**These review questions are for the Skeletal system lecture topic. The questions were adapted from several sources, including 1700+ Review Questions for Anatomy and Physiology II (3rd edition) by R. Michael Anson, Ph.D. Questions marked with an asterisk (\*) are questions from the laboratory, not the lecture, portion of the class.**

You are required to know and understand all the material on the skeletal system that is covered in the lecture and the laboratory. To aid in your review of skeletal system anatomy, a list of bones and bone features is given below. For each of the bones or bone features listed below, be able to (a) find its location on a skeleton, (b) state if it is part of the axial or appendicular skeleton, (c) state what bones it articulates with, and (d) describe its function.

Acetablum Medial malleolus

Acromion Metacarpal

Body (of sternum) Metatarsal

Carpal Nasal

Cervical vertebrae Nasal cavity

Clavicle Obturator foramen

Coccyx Occipital

Costal cartilage Palatine

Hip Paranasal sinuses

Ethmoid Parietal

External auditory meatus Patella

Eye orbit Pelvic girdle

False pelvis Pelvis

False rib Phalanges

Femur Pubis

Fibula Radius

Floating rib Sacrum

Fontanels Scapula

Foramen magnum Shoulder girdle

Frontal Sphenoid

Glenoid cavity Spine (of scapula)

Humerus Sternum

Ilium Sutures

Inferior nasal concha Tarsal

Ischeum Temporal

Lacrimal Thoracic cage

Lateral malleolus Thoracic vertebrae

Lumbar vertebrae Tibia

Mandible True pelvis

Manubrium True rib

Mastoid process Ulna

Maxillary Vomer

Xiphoid process Zygomatic

Zygomatic Process

**Multiple choice questions:**

1) Which is **not** a function of bones?

a) Protect organs

b) Cause movement

c) Anchor organs

d) Support the weight

2) Which is **not** part of bone tissue?

a) Keratin protein

b) Calcium phosphate

c) Bone cells

d) Collagen

3) The hollow space in the center of a bone is called the

a) Osseous space

b) Medullary cavity

c) Bone gaps

d) Skeletal canaliculi

4) During fetal development, the skeleton is made of \_\_\_\_\_ tissue, not bone tissue

a) Epithelial

b) Dense connective

c) Muscle

d) Cartilage

5) The bone cells that convert cartilage tissue to bone tissue are called

a) Osteoblasts

b) Osteoclasts

c) Osteocytes

d) Skelacytes

6) The tissue that fills the medullary cavity of adult bones is called

a) Cartilage

b) Marrow

c) Compact bone

d) Spongy bone

7) Marrow comes in two types:

a) Red and Yellow

b) Cartilage and Bone

c) Liquid and solid

d) Humerus and radius

8) The long shaft of a long bone is called its

a) Epiphysis

b) Head

c) Diaphysis

d) Foremen

9) The round knob-like ends of a long bone are called its

a) Epiphysis

b) Medulla

c) Diaphysis

d) Foremen

10) The growth centers of bone are a zone of cartilage tissue between the epiphysis and the diaphysis, called the

a) Cartilagenous accretion zone

b) Osseogenous region

c) Epiphyseal growth plate

d) Mitotic cavity

11) A(n) \_\_\_\_\_\_\_ is where bones meet (two answers)

a) Epiphysis

b) Joint

c) Articulation

d) Cartilage bridge

e) Osseous connection

f) Bone bar

12) The protective tissue at the ends of bones in joints is (two answers)

a) Hyaline cartilage

b) Fibrocartilage

c) Synovial cartilage

d) Articular cartilage

e) Cartilage discs

f) Epihyseal plate

13) The microscopic circular structures of bone tissue are called (two answers)

a) Bone processes

b) Foremen

c) Osseous canals

d) Bone rings

e) Osteons

f) Haversean systems

14) The medical term for a broken bone is a

a) Rupture

b) Splint

c) Fracture

d) Dislocation

15) A disease of thin or fragile bones often seen in senior citizens

a) Rickets

b) Osteoporosis

c) Compound decay

d) Arthritis

16) A disease of soft and flexible bones seen in children with calcium deficiency

a) Rickets

b) Osteoporosis

c) Compound decay

d) Arthritis

17) Any part of a bone that projects outward from the main body of the bone

a) Process

b) Foremen

c) Head

d) Papillus

`18) How many bones are there in the human skeleton?

a) 206

b) 124

c) 105

d) 103

19) The \_\_\_\_\_ skeleton are the bones of the head, spine, and thorax

a) Central

b) Appendicular

c) Axial

d) Medullary

20) The bones of the limbs are bones of the \_\_\_\_\_ skeleton

a) Distal

b) Appendicular

c) Axial

d) Lateral

21) The cranial bone under the forehead is the \_\_\_\_\_ bone

a) Mental

b) Orbital

c) Superior

d) Frontal

22) The cranial bone at the back (posterior) of the skull is the \_\_\_\_ bone

a) Occipital

b) Postoid

c) Trailing

d) Metacarpal

23) The zig-zag lines on the cranium are the joints between cranial bones, called \_\_\_\_\_\_.

a) Sutures

b) Fibrocytes

c) Articular cranium

d) Osocephalic joints

24) Facial bone of the **upper** jaw:

a) Mandible

b) Zygomatic

c) Maxillary

d) Mastoid

25) Facial bone of the front of the cheeks:

a) Cheechous

b) Zygomatic

c) Mastoid

d) Temporal

26) The \_\_\_\_\_\_ of each vertebra is a solid disc of bone to support the body weight

a) Base

b) Body

c) Process

d) Foremen

27) The \_\_\_\_\_\_ of each vertebra is a ring-shaped area where the spinal cord passes through

a) Vertebral arch

b) Spinous process

c) Neuroforemen

d) Osteon (Haversean system)

28) How many vertebrae are there in the cervical, thoracic, and lumbar regions of the spine?

a) 12, 18, and 17

b) 8, 8, and 10

c) 7, 12, and 5

d) 5, 5, and 14

29) Inferior to the lumbar vertebrae is a bone made of 5 fused vertebrae called the \_\_\_\_\_

a) Coccyx

b) Sacrum

c) Hip

d) Pelvis

30) The most inferior bone of the spine is the \_\_\_\_\_. It is made of 4 fused vertebrae.

a) Coccyx

b) Sacrum

c) Lumbar vertebrae

d) L5

31) The breastbone

a) Sternum

b) Thoracic plate

c) Cardial plate

d) Cardial process

32) There are \_\_\_\_\_ pairs of ribs (including true and false ribs).

a) 7

b) 12

c) 18

d) 18 plus two floating ribs

33) The two bones of the shoulder girdle: (two answers)

a) Deltoid

b) Humerus

c) Trapezius

d) Clavicle

e) Cervical

f) Scapula

34) The bone of the arm (remember that the arm is from the shoulder to the elbow)

a) Humerus

b) Femur

c) Radius

d) Clavicle

35) The two bones of the forearm (two answers)

a) Ulna

b) Radius

c) Tibia

d) Carpal

e) Tarsal

f) Metacarpal

36) Wrist bones

a) Acromions

b) Radii

c) Carpals

d) Phalanges

37) Palm bones

a) Metacarpals

b) Metatarsals

c) Osteons

d) Manus bones

38) Finger bones

a) Digital bones

b) Distal bones

c) Phalanges

d) Manipules

39) The two hip bones are part of the

a) Pelvis

b) Spine

c) Femur

d) Gluteus muscle

40) Which is not a region of the hip bones?

a) Magnum

b) Ileum

c) Ischeum

d) Pubis

41) The thigh bone

a) Femur

b) Humerus

c) Lumbar

d) Brachial

42) The knee cap bone

a) Orthogonal

b) Orthostatic

c) Patella

d) Rodilla

43) The two bones of the leg (remember the leg is from the knee to the ankle) (two answers)

a) Fibula

b) Tarsals

c) Humerus

d)Tibia

e) Xiphoid

f) Maxillary

44) The ankle bones

a) Anchula

b) Carpals

c) Achilles

d) Tarsals

45) The bones of the sole of the foot

a) Achilles

b) Metatarsals

c) Plantar

d) Soleus

46) The bones of the toes

a) Dedoes

b) Tibial bones

c) Phalanges

d) Pedallar bones

47) Which is **not** a type of joint?

a) Rotary

b) Cartilaginous

c) Fibrous

d) Synovial

48) When a bone is out of its normal position in a joint

a) Strain

b) Fracture

c) Dislocation

d) Discontinual articulation

49) When the ligaments of a joint are torn

a) Rupture

b) Splints

c) Sprain

d) Arthritis

50) Painful and inflamed joints is known as…

a) Synovitis

b) Arthritis

c) Paralysis

d) Chondrosis

51) Which type of arthritis is an autoimmune disease?

a) Rheumatoid arthritis

b) Osteoarthritis

c) Gout

d) Cartilolytic arthritis

**Answers to multiple choice questions:**

1 = B

2 = A

3 = B

4 = D

5 = A

6 = B

7 = A

8 = C

9 = A

10 = C

11 = B and C

12 = A and D

13 = E and F

14 = C

15 = B

16 = A

17 = A

18 = A

19 = C

20 = B

21 = D

22 = A

23 = A

24 = C

25 = B

26 = B

27 = A

28 = C

29 = B

30 = A

31 = A

32 = B

33 = D and F

34 = A

35 = A and B

36 = C

37 = A

38 = C

39 = A

40 = A

41 = A

42 = C

43 = A and D

44 = D

45 = B

46 = C

47 = A

48 = C

49 = C

50 = B

51 = A

**Fill-in-the-blank questions:**

1) Two major functions of the skeleton are \_\_\_\_\_\_ and \_\_\_\_\_\_\_.

2) Bone tissue is one of the connective tissues. Like most connective tissues, the cells of bone tissue are embedded in an extracellular matrix. The major mineral (rock like substance) of bone matrix is \_\_\_\_\_\_.

3) Calcium phosphate is made of two ions, calcium and phosphate. Write the correct molecular formulas for these two ions, including their correct ionic charges: \_\_\_\_\_\_\_\_\_ & \_\_\_\_\_\_\_\_\_

4) In addition to calcium phosphate, the bone extracellular matrix contains large amounts of \_\_\_\_\_, a protein that serves several purposes: it reinforces the calcium phosphate ground substance. It also increases bone flexibility.

5) Fill in the blanks with the appropriate bone terms:

The process where cartilage is converted to bone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The cells that convert cartilage to bone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Bone tissue with many small holes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6) During the fetal stage, the skeleton is not made of bone tissue. It is instead made of \_\_\_\_\_ tissue.

7) The term \_\_\_\_\_\_\_ means when cartilage is converted to bone. It occurs during fetal development.

8) Cells that build bone by ossifying cartilage are called \_\_\_\_\_\_\_ cells.

9) The \_\_\_\_\_\_ is a hollow space inside a bone where the cartilage bone of the fetus existed before being covered with bone tissue.

10) By the time a person is born, the medullary cavities of their bones are filled with a substance called \_\_\_\_\_\_\_.

11) \_\_\_\_\_ is the marrow that fills most medullary cavities in an adult's bones, and is composed

of adipose tissue.

12) \_\_\_\_\_ is the marrow that fills the medullary cavities of children’s bones (it also is found in a few bones in adults). It is the type of marrow where blood cells are made.

13) List at least three bones in adults that contain red marrow: \_\_\_\_\_\_, \_\_\_\_\_\_\_, and \_\_\_\_\_\_\_.

14) Bones with a long tubular shape (such as the bones of the arms and legs) are called \_\_\_\_\_ bones.

15) The tubular shaft that forms the long axis of a long bone is called the \_\_\_\_\_. It is composed mostly of \_\_\_\_\_ (a type of bone tissue).

16) The wide knob-like ends of long bones is called the \_\_\_\_\_. They are composed mostly of \_\_\_\_\_ (a type of bone tissue).

17) The outside of the diaphysis is covered with a dense connective tissue membrane called the \_\_\_\_\_.

18) In children, the zone between the epiphysis and the diaphysis is a cartilage area where bone growth occurs. This growth center is called the \_\_\_\_\_\_ of the bone.

19) As children grow and reach their adult size, the epiphyseal plate cartilage is replaced by bone tissue. This process leaves a mark in the bone called the \_\_\_\_\_\_ where the epiphyseal plate used to be.

20) In joints, the tips of bones are covered with a protective layer of \_\_\_\_\_\_\_\_ (a tissue type. Be as specific as possible).

21) The hyaline cartilage in joints is also called \_\_\_\_\_\_\_ cartilage.

22) Bone tissue consists of microscopic circular structures called \_\_\_\_\_ or \_\_\_\_\_\_\_.

23) At the center of each osteon is a hollow space called the \_\_\_\_\_\_\_. This space is where \_\_\_\_\_ pass through the bone.

24) The \_\_\_\_\_ are tiny canals in the osteon that bring blood and nutrients from the central canal to the bone cells of the osteon.

25) The rings of bone tissue that surround the central canal of an osteon are called \_\_\_\_\_\_.

26) The bone cells in osteons are called \_\_\_\_\_\_. They live in tiny hollow spaces in the bone tissue called \_\_\_\_\_\_.

27) Cells that dissolve bone are called \_\_\_\_\_.

28) The proper medical term for a broken bone is a(n) \_\_\_\_\_\_.

29) Using the terms we learned in lecture, name these two bone fracture types:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

30) In \_\_\_\_\_ (a bone disease), calcium removal from the bone occurs faster than calcium deposition to the bone. It leads to extremely thin brittle bones and is very common in advanced old age.

31) Osteoporosis occurs more often in women/men (circle one).

32) Osteoporosis can be caused by lack of \_\_\_\_\_ or \_\_\_\_\_ in the diet, or by lack of \_\_\_\_\_ in a person’s lifestyle.

33) \_\_\_\_\_ is a childhood bone disease of soft, weak bones. It is usually due to lack of \_\_\_\_\_ or \_\_\_\_\_\_ in the diet.

34) What is unusual about the legs of children with rickets? \_\_\_\_\_\_\_\_\_\_\_\_

35) On a bone, a(n) \_\_\_\_\_ is a part of the bone that protrudes from the main body of the bone. These protrusions are often attachment sites for \_\_\_\_\_\_\_.

36) On a bone, a(n) \_\_\_\_\_ is a large, rounded end of the bone. This is usually where the bone fits into a socket in another bone.

37) On a bone, a(n) \_\_\_\_\_ is a tunnel through the bone. This is usually to allow space for \_\_\_\_\_\_\_, \_\_\_\_\_\_\_, or \_\_\_\_\_\_\_ to pass through the bone.

38) There are \_\_\_\_\_\_ (a number) of bones in the human body.

39) The bones of the body are divided by location into two main groups: The \_\_\_\_\_\_ skeleton are the bones of the central part of the skeleton, whereas the bones of the limbs are bones of the \_\_\_\_\_\_ skeleton.

40) The axial skeleton includes bones from three major areas of the skeleton: The \_\_\_\_\_\_\_, the \_\_\_\_\_\_\_, and the \_\_\_\_\_\_\_.

41) The bones of the skull are divided into two groups: The skull bones that form a round protective covering for the brain are called the \_\_\_\_\_\_ bones. The skull bones that form the flat front of the skull (where the eyes, nose, and mouth are located) are called the \_\_\_\_\_ bones.

42) There are \_\_\_\_\_\_ (a number) of cranial bones. List all their names. For the cranial bones that come in left-right pairs, just write their name once but write (pair) after the name.

\_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_

43\*) The \_\_\_\_\_ bone forms the forehead.

44\*) The posterior end of the frontal bone articulates with the \_\_\_\_\_\_ bones.

45\*) The pair of bones that form much of the superior lateral portions of the cranium are the \_\_\_\_\_ bones.

46\*) The posterior of the cranium and much of the bottom of the cranium are formed by the \_\_\_\_\_ bone.

47) The foramen magnum is the hole in the \_\_\_\_\_\_ bone. It allows the \_\_\_\_\_\_ to pass through the skull to connect to the brain.

48\*) The pair of bones that form the inferior lateral region of skull (the region where the ears are located) are the \_\_\_\_\_\_ bones.

49) The “cheekbone” is not itself a bone. It is made up of parts of several bones. The posterior section of the “cheekbone” is the \_\_\_\_\_ of the \_\_\_\_\_ bone. Its function is an attachment site for chewing muscles.

50) The \_\_\_\_\_\_\_\_\_ is the hole in the \_\_\_\_\_\_ bone where sounds enter for hearing.

51) The \_\_\_\_\_\_\_ process of the \_\_\_\_\_\_ bone is a thin pencil-like structure where muscles of the tongue and throat attach.

52\*) The \_\_\_\_\_\_\_ is a large cranial bone that (along with the occipital bone) forms the floor of the cranium. This bone is anterior to the occipital bone.

53\*) The \_\_\_\_\_ bone is the smallest cranial bone. Although small, it spans from the medial orbit of one eye to the medial orbit of the other eye. In between, it forms the superior portion of the roof of the nasal cavity and the top part of the nasal septum.

54\*) The crista galli is a small crest on the \_\_\_\_\_ bone.

55\*) The cribiform plate is a surface on the \_\_\_\_\_\_ bone filled with many small foramina (holes). Its purpose is to allow nasal nerves for the sense of small to reach the brain.

56\*) The “soft spots” on an infant’s skull are unossified cartilage areas called \_\_\_\_\_\_\_. They allow for \_\_\_\_\_\_ during birth and, afterwards, they allow for \_\_\_\_\_\_ during early development.

57) \_\_\_\_\_ are zig-zag lines on the cranium formed by the joints between cranial bones.

58\*) There are \_\_\_\_\_\_ (a number) of facial bones. List all their names. For the facial bones that come in left-right pairs, just write their name once but write (pair) after the name.

\_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_ \_\_\_\_\_\_, \_\_\_\_\_\_

59\*) The pair of bones that form the bridge (top) of the nasal cavity are the \_\_\_\_\_ bones.

60\*)Within each eye orbit, there is a small facial bone called the \_\_\_\_\_ bone, which contains a groove to allow tear drainage. The name of this bone means “tears.”

61\*) The “cheekbone” is not itself a bone. It is made up of parts of several bones. The anterior section of each “cheekbone” is formed by part of the \_\_\_\_\_\_ (a facial bone) and also by part of the \_\_\_\_\_\_ (another facial bone).

62\*) The nasal septum is the bony region that divides the nasal cavity into left and right halves. The flat thin bone that forms the lower part of the nasal septum is the \_\_\_\_\_\_ bone.

63\*) The pair of bones that form the posterior of the hard pallet (the roof of the mouth) are the \_\_\_\_\_ bones.

64\*) The \_\_\_\_\_ bone forms the superior region of each orbit (eye socket).

65\*) Each end of the \_\_\_\_\_\_ (lower jaw bone) articulates with a \_\_\_\_\_\_ (a cranial bone).

66\*) The \_\_\_\_\_ are a pair of tiny shell-shaped bones in the nasal cavity. They increase the ability of the nose to trap dust, preventing it from reaching the lungs.

67\*) The \_\_\_\_\_ bones are a pair of bones that form the upper jaw, the front part of the "cheekbone," and the lateral sides of the nasal cavity.

68\*) The roof of the mouth (which is also called the hard pallet) is formed by several bones. The \_\_\_\_\_\_ pair of bones form the anterior part of the hard pallet. The \_\_\_\_\_\_ pair of bones form the posterior part of the hard pallet.

69) The \_\_\_\_\_ are hollow cavities inside certain skull bones that are near the nose. The function of these cavities is not clear, but they can easily become infected when we have a cold, causing a stuffy or pressurized feeling in the head.

70\*) The bones of the skull that contain paranasal sinuses are the \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and the \_\_\_\_\_\_.

71) The “backbone” (the medial bones of the back) is really a stack of individual bones called \_\_\_\_\_\_. The entire stack of these bones is called the \_\_\_\_\_\_ or the \_\_\_\_\_\_.

72) The spine has two main functions: \_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_.

73) The ring-shaped region of each vertebra is called the \_\_\_\_\_\_\_.

74) The spinal cord passes through the \_\_\_\_\_ of each vertebra, which is the hole in the middle of the vertebral arch.

75) The tunnel made by all the vertebral foremen stacked on top of each other in the spine is called the \_\_\_\_\_\_\_\_.

76) The solid round region of each vertebra is called the \_\_\_\_\_\_\_ of the vertebra. Its purpose is to \_\_\_\_\_\_.

77) Between neighboring vertebrae are round discs of cartilage called \_\_\_\_\_\_ which cushion the vertebrae from the body weight.

78) There are bony projections called \_\_\_\_\_\_\_ that point outward from the vertebral arch. These serve as attachment sights for muscles.

79) The drawing below represents a vertebra. Name parts a, b, c, and d.

a)\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b)\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) \_\_\_\_\_\_\_\_\_\_\_\_\_

d) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which part (a, b, c d, or e)…

Has a cartilage disc on it for cushioning \_\_\_\_\_\_

Is where the spinal cord passes through\_\_\_\_\_\_\_

Is where the muscles that bend the back attach \_\_\_\_\_\_\_

Articulates with the sacrum \_\_\_\_\_\_\_

80\*) The vertebral arch is posterior/anterior (circle one) to the body of the vertebra.

81\*) The vertebral arch is more superficial /deep (circle one) than the body of the vertebra.

82) Name the five regions of the vertebral column in their correct order, from superior to inferior. After each answer state how many vertebrae are in that region (In the case of fused vertebrae, write how many vertebrae are fused together in that region, followed by the word fused).

Name of spine region: Number of vertebrae

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83) There are \_\_\_\_\_ (a number) cervical vertebrae, \_\_\_\_\_ (a number) thoracic vertebrae, and \_\_\_\_\_ (a number) lumbar vertebrae.

84\*) One distinguishing feature of the cervical vertebrae is small \_\_\_\_\_ in the processes of their vertebral arch. These provide a bony channel for blood vessels supplying the brain.

85\*) Another distinguishing feature of the cervical vertebrae is \_\_\_\_\_\_ (hint: Something about the tips of their spinous process, which is the most posterior of the vertebral arch processes).

86\*) The first cervical vertebra (C1) is called the \_\_\_\_\_; it articulates superiorly with the \_\_\_\_\_ bone of the skull.

87\*) The second cervical vertebra (C2) is called \_\_\_\_\_.

88\*) A distinguishing feature of the thoracic vertebrae is the shape of their spinous process. Its shape is \_\_\_\_\_\_.

89\*) A distinguishing feature of the lumbar vertebrae is the shape of their spinous process. Its shape is \_\_\_\_\_\_.

90\*) The body of cervical/thoracic/lumbar (circle one of the three) vertebrae are the largest and thickest of the spine.

91) Each thoracic vertebra articulates with one pair of \_\_\_\_\_.

92\*) The \_\_\_\_\_\_ is the region of the spine directly below the lumbar vertebrae. It consists of \_\_\_\_\_ (a number) of fused vertebrae.

93\*) The \_\_\_\_\_ is the inferior-most region of the spine. It is directly below the sacrum and articulates with it. It is made out of \_\_\_\_\_\_ (a number) of fused vertebrae.

94) The thoracic cage is formed from three bone groups: \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.

95) The sternum is formed by the fusion of three bones: the \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

96) There are \_\_\_\_\_\_ (a number) pairs of ribs. The superior-most \_\_\_\_\_ (a number) are “true ribs” and the inferior-most \_\_\_\_\_\_ (a number) pairs are “false ribs”. The lowest \_\_\_\_\_\_ (a number) pairs of false ribs are called the “floating ribs”.

97) Anteriorly, ribs articulate with the \_\_\_\_\_\_ (a bone). Posteriorly, ribs articulate with \_\_\_\_\_\_ (a type of bone. Be as specific as possible).

98) The cartilage connection between a rib and the sternum are called its \_\_\_\_\_ cartilage.

99) The appendicular skeleton includes the bones of the limbs, and also the bones of the \_\_\_\_\_\_, which are the bony junctions between limb bones and axial bones.

100) The bones of the upper limbs are attached to the axial skeleton by the \_\_\_\_\_ girdle. The bones of the lower limbs are attached to the axial skeleton by the \_\_\_\_\_ girdle.

101) Each shoulder girdle consists of one \_\_\_\_\_ bone and one \_\_\_\_\_ bone.

102) The lateral end of the clavicle articulates with the \_\_\_\_\_ (a process) of the \_\_\_\_\_ bone.

103) The medial end of the clavicle articulates with the \_\_\_\_\_ bone.

104) "Shoulder blade" is the common term for the \_\_\_\_\_ bone.

105) Each scapula articulates distally with the \_\_\_\_\_ bone and proximally with the \_\_\_\_\_ bone.

106) The \_\_\_\_\_ cavity of the scapula articulates with the humerus.

107) The back of the scapula has a ridge-shaped process called the \_\_\_\_\_\_ of the scapula. Its function is \_\_\_\_\_\_\_\_.

108) The upper limb consists of three regions. From shoulder to elbow is the \_\_\_\_\_\_. From elbow to wrist is the \_\_\_\_\_\_. Distally from the wrist is the \_\_\_\_\_\_\_.

109) The arm (recall, the arm is the region from shoulder to elbow) has only one bone, the \_\_\_\_\_.

110) The humerus articulates proximally with the \_\_\_\_\_ and distally with the \_\_\_\_\_ and \_\_\_\_\_.

111) The proximal end of the humerus is shaped like a large round knob. This rounded end is called the \_\_\_\_\_\_ of the humerus. It articulates with the \_\_\_\_\_\_ (a cavity) of the \_\_\_\_\_\_ bone.

112) The forearm has two bones: The \_\_\_\_\_\_ and the \_\_\_\_\_\_\_.

113\*) The radius is the medial/lateral (circle one) bone of the forearm. The ulna is the medial/lateral (circle one) bone of the forearm.

114) The hand (which includes the wrist) contains three types of bones: the \_\_\_\_\_ of the wrist, the \_\_\_\_\_ of the palm, and the \_\_\_\_\_ of the fingers.

115) On each hand, there are \_\_\_\_\_ (a number) of carpals, \_\_\_\_\_ (a number) of metacarpals, and (a number) of phalanges.

116) Each finger has \_\_\_\_\_\_ (a number) of phalanges, except the thumb which has only \_\_\_\_\_\_ (a number).

117) The pelvis is formed from the two \_\_\_\_\_\_ bones and also the spine’s \_\_\_\_\_\_ and \_\_\_\_\_\_ bones.

118) The hip bones are part of the \_\_\_\_\_. Each hip bone is formed by fusion of three bones: the

\_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.

119\*) The superior portion of each hip bone is the \_\_\_\_\_\_. You can feel this region as the upward ridge at the side of your pelvis.

120\*) The posterior and inferior region of each hip bone is the \_\_\_\_\_\_\_.When you sit down, this is the region of each hip bone that touches the chair.

121\*) The anterior and inferior region of each hip bone is the \_\_\_\_\_\_\_.

122) The \_\_\_\_\_\_\_ is a shallow depression in each hip bone. It articulates with the femur.

123) Each hip bone has hole in it called the \_\_\_\_\_\_\_, which serves as a passage to allow nerves and blood vessels to connect to the thigh.

124) Together, the bones of the pelvis form a structure shaped like a bowl with a hole at the bottom. The diameter (size) of the top of the pelvis is called the \_\_\_\_\_\_ pelvis. The size (diameter) of the opening at the bottom of the pelvis is called the \_\_\_\_\_\_ pelvis.

125) In women, the true pelvis is wider/narrower (circle one) than in males.

126) The lower limb consists of three regions. From hip to knee is the \_\_\_\_\_\_. From knee to ankle is the \_\_\_\_\_\_. Distally from the ankle is the \_\_\_\_\_\_\_.

127) The thigh has only one bone, the \_\_\_\_\_\_.

128) The femur articulates proximally with the \_\_\_\_\_ and distally with the \_\_\_\_\_, and \_\_\_\_\_.

129) The proximal end of the femur is shaped like a large round knob. This rounded end is called the \_\_\_\_\_\_ of the femur. It articulates with the \_\_\_\_\_\_ (a cavity) of the \_\_\_\_\_\_ bone.

130) The \_\_\_\_\_\_ bone is the knee cap.

131) Three bones are part of the knee joint: The \_\_\_\_\_\_, the \_\_\_\_\_\_, and the \_\_\_\_\_\_.

132) The leg has two bones: The \_\_\_\_\_\_ and the \_\_\_\_\_\_\_.

133) The tibia is the medial/lateral (circle one) bone of the leg. The fibula is the medial/lateral (circle one) bone of the leg.

134\*) The fibula is larger/smaller (circle one) than the tibia.

135) The fibula is/isn’t (circle one) part of the knee joint.

136) The proximal end of the fibula articulates with the \_\_\_\_\_\_.

137) If you feel the bones near the top of your ankle, you will feel a knob of bone on the medial side and a knob of bone on the lateral side. The knob on the medial side is called the \_\_\_\_\_\_. It is part of the \_\_\_\_\_\_\_ bone. The knob on the lateral side is the \_\_\_\_\_\_\_. It is part of the \_\_\_\_\_\_\_ bone.

138) The foot (which includes the ankle) contains three types of bones: The \_\_\_\_\_ of the ankle, the \_\_\_\_\_ of the sole, and the \_\_\_\_\_ of the toes.

139) The heel of the foot is the \_\_\_\_\_\_ (the name of a specific tarsal).

140\*) The distal ends of the tibia and fibula articulate with \_\_\_\_\_\_ (the name of a specific tarsal).

141) The talus is superior/inferior (circle one) to the calcaneus.

142) The bones of the sole of the foot are called the \_\_\_\_\_\_ bones.

143) The bones of the toes, like the bones of the fingers, are called \_\_\_\_\_.

144) Each toe has \_\_\_\_\_\_ (a number) of phalanges, except the big toes which has only \_\_\_\_\_\_ (a number).

145) On each foot, there are \_\_\_\_\_ (a number) of tarsals, \_\_\_\_\_ (a number) of metatarsals, and (a number) of phalanges.

146) The largest single bone of the skeleton is the \_\_\_\_\_\_.

147) A(n) \_\_\_\_\_ is any site where two bones meet. This is also called a \_\_\_\_\_\_\_.

148) The dense connective tissue structures that surround the outside of a joint and hold the bones together are called \_\_\_\_\_\_.

149) Based on the type of tissue between the bones, the three types of joints are \_\_\_\_\_\_, \_\_\_\_\_\_, and \_\_\_\_\_\_.

150) For \_\_\_\_\_ joints, the bones are joined by fibrous connective tissue and their function is to prevent separation (in other words, to hold the bones solidly together with no movement).

151) An example of a fibrous joint in the body is \_\_\_\_\_\_.

152) For \_\_\_\_\_ joints, there is a cartilage disc between the bones, which functions to cushion the joint. This type of joint is found in parts of the skeleton that carry the body weight.

153) An example of a cartilaginous joint in the body is \_\_\_\_\_\_.

154) In \_\_\_\_\_ joints, between the bones there is a joint cavity filled with a slippery lubricating fluid. The fluid is called \_\_\_\_\_\_ fluid and it is made by the \_\_\_\_\_\_ membrane that encloses the joint cavity.

155) An example of a synovial joint in the body is \_\_\_\_\_\_.

156) Because synovial joints do not have any tissue directly between the bones to hold them together, they are reinforced by connective tissues outside the joint cavity. List the two types of connective tissue structures found on the outside of synovial joints: \_\_\_\_\_\_ and \_\_\_\_\_\_\_.

157) List the three joint types from the one with the most mobility to the one with the least mobility:

\_\_\_\_\_\_, \_\_\_\_\_\_, and \_\_\_\_\_\_.

158) A sprain is due to damaged or torn \_\_\_\_\_.

159) When two bones that normally articulate are separated forcibly and stay apart, the injury is called a \_\_\_\_\_.

160) When a joint itself becomes painful and its mobility is reduced, the condition is called \_\_\_\_\_.

161) Name the three types of arthritis we discussed in lecture. Circle the one that is most common in seniors. Put a box around the one that is an autoimmune disease.

162) The cause of osteoarthritis is when the \_\_\_\_\_\_ of a joint is worn out due to decades of use. This is why the people who get osteoarthritis are usually senior citizens.

163) The cause of rheumatoid arthritis is when the articular cartilage is destroyed by \_\_\_\_\_\_\_.

164) Rheumatoid arthritis is more common in males/females (circle one).

165) \_\_\_\_\_\_\_ is a painful form of arthritis that is caused by the buildup of \_\_\_\_\_\_ acid in the joints.

**Answers to fill-in-the-blank review questions:**

1) Support weight

Protect/Anchor organs

2) Calcium phosphate

3) Ca2+

PO43-

4) Collagen

5) Ossification

Osteoblasts

Spongy bone

6) Cartilage

7) Ossification

8) Osteoblasts

9) Medullary cavity

10) Marrow

11) Yellow

12) Red

13) Skull

Ribs

Vertebrae

14) Long bones

15) Diaphysis

Compact

16) Epiphysis

Spongy

17) Periosteum

18) Epiphyseal plate

19) Epiphyseal line

20) Hyaline cartilage

21) Articular cartilage

22) Osteons

Haversian systems

23) Central canal

Blood vessels

24) Canaliculi

25) Lamella

26) Osteocytes

Lacuna

27) Osteoclasts

28) Fracture

29) Closed fracture (or simple fracture)

Open fracture (or compound fracture)

30) Osteoporosis

31) Women

32) Calcium

Vitamin D

Exercise

33) Rickets

Calcium

Vitamin D

34) The legs bow outward

35) Process

Muscles

36) Head

37) Foreman

Blood vessels

Nerves

Tendons

38) 206

39) Axial skeleton

Appendicular skeleton

40) Skull

Thoracic cage

Spine

41) Cranial bones

Facial

42) Eight

Frontal bone

Parietal bones (pair)

Occipital

Temporal (pair)

Sphenoid

Ethmoid

43) Frontal bone

44) Parietal bones

45) Parietal bones

46) Occipital bone

47) Occipital bone

Spinal cord

48) Temporal bones

49) Zygomatic process

Temporal bone

50) External auditory meatus

Temporal bone

51) Styloid process

Temporal bone

52) Sphenoid bone

53) Ethmoid bone

54) Ethmoid bone

55) Ethmoid bone

56) Fontanels

Flexing of the skull

Growth of the brain

57) Sutures

58) Fourteen

Mandible

Maxillary (pair)

Zygomatic (pair)

Nasal (pair)

Palantine (pair)

Inferior nasal concha (pair)

Lacrimal (pair)

Vomer

59) Nasal bones

60) Lacrimal bones

61) Zygomatic bones

Maxillary bones

62) Vomer

63) Palantine bones

64) Frontal bone

65) Mandible

Temporal bone

66) Inferior nasal concha

67) Maxillary

68) Maxillary

Palantine

69) Paranasal sinuses

70) Frontal

Maxillary

Ethmoid

Sphenoid

71) Vertebrae

Spine

Vertebral column

72) Support body weight

Protect the spinal cord

73) Vertebral arch

74) Vertebral foremen

75) Vertebral canal

76) Body

Carry body weight

77) Intervertebral discs

78) Processes

79) a = Spinous process

b = Transverse processes

c = Vertebral arch

d = Vertebral foremen

e = Body

e

d

a and b

e

80) Posterior

81) Superficial

82) Cervical 7

Thoracic 12

Lumbar 5

Sacrum 5 (fused)

Coccyx 4 (fused)

83) Seven

Twelve

Five

84) Foremen

85) Forked end of spinous process

86) Atlas

Occipital

87) Axis

88) Long and narrow (like a horse head)

89) Hatchet shaped

90) Lumbar

91) Ribs

92) Sacrum

Five

93) Coccyx

Four

94) Ribs

Sternum

Thoracic vertebrae

95) Manubrium

Body

Xiphoid process

96) Twelve

Seven

Five

Two

97) Sternum

Thoracic vertebrae

98) Costal cartilage

99) Girdles

100) Shoulder girdle

Pelvic girdle

101) Clavicle

Scapula

102) Acromion process

Scapula

103) Sternum

104) Scapula

105) Humerus

Clavicle

106) Glenoid cavity

107) Spine

Attachment site for shoulder muscles

108) Arm

Forearm

Hand

109) Humerus

110) Scapula

Radius

Ulna

111) Head

Glenoid cavity

Scapula

112) Radius

Ulna

113) Lateral

Medial

114) Carpals

Metacarpals

Phalanges

115) Eight

Five

Fourteen

116) Three

Two

117) Hip

Sacrum

Coccyx

118) Pelvis

Ileum

Ischeum

Pubis

119) Ileum

120)Ischeum

121) Pubis

122) Acetablum

123) Obturator Foremen

124) False

True

125) Wider

126) Thigh

Leg

Foot

127) Femur

128) Hip bone

Tibia

Patella

129) Head

Acetablum

Hip

130) Patella

131) Femur

Patella

Tibia

132) Tibia

Fibula

133) Medial

Lateral

134) Smaller

135) Isn’t

136) Tibia

137) Medial malleolus

Tibia

Lateral malleolus]

Fibula

138) Tarsals

Metatarsals

Phalanges

139) Calcaneous

140) Talus

141) Superior

142) Metatarsals

143) Phalanges

144) Three

Two

145) Seven

Five

Fourteen

146) Femur

147) Articulation

Joint

148) Ligaments

149) Fibrous

Cartilaginous

Synovial

150) Fibrous

151) The sutures of the skull

152) Cartilaginous

153) Knee joint (or vertebral joints)

154) Synovial joints

Synovial fluid

Synovial membrane

155) Shoulder (or hip, knee, or elbow)

156) Ligaments

The fibrous capsule

157) Synovial

Cartilaginous

Fibrous

158) Ligaments

159) Dislocation

160) Arthritis

161) Osteoarthritis (circled)

Rheumatoid arthritis (boxed)

Gout

162) Articular cartilage

163) The immune system

164) Females

165) Gout

Uric acid

**Short answer questions:**

1) Cross out the term that does not belong with the others, and write a brief explanation why the term you crossed out does not belong with the others.

Diaphysis Compact bone Medullary cavity Spongy bone

2) Contrast red and yellow marrow: What is the function of each? In what way do they change as we age?

3) Answer the following questions about the epiphyseal plate (the growth centers of bones).

a) Where in the bone are epiphyseal plates located?

b) What type of tissue are they?

c) What part of the bone do they lengthen?

d) Briefly describe the process by which the epiphyseal plates make new bone tissue.

e) In adults, the bones no longer have epiphyseal plates. What has happened to the epiphyseal plates and what are the remnants of them called?

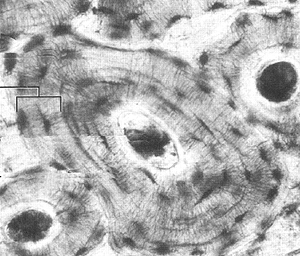
4) In the lecture, three different bone cells were mentioned. Name each bone cell type and describe what it does.

a)

b)

c)

5) The picture below shows a microscopic view of bone tissue. Notice that bone tissue is made of circular units. Identify the name of the circular units and for each of the unit’s 5 parts, name the part and state its function. Circular unit name:



(the rings of bone tissue)

(the tiny dark lines)

6) Name some causes of osteoporosis and rickets. What physical deformity is associated with rickets but not osteoporosis.

7) What is the defining difference between true ribs and false ribs? Which of the 12 pairs of ribs are true ribs and which are false ribs?

8) What is a floating rib? Which of the 12 pairs of ribs are floating ribs?

9) When standing in anatomical position, the palms are facing forward. In this position, the radius is lateral to the ulna. When we rotate our palms inward, such that they face our thigh, what happens to the positions of the radius and ulna? Be as exact as possible and answer in terms of lateral, medial, proximal, and distal.

10) Using the proper anatomical terminology, describe the difference in pelvis diameter between males and females. Also, explain the purpose of this difference.

11) What is the correct anatomical term for the thigh bone? \_\_\_\_\_\_\_\_\_\_\_

Draw a thigh bone below. Label in your drawing the head, the epiphysis, the diaphysis, and the compact bone and spongy bone areas. Make lines on your drawing showing where growth of the bone occurs, and label these growth areas with their proper name.

12) Tendons and ligaments are both examples of dense connective tissue structures that connect to bones. What is the difference between a tendon and a ligament?

**Answers to short answer questions:**

1) Spongy bone (crossed out). All the terms except spongy bone are found in the center of longbones: Diaphysis is the name of the shaft-shaped center of a longbone, it is made of compact bone, and it contains the medullary cavity. Spongy bone, on the other hand, is found at the ends of a longbone (in the epiphysis).

2) Red marrow makes blood cells. Yellow marrow is adipose (fat) tissue. We are born with red marrow in all of our bones, but as we get older more and more of the red marrow is converted into yellow marrow.

3) a) The epiphyseal plates are located between the diaphysis and the epiphysis at each end of the longbone.

b) The epiphyseal plates are made of cartilage

c) They lengthen the diaphysis of the longbone.

d) During growth of the skeleton, the epiphyseal plates make more cartilage, but osteoblast cells convert the cartilage to bone tissue as fast as it is made.

e) The cartilage tissue of the epihyseal plates is converted to bone tissue by the hormones of puberty. Therefore no more skeletal lengthening is possible. The bones of adults have a line called the epiphyseal line that marks the former location of the epiphyseal plate.

4) Osteoblasts Cause bone growth by converting cartilage into bone tissue.

Osteocytes Bone cells that maintain bone tissue. They live within the bone

tissue (in lacuna of osteons)

Osteoclasts Dissolve bone to release calcium to the blood.

5) Circular unit name: Osteon (or Haversean system)

Central canal

Osteocyte (in a lacuna)

Lamella

Canaliculi

6) Osteoporosis and Rickets can both be caused by lack of calcium or lack of vitamin D in the diet. Rickets causes a bowing outward of the legs, but this deformity is not a symptom of osteoporosis.

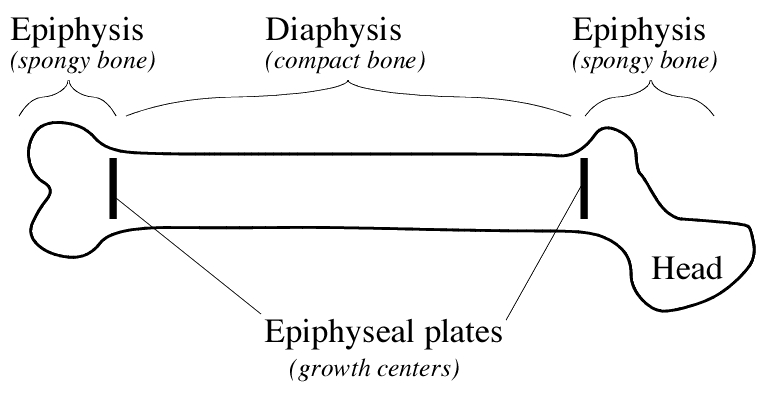
7) A true rib has a direct cartilage connection to the sternum. A false rib does not have a direct cartilage connection to the sternum. (Some false have cartilage connections to the cartilage of true ribs and some false ribs have no cartilage connections at all). The superior seven pairs of ribs are true ribs. The inferior five pairs of ribs are false ribs.

8) Floating ribs are the ribs that do not have any cartilage connections at all. The floating ribs are the two inferior-most pairs of the twelve pairs of ribs. In terms of the false ribs (see question 7, above) the floating ribs the lowest two of the five pairs of false ribs. This means that all floating ribs are false ribs but not all false ribs are floating ribs.

9) Recall that in anatomical position the palms are facing forward and the radius is lateral to the ulna. When we turn our palms inward from anatomical position, the distal end of the radius crosses over the ulna. This means at the end of forearm near the wrist, the distal end of the radius is now medial and the ulna is now lateral. At the proximal end of the forearm, however, the bones do not cross over, so the radius is lateral and the ulna is medial.

10) Recall that the pelvis is shaped like a bowl with a hole in the bottom. The diameter of the “top of the bowl” is called the false pelvis. The diameter of the “hole at the bottom of the bowl” is called the true pelvis. The true pelvis is larger in females than in males. This is because babies must pass through the true pelvis during birth.

11) The femur is the correct anatomical term for the thigh bone.



12) A tendon connects muscle to bone. A ligament connects bone to bone.