

The Skeletal System

Key ideas

206 bones in an adult. **Axial skeleton:** skull, vertebral column, ribs and sternum. **Appendicular skeleton:** limbs plus the shoulder and hip girdles.

Joints are where bones meet. **Ligaments** join bone to bone; **tendons** join muscle to bone; **cartilage** cushions the ends of bones.

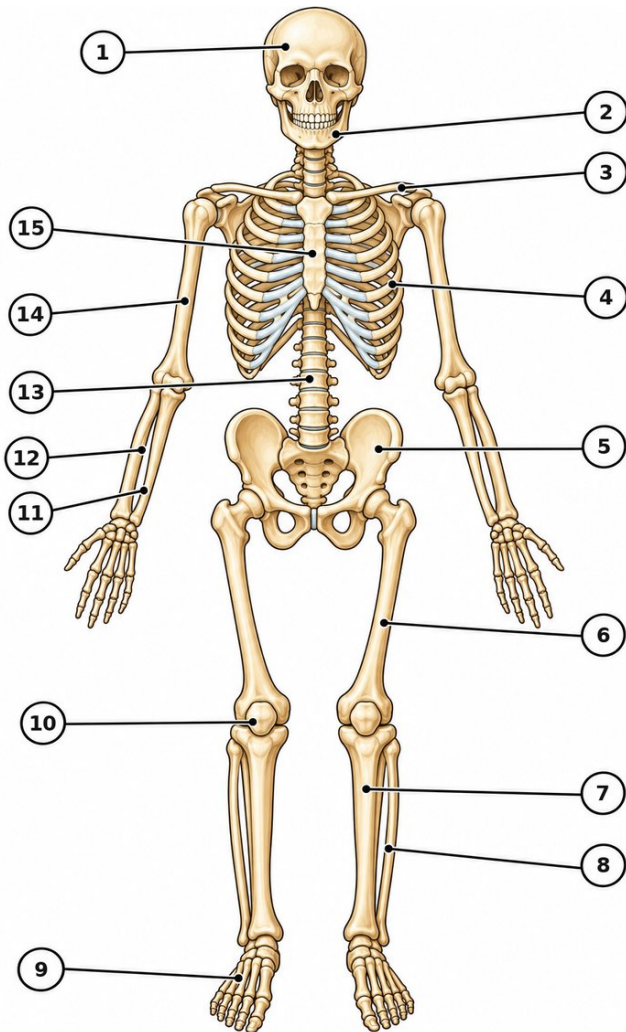
Bone is living tissue: compact bone on the outside, spongy bone inside, and marrow that makes blood cells or stores fat.

A Label the skeleton

7½ marks

½ mark each.

Word bank: Clavicle · Femur · Fibula · Foot bones · Humerus · Mandible · Patella · Pelvis · Radius · Ribs · Skull (cranium) · Sternum · Tibia · Ulna · Vertebral column



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____

B Axial or appendicular?

4½ marks

16. Sort the bones into the correct box (½ mark each).

- Skull
- Femur
- Ribs
- Clavicle
- Vertebrae
- Humerus
- Mandible
- Sternum
- Hip bone

Axial skeleton

Appendicular skeleton

C Functions of the skeleton

3 marks

Write the letter of the matching example (½ mark each).

- | | |
|---------------------------------|---|
| 17. _____ Support | a. Yellow marrow in long bones stores fat |
| 18. _____ Protection | b. The rib cage surrounds the heart and lungs |
| 19. _____ Movement | c. Red marrow makes red and white blood cells |
| 20. _____ Blood cell production | d. The skeleton gives the body its shape and holds it upright |
| 21. _____ Mineral storage | e. Muscles pull on bones, which act as levers |
| 22. _____ Energy (fat) storage | f. Bones hold calcium and phosphorus for the body to use |

D Connective tissues

2 marks

Write the letter of the matching description (½ mark each).

23. _____ Ligament
24. _____ Tendon
25. _____ Cartilage
26. _____ Synovial fluid
- a. Connects muscle to bone
- b. Lubricates a movable joint so bones slide smoothly
- c. Connects bone to bone at a joint
- d. Smooth, flexible tissue that cushions the ends of bones

E Joints

4 marks

Fill in the blank cells (1 mark per row).

	Type of joint	Example	Movement allowed
27.	Ball-and-socket		
28.		Elbow or knee	Back and forth in one direction, like a door
29.	Pivot		Rotation around one axis, as in shaking your head
30.		Sutures between skull bones	

F Skeleton calculations

4 marks

- 31.** The skeleton makes up about 15% of a person's body mass. Find the skeleton mass of a 60 kg student.
- 32.** Forensic scientists estimate the height of an adult male from his femur: $\text{height (cm)} = 2.38 \times \text{femur length (cm)} + 61.4$. Estimate the height of a man whose femur is 45 cm long.

- 33.** Use the same formula to find the femur length of a man who is 180 cm tall. (2 marks)

G Bone health and growth

5 marks

- 34.** Compare red bone marrow and yellow bone marrow. (2 marks)
- 35.** Explain why weight-bearing exercise, such as running, helps prevent osteoporosis. (2 marks)

- 36.** A newborn baby has about 300 bones, but an adult has 206. Explain why.

H Spot the mistake

2 marks

- 37.** A student writes: "Bones are dead, dry tissue." Explain the error and correct it.
- 38.** A student writes: "Ligaments connect muscles to bones." Explain the error and correct it.

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ANSWER KEY

Key ideas

206 bones in an adult. **Axial skeleton:** skull, vertebral column, ribs and sternum. **Appendicular skeleton:** limbs plus the shoulder and hip girdles.

Joints are where bones meet. **Ligaments** join bone to bone; **tendons** join muscle to bone; **cartilage** cushions the ends of bones.

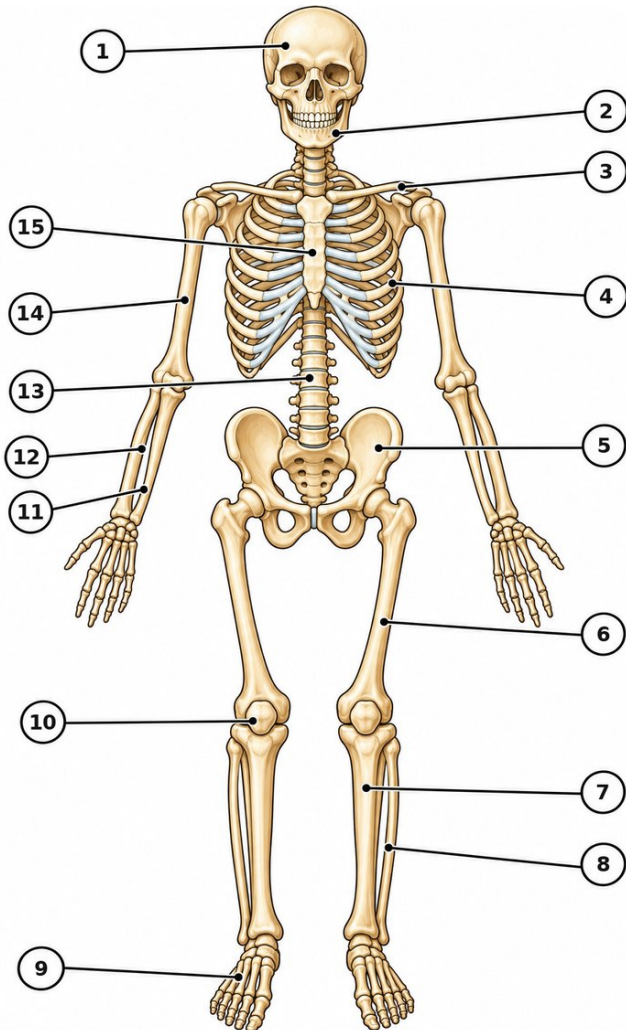
Bone is living tissue: compact bone on the outside, spongy bone inside, and marrow that makes blood cells or stores fat.

A Label the skeleton

7½ marks

½ mark each.

Word bank: Clavicle · Femur · Fibula · Foot bones · Humerus · Mandible · Patella · Pelvis · Radius · Ribs · Skull (cranium) · Sternum · Tibia · Ulna · Vertebral column

1. **Skull (cranium)**2. **Mandible**3. **Clavicle**4. **Ribs**5. **Pelvis**6. **Femur**7. **Tibia**8. **Fibula**9. **Foot bones**10. **Patella**11. **Ulna**12. **Radius**13. **Vertebral column**14. **Humerus**15. **Sternum**

B Axial or appendicular?

4½ marks

16. Sort the bones into the correct box (½ mark each).

Skull Femur Ribs Clavicle Vertebrae

Humerus Mandible Sternum Hip bone

Axial skeleton

**Skull, Mandible, Ribs,
Vertebrae, Sternum**

Appendicular skeleton

**Femur, Clavicle,
Humerus, Hip bone**

C Functions of the skeleton

3 marks

Write the letter of the matching example (½ mark each).

17. **d** Support18. **b** Protection19. **e** Movement20. **c** Blood cell production21. **f** Mineral storage22. **a** Energy (fat) storage

a. Yellow marrow in long bones stores fat

b. The rib cage surrounds the heart and lungs

c. Red marrow makes red and white blood cells

d. The skeleton gives the body its shape and holds it upright

e. Muscles pull on bones, which act as levers

f. Bones hold calcium and phosphorus for the body to use

D Connective tissues

2 marks

Write the letter of the matching description (½ mark each).

23. c Ligament

24. a Tendon

25. d Cartilage

26. b Synovial fluid

a. Connects muscle to bone

b. Lubricates a movable joint so bones slide smoothly

c. Connects bone to bone at a joint

d. Smooth, flexible tissue that cushions the ends of bones

E Joints

4 marks

Fill in the blank cells (1 mark per row).

	Type of joint	Example	Movement allowed
27.	Ball-and-socket	Shoulder or hip	Movement in all directions, including rotation
28.	Hinge	Elbow or knee	Back and forth in one direction, like a door
29.	Pivot	Top of the neck (atlas and axis)	Rotation around one axis, as in shaking your head
30.	Fixed (immovable)	Sutures between skull bones	No movement

F Skeleton calculations

4 marks

31. The skeleton makes up about 15% of a person's body mass. Find the skeleton mass of a 60 kg student.

$$0.15 \times 60 = 9.0 \text{ kg}$$

32. Forensic scientists estimate the height of an adult male from his femur: height (cm) = $2.38 \times$ femur length (cm) + 61.4. Estimate the height of a man whose femur is 45 cm long.

$$2.38 \times 45 + 61.4 = 168.5 \text{ cm}$$

33. Use the same formula to find the femur length of a man who is 180 cm tall. (2 marks)

$$180 = 2.38L + 61.4 \rightarrow L = 118.6 \div 2.38 = 49.8 \text{ cm}$$

G Bone health and growth

5 marks

34. Compare red bone marrow and yellow bone marrow. (2 marks)

Red marrow (in spongy bone, e.g. hip bones, ribs, sternum) makes blood cells. **Yellow marrow** (in the shaft of long bones) is mostly fat and stores energy.

35. Explain why weight-bearing exercise, such as running, helps prevent osteoporosis. (2 marks)

Stress on bones stimulates bone-building cells to lay down more calcium and collagen, so bones become denser and stronger. Osteoporosis is a loss of bone density, so stronger bones lower the risk of fractures.

36. A newborn baby has about 300 bones, but an adult has 206. Explain why.

Many bones, such as those in the skull and the sacrum, fuse together as the child grows.

H Spot the mistake

2 marks

37. A student writes: "Bones are dead, dry tissue." Explain the error and correct it.

Bone is living tissue with cells, blood vessels and nerves. It grows, repairs fractures and constantly remodels.

38. A student writes: "Ligaments connect muscles to bones." Explain the error and correct it.

Tendons connect muscle to bone; ligaments connect bone to bone at joints.