

**UNIVERSITY OF BOLTON**  
**SCHOOL OF CLINICAL AND BIOMEDICAL SCIENCES**  
**FOUNDATION + BSc (HONS) SPORTS**  
**REHABILITATION**  
**SEMESTER TWO EXAMINATIONS 2021/2022**  
**FOUNDATIONS OF BIOMECHANICS IN SPORT**  
**MODULE NO: SRB3025**

**Date: Monday 16<sup>th</sup> May 2022**

**Time: 10:00 – 12:00**

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**INSTRUCTIONS TO CANDIDATES:**

**Please answer all questions.**

**This examination is TWO hours long.**

**This examination paper carries a total of  
100 marks.**

**The pass mark is 40%**

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Student name..... Student Number.....

Please attach this sheet (page 2) with your answer booklet

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

- a. Horizontal jumping distance.
- b. Jumping force
- c. Quadriceps:Hamstrings ratio
- d. Running step length
- e. Angle of knee flexion during sprinting

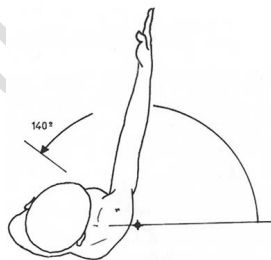
10 Marks

2. Label the correct plane of motion in each diagram

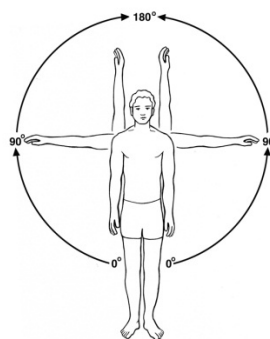
A



B



C



3 Marks

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3. Discuss the importance of the study of biomechanics in the field of sports rehabilitation.

**4 Marks**

4. Define the following terms:

a. Kinetics

**2 Marks**

b. Kinematics

**2 Marks**

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

a. Knee

**2 Marks**

b. Hip joint

**3 Marks**

c. Radio-Ulna joint

**2 Marks**

d. Ankle joint

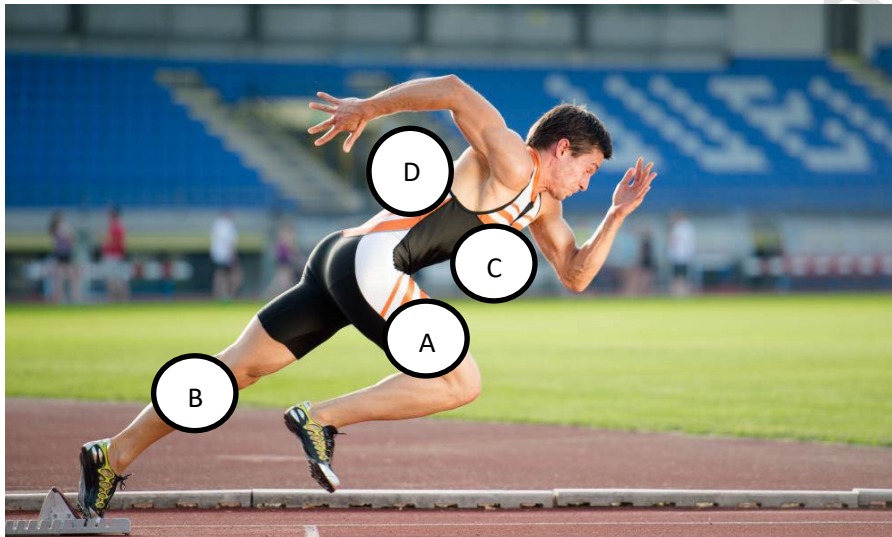
**2 Marks**

**Please turn the page**

6. Describe the following points relative to each other using the following terms:

**Medial, lateral, proximal, distal, anterior, posterior**

For example, 'point c is more anterior than point d, and distal to point B'.



**4 Marks**

Calculate the following:

7. A 200m sprinter runs his event in 20.1 seconds. What is the average speed of the sprinter?

**1 Mark**

8. If a runner travels at 4 m/s for 5 minutes, what is the distance covered?

**1 Mark**

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9. A footballer covers 9500m during a match that lasts 90 minutes. What is the average speed of movement of the footballer?

**Using equations of motion:**  $v = u + at$  or  $v^2 = u^2 + 2ad$

**1 Mark**

10. Find the final velocity reached if a cyclist accelerates from a stationary start at a constant rate of  $2.8\text{m/s}^2$  for 10 seconds.

**2 Marks**

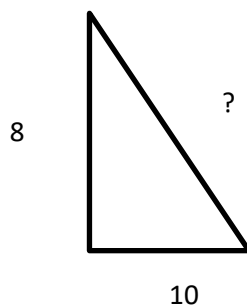
11. Find the height of a ball thrown straight up at initial velocity of 20 m/s.

**3 Marks**

12. Describe 3 characteristics of a vector.

**3 Marks**

13. Using Pythagoras theorem, calculate the following:



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**3 Marks**

**Please turn the page**

14. A hiker walks south for 500m, then west for 900m.

a. What is the distance covered?

**1 Marks**

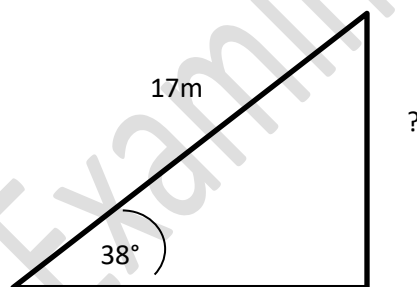
b. What is the displacement covered?

**3 Marks**

15. Explain the difference between Speed and Velocity.

**1 Marks**

16. Using trigonometry, calculate the following:



**4 Marks**

17. A rugby ball is thrown at 17m/s at an angle of 35 degrees to the horizontal. Using trigonometry, calculate the velocity of the ball in the:

a. Vertical direction

**3 Marks**

b. Horizontal direction

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**3 Marks**

**Please turn the page**

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 68kg?

**1 Mark**

22. If a rugby player of 105kg standing on the ground, supports a barbell of 45kg 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**

**Please turn the page**

25. Who has the greatest momentum:

- a. A 85kg sprinter running at 6m/s or
- b. A 75kg distance runner running at 7m/s?

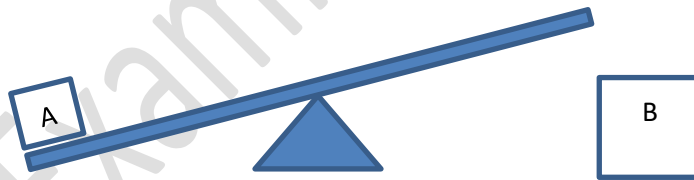
**2 Marks**

26. A high jumper produces an average vertical jump force of 1000N 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 11m from the pivot point. Block B is 8kg. How far should it be placed from the pivot point to balance the system?



**2 Marks**



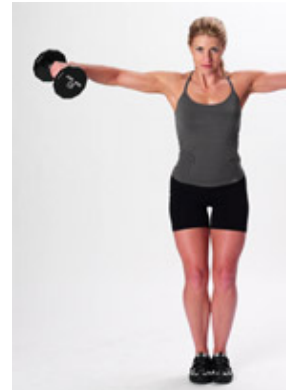
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28. Using the formula ***Torque = force x distance:***

When holding the arm at 90° with a 5kg dumbbell,

A: Calculate the torque in the shoulder joint

if the dumbbell is 0.65m from the shoulder joint



**1 Mark**

B: Calculate the force the deltoid muscle has to provide if its insertion point is 0.2m from the shoulder joint.

**3 Marks**

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



6 Marks

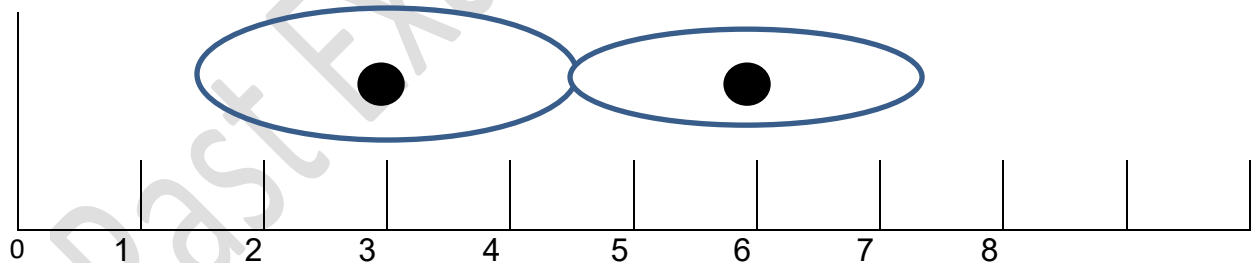
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30. Find the overall position centre of gravity (CoG) of the following body. Express your answer as a number relating to the scale below, e.g. *the CoG is at position 5.2*

The following information is known:

Gravitational force of larger segment = 45N, position of CoG is at 3.0

Gravitational force of smaller segment = 33N, position of CoG is at 6.0



5 Marks

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**END OF QUESTIONS**

Past Examination Paper