use it or lose it**’ which means that if the training stimulus is not maintained, gains previously made from training are lost.
- This means that our hockey players will need to maintain or even continue the increase the volume of work stressing the anaerobic lactic acid energy system, otherwise anaerobic adaptations will reverse.
- The acronym **FITT** outlines the key components of an effective exercise programme, and the initials FITT stand for: Frequency, Intensity, Time and Type.
 - **Frequency** ...refers to the frequency of exercise undertaken or how often you exercise.
 - **Intensity** ...refers to the intensity of exercise undertaken or how hard you exercise.
 - **Time** ...refers to the time you spend exercising or how long you exercise for.
 - **Type** ...refers to the type of exercise undertaken or what kind of exercise you do.
- Example for general fitness: Frequency - 3 days of aerobic running (type) activity per week, working for as long as you can at a moderate intensity, a 20 minute run on a Monday and a 30 minute runs on Wednesday and Friday (time).

- 16) Identify the ways in which training intensity can be determined? 3 marks

Answer:

3 marks for 3 of:

- **Duration** of the exercise period.
- **Intensity** of the exercise period.
- Number of **repetitions** within a set.
- Number of **sets** within a session.
- **Duration** of the rest intervals (rest relief) or recovery.

- 17) Explain how the principle of specificity can be applied to the design of a training programme for a shot putter. 4 marks

Answer:

1 mark for definition:

- Specificity is defined as the **relevance** of the choice of exercise to the activity to be improved.
- Specificity can be applied to the **design** of a training programme.

3 marks for 3 of:

- Shot putting is a high energy, all body, explosive activity that requires **power** and **skill**.
- So the design of a training programme must include **explosive**, muscular power.
- For example, strength training using weights, lifting close to **one repetition maximum**.
- **All body exercises** such as power clean and snatch.
- A **flexibility** programme that increases hip range to glide or rotate across the circle.
- A **speed** element that enhances the travel across the circle, for example, short sprints.
- Drill-based **practices** that develop the required technique.

- 18) **A Level.** Your PE group has been asked to devise a running training schedule for an elite 1500m runner. Using your knowledge of both interval and continuous training methods show how you could use this information to produce both aerobic and anaerobic adaptations.

15 marks

Answer:

3 marks for interval training:

- Is also known as **interval** training and can be manipulated by using the following variables:
- **Duration** of the exercise period.
- **Intensity** of the exercise period.
- Number of **repetitions** (reps) within a set.
- Number of **sets** within a session.
- Duration of the rest interval (rest relief) or **recovery**.

3 marks for our 1500m athlete would benefit from the following track interval sessions:

- **Lactate acid intervals** increase lactate tolerance.
- Working between medium to high intensity effort i.e. 60-80% of maximum effort.
- Lasting between 30-90 seconds.
- For example, 3 sets x (8 reps x 200m) with 30 seconds rest relief between reps and 5 minutes rest relief between sets.
- **Frequency** of sessions at least 3 times per week to benefit from anaerobic adaptations.
- **Aerobic intervals** increase aerobic capacity or $\dot{V}O_{2max}$.
- Working at low intensity effort i.e. below 50% of maximum effort.
- For example, 6 reps x 2000m with 3 minutes recovery.

3 marks for continuous training:

- Involves continuous activity in which there is **no rest or break**.
- Is normally associated with developing aerobic capacity ($\dot{V}O_{2max}$).
- Recommended intensity should be between 60-75% of maximum heart (HR_{max}).
- For example, **session 1**: 45 minute steady run at 65% of HR_{max} , **session 2**: 3 km run – 1st km steady at 60% of HR_{max} , 2nd km 70% HR_{max} and 3rd km 75% HR_{max} .
- Frequency of sessions at least 3 times per week to benefit from aerobic adaptations.

2 marks for expected respiratory and cardiac adaptations resulting from the interval and continuous sessions would be:

- **Improved strengthening of respiratory muscles** would enable athlete to train for longer.
- **Increased pulmonary blood flow**, particularly to upper lobes of lungs, and hence greater utilisation of **alveoli** would increase gaseous exchange and $\dot{V}O_{2max}$.
- Improved **heart rate recovery** between intervals enables athlete to reduce **recovery time** between repetitions.
- Ability of athlete to work at a greater submaximal HR intensity or **increased steady state**.
- Enabling athlete to **increase percentage workload** relative to $\dot{V}O_{2max}$.

4 marks for the major training adaptations noted during maximal or high intensity sessions:

- During a maximal training session, such as during the lactate interval session, long-term adaptations would result from **increased breathing rates** and **increased gaseous exchange**.
- Resulting in a large **increase in minute ventilation**.
- These adaptations would enable the athlete to increase intensity of training session by delaying the onset of blood lactate accumulation (OBLA) because more oxygen would be available for tissue site respiration.
- During submaximal workloads, such as during the 45 minute run, breathing rate and $\dot{V}O_{2max}$ would be less because of **greater efficiency** of respiratory musculature.
- Greater O_2 uptake and increase in lung volumes such as tidal volume.
- The $a-\bar{v}O_{2diff}$ would increase with training, reflecting greater oxygen extraction by the tissues and more effective blood distribution to the active tissues.
- **Frequency of training sessions** would ensure that the respiratory and cardiovascular systems are stressed sufficiently to ensure that the above adaptations occur.

19) What is the difference between a single and double periodised year?

2 marks

Answer:

Single periodised year:

- This is a year partitioned up into the various phases of preparation, transition, competition, and active recovery over a single year of activity and training. There will be a **single competitive phase**.

Double periodised year:

- This is a year partitioned in the same way as the single year, but with **two competitive periods**, usually separated by some months.

20) Define macrocycle, mesocycle and microcycle as part of a periodised year

3 marks

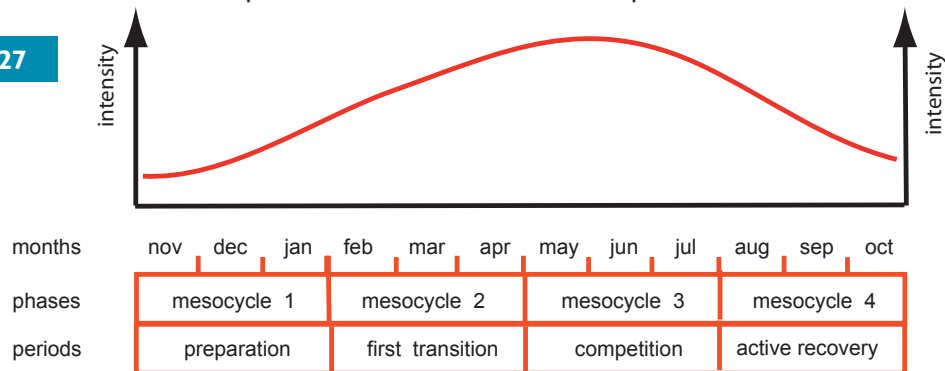
Answer:

- A **macrocycle** is a phase within the periodised year lasting between 4 to 26 weeks.
- Or the time available for preparation up to a major goal or competition.
- A **mesocycle** is a phase within the periodised year lasting between 2 to 4 weeks and has a specific purpose.
- A **microcycle** is a phase within the periodised year lasting 1 week or less, sequencing several training sessions.

21) a) Figure 11.27 shows a curve that represents the intensity of training over a single periodised year. Draw in a further two curves that represent volume of work and technique.

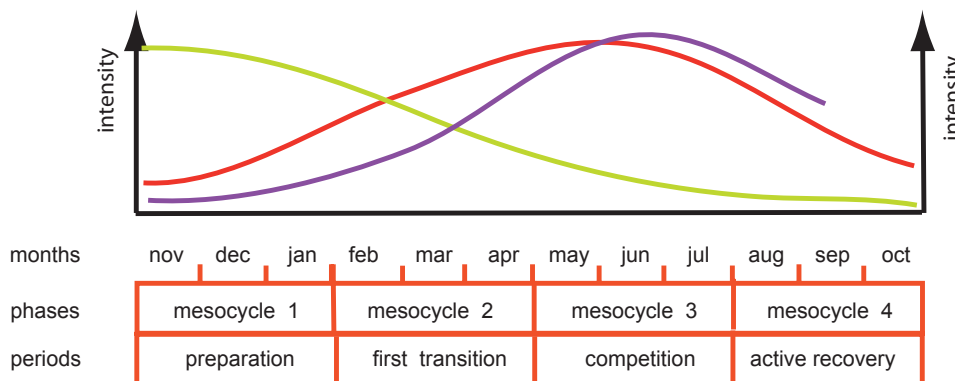
2 marks

figure 11.27



Answer:

figure Q11.1 – work and technique over the year



- See figure Q11.1

— = volume — = intensity — = technique

21) b) The competitive phase lets the performer peak for competition. Using the intensity curve explain how strength development changes over the periodised year.

Give examples of work volume in terms of sets, repetitions, and percentages of 1RM.

6 marks

Answer:

2 marks for 2 of - the intensity curve:

- Starts off low and strength development gradually increases during **mesocycle 2** and peaking during **mesocycle 3** as shown on the graph.
- The closer to competition the lower the volume and the higher the intensity and the higher the specificity of strength work development.
- Strength development is gradually increasing during **mesocycle 2** and peaking during **mesocycle 3** on the graph.

2 marks for 2 of - examples of work volumes:

- During **mesocycle 1** the emphasis is general preparatory exercises with intensity of workload.
- Circuit training is introduced early on during the preparation phase.
- Developing muscular strength and strength endurance.
- For example, an 8 station circuit consisting of shuttle runs, start jumps, v-sit ups, bench dips, chin ups, alternate dumbbell press, steps ups, rope climb.
- 3 circuits/sets working at each exercise for 60 seconds at each station for the 1st circuit, 30 seconds at each station for the 2nd circuit, 15 seconds at each station for the 3rd circuit.
- Repetitions are dependent on the number achieved within the specified time period.
- 70-80 % Percentage of 1RM depending on the exercise.

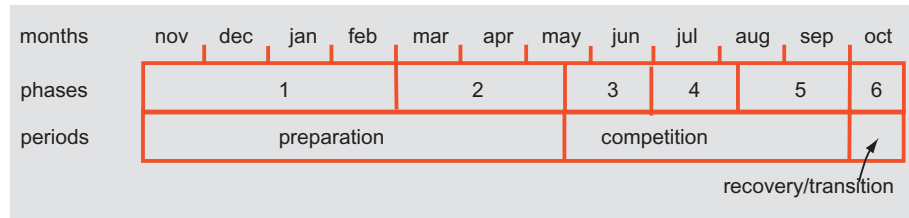
2 marks for 2 of - strength development

- Becomes more specific to the sporting event and so increases during **mesocycle 2 and 3**.
- For throws, sprints and jumps strength development would vary depending on the needs of the athlete.
- Strength training exercises such as Olympic lifts, explosive jumping, uphill sprinting, bounding exercises and resisted or assisted sprints medicine ball work.
- Work volume at 85% or more of 1RM, sets between 4-6 and repetitions low.
- For example, clean weight training exercise 4 sets of 5 repetitions with 2-3 minutes rest relief between each set.
- For example, 6 x 30 metre timed sprints towing a sledge at 100% effort, 3 minutes rest relief between each sprint.
- For example, 5 sets of 2 foot bounds over 15 metres at 100% effort, 3 minutes rest relief between each repetitions.
- **Strength development** peaking during the **competitive phase**.

- 22) **A Level.** Periodisation is a training concept that explains the variation in training volume and intensity over a specific period of time. Outline the basic structure of a single periodised year and illustrate how a coach is able to use this structure when planning a training programme for an athletics group. 15 marks

Answer:

figure Q11.2 – a single periodised year



3 marks for:

- Diagram or chart showing the layout of a single periodised year (see figure Q11.2).

2 marks for the features of periodised year:

- Year blocked into **periods** lasting 2 to 6 months each.
- Labelled **preparation, competition, recovery, transition**.

10 marks for the use of the structure:

- During **preparation** phase, the athlete will do gross conditioning training.
- Involving fitness, strength, speed or cardiovascular endurance work depending on the events or sport being performed.
- This phase will be split up into **mesocycles** lasting between 4 and 6 weeks.
- Each mesocycle will have its own aims.
- For example, to improve strength, speed, fitness, and so on.
- Each cycle will have **progression** and **overload**.
- Each cycle will follow a plan for each fitness component like that in figure Q11.3.
- Each mesocycle will be split up into **microcycles** lasting typically one week.
- The training intensity will vary according to a plan as in figure Q11.4.

figure Q11.3 – training intensity by mesocycle

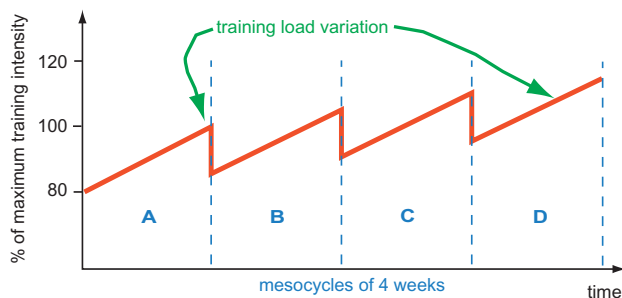
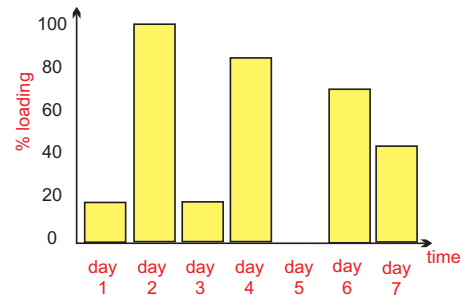


figure Q11.4 – variation in training intensity during a microcycle



- This is to allow **recovery** after intense training.
- And to spread out all the different elements of training so that learning can take place when the athlete is recovered.
- **Microcycles** will include rest and recovery.
- **Mesocycles** can include rest and recovery - this will be built into the training plan so that injury may be avoided.

3 marks for the competition period which includes:

- **Reduction in training loads.**
- **Tapering** in preparation for important competitions, for example the Olympics.
- Maintenance of **sufficient intensity** to keep and possibly develop the fitness achieved in the preparation period.
- This period will again be organised into mesocycles and microcycles.

2 marks for the recovery period which includes:

- Almost **complete reduction in training intensity**.
- To allow rest and **recovery**.
- Best achieved actively – playing games or undertaking another activity to keep basic fitness during this period.
- **Without risk of injury** or overtraining.

23) Briefly describe the following strength training methods: multi-gym, weights, and circuit training.

6 marks

Answer:

Multi-gym

- Resistance machines on which **multiple exercises** can be performed.
- In which slotted weights are moved by levers.

Weights

- Free weights, such as barbells, dumbbells and discs.
- Require more control and stability than multi-gyms.

Plyometrics

- Plyometrics is a form of exercise that involves rapid and repeated stretching and contracting of the muscles involving **eccentric-to-concentric** actions at 100%.
- For example, repeated jumping from a height, followed by a rapid secondary jump.
- In order to utilise the stretch reflex.

Circuit training

- Involves a **variety of exercises** prepared at different stations that stress different body parts.
- Performer moves one station to the next, with minimum rest period between each station.

24) a) Distinguish between continuous training and interval training giving examples of each training method.

4 marks

Answer:

- Continuous training consists of '**Long Slow**' training - i.e low intensity and long duration.
- With **even pace/tempo/work intensity** at around 60-70% of maximum heart rate.
- This would be an **aerobic** workout.
- Interval training consists of **bouts** of training.
- Which are repeated with **gaps** in between (the **rest relief** periods).
- Usually the exercise is **intense** within each bout.
- And the number of **repetitions** of the bouts will determine the outcome.
- The best example of this is weight training.
- Or sprint training.
- Which are usually **anaerobic** in nature.

b) Continuous training is one of the least used methods of training by top performers. Suggest how this training method can benefit a performer.

2 marks

Answer:

- Continuous training builds aerobic benefits such as an **improved CVR** (cardiovascular response).
- Suitable for **technique** training.
- Suitable for **recovery** sessions.

25) Fartlek training is a type of training that is used to develop aerobic capacity.

What does the term fartlek mean? Illustrate your answer by outlining the training principles used to create a typical fartlek training session.

3 marks

Answer

- Fartlek means '**speed play**'.
- Whereby pace is **varied** from sprinting to jogging.
- In a combined form of **continuous** and **interval** training.
- Normally performed in the **countryside** over a variety of terrains.
- For 45 minutes or longer.

26) Discuss the possible mechanisms by which static stretching could temporarily impair strength performance.

3 marks

Answer:

- Static stretching could temporarily impair strength performance by reducing the ability to **fully activate muscles**.
- If the static stretching were to decrease **muscle-tendon unit stiffness** (as a result of **inhibiting proprioceptors** such as muscle spindles and Golgi tendon organs).
- The result would be an **increase in stretch tolerance** due to the slackening of the **elastic component** in muscle tissue.
- Which would temporarily decrease **rate of force** and so reduce the effectiveness of muscle strength performance.