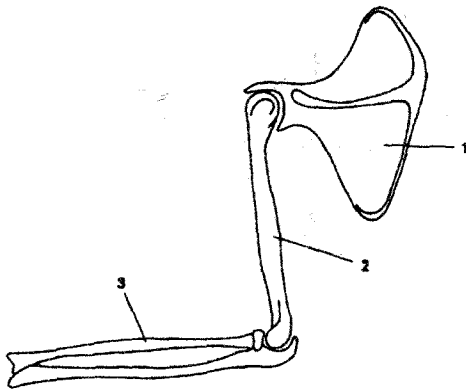


Unit 8 Locomotion In Mammals
M C Q S e c t i o n

1. The diagram shows the bones of a human arm.



What are the numbered bones?

- | | | | |
|---|---------|---------|--------|
| | 1 | 2 | 3 |
| A | humerus | radius | ulna |
| B | humerus | scapula | radius |
| C | scapula | humerus | radius |
| D | scapula | humerus | ulna |
| E | scapula | radius | ulna |

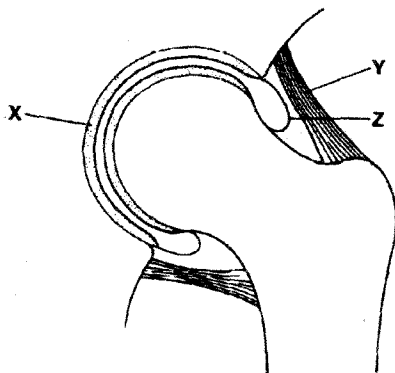
[D93/P1/Q17]

2. Which two bones form a hinge joint?

- A humerus and ulna
- B radius and humerus
- C radius and ulna
- D scapula and humerus
- E ulna and scapula

[J93/P1/Q18]

3. The diagram shows a synovial joint.

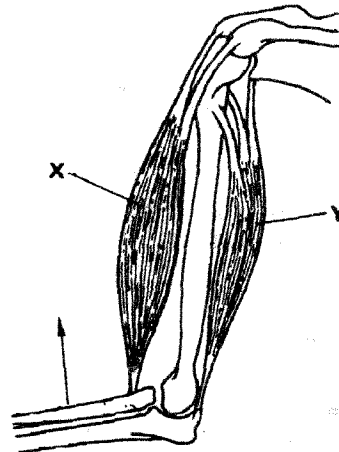


What are the structures labelled X, Y and Z?

- | | | | |
|---|-------------------|-------------------|-------------------|
| | X | Y | Z |
| A | cartilage | ligament | synovial membrane |
| B | cartilage | synovial membrane | ligament |
| C | ligament | cartilage | synovial membrane |
| D | synovial membrane | cartilage | ligament |
| E | synovial membrane | ligament | cartilage |

[D92/P1/Q17]

4. The diagram shows the muscles of the upper arm.



What happens to muscles X and Y to raise the bones of the lower arm?

- | | | |
|---|-----------------|-----------------|
| | <i>muscle X</i> | <i>muscle Y</i> |
| A | contracts | contracts |
| B | contracts | relaxes |
| C | expands | contracts |
| D | expands | relaxes |
| E | relaxes | contracts |

[J92/P1/Q19]

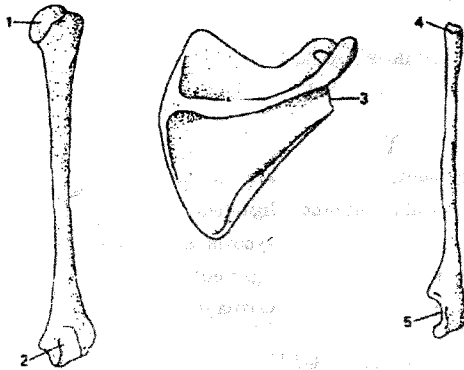
1. C Scapula is at the shoulder blade and is joined to the humerus and the radius in the shorter bone.

2. A The elbow joint is a hinge joint. It is the joint between the humerus and ulna.

3. A Cross-section of a joint.

4. B Biceps (X) contracts and triceps (Y) relaxes to bring about flexion of the forearm.

5. The diagrams show three bones from a human skeleton drawn to the same scale.

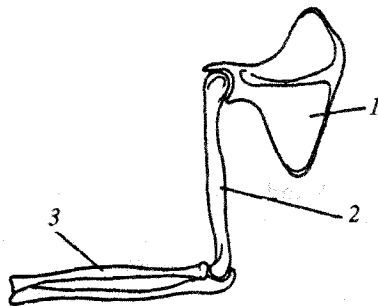


Between which labelled parts would a hinge joint be formed?

- A 1 and 3
- B 1 and 5
- C 2 and 4
- D 2 and 5
- E 3 and 4

[J91/P1/Q19]

6. The diagram shows the bones of a human arm. What are the names of the numbered bones?



- | | 1 | 2 | 3 |
|---|---------|---------|--------|
| A | humerus | radius | ulna |
| B | humerus | scapula | radius |
| C | scapula | humerus | radius |
| D | scapula | radius | ulna |
| E | scapula | humerus | ulna |

[D90/P1/Q18]

7. Which two bones form a ball and socket joint?
- A humerus and ulna
 - B radius and humerus

- C radius and ulna
- D scapula and humerus
- E ulna and scapula

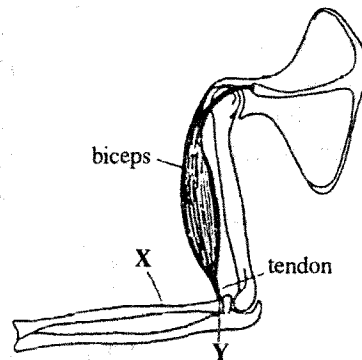
[J90/P1/Q18]

8. Why are the muscles which operate limbs usually found in antagonistic pairs?

- A Two muscles are needed to bend a limb.
- B Two muscles are needed to straighten a limb.
- C Muscles produce force only when they contract.
- D Muscles produce force only when they expand.
- E Two muscles produce more force than one.

[J89/P1/Q18]

9. The diagram below shows the position of the biceps muscle in the human arm.



What is the advantage of having the tendon of the biceps muscle attached at position Y rather than at position X?

- A A smaller change in muscle length produces a large movement of the forearm.
- B A smaller muscle is needed to move the forearm.
- C A less powerful muscle is required to raise the arm quickly.
- D There is less strain on the tendon when the arm is bent.
- E It is easier to lift heavy objects.

[J88/P1/Q17]

5. D This is the elbow joint between the humerus and ulna.

6. C The radius lies on the outside when the palm faces forwards.

7. D The shoulder (scapula) and the upper arm (humerus).

8. C When one set of muscle contracts, it moves the limb in one direction, and when the other set contracts, it moves the bone in the opposite direction.

9. A Bending of the elbow works on the principle of 3rd-order lever. The nearer the effort (biceps) to the fulcrum, the easier it is to lift the load.

10. Choose the appropriate description from the list below to describe the joint between the humerus and the ulna.

- A ball and socket joint
- B fixed joint
- C hinge joint
- D peg and socket joint
- E sliding (or gliding) joint

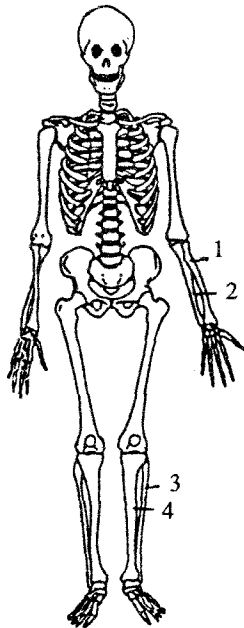
[J87/P1/Q17]

11. In addition to calcium, the mammalian skeleton stores large amounts of

- A iron. D sodium.
- B nitrogen. E sulphur.
- C phosphorus.

[D86/P1/Q16]

12. The diagram below shows a human skeleton.

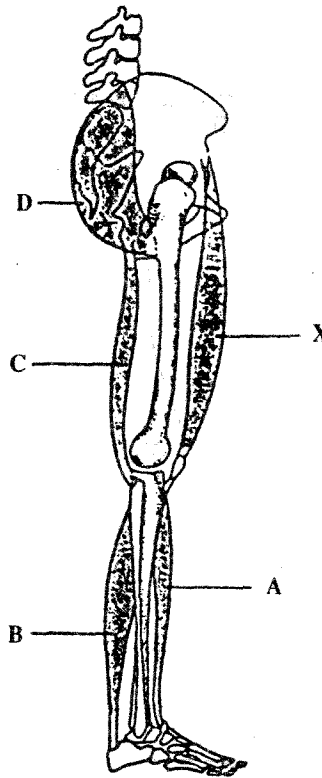


Which one of the following alternatives correctly identifies the bones numbered 1 to 4?

	radius	ulna	fibula	tibia
A	1	2	3	4
B	1	2	4	3
C	2	1	3	4
D	2	3	1	4
E	3	1	4	2

[J86/P1/Q17]

13. The diagram below shows some of the muscles used in standing and walking.



Which muscle, A, B, C or D is antagonistic to muscle X?

[D85/P1/Q16]

10. C It is between the forearm and upper arm of the elbow, a hinge joint.

11. C It is needed in the formation of bones.

12. A Radius and ulna are the bones in the arms while fibula and tibia are in the shank. The fibula is the thinner one.

13. C The muscle which performs the opposite function to X when X is relaxing.

Unit 8 Locomotion In Mammals
THEORY Section

Question 1

Fig. 2 is a diagram of the human arm. Fig. 3 is a transverse (cross) section of this arm taken through the line A—B.

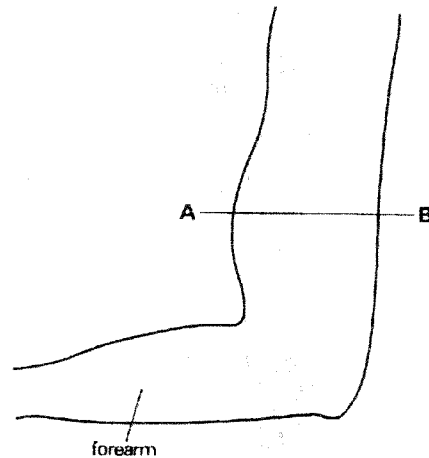


Fig. 2

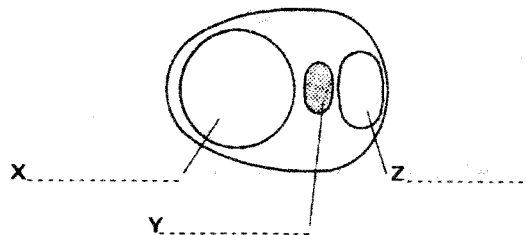


Fig. 3

- (a) (i) Label the structures **X**, **Y** and **Z** on Fig. 3.
 (ii) Which of these structures would increase in diameter when the forearm is raised? [4]
- (b) Name **two** other structures which might have been included in Fig. 3. [2]
- (c) By drawing on Fig. 2, show the positions occupied by the structures **X**, **Y** and **Z**. [3]

[D91/P2/Q3]

Solution

(a) (i)

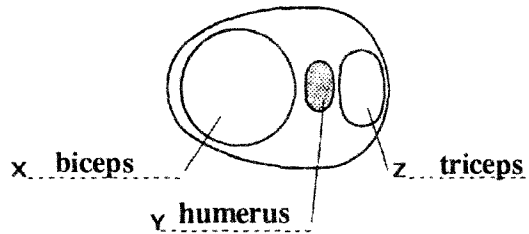


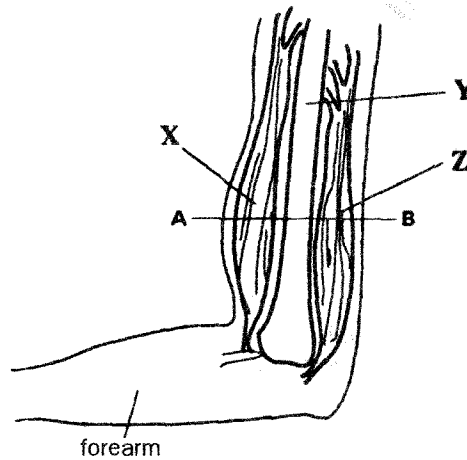
Fig. 3

(ii) X

(b) 1. Vein 2. Artery

(c)

Fig. 2



Comment On Answer

- (a) The biceps bulge during bending, while the smaller triceps relaxes. The humerus is the bone in the upper arm.
- (b) In the arm there are blood vessels to conduct blood. •

Question 2

Fig. 1 below shows a diagram of a human left leg and pelvic girdle, together with some of the muscles attached to the bones.

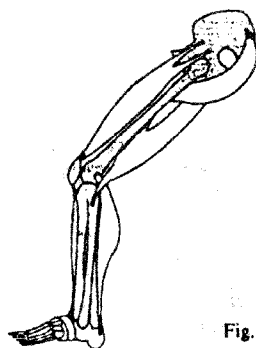


Fig. 1

(a) On the diagram in Fig. 1

- (i) shade in and label with a large letter X, the muscle which contracts to straighten the leg at the knee; [1]
- (ii) shade in and label with a large letter Z, the muscle which contracts to bend the leg at the knee. [1]

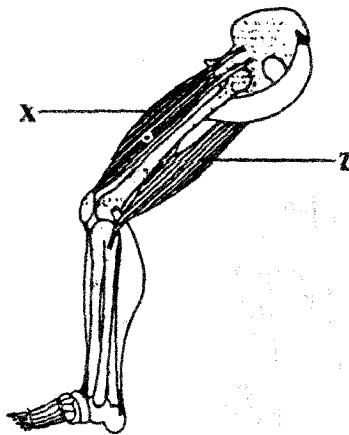
(b) "Antagonistic muscles are grouped together in pairs so that when one muscle contracts the other expands".

There is one word in the above statement that is not correct. Identify the word and explain why it is not correct. [2]

[J88/P2/Q1]

Solution

(a)



Comment On Answer

- (a) i) The upper muscle of the thigh is marked X. This muscle contracts when the leg is straightened.
- ii) The lower muscle of the thigh is marked Z. It contracts on bending of the leg.
- (b) All other words are correct except 'expands'.

(b) Muscles can only work by contracting and never by expanding (in length). However, the action is brought about by one muscle contracting and the other RELAXING.

Question 3

With the aid of labelled diagrams, describe how the muscles produce movement at a named hinge joint of a mammal.

[J87/P2/Q8]

Solution

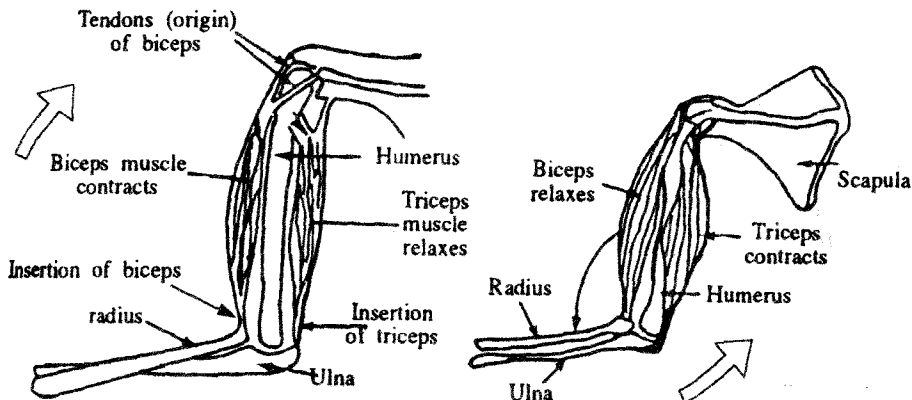


Diagram A Flexion Of The Arm

Diagram B Extension Of The Arm

Comment On Answer

- The answer should include all possible movements of the joint. In this case they are the bending and straightening of the arm. Label the diagrams carefully.

During the course of action when the forearm is pulled upward towards the scapula, the antagonistic muscles of the upper arm are used.

In this case, the biceps contract pulling the radius up (as shown in Diagram A). However, the flexion of the forearm at the elbow is effected only when the triceps relax at the same time as the biceps contract.

When straightening of the arm, the biceps relax while the triceps contract (as shown in Diagram B). The contraction of the triceps pulls the ulna down and the relaxation of the biceps assists in the pushing down of the radius.

Common Error

- Students tend to waste time in explaining the attachments of the muscles which is not necessary since this can be seen from the diagrams. Only the movements produced by the muscles are required. Students often wrongly write that muscles expand; muscles can only contract or relax.

Question 4

(a) Complete Table 1 by adding appropriate answers in the blank spaces.

Type of joint	Example	Type of movement
hinge		180° in one plane
		almost universal

Table 1

(b) List **three** important functions of a skeleton.

[D85/P2/Q3]

Comment On Question

- (a) Almost universal movement means almost in all direction.

Solution

(a)

Type of joint	Example	Type of movement
hinge	knee	180° in one plane
ball and socket	hip	almost universal

Table 1

- (b) (1) To protect the delicate internal organs from physical damage.
 (2) To enable locomotion to take place, by providing attachment for muscles.
 (3) To give animals a definite physical structure.

Comment On Answer

- (a) i) Answer is not unique; the **elbow** is another answer.
 ii) The **shoulder** is a possible answer.
- (b) It also produces blood cells in the bone marrow of the ribs and long bones.