

Bone Biology & Hematopoiesis - 20 Hard MCQs

1) A 45-year-old woman on long-term glucocorticoids develops osteoporosis. Which mechanism is MOST responsible?

- A) Increased OPG production
- B) Increased RANKL expression
- C) Decreased IL-1
- D) Suppressed osteoclast differentiation

Answer: B

2) Which structure is MOST richly innervated and responsible for bone pain in fractures?

- A) Endosteum
- B) Medullary cavity
- C) Periosteum
- D) Compact bone

Answer: C

3) A mutation prevents Type I collagen synthesis. Which bone component is primarily affected?

- A) Hydroxyapatite
- B) Osteoid
- C) BMP
- D) RANK

Answer: B

4) Woven bone found in an adult most strongly suggests:

- A) Normal remodeling
- B) Peak bone mass
- C) Pathologic process (e.g., fracture/malignancy)
- D) Aging change

Answer: C

5) Peak bone mass is typically achieved at what age range?

- A) 10–15
- B) 15–20
- C) 20–30
- D) 40–50

Answer: C

6) Which factor directly binds RANK to promote osteoclast activation?

- A) M-CSF
- B) OPG
- C) RANKL
- D) BMP

Answer: C

7) Osteoclasts originate from which lineage?

- A) Mesenchymal stem cells
- B) Neural crest cells
- C) Monocyte-macrophage system

D) Fibroblasts

Answer: C

8) The primary inorganic component of bone matrix is:

A) Type II collagen

B) Calcium carbonate

C) Inorganic hydroxyapatite

D) Elastin

Answer: C

9) Endochondral ossification is characterized by:

A) Direct mesenchymal differentiation

B) Cartilage model replacement

C) Absence of epiphyseal plate

D) Immediate lamellar bone formation

Answer: B

10) Which region of a long bone contains the epiphyseal growth plate?

A) Diaphysis

B) Metaphysis

C) Medullary cavity

D) Periosteum

Answer: B

11) Increased OPG levels would MOST likely result in:

A) Increased bone resorption

B) Decreased osteoclast activation

C) Increased IL-1

D) Increased RANK binding

Answer: B

12) Lamellar bone differs from woven bone because it:

A) Has disorganized collagen

B) Is highly cellular

C) Has organized Type I collagen

D) Is weaker structurally

Answer: C

13) A drug that mimics OPG would primarily:

A) Stimulate BMP

B) Block RANKL interaction

C) Increase IL-1

D) Increase M-CSF secretion

Answer: B

14) Which hormone physiologically increases osteoclastic bone resorption?

A) Estrogen

B) Testosterone

C) PTH

D) OPG
Answer: C

15) Hematopoiesis in adults primarily occurs in:

- A) Compact bone
- B) Articular cartilage
- C) Bone marrow in medullary cavity
- D) Periosteum

Answer: C

16) A deficiency in estrogen after menopause leads to osteoporosis primarily because:

- A) Decreased osteoblast activity only
- B) Increased osteoclast differentiation
- C) Increased OPG secretion
- D) Reduced calcium absorption only

Answer: B

17) Which cells are embedded within lacunae and maintain bone metabolism?

- A) Osteoblasts
- B) Osteoclasts
- C) Osteocytes
- D) Chondrocytes

Answer: C

18) Intramembranous ossification forms which structure?

- A) Femur
- B) Humerus
- C) Skull bones
- D) Tibia

Answer: C

19) Steroid therapy predisposes to fractures mainly due to:

- A) Decreased RANKL
- B) Increased osteoclast activity
- C) Increased BMP
- D) Increased Type I collagen

Answer: B

20) Failure of M-CSF signaling would MOST directly impair:

- A) Osteoblast mineralization
- B) Osteoclast precursor maturation
- C) Hydroxyapatite formation
- D) Epiphyseal closure

Answer: B