UNIVERSITY OF BOLTON

SCHOOL OF SPORT AND BIOLOGICAL SCIENCES

SPORT REHABILITATION WITH FOUNDATION PATHWAY

SEMESTER ONE EXAMINATIONS 2018/2019

SPORTS BIOMECHANICS

MODULE NO. SRB3009

Date: Friday 18 January 2019   Time: 10.00 am – 12.00 pm

INSTRUCTIONS TO CANDIDATES: There are 100 Marks on the paper.

Answer all questions.

Sport and Biological Sciences
Sport Rehabilitation with Foundation Pathway
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Sports Biomechanics
Module No. SRB3009

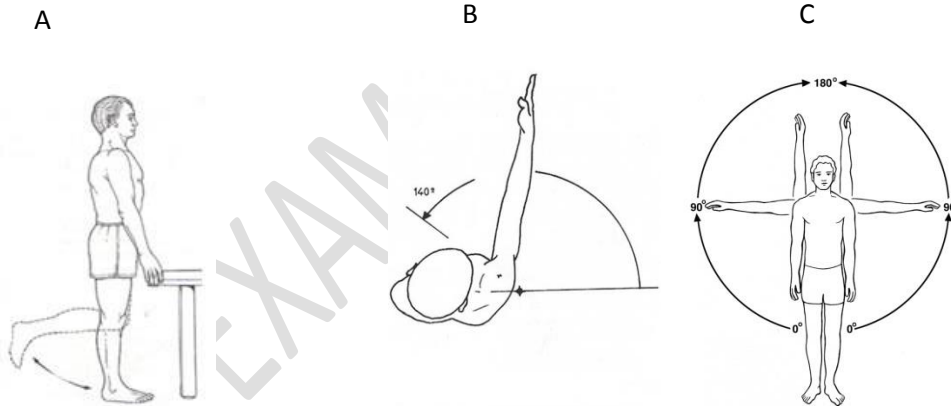1. Briefly describe the Gait cycle in walking.

4 marks

2. How would you assess the following athletic qualities in a laboratory setting:

   a. Horizontal jumping distance.
   b. Jumping force
   c. Bicep tricep ratio
   d. Stride length in sprinting
   e. Angle of hip flexion during the gait cycle

10 Marks

3. Name the plane of motion indicated in each diagram

3 Marks

A
B
C

4. Define the following terms:

   a. Kinetics

2 Marks

   b. Kinematics

2 Marks

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5. Describe the potential joint motion available at the following joints:

   a. Elbow

   2 Marks

   b. Shoulder joint

   3 Marks

   c. Radio-Ulna joint

   2 Marks

   d. Ankle (Talocrural) joint

   2 Marks

Calculate the following:

6. A 200m sprinter runs his event in 20.11 seconds. What is the average speed of the sprinter?

   1 Mark

7. If a runner travels at 3.6 m/s for 4 minutes, what is the distance covered?

   1 Mark

8. A footballer covers 14000m during a match that lasts 90 minutes. What is the average speed of movement of the footballer?

   1 Mark

Using equations of motion: *v = u +at*   or   *v² = u² + 2ad*

9. Find the final velocity reached if a cyclist accelerates from a stationary start at a constant rate of 2.44 m/s² for 4 seconds.

   2 Marks

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10. Find the height of a ball thrown straight up at initial velocity of 15.4 m/s.
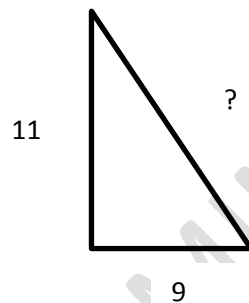
3   Marks

11. Describe 3 characteristics of a vector.

3   Marks

12 Detail the importance of the study of biomechanics in the fields of sport science and rehabilitation.

4   Marks

13 Using Pythagoras theorem, calculate the following:

3 Marks

14 A hiker walks south for 385m, then west for 713m.

a. What is the distance covered?
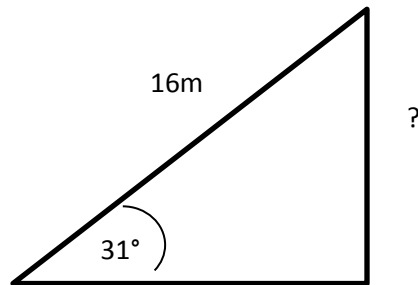
1 Mark

b. What is the displacement covered?

3 Marks

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15 Explain the difference between Speed and Velocity.

1 Mark

16 Using trigonometry, calculate the following:

4 Marks

16m

?

31°

17 A rugby ball is thrown at 12m/s at an angle of 39 degrees to the horizontal.
Using trigonometry, calculate the velocity of the ball in the:

   a. Vertical direction

3 Marks

   b. Horizontal direction

3 Marks

18 Describe Newton's three laws and describe a practical example in each case.

6 Marks

19 What is the difference between weight and mass?

2   Marks

20 What is ground reaction force?

2 Marks

21 What is the *weight* of a female athlete of mass 74kg?

1 Mark

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22 If a rugby player of 101kg standing on the ground, supports a barbell of 55kg on his back, what would be the ground reaction force?

2 Marks

23 What is momentum? Provide practical examples demonstrating how momentum can change in sport and exercise

3 Marks

24 Calculate the momentum of a rugby player of 100kg running at 6m/s.

1 Mark

25 Who has the greatest momentum:
   a. A 90kg sprinter running at 6m/s   or
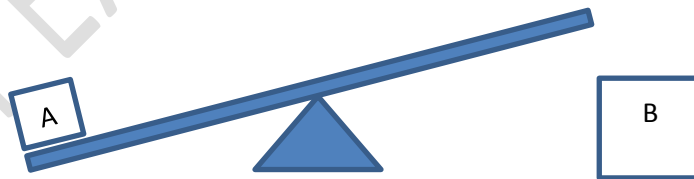   b. A 80kg distance runner running at 7m/s?

2 Marks

26 A high jumper produces an average vertical jump force of 1200N over a time period of 0.3 seconds. Calculate the impulse of the jump.

1 Mark

27 Balance the following lever system:
   Block A is 5 kg positioned at 10m from the pivot point. Block B is 8kg. How far should it be placed from the pivot point to balance the system?

2 Marks

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28   Using the formula ***Torque = force x distance:***

When holding the arm at 90° with a 7kg dumbbell,
      a. Calculate the torque in the shoulder joint
         if the dumbbell is 0.62m from the shoulder joint

                                          1 Mark

      b. Calculate the force the deltoid muscle has to
         provide if its insertion point is 0.22m from the
         shoulder joint.   3 Marks

      c. Describe centre of gravity principles in relation to balance and stability,
         using examples below to explain your answer.

                                            6 Marks

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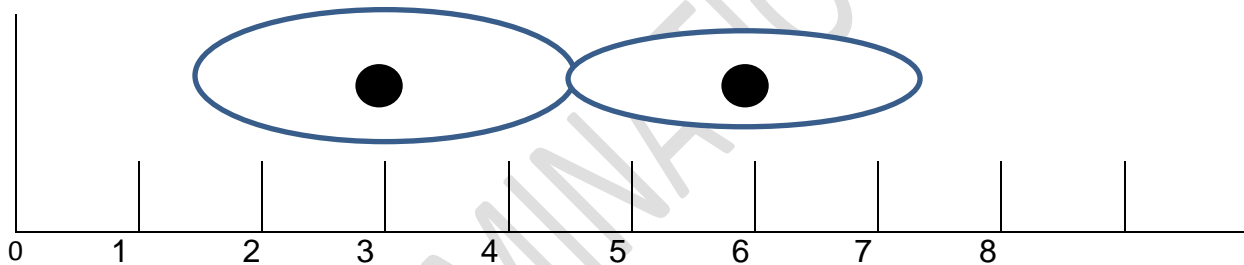Sports Biomechanics
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    d. Find the overall position centre of gravity (CoG) of the following body. Express your answer as a number relating to the scale below, *e.g. the CoG is at position 5.2*

The following information is known:

Gravitational force of larger segment = 55N, position of CoG is at 3.0

Gravitational force of smaller segment = 35N, position of CoG is at 6.0

5 Marks

END OF QUESTIONS