PHYSICAL EDUCATION

CHAPTER 9: TRAINING IN SPORTS

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TRAINING IN SPORTS

Training in sports:

Training in sports is very important to improve the performance of a player. Training should be specific, systematic, and scientifically based.

Each activity required specific types of physical fitness components and training methods are required to develop that component.

There are five Physical fitness components, all are related to each other.

- Strength
- Speed
- Endurance
- Flexibility
- Coordination

Strength

To achieve the ultimate aim there are many objectives which are as follow:

Strength is the ability of a muscle to overcome resistance. It is the total amount of force a muscle can exert.

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Different sports require different levels and types of strength, which can be improved through specific training. Strength can be measured in pounds or Dynes.

Types of strength

- **Static Strength:** It is the ability to act against resistance from one position without any movement, e.g., arm wrestling, powerlifting, wall pushing. It is also known as isometric Strength.
- **Dynamic Strength:** It is the ability to act against resistance with movement. Movements are visible when someone is doing dynamic strength training. It is divided into three parts.
- **Maximum Strength:** It is the ability to act against maximum resistant. It is required in weightlifting, throwing, wrestling, etc.
- **Explosive Strength:** It is the ability to overcome resistance with high speed. It is the ability to forceful movement at a quickest possible time. It is generally required in jumping activities. This Strength can be measured by Dynamometer.
- **Strength Endurance:** It is the ability to overcome resistance for a longer period under conditions of fatigue. This quality enables a person to sustain his working muscle group for an extended period.

Methods To Improve Strength

In knock out tournament only winning teams continue to play further and teams once get defeated, automatically get eliminated.

Isotonic Exercises

While doing exercises tension creates in working muscles and there is a change in length. Muscles get shortened and lengthened.

Isotonic exercises tone up the muscle. Muscles become flexible. Activities like Jumping, running, Weightlifting are some examples of isotonic exercises.

Isotonic Exercises are of two types

- **Concentric:** It is the upward movement of action in which flexor muscles shortens and extensor muscle lengthens in size.
- **Eccentric:** It is the downward movement of action in which flexor muscles lengthen and extensor muscles shorten in length.

Isometric Exercises

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In these Strength training exercises; the length of muscles remains the same during workouts. These exercises have no external movement, but the tension created inside the muscle.

In these exercises, flexor and extensor muscles feel tremendous pressure but there is no movement. Examples of these exercises are pushing the wall, lifting heavy weights, pulling the rope in a tug of war, arm wrestling, etc.

Isokinetic Exercises

In these exercises, there is a movement with continuous tension in both flexor and extensor muscles. In this muscles contract throughout the range of movement at a constant speed.

Both flexor and extensor muscles contract simultaneously, as a result, both develop, thus it takes less time to build muscle.

Endurance

Endurance is the ability to sustain or continue the activity. In other words, it is the ability to resist fatigue for a longer period.

Endurance is required for almost all major sports. It is one of the important components for middle and long-distance races, football, hockey, basketball, handball, etc.

Types of Endurance

Muscular Endurance/ Short Term Endurance.

Speed Endurance

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This is the type of endurance in which the activity is done with high speed and intensity. This endurance is for a shorter duration (from 30 to 60 sec) with 80% to 90% of top speed ability.

This type of Endurance is required in medium distance races, swimming, basketball, tennis, badminton, etc.

Strength Endurance

This type of activity is done powerfully and forcefully for a shorter duration. This duration is from 2 to 3 minutes. Strength endurance is generally performed in absence of oxygen. It is required in wrestling, boxing, Judo, etc.

Long term Endurance

This type of Endurance is required when the activity is done for a longer duration and the intensity or speed is slow. It delays fatigue, it is required for long-distance running, cycling, cross country, marathon, football, etc.

Methods To Improve Endurance

Continuous Training Method

It is one of the best methods for improving endurance. In this method, Athletes perform running for long periods without taking rest in between.

In this method, speed remains slow because the exercise is done for a longer period. This method develops a very high level of Endurance.

This method has three types:

i. **Slow Continuous Training Method:** This method is used by long-distance runners. Duration of workout is 1 – 2 hours, distance covered is 10 – 20km

ii. **Fast Continuous Training Method:** This method is used by middle-distance runners. Duration of workout is 15 – 40 minutes, distance covered is 5 – 10km

iii. **Variable Continuous Training Method:** This method is a combination of fast and slow pace continuous methods. Here the workout is done with a variable speed of 40-100 percent of the best capacity.

Advantages of Continuous Training Method

- Increases glycogen in muscle.

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- Increases number and size of mitochondria.
- Increases efficiency of heart and lungs.
- Improves willpower and confidence.

Interval Training Method

In this method, the principle of effort and incomplete recovery is followed. It is special endurance training that involves high-intensity workouts followed by incomplete rest.

This method is the best method for endurance development. The Interval training method is based upon the scientific principles where the load is controlled through various factors to provide incomplete recovery.

- Volume or total distance.
- Intensity or speed of work.
- Duration of workout.
- Number of repetition.
- Duration of rest.
- Mode of recovery.

In this training method, the total workout is done in small parts, where incomplete rest is given between each workout.

Workout – Rest – Workout – Rest

The load can be increased by increasing the workout or by reducing recovery

Fartlek Training Method

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Fartlek means speed play. It is a combination of continuous and interval training methods. In this method, an Athlete used a natural environment for a workout.

In this method, speed is not pre-planned. He/she can change speed according to the surroundings (hills, river, forest, muddy road, etc). Athletes are made free to choose their path. He may take a rest in between, run fast or slow.

The only thing to keep in mind, that he needs to reach the finishing point in the desired time.

Advantages of Fartlek Training Method:

- It can practice in off season period.
- It develops creativity and gives adventure.
- Natural motivation is there with no boredom.
- Art of self-learning is experienced.

Speed

Speed is the ability to perform the movement at a faster rate. Speed depends on heredity but can be developed through proper training.

It is the capacity of moving a body with the greatest possible velocity.

Types of Speed:

- **Reaction Time:** It is the time taken by the body to respond immediately after the stimulus. It is the first reaction to bring our body into action.
- **Acceleration Ability:** It is the time taken by the body to reach maximum speed. This ability depends upon explosive strength, technique, and flexibility.
- **Speed of Movement:** It is the time taken by the body to perform complete action.
- **Locomotor ability:** It is the ability to maintain maximum speed for maximum distance.
- **Speed endurance:** It is the ability to perform movements with high speed under conditions of fatigue.

Methods To Improve Speed

Acceleration Run

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In this method, Athletes try to attain top speed as fast as possible. They run for 20 – 30-meter distance with maximum speed.

This is repeated 5 to 10 times with a sufficient rest period.

The first few strides should be shorter and the frequencies of steps are very fast.

Pace Run Training Method

Pace races mean running the whole distance of a race at a constant speed. For 800m training athletes can run a distance of 300m or 20% of racing distance at full speed.

Flexibility

Flexibility is when the joints can move to their maximum range. It is the ability to execute movement with greater range.

It is affected by muscle length, adjoin ligaments, tendons. Flexibility helps in preventing injuries, Improving Posture, making the joint healthy, Improving balance.

Types of Flexibility

- **Passive Flexibility:** Joints can move in maximum range with external help, e.g., stretching with a partner.
- **Active Flexibility:** It is performed without external help Active flexibility is further divided into two parts.
- **Static Flexibility:** It is the flexibility performed from a stationary position. e.g., Chakrasana, toe touching.
- **Dynamic Flexibility:** It is the flexibility performed while in motion. This is required for gymnastics, diving, etc.

Methods To Improve Flexibility

- **Ballistic Method:** In this method, individuals perform various stretching exercises while in motion. In this stretching the muscle with help of swinging the limbs.
- **Static Stretching Method:** In this method, various slow stretching exercises are done from a stationary position and hold the final position for sometimes.
- **Passive Flexibility Method:** In this method flexibility exercises are done with external help. Such as partner help, stretch ropes, bid role ball, bar stand, etc.
- **Proprioceptive Neuromuscular Facilitation Techniques (PNF):** This technique is used by advanced athletes for gaining flexibility. Here you move into a

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stretch position then your partner holds the limb in this position.

Coordinative Ability

Coordinative Ability is the ability of the body to perform the movement with perfection and efficiency. It is the ability to execute a sequence of movements smoothly and accurately.

Coordination is required for qualitative movement. It is the proper combination of strength, speed, endurance, and flexibility during movement.

Types of Coordination

- **Adaptive Ability:** Ability to adjust the movement effectively based on changes.
- **Balance Ability:** Ability to protect the body in a stable position.
- **Rhythm Ability:** Ability to observe the rhythm of a movement and to regain balance quickly.
- **Reaction Ability:** Ability to react immediately and quickly to a signal.
- **Coupling Ability:** Ability to combine the movements of different body parts for performing a perfect sports movement.

Important Questions

➢ Multiple Choice Questions:

➢ Very Short Question:

Que 1. What is test?

Que 2. What is measurement?

Que 3. What do you understand by muscular strength?

Que 4. What is Kraus-Weber test?

Que 5. What is motor fitness?

Que 6. What do you understand by cardiovascular fitness?

Que 7. What do you understand by Harward step test?

Que 8. What is Rockport one mile test?

Que 9. What do you understand by flexibility?

Que 10. What do you understand by senior citizen fitness test?

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➢ Short Questions:

Que 1. What do you understand by AAHPER test? Describe any two items of the test.

Que 2. Describe any three tests in Kraus-Weber test.

Que 3. Explain administration of Rockport one mile test.

Que 4. Describe in short Harvard step test.

Que 5. Discuss the back scratch Test for upper body flexibility.

Que 6. Discuss in short sit and reach test.

➢ Long Questions:

Que 1. Explain the AAHPER physical fitness test.

Que 2. Describe the Kraus Weber Test in detail.

Que 3. Explain the measurement of cardiovascular fitness Harvard Step Test.

Que 4. Explain the Arm Curl Test for upper body strength for senior citizens.

Que 5. What are the six test items of the Kraus Weber muscular strength test?

➢ Assertion & Reason Questions:

1. For two statements are given-one labelled Assertion and the other labelled Reason. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

   Assertion (A) Push-ups helps in building muscular strength

   Reason (R) Push-ups are isokinetic muscular movements that provide strength to the joints

   (a) Both A and R are true and R is the correct explanation of A

   (b) Both A and R are true and but R is not a correct explanation of A

   (c) A is true but R is false

   (d) A is false, but R is true.

2. For two statements are given-one labelled Assertion and the other labelled Reason. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

   Assertion (A) Chair stand test is designed to test the fitness of the senior citizens.

   Reason (R) This test is safe enjoyable and meet the scientific standard of reliability and validity.

   (a) Both A and R are true and R is the correct explanation of A

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(b) Both A and R are true and but R is not a correct explanation of A

(c) A is true but R is false

(d) A is false, but R is true.

✓ Answer Key-

➢ Multiple Choice Answers:

1. Answer: American Alliance for Health, Physical Education, Recreation and Dance
2. Answer: Medicine ball put
3. Answer: Rikli and Jones fitness test
4. Answer: 1 mile walk test
5. Answer: 44 cm
6. Answer: Standing broad jump
7. Answer: Sit and Reach test
8. Answer: The strength and endurance of abdominal muscles is measured with the help of this test
9. Answer: Both B and C
10. Answer: Girls
11. Answer: Chair sit and reach test – A test to assess the upper body flexibility
12. Answer: 2001
13. Answer: Aerobic fitness test
14. Answer: Zero
15. Answer: Test

➢ Very Short Answers:

1. Test, may be called as tool, a question, set of question, an examination which use to measure a particular characteristic of an individual or a group of individuals.
2. According to R.N. Patel
   "Measurement is an act or process that involves the assignment of numerical values to whatever is being tested. So it involves the quantity of something."
3. It is the amount of force the muscle or a group of muscles can exert against resistance for short duration as in anaerobic activities.
4. It is mean to test minimum general fitness required by an individual by testing the strength and flexibility of big muscles and joints.
5. Motor fitness is a person's ability to perform physical activities.
6. Cardiovascular fitness is the ability of the heart and lungs to supply oxygen rich blood to the working muscle tissues and the ability of the muscles to use oxygen to produce energy for movement.
7. It is a cardiovascular fitness test. It is good for measurement of fitness and the ability to

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recover after a strenuous exercise.

8. It is cardio respiratory test used to determine VO2 max. (volume of oxygen) V02max is the maximum capacity of the person's body to move and use oxygen during exercise.
9. Flexibility is the range of motion in a joint or group of joints, or, the ability to move joints effectively. Flexibility is related to muscle strength.
10. Senior citizen fitness test are easy to understand and effective tests to measure aerobic fitness, strength and flexibility using minimum and inexpensive equipments.

➢ Short Answer:

1. The AAHPER youth fitness test was formed in 1965 in United States. This test administered on school student of 17 year age. This test was designed to help the physical education teachers and other recreation leaders in the field to find out the performance levels of their students, compare them with national norms.

   Administration of test:-

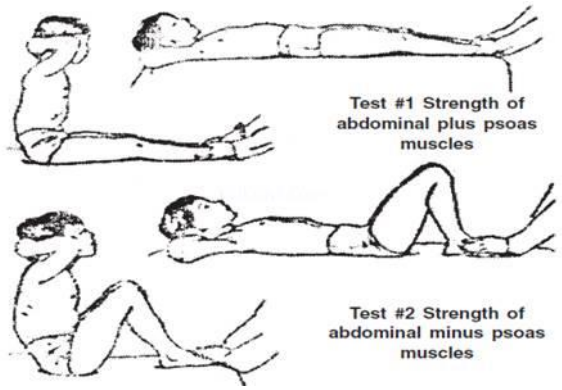
   i. **(a) Pull-ups(boys):** This test measures the total number of repetitions performed without taking rest on a horizontal bar. The total number of pull-ups noted. In this test, the chin must reach above the bar while doing pull-ups.

   (b) Flexed-arm hangs (girls): This is test is administered on an adjusted on an adjustable horizontal bar. The height of the bar should be adjusted so that it is approximately equal to the standing height of the student. With the help of two girls the student's body is lifted off the ground until her chin is positioned above the bar.

   The student holds this position as long as possible. Her time is noted in seconds. She may be allowed for one trial.

   ii. **Flexed-leg sit-ups:** The student is advised to lie on floor on his/her back keeping knees bent. The angle of knee: around 90 degree. The feet are held by partner. The student should put fingers locked and put behind the head curls up and touches the elbows to knees the score is counted as maximum number of sit-ups in 60 seconds.

2. This very test of fitness was firstly used to investigate about the progress of the treatment given for back pain problems. More than eighty who take this test failed to pass it in the first attempt.



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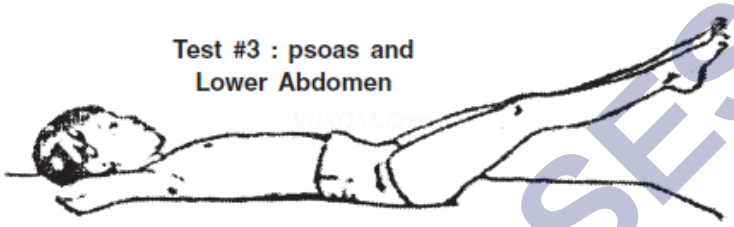
The first test of the six Kraus-Weber tests series is used to evaluate general fitness of a person. In this test one has to keep the feet on the ground: do sit ups while keeping both hands folded on the back and lying body on the ground.

The second part of Kraus-Weber 'Test series is similar to first in posture but only change is that in this test knees of person are folded and the ankles are as close to buttocks as possible; while doing sit ups.



Lower Abdomen

The third part of Kraug-Weber Test series requires the person to lie flat on the back and keeps hands behind the neck and legs remain straight and lifted up for about ten seconds in a stretch.

3. Administration of Test:

(i) Choose a windless day to conduct the test,

(ii) Record your weight in pounds (lbs)

(iii) Walk one mile (1609 mt) as fast as possible,

(iv) Record the time to complete the one mile walk,

(v) Immediately on finishing the walk record your heart rate (beats per minute),

(vi) Determine your maximum cardio-respiratory ability (V02) from the calculation given below.

Calculation procedure: Analysis of the result is done by comparing it with the result of previous test. It is expected that, appropriate training between each test should be done to show improvement.

The formula used to calculate VO2 Max is : 132.853 – (0-0769 × weight) – (0-3877 × Age) + (6-315 × Gender) – (3-2649 × Time) – (0-1565 × Heart rate)

Where:-

(a) Weight is in pounds (lbs),

(b) Gender: Male – 1 and Female = 0

(c) Time is expressed in minutes and seconds,

(d) Heart rate is in beats/minute

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(e) Age in years.

4. The Harvard Step Test is a method used to assess cardio-respiratory fitness, which was developed by Brouhaetal. (1943) in the Harward Fatigue Laboratories during World War II. It is based on heart rate recovery following a given work load of 5 minutes or until exhaustion.

   What do we need?

   - A gym bench or box. 20inches high.
   - A stopwatch
   - Cadence
   - An assistant

   SCORING THE TEST

   There are two versions of the Harvard Step Test, the short form and the long form.

   - **Short Form Equation:** Fitness Index = (100 × test duration in seconds) divided by (5.5 × pulse count between 1 and 1.5 minutes).
   - **Long form Equation:** Fitness Index = (100 × test duration in seconds) divided by (2 × sum of heart beats in the recovery periods).

5. You'll need a ruler or a yardstick. Place your hand over your shoulder, and reach as far as possible down the middle of your back, your palm touching your body. Place your other arm behind your back, palm facing outward and reach up as far as possible attempting to touch or overlap the middle fingers of both hands. Practice two times, and then test two times. Your partner measures the distance between the tips of the middle fingers to the nearest half-inch. If the fingertips touch, score zero. if they do not touch, score a negative distance. such as 2 incites: If they overlap score a positive distance, such as – 1 inch. Take your best score. For women the goal is to have your fingertips no more than 5 inches apart and for men no more that 8 inches apart. If you're unable to reach this goal. You may be at risk for losing the ability to form some activities that require upper body flexibility. Stop the test if you experience pain.

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6. The sit and reach test is a common measure of flexibility, and specifically measures the flexibility of the lower back and hamstring muscles.

   Equipment

   Ruler, step (optional, you could make your own sit and reach box if keen too) After a brief warm up the subject sits on floor with shoes off. Subject places bottom of feet (10 to 12 inches apart) against side of box (approximately 12" or 30 cm high) with knees straight. Tester places measuring stick on box parallel to subjects legs; 15" or 38 cm at edge of box closest to subject and end of measuring stick ("o") toward subject. Subject places hand over hand and reaches as far as possible over measuring stick without bending knees. Best of three tries is recorded.

➢ Long Answer:

1. The AAHPER (American Alliance for Health, Physical Education and Recreation) youth fitness test was formed in 1965 in United States, but was revised in 1976.

   Later, dance was also added and it was known as AAHPERD.

   The students are advised to warm up before they participate in the test. All the students must be medically fit.

   This test has the following six items:

   a) Pull-ups (for boys) / Flexed arm hang (for girls) to measure arm and shoulder strength.
   b) Flexed leg sit-ups to measure abdominal strength and endurance.
   c) Shuttle runs to measure speed and agility.
   d) Standing long jump to measure power.
   e) 50-yard dash to measure speed.
   f) 600-yard run-walk to measure endurance.

2. The Kraus Weber Test is a test of minimum muscular fitness of the various muscles of the body. The test consists of six items which indicate the level of muscular strength and flexibility of key muscle groups. Usually, the scoring of each item is graded either on pass/fail basis or a range of scoring from zero to ten. A subject's grade of zero means that the subject has failed in a particular test item; score ranges from one to ten are for subjects who pass these test items.

   The six tests are:

   - Test 1 tests the strength of the abdominal and psoas muscles.
   - Test 2 tests the strength of the abdominal muscles.
   - Test 3 tests the strength of the psoas muscles.

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- Test 4 tests the strength of the upper back.
- Test 5 tests the strength of the lower back.
- Test 6 tests the strength of the back and hamstring muscles.

3. The Harvard Step Test is a test that measures cardiovascular fitness. The equipment required to perform the test are bench 20 inches high, stopwatch and metronome. The procedure is that the performer steps up and down 30 times a minute on the bench. Each time the subject should step all the way up on the bench with the body erect. The stepping exercise continues for exactly 5 minutes unless the performer is forced to stop sooner due to exhaustion.

   As soon as he stops exercising, the performer sits on a chair quietly while pulse rates are counted at 1 to I 'A, 2 to 2 '/i and 3 to VA minutes after the exercise. The Physical Fitness Index (PFI) is computed using the formula.

4. The Arm Curl Test is a test of upper body strength. The purpose of this test is to measure upper body strength and endurance. The subject has to do as many arm curls as possible in 30 sec. This test is conducted on the dominant arm side (or stronger side).

   Its procedure is:-

   a) The subject sits on the chair holding the weight (8 pounds for men / 5 pounds for women) in the hand using a suitcase grip (palm facing towards the body) with the arrriin a vertically down position beside the chair.

   b) The upper arm is held close to the body so that only the lower arm is moving.

   c) The subject curls the arm up through a full range of motion, gradually turning the palm up (flexion with supination)

   d) Then the arm is lowered through the full range of motion, gradually return to the starting position. The arm must be fully bent and then fully straightened at the elbow.

   e) Repeat this action as.many times as possible within 30 sec.

   f) The score is the total number of controlled arm curls performed in 30 sec.

5. The six test items of the Kraus Weber muscular strength test are given below:

   a) **Abdominals Plus Psoas (hip flexing)**:- Muscles The subject lies supine with hands behind the neck. The feet are held by the examiner. On command, the subject rolls up into a sitting position. This is a test of the strength of abdominal and psoas muscles. If the subject performs one sit-up then passes otherwise score remains zero.

   b) **Abdominals Minus Psoas**:- The subject lies supine, hands behind neck and knees bent. On command, the subject tries to roll up into a sitting position. This is a further

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test of abdominal muscles without psoas. Scoring is like test 1.

c) **Psoas or P:-** The subject lies supine with hands behind the neck and legs extended. On command, the feet are lifted 25 cms (10 inches) above the ground and maintained for ten seconds. This is a test for the strength of psoas and lower abdominal muscles. Scoring depends on the number of seconds the exact position is held.

d) **Upper Back or UB:-** The subject lies prone with a pillow under the abdomen but far enough down to give a see-saw effect. He holds his hands behind the neck. The examiner holds down the feet and asks the subject to raise up his chest, head and shoulders and maintain the position for ten seconds. This test is for the strength of the upper back muscles. Scoring is like test 3.

e) **Lower Back or LB:-** The subject lies prone over the pillow and places his hands in front and rests his head on them. The examiner holds the chest down and asks the subject to lift his legs up without bending the knees and maintain the position for ten seconds. This is a test for the strength of the lower back muscles. Scoring is like test 3.

f) **Back and Hamstring or BH:-** The subject stands erect with his hands at sides and feet together. On command, he leans down slowly to touch the floor with his fingertips. The knees are kept straight and the leaning down position is maintained for ten seconds. No bouncing is allowed to touch. This tests the length of back and hamstring muscles and is a test of flexibility. Scoring is like the above tests.

➢ Assertion and Reason Answers:

1. (c) A is true but R is false.

2. (a) Both A and R are true and R is the correct explanation of A.

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