Skeleton and Joints (Option B2 and B3): Eduqas A Level Biology Exam Questions by Topic

20 questions · 38 marks · about 46 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · A level Component 3 · June 2025 · Q8(a)(i) · 1 mark

8. (a) The axial skeleton includes the vertebral column and rib cage.

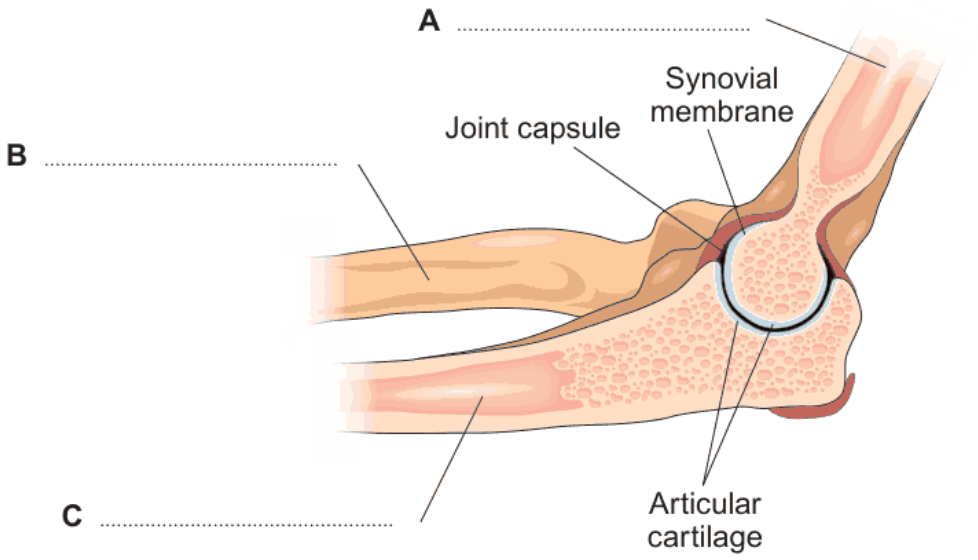
(i) State **one** function of the axial skeleton. [1]

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Question 2 · A level Component 3 · June 2019 · Q9(a)(i) · 1 mark

9. *(a)* Figure 9.1 shows the elbow joint, which is part of the appendicular skeleton. Muscles are attached to the bones and move the bones at the joint.

Figure 9.1

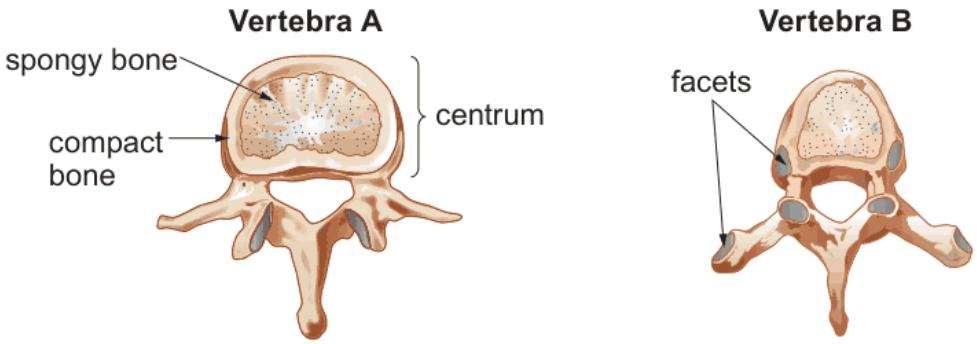


(i) Label the bones **A-C** of the arm as indicated in figure 9.1. [1]

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9. *(a)* **Image 9.1** shows two different vertebrae.

Image 9.1



(i) Vertebra **A** is found in the lumbar region of the vertebral column.
Identify the region of the vertebral column where vertebra **B** is found and state the specific function of the facets labelled on the image. [2]

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Question 4 · information from earlier in the question

(b) The centrum plays a role in supporting body weight when upright. Bone should have a high enough density to carry out this function.

A bone density loss of 25% results in a condition called osteoporosis which carries a greater risk of fractures.

Bone density loss is a problem for astronauts on long duration space flights.

In 1989, American and Russian scientists investigated bone density changes in astronauts before and after space flights lasting 4–14 months.

Eighteen crew members underwent spine, pelvis and wrist bone density scans.

A baseline reading was taken from a scan 30 days before flight.

All astronauts carried out regular exercise, such as running on a treadmill, during flights. The space station was at 0.6 of the Earth's gravity.

A summary of the results is shown in **table 9.3**.

Table 9.3

Region of skeleton	Mean loss of bone density / % month^{-1}	Standard deviation (sd)
Spine (L1–L4) Lumbar		0.63
Spine Cervical	–1.15	0.84
Pelvis	–1.56	0.54
Wrist	–0.04	0.88

Question 4 · A level Component 3 · Autumn 2020 · Q9(b)(iii) · 2 marks

(iii) Suggest a reason why the scientists chose to measure the bone density of lumbar vertebrae and the wrist as part of their study. [2]

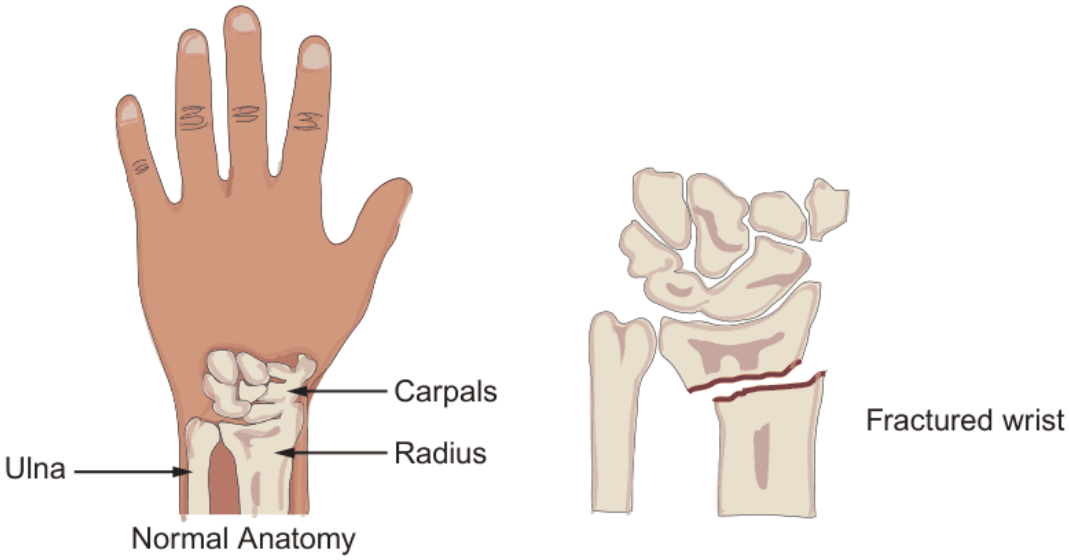
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(d) Wrist fractures are very common in women in their 50s, typically after a fall onto an outstretched arm. This can be the first sign of underlying osteoporosis.



(i) The image above depicts a displaced fracture of the wrist. Suggest **one** possible treatment for this. [1]

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Question 6 · A level Component 3 · June 2023 · Q8(b) · 3 marks

(b) A common fracture in osteoporosis sufferers is a fracture of the wrist as shown in **Image 8.3**.

Image 8.3



Identify the type of fracture **and** the bones involved in the wrist fracture shown in **Image 8.3**. Describe **one** possible course of treatment required. [3]

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Question 7 · A level Component 3 · June 2018 · Q9(c)(ii) · 1 mark

(ii) Both fractures required surgery and the use of screws and/or metal plates. Suggest why this treatment would lead to a faster recovery than bed rest or immobilisation. [1]

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Question 8 · A level Component 3 · June 2022 · Q8(d)(i) · 1 mark

(d) **Image 8.7** is an X-ray photograph showing a different type of deformity of the skeleton.

Image 8.7



(i) Identify the condition shown in **Image 8.7**. [1]

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Question 9 · A level Component 3 · June 2022 · Q8(d)(ii) · 1 mark

(ii) State **one** potential cause of this condition. [1]

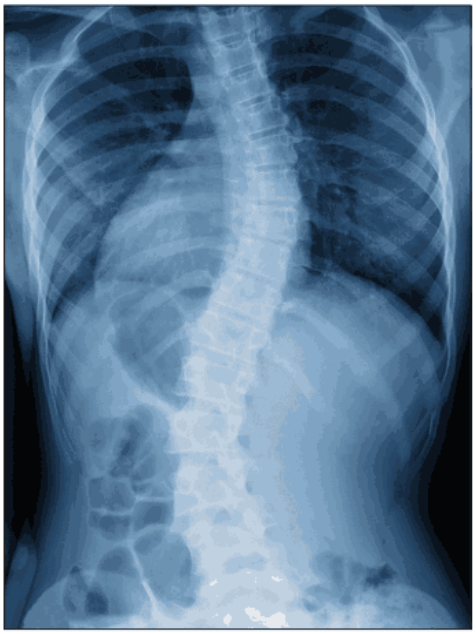
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Image 8.1 shows an X-ray of part of the axial skeleton of a patient with a postural deformity.

Image 8.1



(ii) Name the type of deformity shown in **Image 8.1** and identify the region of the spine which is most affected in this patient. [2]

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Question 11 · A level Component 3 · June 2017 · Q8(e)(i) · 4 marks

(e) Arthritis affects joints, particularly those in the hands and wrists.



Finger Joint Arthritis

(i) Compare and contrast the structure and movement of the wrist joint with those found in the fingers. [4]

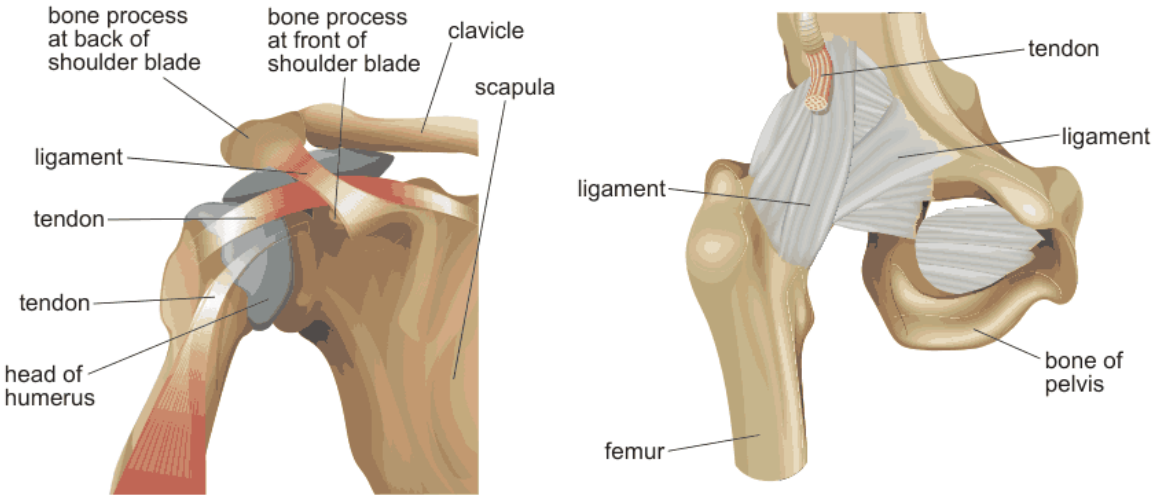
Question 12 · A level Component 3 · June 2019 · Q9(a)(ii) · 2 marks

(ii) The cartilage in the elbow joint is made of hyaline cartilage. Describe the role of the hyaline cartilage in the elbow joint and how the structure of the joint allows it to perform its function. [2]

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(d) The articulation of the limbs with the pectoral and pelvic girdles each form a ball and socket joint. The diagrams in **image 8.6** show a shoulder and a hip joint.

Image 8.6



Skiing is a sport that uses the arms to assist locomotion. Some injuries to the pectoral girdle are more likely to occur in skiers than swimmers.

After a fall, a skier suffered a dislocation at the shoulder and a fracture of the clavicle (collar bone).

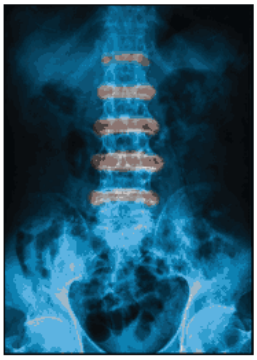
(i) Use the information in **image 8.6** and your knowledge of the structure of ball and socket joints in the pectoral and pelvic girdles to explain why shoulder dislocation is more common than a hip dislocation. [2]

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Question 14 · A level Component 3 · Autumn 2020 · Q9(c)(i) · 2 marks

(c) Arthritis is a disease that causes inflammation and pain at joints.
Image 9.4 is an X-ray photograph showing osteoarthritis in part of the spine.

Image 9.4



(i) The position of inflammation is highlighted by the red areas. From the image, identify the tissue most likely to be affected in those areas. Explain how pain and further damage to the joint is likely to be the result. [2]

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Question 15 · A level Component 3 · Autumn 2020 · Q9(c)(ii) · 1 mark

(ii) Rheumatoid arthritis is an autoimmune disease that results in joint inflammation. Explain the cause of inflammation in this form of arthritis. [1]

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Question 16 · information from earlier in the question

(c) **Images 8.4A** and **8.4B** show two X-ray images of the knee joint.

Image 8.4A

Knee of patient



Image 8.4B

Healthy knee



Question 16 · A level Component 3 · June 2024 · Q8(c)(ii)II · 2 marks

II. The patient was 27 years old. Their weight was within normal range but they had low levels of physical activity. The patient's knee was swollen and warm to the touch. The patient was in a great deal of pain and had difficulty walking.

Use all the information provided to suggest why a diagnosis of rheumatoid arthritis was made rather than osteoarthritis. [2]

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Question 17 · A level Component 3 · June 2025 · Q8(d)(ii) · 3 marks

(ii) The patient above was advised that they would be a suitable candidate for knee replacement surgery.
State **three disadvantages** of this treatment. [3]

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II. .....

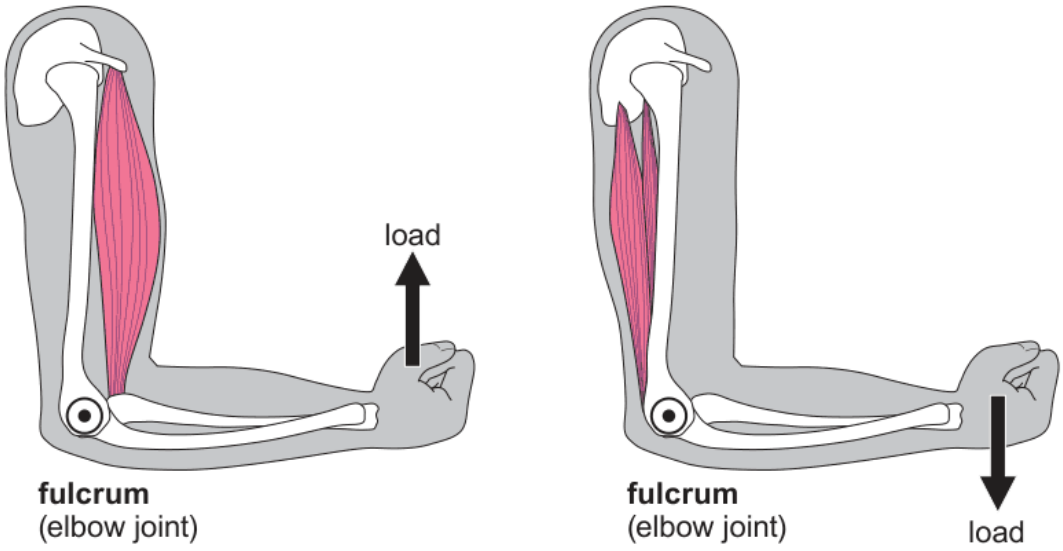
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III. .....

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Question 18 · A level Component 3 · June 2018 · Q9(d)(i) · 1 mark

(d) The drawings below show the muscles that control movement of the lower arm. These muscles work with the elbow joint as levers.



(i) State the orders of lever represented in the elbow joint when the: [1]

Biceps are contracting .....

Triceps are contracting .....

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Question 19 · A level Component 3 · June 2018 · Q9(d)(ii) · 2 marks

(ii) Explain why there is a difference in the type of lever represented when the arm is being bent and straightened. [2]

Question 20 · A level Component 3 · June 2023 · Q8(c)(iii) · 4 marks

(iii) The flexion and extension of the elbow involves antagonistic pairs of muscles which alternately contract and relax to flex and extend the elbow.

Explain why the muscles of the upper arm are arranged in this way and how they work to produce movement at the elbow. [4]

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Mark schemes

Question 1 · A level Component 3 · June 2025 · Q8(a)(i) · 1 mark

8	(a)	(i)	**Any one (x1) from** Support (1) Protection (1) Muscle attachment (1)	1	1	

Question 2 · A level Component 3 · June 2019 · Q9(a)(i) · 1 mark

9	*(a)*	(i)	A Humerus B Radius C Ulna **All three** correct = 1 mark	1	1

Question 3 · A level Component 3 · Autumn 2020 · Q9(a)(i) · 2 marks

9	*(a)*	(i)	Thoracic; Articulation of/joint with ribs (2)	1	1	2

Question 4 · A level Component 3 · Autumn 2020 · Q9(b)(iii) · 2 marks

(iii)	Lumbar vertebrae - support the (entire) weight of the upper body/ position under the centre of gravity for support; Wrist - supports least body weight so proportionally less affected by loss of weight (when taken from earth's gravity) OWTTE (2)	2	2	2

Question 5 · A level Component 3 · June 2017 · Q8(d)(i) · 1 mark

(d)	(i)	Realignment + {Immobilisation with cast or splint) / Surgery with pins or plates }	1	1

Question 6 · A level Component 3 · June 2023 · Q8(b) · 3 marks

(b)	Simple / Displaced (fracture) (1) Radius / ulna (1) Manipulation / re-alignment (to set the fracture)/ Immobilisation to allow fracture to heal/ owtte Painkillers/ anti-inflammatory (1)	2	1		3	1

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Question 7 · A level Component 3 · June 2018 · Q9(c)(ii) · 1 mark

(ii)	Patient will be mobile more quickly **and** this promotes healing/ reduced complications with blood clots/pressure sores/ less muscle wastage/ DVT	1	1

Question 8 · A level Component 3 · June 2022 · Q8(d)(i) · 1 mark

	(d)	(i)		Scoliosis		1 1	

Question 9 · A level Component 3 · June 2022 · Q8(d)(ii) · 1 mark

	(ii)		Genetic/inherited/gene mutation/{muscle problems/ or description of}	1	1	

Question 10 · A level Component 3 · June 2025 · Q8(a)(ii) · 2 marks

(ii)	Scoliosis (1) {Thoracic/ lumbar} region (1)		2		2	

Question 11 · A level Component 3 · June 2017 · Q8(e)(i) · 4 marks

(e)	(i)	Wrist is a gliding joint (1)		1	
		wide range of movement/ moves in more than one plane (1)	1		4
		finger is hinge joint (1)			
		bends and straightens/ movement in one plane(1)	1	1	

Question 12 · A level Component 3 · June 2019 · Q9(a)(ii) · 2 marks

(ii)	It reduces friction in the joint/ stops rubbing. (1) The joint moves in one plane only / (it is a hinge joint) so the forearm can **only** {move up / flex} **and** {down / extend} in relation to the humerus. (1) NOT one direction	2	2

Question 13 · A level Component 3 · Autumn 2021 · Q8(d)(i) · 2 marks

(d)	(i)	A hip (joint) socket is deeper (OWTTE) (ball of the hip joint fits further into/is surrounded by more bone of the socket) (1) Ligaments of the hip (joint) are larger/cover larger area of bone/surround a larger area of the joint/there are more ligaments. (Reject stronger) (1) Accept converse if clear.	1	1	2

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Question 14 · A level Component 3 · Autumn 2020 · Q9(c)(i) · 2 marks

(c)	(i)	Cartilage (white fibrous) (1) Any **one** from: {Reduction in/damage to} cartilage causes increased {friction/contact} between bones (1) Bone develops irregular spurs (causing further inflammation/friction) (1) Possible pressure on nerves of the spine (1)	1	1	2

Question 15 · A level Component 3 · Autumn 2020 · Q9(c)(ii) · 1 mark

(ii)	(Immune system/lymphocytes) recognise <u>proteins</u> in the joint tissue as antigens/ recognise antigens in the joint tissue (1)	1	1	

Question 16 · A level Component 3 · June 2024 · Q8(c)(ii)II · 2 marks

II	Age - osteoarthritis is mainly in older patients / ORA (1) low activity levels of patient therefore not due to wear and tear (1) Swollen / warm indicates {inflammation / immune response} (1)	1	1	2

Question 17 · A level Component 3 · June 2025 · Q8(d)(ii) · 3 marks

(ii)	surgical risks such as increased risk of a blood clot and infection (1) long recovery period (1) the replacement joint could fail after 15-20 years / would need replacing (1)

3			3		

Question 18 · A level Component 3 · June 2018 · Q9(d)(i) · 1 mark

	(d)	(i)	Biceps – third order **and** Triceps – first order	1	1

Question 19 · A level Component 3 · June 2018 · Q9(d)(ii) · 2 marks

		(ii)	When bicep flexes **E**ffort is between **F**ulcrum and **L**oad/ effort in middle (1) When tricep flexes **F**ulcrum is between **L**oad and **E**ffort/ fulcrum in middle (1)	2		2	

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Question 20 · A level Component 3 · June 2023 · Q8(c)(iii) · 4 marks

(iii)	**Any 4 (x1) from:** Muscles can only exert a pulling force / can only contract and relax (1) Can only move bones when they contract / can only pull on bones (1) biceps and triceps (are antagonistic) / when biceps contracts, triceps relaxes (1) biceps contracts to pull the lower arm up / flex arm (1) triceps contracts to pull lower arm down / extend arm (1)	4		4		

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