PiXL Independence:

PE – Student Booklet

KS5

Biomechanical Movement

Contents:

I. Quizzes

Complete the quizzes.*10 credits each.*

Biomechanical Principles and Levers

1. Which of the following movements would involve a 2nd class lever? **(1)**

   The release point in the elbow when shooting in basketball

   Rising on to tip toes in a ballet routine

   Controlling a football using your knee

   Performing a chest pass in netball

2. Which of the following statements is true? **(1)**

   A second class lever has the effort in the middle

   A first class lever has the resistance in the middle

   A second class lever has the fulcrum in the middle

   A first class lever has the fulcrum in the middle

3. Name and sketch the lever system that operates flexion at the hip joint. **(3)**

4. Define the term mechanical advantage and provide a practical example of its use within sport. **(2)**

5. If a skier skis at a speed of 13 metres per second for 40 seconds, calculate the distance covered. **(2)**

6. Explain the term 'centre of mass'. Outline how factors can affect stability, using sporting examples. **(3)**

7. Evaluate the use of Newton's law whilst playing a game of football. **(8)**

Linear Motion

1. Which of the following is not a force that acts on a performer during linear motion?

    Weight

    Frictional force

    Air resistance

    Upthrust

2. What calculation works out impulse?

    Speed x time

    Force x speed

    Force x time

    Force x mass

3. Describe what is meant by scalar quantity, using an example from sport to justify your answer. **(2)**

4. Draw two graph which demonstrate distance over time.

    a) When a goalkeeper in football waiting for a penalty to be taken **(2)**
    b) The first 30m of a 200m sprint race **(2)**

5. Describe what momentum is using a practical example. Work out the momentum of a prop in a game of rugby if they weigh 120kg and have a velocity of 9m/s. **(3)**

6. Using sporting examples, explain reaction force and frictional force. **(4)**

Angular Motion

1. Which of the following is an example of tranverse axis rotation?**(1)**

A cartwheel

Throwing a discus

A spin in ice skating

A forward somersault

2. Angular velocity equals: **(1)**

Distance divided by time taken

Angular displacement divided by time taken

Changes in Angular velocity divided by time taken

Time taken divided by angular displacement

3. Explain Newton's second law of motion using a sporting example. **(4)**

4. Describe the term 'moment of inertia'. **(2)**

5. Using a practical example, explain the conservation of angular momentum. **(3)**

6. Explain two sporting examples when a force is applied outside the centre of mass of an object or body to cause rotation to occur. **(4)**

7. Evaluate what is meant by the terms Angular Velocity, Moment of Inertia and Angular Momentum and sketch a graph showing their relationship when a gymnast performs a somersault from take off to landing. **(8)**

Projectile Motion

1. Which of the following is not a factor which affects the horizontal displacement of a projectile? **(1)**

Angle of release

Speed of release

Distance of release

Height of release

2. A parabola is: **(1)**

A fast incline moving into a plateau

A slow gradual incline and a sharp decline

A curve with matching left and right sides

A fast incline and a slow decline

3. In a game of cricket the batter hits a lofted drive into the air and it then becomes a projectile. Explain how the various forces act to affect the cricket ball during its flight. **(3)**

4. Describe the three factors which affect the release of a basketball when in the shooting motion. **(3)**

5. Explain the effect vector components have during parabolic flight. Use a sporting example to support your answer. **(4)**

6. Describe two factors that would affect the flight paths of different projectiles. **(2)**

7. Draw a free body diagram for each projectile, showing all the forces acting during the flight of a javelin. Explain the shape of the flight path for each of the projectiles. **(8)**

Fluid Mechanics

1. Which of the following is a factor that does not reduce and increase drag? **(1)**

Velocity of the moving body

Cross-sectional area of the moving body

Shape and surface characteristics of a moving body

Direction of the moving body

2. Which term best describes 'drag force'? **(1)**

A force that acts in the same motion of movement

A force that acts in opposition to the motion

A force that acts upwards to the motion

A force that acts downwards to the motion

3. Explain the two types of drag using sporting examples to justify your answers. **(4)**

4. Describe two factors that reduce and increase drag. Outline how these are implemented in sport using an example. **(4)**

5. Describe how lift force acts on a discus in flight. **(2)**

6. How does a skier reduce and increase drag? **(3)**

7. Compare the ski jumper's use of the Bernoulli Effect during flight with that of a Formula 1 car when racing and explain how this improves performance for each. **(8)**

II. Reading Task

Choose a scholarly article for the list below. Summarise the key ideas within the article – ideally in ten points. Create 5 questions relating to both the article and your specification.

50 credits.

https://www.sciencelearn.org.nz/resources/1924-what-levers-does-your-body-use

http://www.profedf.ufpr.br/rodackibiomecanica_arquivos/Books/Introduction%20to%20Sports%20Biomechanics.pdf

http://aapt.scitation.org/doi/abs/10.1119/1.19199

http://www.annualreviews.org/doi/abs/10.1146/annurev-fluid-010313-141255

III. Research Task

Part 1: Select 4 main ideas within the text and produce a spider diagram of the main points and prior learning you know regarding key quotes from the text.

Part 2: Research and find an article which supports or disclaims the ideas in the original article. Write a paragraph to summarise your findings. In this paragraph you must provide a sporting example to support your findings.

Part 3: Draw upon examples from sport and real-life occurrences to create your own newspaper article on the topic area.

80 credits.

IV. Website Task

Website task: Select a website and design a power point presentation you could give to a group of students just beginning the A Level PE course. Include key notes you could discuss on each slide.

80 credits.

- Levers: https://www.brianmac.co.uk/levers.htm
- Linear motion: http://www.teachpe.com/biomechanics/linear-motion/speed-velocity
- Projectile motion: http://www.physicsclassroom.com/Class/vectors/u3l2a.cfm
- Fluid mechanics: https://www.asu.edu/courses/kin335/documents/Fluid%20mechanics.pdf
- Biomechanical principles: https://669659.medium.com/newtons-three-laws-of-motion-in-sports-924510aa7fde

V. Long Answer Questions

Choose a longer answer question from the question bank below. Write a response to the question. You must include a plan of what you are going to include, a key word board and your final written answer, completed in full sentences and paragraphs.

100 credits each.

1. Using Newton's laws, compare a gymnast's performance of a somersault with that of a skier performing a turn during a slalom. **(15)**

2. Use Newton's laws to explain the relationship between impulse and the motion of a long jumper during takeoff and landing. Explain how the long jumper uses the centre of mass to maximise performance. **(15)**

3. Explain the methods used to reduce the forces acting on a ski jumper whilst descending down a ski ramp before takeoff. Compare the ski jumper's use of the Bernoulli Effect during flight with that of a sprint track cyclist within the Velodrome and how it helps to maximise performance. **(15)**

VI. Videos

Produce a video that shows the use of the body in a practical way. The video must include key sporting examples and clear explanations of what is occurring within the video.

Try to include the whole unit topic in one video.

80 credits per topic.

- Biomechanical principles
- Levers
- Linear motion
- Angular motion
- Projectile motion
- Fluid mechanics

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