

UNIVERSITY OF FORT HARE

**Exercise and Sport
Biomechanics
HUS323**

DEGREE EXAMINATIONS

NOVEMBER / JANUARY

2024

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Time: 2.5 Hours

Subject: HUS323

Marks: 100

**This paper consists of 4 pages including the
cover page**

Internal Examiners
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External Examiners
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INSTRUCTIONS

- 1. Answer all questions**
- 2. It is in the candidate's best interest to write legibly**
- 3. Show all calculations on the answer paper**
- 4. Please number your answers**

QUESTION 1**(10)**

Answer the following multiple-choice questions by selecting ONE of the answers below each question. Please write the answer clearly in your answer booklet.

{1}

1.1 When air passes over a ball, the main contributor to surface drag is:

- a) The velocity of the air flow
- b) Surface Drag
- c) The smoothness of the surface
- d) Friction

1.2 Work is defined as

{1}

- a) Energy transferred to or from an object via the application of force, resulting in displacement
- b) Energy lost from the collision of two objects
- c) The time spent between 9am and 5pm in an office
- d) Mass multiplied by distance

1.3 A human sitting in a car driving forward is an example of what type of motion?

{1}

- a) Angular
- b) Linear
- c) General
- d) Spectacular

1.4 Which of the following is an example of a vector?

{1}

- a) Speed
- b) Distance
- c) Gravity
- d) Speed

1.5 Which one of the following is an example of a scalar?

{1}

- a) Temperature
- b) Force
- c) Gravity
- d) None of the above

- 1.6 Which formula best explains the concept of momentum in impacts. {1}
- a) $W=m.a.d$
 - b) $E=mc^2$
 - c) $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$
 - d) $F=m.a$
- 1.7 Which of the following can best explain back spin. {1}
- a) rotational component < translational component
 - b) rotational component > translational component
 - c) rotational component = translational component
 - d) There is only a rotational component
- 1.8 Which factor is the top contributor towards the acceleration of an athlete {1}
- a) Height
 - b) Arm swing
 - c) Velocity
 - d) Mass
- 1.9 The coefficient of restitution is defined as {1}
- a) The ability of an object to absorb force after impact
 - b) The ability of two objects to restore themselves after impact
 - c) The ability of an object to change shape
 - d) None of the above
- 1.10 A couple force is defined as {1}
- a) Two forces acting in the same direction
 - b) Two equal and opposite forces that cause translations
 - c) A force acting through the centre of mass of an object
 - d) None of the above

QUESTION 2**{10}**

Define biomechanics and explain the importance of kinetics and kinematics in the discipline.

QUESTION 3**(6)**

Explain the difference between an eccentric and centric force.

QUESTION 4**(6)**

Explain the right-hand thumb rule in relation to angular rotation.

QUESTION 5**(9)**

Name and define Newton's three laws of motion.

QUESTION 6**(10)**

During the Intervarsity sports tournament, Kwezi, a squash player, notices that her opponent cannot counter any of her fast shots. Using your understanding of impact and spin, identify and explain how Kwezi can increase the post impact velocity

QUESTION 7**(18)**

- a) Name and describe the characteristics of the three classes of levers. Provide an example of each. **{12}**
- b) Explain the difference between mechanical advantage and mechanical disadvantage in relation to levers **{6}**

QUESTION 8**(15)**

Explain the techniques a biomechanist would use to identify the centre of gravity of an object

QUESTION 9**(16)**

- a) A rugby player runs the length of the field (100m) in 12.5seconds. What was the average velocity of the player. Show your calculations **{4}**
- b) If the player runs the first half of the field at a velocity of 6.5m/s, what is their velocity for the remaining 50m. **{4}**
- c) The same player is running North and is tackled by a player running West at 10m/s. Calculate the resultant vector and kinematically describe the collision. **{8}**

TOTAL: 100