



PE.MA4 Movement Analysis: Joint Actions and Joint Types

AQA 8582 · Calculators not allowed · about 50 minutes

Total Marks

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Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 Which term describes a movement that decreases the angle at a joint?

- ☐ A) Flexion
- ☐ B) Extension
- ☐ C) Abduction
- ☐ D) Rotation

(Total for Question 1 is 1 mark)

2 Four joint actions are defined below.

(a) State what is meant by 'flexion'. (1)

(b) State what is meant by 'extension'. (1)

(c) State what is meant by 'abduction'. (1)

(d) State what is meant by 'adduction'. (1)

(Total for Question 2 is 4 marks)

- 3** Diagram 1 shows the same shoulder joint action shown two ways. In the side-view panel, the dashed arm shows the resting starting position and the solid arm shows the finishing position reached by following Arrow 1. In the front-view panel, the dashed arm shows the resting starting position and the solid arm shows the finishing position reached by following Arrow 2.



Arrow 1
side view

Arrow 2
front view

- (a) Name the joint action and the plane of movement shown by Arrow 1. (2)
- (b) Name the joint action and the plane of movement shown by Arrow 2. (2)
- (c) Both arrows show the same shoulder joint moving from the same resting position, but the movements take place in different planes. Explain why this is possible at the shoulder. (2)

(Total for Question 3 is 6 marks)

- 4** Table 1 gives four short descriptions of what a joint type allows or does not allow.

Table 1

Row	Description
(a)	Allows rotation only, and no other movement
(b)	Allows flexion, extension, abduction and adduction, but not rotation
(c)	Allows the greatest range of movement of any joint type, including full rotation
(d)	Allows flexion and extension only, in one plane, like a door hinge

(a) Name the joint type described in row (a). (1)

(b) Name the joint type described in row (b). (1)

(c) Name the joint type described in row (c). (1)

(d) Name the joint type described in row (d). (1)

(Total for Question 4 is 4 marks)

- 5** A basketball player raises one arm forward and upward to shoulder height, in a straight line in front of the body, to execute an overhead chest pass.
- (a)** Name the joint action taking place at the shoulder. (1)
 - (b)** State the plane of movement this action takes place in. (1)
 - (c)** Name the joint type found at the shoulder. (1)
 - (d)** Explain why the shoulder needing to be a ball and socket joint, rather than a hinge joint, matters for a basketball player who must both pass overhead and dribble the ball sideways around their body. (2)

(Total for Question 5 is 5 marks)

- 6** During a side-foot pass, a footballer first swings their kicking leg out to the side to line up the strike, then swings it back in towards the midline of their body to make contact with the ball.
- (a)** Name the two joint actions taking place at the hip during this passing action, in the order they occur. (2)
 - (b)** State the plane of movement these actions take place in, and name the joint type at the hip. (2)
 - (c)** Explain why a ball and socket joint, rather than a hinge joint, is needed at the hip for a footballer to be able to both flex/extend the leg (as when running) and abduct/adduct it (as when side-footing a pass). (2)

(Total for Question 6 is 6 marks)

7 Table 2 gives four sporting descriptions.

Table 2

Row	Description
(a)	A footballer points their toes down and away from the shin to strike a volley
(b)	A sprinter pulls their toes up towards the shin during the recovery phase of the running stride
(c)	A swimmer's arm moves through a full circular path during the recovery phase of front crawl, combining flexion, extension, abduction and adduction in sequence
(d)	A cricket bowler's whole arm turns around its own long axis during a delivery

(a) Name the joint action described in row (a). (1)

(b) Name the joint action described in row (b). (1)

(c) Name the joint action described in row (c). (1)

(d) Name the joint action described in row (d). (1)

(Total for Question 7 is 4 marks)

8 Which joint type allows flexion, extension, abduction and adduction, but does NOT allow rotation?

- ☐ A) Ball and socket joint
- ☐ B) Hinge joint
- ☐ C) Pivot joint
- ☐ D) Condylloid joint

(Total for Question 8 is 1 mark)

9 State what is meant by 'circumduction', name the joint type(s) that allow it, and give a named sporting example.

(Total for Question 9 is 3 marks)

- 10** From a hang on the rings, a gymnast lifts both straight legs together forward until they are horizontal in front of the body.

(Total for Question 10 is 2 marks)

- 11** During the leg kick in front crawl swimming, a swimmer's legs move up and down at the hip in a continuous, alternating pattern.

(Total for Question 11 is 2 marks)

- 12** Explain, using named sporting examples, why the ball and socket joint at the hip allows a much wider range of joint actions than the hinge joint at the knee.

(Total for Question 12 is 6 marks)

- 13** Which of the following joint actions would NOT be possible at a hinge joint such as the knee?

- ☐ A) Flexion
- ☐ B) Extension
- ☐ C) Abduction
- ☐ D) None of these; all are possible at a hinge joint

(Total for Question 13 is 1 mark)

- 14** Kwame is a goalkeeper. During a single diving save, his hip abducts and rotates to drive his body sideways, his shoulder flexes and abducts to reach the arm towards the ball, and his elbow extends to add to his reach.

Discuss how the different joint types found at Kwame's hip, shoulder and elbow allow him to combine these joint actions into a single diving save, and evaluate whether a goalkeeper's save would still be possible if the shoulder and hip were hinge joints instead of ball and socket joints.

(Total for Question 14 is 9 marks)

- 15** During the drive phase of a sprint start, a sprinter's foot presses hard against the blocks, with the ankle driving down and back as the foot leaves the ground.

(Total for Question 15 is 2 marks)

- 16** At the moment of contact, a volleyball setter snaps both wrists forward sharply, bending the hands towards the palm side, to direct the ball upward to a team-mate.

(Total for Question 16 is 2 marks)

- 17** State the joint type found at the elbow, and name the ONE pair of joint actions it allows.

(Total for Question 17 is 2 marks)

Mark scheme • PE.MA4 Movement Analysis: Joint Actions and Joint Types

Question 1

- **B1 A**
- **Answer: A**

Question 2

- (a) **B1** a movement that decreases the angle at a joint, oe
- (a) **Answer: A movement that decreases the angle at a joint.**
- (b) **B1** a movement that increases the angle at a joint, oe
- (b) **Answer: A movement that increases the angle at a joint.**
- (c) **B1** movement of a limb away from the midline of the body, oe
- (c) **Answer: Movement of a limb away from the midline of the body.**
- (d) **B1** movement of a limb back towards the midline of the body, oe
- (d) **Answer: Movement of a limb back towards the midline of the body.**

Question 3

- (a) **B1** flexion
- (a) **B1** sagittal plane
- (a) **Answer: Flexion, in the sagittal plane.**
- (b) **B1** abduction
- (b) **B1** frontal plane
- (b) **Answer: Abduction, in the frontal plane.**
- (c) **B1** the shoulder is a ball and socket joint, oe
- (c) **B1** this joint type allows movement in multiple directions/planes from the same joint (flexion/extension in the sagittal plane as well as abduction/adduction in the frontal plane, plus rotation), unlike a joint type such as a hinge that only allows movement in one plane, oe
- (c) **Answer: The shoulder is a ball and socket joint, which allows movement in multiple directions and planes from the same joint (flexion/extension in the sagittal plane as well as abduction/adduction in the frontal plane, plus rotation), unlike a hinge joint, which only allows movement in one plane.**

Question 4

- (a) **B1** pivot joint
- (a) **Answer: Pivot joint.**
- (b) **B1** condyloid joint
- (b) **Answer: Condyloid joint.**
- (c) **B1** ball and socket joint
- (c) **Answer: Ball and socket joint.**
- (d) **B1** hinge joint
- (d) **Answer: Hinge joint.**

Question 5

- (a) **B1** flexion
- **(a) Answer: Flexion.**
- (b) **B1** sagittal plane
- **(b) Answer: Sagittal plane.**
- (c) **B1** ball and socket joint
- **(c) Answer: Ball and socket joint.**
- (d) **B1** a hinge joint would only allow flexion and extension (forward/backward movement in one plane), oe
- (d) **B1** a ball and socket joint additionally allows abduction/adduction and rotation, so the same shoulder can also move the arm sideways to dribble around the body, which a hinge joint could not do, oe
- **(d) Answer: A hinge joint would only allow flexion and extension, forward/backward movement in one plane. A ball and socket joint additionally allows abduction/adduction and rotation, so the same shoulder can also move the arm sideways to dribble around the body, which a hinge joint could not do.**

Question 6

- (a) **B1** abduction (swinging the leg out)
- (a) **B1** adduction (swinging the leg back in)
- **(a) Answer: Abduction (swinging the leg out), followed by adduction (swinging the leg back in).**
- (b) **B1** frontal plane
- (b) **B1** ball and socket joint
- **(b) Answer: Frontal plane; the hip is a ball and socket joint.**
- (c) **B1** a hinge joint only allows movement in one plane (flexion/extension), oe
- (c) **B1** a ball and socket joint allows movement in more than one plane from the same joint, so the same hip can both flex/extend for running and abduct/adduct for a side-foot pass, oe
- **(c) Answer: A hinge joint only allows movement in one plane, flexion and extension. A ball and socket joint allows movement in more than one plane from the same joint, so the same hip can both flex and extend for running and abduct and adduct for a side-foot pass.**

Question 7

- (a) **B1** plantarflexion
- **(a) Answer: Plantarflexion.**
- (b) **B1** dorsiflexion
- **(b) Answer: Dorsiflexion.**
- (c) **B1** circumduction
- **(c) Answer: Circumduction.**
- (d) **B1** rotation
- **(d) Answer: Rotation.**

Question 8

- **B1** D
- **Answer: D**

Question 9

- **B1** a full circular movement of a limb, combining flexion, extension, abduction and adduction in one continuous sequence, oe
- **B1** ball and socket joints (e.g. shoulder, hip), oe
- **B1** a correct named sporting example, e.g. the arm recovery in front crawl swimming, or the full circular arm swing in a cricket bowling action, oe
- **Answer: Circumduction is a full circular movement of a limb, combining flexion, extension, abduction and adduction in one continuous sequence. It requires a ball and socket joint, such as the shoulder, and one sporting example is the arm recovery phase of front crawl swimming.**

Question 10

- **B1** hip flexion
- **B1** sagittal plane
- **Answer: Hip flexion, in the sagittal plane.**

Question 11

- **B1** hip flexion and extension
- **B1** sagittal plane
- **Answer: Hip flexion and extension, alternating, in the sagittal plane.**

Question 12

- **B1** the hip is a ball and socket joint; the knee is a hinge joint
- **B1** a ball and socket joint allows flexion, extension, abduction, adduction, rotation and circumduction, oe
- **B1** a hinge joint allows flexion and extension only, oe
- **B1** structural reason: the rounded head of the femur sitting inside a deep, cup-shaped socket allows movement in almost any direction, whereas the hinge shape of the knee only permits movement in one plane, oe
- **B1** sporting example showing the hip's wider range, e.g. a footballer's hip flexing to sprint, abducting/adducting to side-foot pass, and rotating to change direction, all at the same joint, oe
- **B1** contrasting example showing the knee's narrower range, e.g. the knee can flex and extend to sprint or kick, but cannot abduct, adduct or rotate to change direction the way the hip can, oe
- **Answer: The hip is a ball and socket joint and the knee is a hinge joint. A ball and socket joint allows flexion, extension, abduction, adduction, rotation and circumduction, because the rounded head of the femur sitting inside a deep, cup-shaped socket allows movement in almost any direction; a hinge joint allows flexion and extension only, because its shape only permits movement in one plane. For example, a footballer's hip can flex to sprint, abduct and adduct to side-foot pass, and rotate to change direction, all at the same joint, while the knee can only flex and extend to sprint or kick, and cannot abduct, adduct or rotate the way the hip can.**

Question 13

- **B1** C
- **Answer: C**

Question 14

- **Level 3** (7-9): A detailed and coherent response that accurately names the joint type and relevant joint actions at Kwame's hip, shoulder and elbow, explains how they combine to produce the diving save, and gives a well-justified evaluation of what would be lost if the shoulder and hip were hinge joints instead of ball and socket joints. Sustained, accurate use of joint-action and joint-type terminology throughout.
- **Level 2** (4-6): Some accurate naming of joint types and joint actions at Kwame's hip, shoulder and/or elbow, with some explanation of how they combine, but coverage of all three joints or the evaluative point may be incomplete or underdeveloped.
- **Level 1** (1-3): Basic or generic statements about joints and movement with little or no application to Kwame's specific save, and little or no evaluation.
- **Level 0** (0): No relevant content.
- **Indicative content:**
 - The hip is a ball and socket joint, allowing the abduction (sideways) and rotation described, which drives Kwame's whole body sideways towards the ball.
 - The shoulder is also a ball and socket joint, allowing both flexion (reaching the arm forward/up) and abduction (reaching the arm sideways) at the same joint, which lets Kwame reach towards a ball that could be in many different directions.
 - The elbow is a hinge joint, allowing only extension (straightening the arm), which adds extra reach in a single, simple plane once the shoulder has already aimed the arm in the right direction.
 - The combination shows a general principle: ball and socket joints (hip, shoulder) provide the multi-directional positioning needed for an unpredictable sporting situation, while hinge joints (elbow) provide simple, single-plane extension to extend that reach further.
 - Evaluative point: if the shoulder and hip were hinge joints, Kwame could only flex/extend at each, meaning he could reach forward or straighten his body in one plane, but could not abduct/rotate sideways or diagonally to reach a ball that was not directly in front of him.
 - Evaluative point: because most diving saves need to cover a wide range of directions (not just straight ahead), a hinge-joint hip and shoulder would make many real saves impossible or far less effective, showing how essential the ball and socket joint type is to this specific sporting skill.
 - Balanced conclusion: the save relies on ball and socket joints for direction and reach and a hinge joint for simple extension, and each joint type is suited to the specific role it plays in the movement, rather than one joint type being generally superior to the other.

Question 15

- **B1** plantarflexion
- **B1** sagittal plane
- **Answer: Plantarflexion, in the sagittal plane.**

Question 16

- **B1** wrist flexion
- **B1** sagittal plane
- **Answer: Wrist flexion, in the sagittal plane.**

Question 17

- **B1** hinge joint
- **B1** flexion and extension
- **Answer: The elbow is a hinge joint, allowing flexion and extension.**