2.1 Movement Analysis: Levers, Planes and Axes: 10-minute Pack

AQA 8582 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Which class of lever is the most common in the human body, and is generally suited to producing speed and range of movement rather than force?

- ☐ A) First class lever
- ☐ B) Second class lever
- ☐ C) Third class lever
- ☐ D) Fourth class lever

(Total for Question 1 is 1 mark)

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2 A trampolinist performs a routine consisting of two rotating skills: a tucked front somersault, and a straight 'barani' (a somersault combined with a half twist about the body's long axis).

(a) Identify the plane of movement and the corresponding axis of rotation used for the basic tucked front somersault. **(2)**

(b) Identify the plane of movement and the corresponding axis of rotation used for the additional twisting rotation during the barani. **(2)**

(c) Explain why a skill that combines a somersault with a twist, such as the barani, involves rotation in more than one plane at the same time. **(2)**

(Total for Question 2 is 6 marks)

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3 Explain, using the term 'mechanical advantage', why most lever systems in the human body are suited to producing speed and range of movement rather than force.

(Total for Question 3 is 4 marks)

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Mark scheme · 2.1 Movement Analysis: Levers, Planes and Axes: 10-minute Pack

Question 1

C (third class lever) **B1**

Answer: C (third class lever)

Question 2

(a) sagittal plane **B1**

(a) transverse (frontal) axis **B1**

(a) Answer: Sagittal plane, rotating about the transverse (frontal) axis.

(b) transverse plane **B1**

(b) longitudinal axis **B1**

(b) Answer: Transverse plane, rotating about the longitudinal axis.

(c) a somersault is a rotation about the transverse axis, taking place in the sagittal plane, oe **B1**

(c) a twist is a separate, simultaneous rotation about the longitudinal axis, taking place in the transverse plane, so combining the two skills means the body is rotating about two different axes, in two different planes, at the same time, oe **B1**

(c) Answer: A somersault (rotation about the transverse axis, in the sagittal plane) and a twist (rotation about the longitudinal axis, in the transverse plane) are two separate rotations; performing both together means the body rotates about two different axes, and therefore moves in two different planes, at the same time.

Question 3

most levers in the body, particularly third class levers (the most common type), have the effort acting close to the fulcrum, oe **B1**

this makes the effort arm short compared with the load arm, giving a mechanical advantage of less than 1, oe **B1**

a mechanical advantage of less than 1 means more muscular effort force is needed than the size of the load being moved (a force disadvantage), oe **B1**

however, this arrangement means a small movement of the muscle close to the joint produces a much larger, faster movement at the end of the limb, which is why the body is generally suited to speed and range of movement rather than raw force, oe **B1**

Answer: Because most levers in the body (especially third class levers, the most common type) have the effort close to the fulcrum and the load much further away, the effort arm is short relative to the load arm, giving a mechanical advantage below 1; this needs more muscular force than the load itself, but it means a small movement of the muscle produces a much larger, faster movement at the end of the limb, which is why the body favours speed and range of movement over force.

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