

UNIVERSITY OF BOLTON
SCHOOL OF CLINICAL AND BIOMEDICAL
SCIENCES
SPORTS REHABILITATION WITH FOUNDATION
SEMESTER 2 EXAMINATIONS 2023/2024
SPORTS BIOMECHANICS
MODULE NO: SRB3025

Date: Wednesday 15th May 2024

Time: 10 – 12

INSTRUCTIONS TO CANDIDATES:

There are 100 Marks on the paper.

Answer all questions.

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1. Define the following terms, give an example.

a. Kinetics

2 Marks

b. Kinematics

2 Marks

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

a. Hip joint

3 Marks

b. Glenohumeral joint

3 Marks

c. Radio-Ulna joint

1 Mark

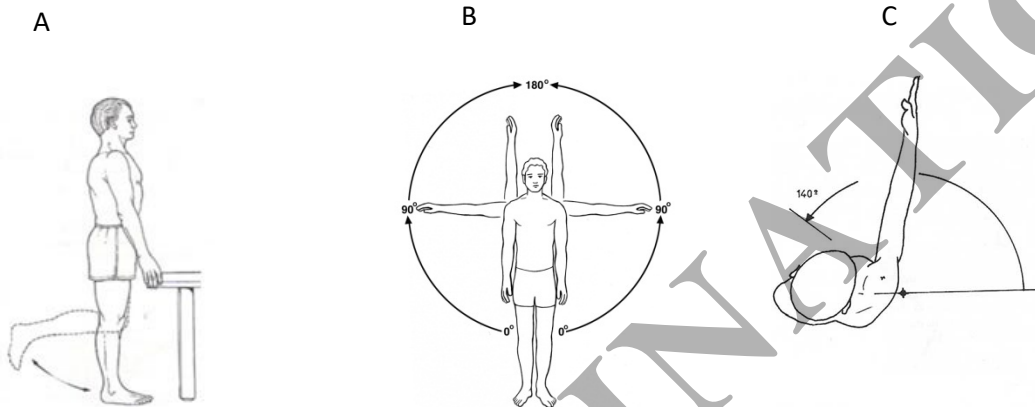
d. knee joint

2 Marks

Please turn the page

3. Label the correct plane of motion in each diagram

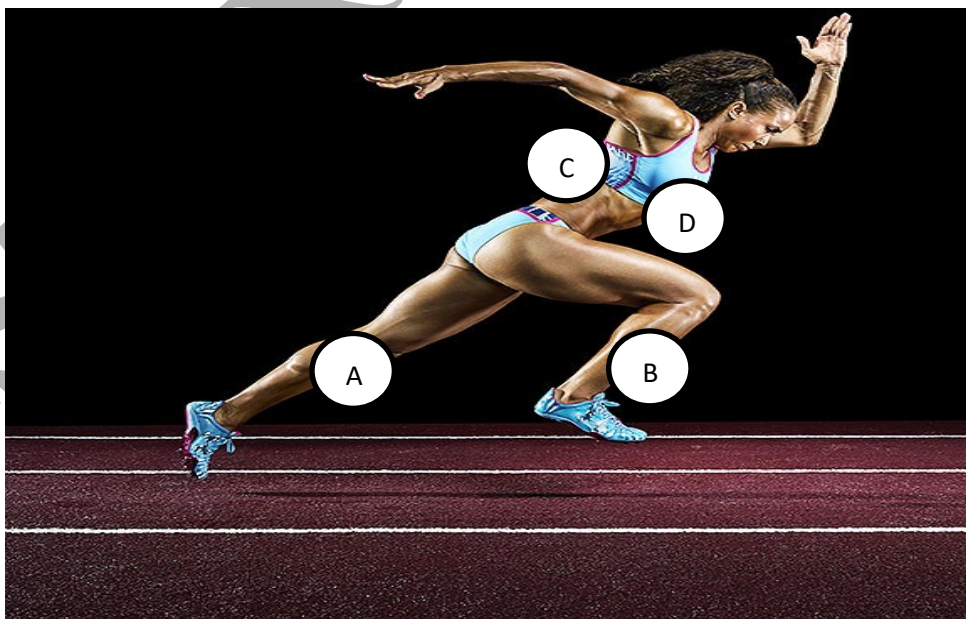
3 Marks



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

Medial, lateral, proximal, distal, anterior, posterior

For example, 'point A is more anterior than point B, and distal to point C'.



4 Marks

Please turn the page

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Calculate the following:

5. A 200m sprinter runs her event in 23.9 seconds. What is the average speed of the sprinter?

1 Mark

6. If a runner travels at 5.2 m/s for 3 minutes, what is the distance covered?

1 Mark

7. A footballer covers 18000m 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 $v^2 = u^2 + 2ad$

8. Find the final velocity reached if a cyclist accelerates from a stationary start at a constant rate of 2.8m/s^2 for 7 seconds.

2 Marks

9. Find the height of a ball thrown straight up at initial velocity of 16 m/s.

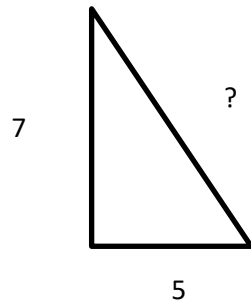
4 Marks

10. Describe 3 characteristics of a vector.

3 Marks

Please turn the page

11. Using Pythagoras theorem, calculate the following:



3 Marks

12. A fell runner moves north for 950m, then east for 411m.

- What is the distance covered?
- What is the displacement covered?

1 Mark

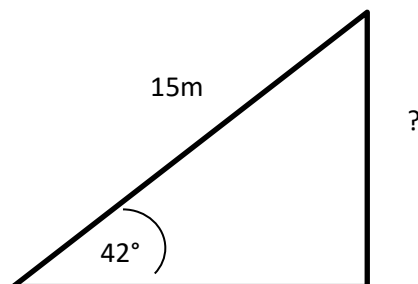
3 Marks

13. Explain the difference between distance and displacement.

1 Mark

14. Using trigonometry, calculate the following:

3 Marks



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15. A ball is kicked at 16m/s at an angle of 44 degrees to the horizontal. Using trigonometry, calculate the velocity of the ball in the:

a. Vertical direction

3 Marks

b. Horizontal direction

3 Marks

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

6 Marks

17. What is ground reaction force?

2 Marks

18. What is the difference between weight and mass?

2 Marks

19. What is the *weight* of a female athlete of mass 75kg?

1 Mark

20. If a rugby player of 98kg standing on the ground, supports a barbell of 59kg on his back, what would be the ground reaction force?

2 Marks

Please turn the page

21. What is the momentum? Provide practical examples demonstrating how momentum can change in sport and exercise

3 Marks

22. Calculate the momentum of a soccer player of 95kg running at 3m/s.

1 Mark

23. Who has the greatest momentum:

- a. A 75kg sprinter running at 6m/s or
- b. A 70kg distance runner running at 7m/s?

2 Marks

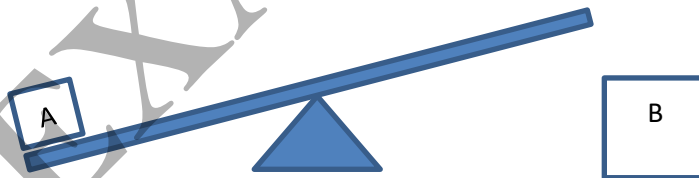
24. A high jumper produces an average vertical jump force of 900N over a time period of 0.5 seconds. Calculate the impulse of the jump.

1 Mark

25. Balance the following lever system:

Block A is 6kg positioned at 9m from the pivot point. Block B is 6.5kg. How far should it be placed from the pivot point to balance the system?

2 Marks



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

When holding the arm at 90° with a 4kg dumbbell,

- a. Calculate the torque in the shoulder joint if the dumbbell is 0.78m from the shoulder joint

1 Marks

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

5 Marks



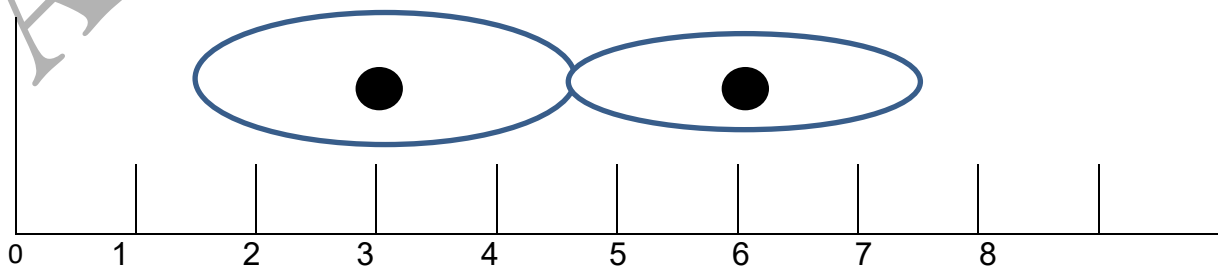
28. Find the overall position centre of gravity (CoG) of the following body. Express your answer as a number relating to the scale below, e.g. *the CoG is at position 5.2*

The following information is known:

Gravitational force of larger segment = 50N, position of CoG is at 3.0

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

5 Marks



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

- a. Acceleration
- b. Jumping force
- c. Quadriceps:Hamstrings ratio
- d. Running stride length
- e. Angle of hip flexion during sprinting

10 Marks

30. Discuss the importance of the study of biomechanics in the field of rehabilitation and sport science.

4 Marks

31. What is the difference between displacement and distance?

1 Mark

END OF QUESTIONS

PAST EXAMINATION