1.2 Synovial Joints: Ligaments, Tendons and Cartilage: 30-minute Pack

AQA 8582 · Calculators not allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State the name of a major ligament found inside the knee joint that is commonly injured when a footballer suddenly changes direction while their foot is planted on the ground.

(Total for Question 1 is 1 mark)

2 A long-distance runner has trained on hard road surfaces for many years. Suggest one way this repeated high-impact training could affect the cartilage in their knee joints over time.

(Total for Question 2 is 2 marks)

3 Explain how the synovial membrane and the joint capsule work together to keep synovial fluid contained within a joint.

(Total for Question 3 is 2 marks)

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4 A weightlifter injures their shoulder during a heavy overhead lift. The tendon connecting one of their rotator cuff muscles to the humerus is strained, and the ligaments supporting the shoulder joint are also stretched.

(a) Explain how the strained tendon is likely to affect the weightlifter's ability to lift. **(2)**

(b) Explain how the stretched ligaments could increase the weightlifter's risk of future injury. **(2)**

(Total for Question 4 is 4 marks)

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5 A basketball player jumps to catch a rebound and lands awkwardly, twisting their ankle joint beyond its normal range of movement.

(a) Explain what is likely to happen to the ligaments at the ankle as a result of this injury. **(2)**

(b) Explain what is likely to happen to the joint capsule as a result of this injury. **(2)**

(Total for Question 5 is 4 marks)

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6 Which of the following is NOT a function of cartilage at a synovial joint?

- ☐ A) Absorbing shock
- ☐ B) Reducing friction between bones
- ☐ C) Producing synovial fluid
- ☐ D) Providing a smooth surface for movement

(Total for Question 6 is 1 mark)

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7 Using a named sporting example, explain how ligaments, tendons and cartilage each play a different role in allowing controlled, stable movement at a joint.

(Total for Question 7 is 3 marks)

8 Explain why the ligaments at a joint need to be strong but only slightly elastic.

(Total for Question 8 is 2 marks)

9 State two structures, other than the bones themselves, that would be found at any synovial joint such as the elbow.

(Total for Question 9 is 2 marks)

10 During a rugby tackle, a player's ankle is forced beyond its normal range of movement, and the connective tissue holding the tibia and fibula to the foot bones is stretched and partially torn. Name the damaged structure and explain your answer.

(Total for Question 10 is 2 marks)

11 A discus thrower rotates their head to track the discus during the throw, using the joint between the top of the spine and the base of the skull.

(a) Name the type of joint used to produce this head rotation. **(1)**

(b) Give one other sporting example of rotation occurring at a pivot joint. **(1)**

(Total for Question 11 is 2 marks)

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12 A gymnast dismounts from the beam and lands heavily on both feet, then must immediately stabilise and hold the landing position for the judges.

Evaluate the role of the different structures of a synovial joint (cartilage, synovial fluid, ligaments and tendons) in allowing the gymnast to land safely and hold a stable position.

(Total for Question 12 is 6 marks)

13 A tennis player develops repeated friction over the point of their elbow from the joint bending and straightening during serves, causing a small fluid-filled sac near the joint to become swollen and painful.

(a) Name the structure that has become swollen. **(1)**

(b) State the normal function of this structure. **(1)**

(Total for Question 13 is 2 marks)

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Mark scheme · 1.2 Synovial Joints: Ligaments, Tendons and Cartilage: 30-minute Pack

Question 1

anterior cruciate ligament (ACL), oe (accept posterior cruciate ligament, medial collateral ligament or lateral collateral ligament) **B1**

Answer: Anterior cruciate ligament (ACL)

Question 2

repeated high-impact forces can gradually wear down/thin the articular cartilage covering the bone ends over many years, oe **B1**

this can reduce the joint's shock-absorbing and friction-reducing ability, sometimes contributing to joint pain or conditions such as osteoarthritis in later life, oe **B1**

Answer: Repeated high-impact training can gradually wear down/thin the cartilage in the knee over many years, reducing its shock-absorbing ability and sometimes contributing to joint pain or conditions such as osteoarthritis.

Question 3

the synovial membrane lines the inside of the joint capsule and produces/secretes the synovial fluid, oe **B1**

the joint capsule is the tough outer sleeve that encloses the whole joint, containing the fluid produced by the membrane within the joint space, oe **B1**

Answer: The synovial membrane lines the inside of the joint capsule and produces the synovial fluid; the joint capsule is the tough outer sleeve that encloses the joint, so together they contain the fluid produced by the membrane within the joint space.

Question 4

(a) the tendon transmits the force of the muscle's contraction to the bone, so a strained (damaged) tendon will transmit force less effectively/painfully, oe **B1**

(a) reducing the amount of force the weightlifter can safely generate at the shoulder, limiting the weight they can lift, oe **B1**

(a) Answer: Because the tendon transmits the force of the muscle's contraction to the bone, a strained tendon will transmit force less effectively and painfully, reducing the amount of weight the lifter can safely lift.

(b) ligaments normally hold the bones of the shoulder joint firmly together and limit its range of movement, oe **B1**

(b) if they are stretched/weakened, the joint becomes less stable, making it more likely to move beyond its safe range and be injured again in future, oe **B1**

(b) Answer: Ligaments normally hold the bones of the shoulder joint firmly together and limit its range of movement, so if they are stretched and weakened, the joint becomes less stable and more likely to be injured again in future.

Question 5

(a) the ligaments hold the bones of the ankle joint together and normally limit its range of movement, oe **B1**

(a) being forced beyond this normal range stretches/tears the ligaments, causing a sprain, oe **B1**

(a) Answer: The ligaments, which normally hold the ankle bones together and limit the joint's range of movement, are stretched or torn by being forced beyond that normal range, causing a sprain.

(b) the joint capsule is the fibrous sleeve enclosing the joint, oe **B1**

(b) the same excessive force can also stretch or partially tear the joint capsule, which may cause swelling as fluid leaks/builds up around the joint, oe **B1**

(b) Answer: The joint capsule, the fibrous sleeve enclosing the ankle joint, can also be stretched or partially torn by the same excessive force, which may cause swelling as fluid builds up around the joint.

Question 6

C (producing synovial fluid) **B1**

Answer: C (producing synovial fluid)

Question 7

ligaments hold the bones of the joint together and limit its range of movement, providing stability, oe **B1**

tendons transmit the force of a muscle's contraction to a bone, producing controlled movement at the joint, oe **B1**

cartilage covers the bone ends, absorbing shock and reducing friction so the movement is smooth, with a valid named sporting example applied to at least one structure, e.g. a basketball player's knee ligaments preventing dislocation on landing while the quadriceps tendon controls the bend of the knee, oe **B1**

Answer: For example, in a basketball player's knee: the ligaments hold the femur and tibia together and stop the joint moving too far, giving stability; the quadriceps tendon transmits the force of the thigh muscle to control how much the knee bends; and the cartilage covering the bone ends absorbs shock and keeps the movement smooth and low-friction.

Question 8

they must be strong so they can withstand the large forces placed on a joint during movement without tearing, oe **B1**

they must be only slightly elastic (not too stretchy) so they hold the bones firmly together and limit the joint's range of movement, preventing dislocation/instability, oe **B1**

Answer: Ligaments must be strong so they can withstand large forces without tearing, and only slightly elastic so they hold the bones firmly together and limit the joint's range of movement, preventing dislocation.

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Question 9

any one of: ligament / tendon / cartilage / synovial fluid / synovial membrane / joint capsule / bursa **B1**

any second, different one of the above list **B1**

Answer: For example, a ligament and a tendon.

Question 10

ligament **B1**

ligaments connect bone to bone and their role is to hold the joint together/limit its range of movement, so a joint forced beyond its normal range damages the bone-to-bone connective tissue (the ligament) rather than a muscle-to-bone tendon, oe **B1**

Answer: The structure damaged is a ligament, because ligaments connect bone to bone and limit a joint's range of movement, so it is the ligament (not the muscle-to-bone tendon) that is stretched when a joint is forced beyond its normal range.

Question 11

(a) pivot joint **B1**

(a) Answer: Pivot joint

(b) any one of: forearm rotation (pronation/supination) at the joint between the radius and ulna, e.g. a tennis player rotating the forearm to apply topspin / a bowler rotating the wrist and forearm in cricket **B1**

(b) Answer: For example, a tennis player rotating their forearm at the pivot joint between the radius and ulna to add topspin to a shot.

Question 12

Level 3 A detailed and coherent evaluation that explains the distinct roles of at least three different synovial joint structures (e.g. cartilage, synovial fluid, ligaments, tendons) and clearly links each one to how it contributes to a safe, stable landing, using correct anatomical terminology throughout. **5-6**

Level 2 The roles of at least two synovial joint structures are explained with some accuracy, with some link made to the landing, but the answer may lack detail or full development for each structure. **3-4**

Level 1 One or two relevant points are made about synovial joint structures, but with little explanation or clear link to the landing. **1-2**

Level 0 No relevant content. **0**

Indicative content:

- Cartilage covers the ends of the bones (e.g. at the knee and ankle) and absorbs a significant amount of the shock/impact force of landing, protecting the bone ends from damage.
- Synovial fluid lubricates the joints, reducing friction between the bones during the rapid flexion of the knees and ankles used to absorb the landing.
- Ligaments hold the bones of each joint firmly together and limit the range of movement at the joint, preventing the ankle, knee or hip from being forced beyond its normal range and dislocating as the gymnast absorbs the force of landing.
- Tendons attach the leg muscles (e.g. quadriceps, gastrocnemius) to the bones and transmit the force generated when these muscles contract, allowing the gymnast to actively control the bend of the knees and ankles rather than collapsing.
- The joint capsule encloses each joint and, together with the ligaments, adds further stability, helping the gymnast hold the final landing position still for the judges.
- A balanced evaluation might conclude that no single structure works alone: cartilage and synovial fluid absorb shock and reduce friction during the landing itself, while ligaments and tendons together provide the stability and controlled muscular force needed to hold the position afterwards.

Question 13

(a) bursa **B1**

(a) Answer: Bursa

(b) reduces friction between tendons, bones and skin around a joint, oe **B1**

(b) Answer: It reduces friction between tendons, bones and skin around a joint.

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