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## Skeletal System: Introduction and the Axial Skeleton

### Answers and Explanations

#### I. Organization of the Skeletal System

##### A. Multiple Choice Questions

1. (d) – Age is of significance because of the fusing of separate bones as a person grows. Furthermore, genetic factors also may account for individual differences in the number of bones.
2. (b) – The patella is an example of a sesamoid bone formed in a tendon.
3. (c) – The ossa coxae (hipbones) are a part of the pelvic girdle in the appendicular skeleton.
4. (a) – The vertebral column is a major structure of the axial skeleton.

##### B. True-False Questions

1. False – There are more bones in an infant than in an adult. Many bones fuse as the infant grows.
2. False – Everyone has sesamoid bones, two of which are the patellae (kneecaps).
3. False – The hyoid bone is an irregular bone. Sutural bones are found in the lambdoid suture.
4. False – The pectoral girdle is not a complete girdle because it lacks a posterior attachment to the axial skeleton.

#### II. Functions of the Skeletal System

##### A. Multiple Choice Questions

1. (d) – Coordination involves the nervous and muscular systems.
2. (c) – Muscles are attached to and cover many of the bones in the body, and thus are not protected by the skeletal system.
3. (d) – Adequate amounts of dietary calcium and phosphorous are important in maintaining healthy bones.
4. (a) – The skeletal system is involved in the support, movement, and protection of the body, as is the muscular system.

##### B. True-False Questions

1. False – The spleen and liver are responsible for hemopoiesis in infants.
2. True – Calcium and phosphorous are the major components of bone matrix, which is the hard, dense portion of bone.
3. False – The living cells within bone provide flexibility.
4. True – All visceral organs are directly or indirectly supported by bone, and a number of other organs are also protected by the skeletal system.

#### III. Bone Structure

##### A. Multiple Choice Questions

1. (c) – Although some bones are relatively thick, they are not classified by thickness.
2. (c) – A long bone is shaped like a lever and functions as such in the movement of the body.
3. (c) – A shallow facet permits slight movement at the head of the bone with which it articulates.
4. (c) – A fovea is a small pit or depression on a bone, usually where a tendon attaches.
5. (b) – The endosteum lines the medullary cavity, which contains red bone marrow.

##### B. True-False Questions

1. True – Diploe affords protection to the brain in the event of a blow to the head.
2. False – Each bone is an organ because it is composed of several kinds of tissues.
3. True – Bone remodeling is constantly taking place at the periosteum.
4. False – A condyle is a major articulating surface. An epicondyle usually serves for muscle attachment.

#### IV. Bone Tissue

##### A. Multiple Choice Questions

1. (d) – Osteoclasts are specialized bone cells that can enzymatically cause bone resorption.
2. (e) – Bone-lining cells occur along the surface of most bones in the adult skeleton, where they regulate the movement of calcium and phosphate into and out of bone tissue.
3. (a) – A lacuna is a small capsule within bone tissue that houses an osteocyte.
4. (b) – The lamellae of bone matrix give structural support to an osteon.
5. (b) – *Osteo* means “bone,” *-blast* refers to “building up,” and *-clast* refers to “breaking down.”
6. (a) – As a substance undergoes calcification, it hardens. Ossification is the development and hardening of bone tissue through calcification.

##### B. True-False Questions

1. False – Trabeculae give strength to spongy bone.
2. True – Osteocytes have relatively low metabolic requirements and function in maintaining already formed bone tissue.
3. True – The canaliculi provide passageways from one lacuna to another, where the osteocytes are located.
4. True – The nutrients and oxygen carried in blood are made available to osteocytes by way of nutrient vessels that pass through bone tissue horizontally and vertically.

#### V. Bone Growth

##### A. Completion Questions

1. Calcification
2. Osteoid
3. secondary ossification
4. epiphyseal plate
5. ossification zone

##### B. True-False Questions

1. True – Most bone development occurs as a cartilaginous model is gradually replaced by bone tissue during endochondral bone formation.
2. False – Bones are dynamic and adapt to the demands placed upon them by the relative amount of muscle activity.
3. True – Linear bone growth is genetically determined and is influenced by nutrition. Growth in length occurs at the epiphyseal plates of long bones.
4. False – Osteoblasts secrete osteoid in the formation of bone tissue.
5. True – It is through the formation of the primary ossification centers within bones that the cartilage is deteriorated and secondary ossification centers are established.

#### VI. Skull

##### A. Multiple Choice Questions

1. (d) – The fontanelles are adaptive features of the fetal skull that accommodate delivery and growth of the brain and skull.
2. (a) – There is an anterolateral and a posterolateral fontanel, but not a lateral fontanel.
3. (d) – The occipital bone is on the posterior side of the cranium.
4. (e) – One of the four principal parts of the temporal bone is the mastoid part, from which extends the mastoid process.
5. (b) – The sella turcica is located on the superior surface of the sphenoid bone, directly posterior to the sphenoidal sinus.
6. (a) – A cranial bone is classified as such because it comes in direct contact with the brain, which the facial bones do not.
7. (d) – The facial bones are those bones of the skull that do not come in contact with the brain.

##### B. True-False Questions

1. False – The oral cavity, nasal cavity, and all of the paranasal sinuses are also cavities within the skull.
2. True – The foramen magnum is on the inferior portion of the occipital bone.
3. False – The vomer is also an unpaired bone of the skull.
4. True – There are only 8 cranial bones and 14 facial bones.
5. False – The mandible is one of the 14 facial bones.

## VII. Vertebral Column

### A. Multiple Choice Questions

1. (d) – Reflex actions are a function of the spinal cord itself.
2. (a) – *Brachial* refers to the proximal segment of the upper extremity. The curvature not included here is the pelvic curve.
3. (d) – Inferior articular processes of one vertebra articulate with superior articular processes of the vertebra directly below the first, thus limiting movement.
4. (a) – Transverse foramina are passageways for the vertebral arteries.

### B. True-False Questions

1. False – The thoracic and pelvic curves are called the primary curves.
2. False – There are 8 to 10 fused vertebrae and 24 unfused vertebrae.
3. False – The vertebrae of the coccyx are the smallest vertebrae.
4. True – The four or five vertebrae of the coccyx are fused.

## VIII. Rib Cage

### A. Multiple Choice Questions

1. (a) – The clavicles are a part of the pectoral girdle.
2. (b) – The manubrium is the superior component of the sternum, the body is the largest component, and the xiphoid process is the inferior component.
3. (b) – Ribs attach to the body of the sternum at the costal notches.
4. (d) – The two floating ribs do not have a tubercle.

### B. True-False Questions

1. True – The rib cage is compressed in an anterior-posterior direction and is narrower superiorly than inferiorly.
2. True – The ribs are a major site for the production of blood.
3. True – The jugular notch is located on the superior surface of the manubrium.
4. False – All of the ribs are bony structures. The inferior five pairs of ribs are false ribs, and pairs 11 and 12 are floating ribs.

## IX. Developmental Exposition of the Axial Skeleton

### A. True-False Questions

1. True – Bones continue to fuse and grow as one matures, primarily at the epiphyseal plates of long bones.
2. True – Intervertebral discs contain a substance known as nucleus pulposus, which is a remnant of the notochord.
3. False – Most bones are endochondral bones that first form as hyaline cartilage and then undergo ossification.

### B. Completion Questions

1. fourth/tenth
2. mesenchyme
3. hyaline
4. intramembranous
5. Sesamoid

## X. Clinical Considerations

### A. Multiple Choice Questions

1. (b) – The bones of the lower extremities of a person with rickets will tend to bow under the weight of the body due to their underdeveloped and weak condition.
2. (a) – It is believed that decreased production of estrogen in postmenopausal women is a contributing factor in the development of osteoporosis.
3. (c) – The pituitary growth hormone is essential for normal bone growth.
4. (c) – Osteogenic sarcoma is an aggressive type of cancer that readily spreads through the blood.

B. True-False Questions

1. True – Adequate amounts of vitamin D are extremely important in the diet of children as the bones are developing.
2. True – Since it is benign, an osteoma can generally be successfully treated.
3. False – Adult bone tissue is prone to malignant cancer.
4. True – The derivation of the term *orthopedics* helps to explain its meaning: *orthos*, straight, correct, right; *pais*, child.

**XI. Chapter Review**

A. Completion Questions

- |                                 |                   |
|---------------------------------|-------------------|
| 1. axial/appendicular           | 10. nasal conchae |
| 2. rickets                      | 11. coruna        |
| 3. Hemopoiesis                  | 12. fontanel      |
| 4. intramembranous              | 13. Spina bifida  |
| 5. nucleus pulposus             | 14. Osteoporosis  |
| 6. condyles                     | 15. hard palate   |
| 7. endosteum/yellow bone marrow | 16. lacunae       |
| 8. osteoclasts                  | 17. Osteoblasts   |
| 9. roentgenogram                |                   |

B. Matching Questions

- |        |         |
|--------|---------|
| 1. (g) | 6. (j)  |
| 2. (b) | 7. (i)  |
| 3. (e) | 8. (a)  |
| 4. (f) | 9. (h)  |
| 5. (c) | 10. (d) |