Skeletal System Packet

I. Bones: An Overview

Classify each of the following terms as a projection (P) or a depression or opening (D). Enter the appropriate letter in the answer blanks.

_____ 1. Condyle	_____ 4. Foramen	_____ 7. Ramus
_____ 2. Crest	_____ 5. Head	_____ 8. Spine
_____ 3. Fissure	_____ 6. Meatus	_____ 9. Tuberosity

Group each of the following bones into on of the four major bone categories. Use L for long bone, S for short bone, F for flat bone, and I for irregular bone. Enter the appropriate letter in the space provided.

_____ 1. Calcaneus	_____ 4. Humerus	_____ 7. Radius
_____ 2. Frontal	_____ 5. Mandible	_____ 8. Sternum
_____ 3. Femur	_____ 6. Metacarpal	_____ 9. Vertebra

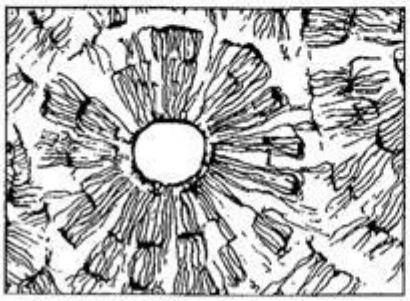
II. Bone Matrix

Like all other living structures, bone is made of cells. Because they are embedded in the calcified material that makes bones hard, bone cells (called osteocytes) have special needs; an unusual kind of circulation, for example, is needed to bring nutrients to these cells and carry away wastes. When looking at the diagram, you will notice large dark dots; they are called "Haversian canals", and they are really tubes that run through the bone. Blood vessels travel through them, carrying nutrient-rich blood plasma and carrying away wastes. The Haversian canal has small irregularly shaped spaces arranced around it in rings. These spaces are called "lacunae". Each Haversian canal is really a branch from a network of canals that travels through the compact bone of the diaphysis. These canals are called "Volkmann's canals".The periosteum (th efibrous covering of the bone) contains many small blood vessels. These blood vessels leave the periosteum, enter the bone, and then travel a short distance through the Volkmann's canals. As the Volkmann's canals branch to form the Haversian canals, the blood vessels traveling within the Volkmann's canals also divide, sending a branch into each of the branches of the Haversian canal. While in the Haversian canal, blood passes out of the blood vessels and travels through small cracks in the compact bone. These cracks, called "canaliculi", direct the blood to the lacunae, where the osteocytes (bone cells) live.

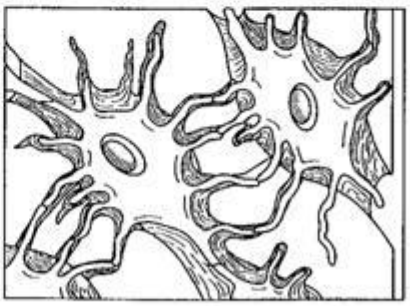
1. Bone cells are called _____.
2. The Haversian system makes it possible for osteocytes to obtain _____ and to release _____.
3. A Haversian system consists of a _____ canal with small irregularly shaped spaces called _____ around it.
4. What is the function of the Volkmann's canals? _____
5. What is the periosteum? _____
6. From the Haversian canal, the blood passes through small cracks called _____ on its way to the _____.
7. What lives in the lacunae? _____
8. Why do osteocytes need a special kind of circulation? _____
9. How is a Haversian canal related to a Volkmann's canal? _____

Match the term in column B with the correct function in column A. Label the diagrams below by color coding the circle to the correct structure.

Column A		Column B
_____	1. Layers of calcified matrix	Haversian Canal ◯
_____	2. "Residences" of osteocytes	Lamellae ◯
_____	3. Longitudinal canal, carrying blood vessels and nerves.	Lacunae ◯
		Canaliculi ◯
_____	4. Nonliving, structural part of bone.	Bone Matrix ◯
_____	5. Tiny canals, connecting lacunae	Osteocyte ◯



A



B

III. Anatomy of Bone

Diaphysis	Epiphysis	Yellow marrow cavity
Epiphyseal Plate	Red marrow	

_____ 1. Site of spongy bone in the adult.

_____ 2. Site of compact bone in the adult.

_____ 3. Site of hematopoiesis in the adult.

_____ 4. Scientific name for bone shaft.

_____ 5. Site of fat storage in the adult.

_____ 6. Site of longitudinal growth in a child.

Atrophy	Gravity	Osteoclasts	Parathyroid hormone
Calcitonin	Osteoblasts	Osteocytes	Stress and/or tension

_____ 1. When blood calcium levels begin to drop below homeostatic levels, _____ is released, causing calcium to be released from bones.

_____ 2. Mature bone cells, called _____, maintain bone in a viable state.

_____ 3. Disuse such as that caused by paralysis or severe lack of exercise results in muscle and bone _____.

_____ 4. Large tubercles and/or increased deposit of bony matrix, occur at sites of _____.

_____ 5. Immature, or matrix-depositing, bone cells are referred to as _____.

_____ 6. _____ causes blood calcium to be deposited in bones as calcium salts.

_____ 7. Bone cells that liquefy bone matrix and release calcium to the blood are called _____.

_____ 8. Our astronauts must do isometric exercises when in space because bones atrophy under conditions of weightlessness or lack of _____.

IV. Joints

It is possible for you to move because your skeleton is made of many connected bones. Your leg, for example, is marvelously flexible; at least part of the reason for its flexibility is that it is made of three main bones. Imagine how difficult walking would be if your leg consisted of just one bone instead of three? The skeleton can twist, turn, pivot, and rotate because its bones are connected by joints. A very few joints (those in the cranium, for example) allow no movement, and some (like those in the sternum) allow flexibility but no noticeable movement. Most joints, however, allow at least one kind of movement. At the elbow, for example, the lower arm can swing back and forth like a hinged

door; the elbow is classified as a hinge joint. Other types of joints include pivot joints, gliding joints, and ball-and-sockets joints.

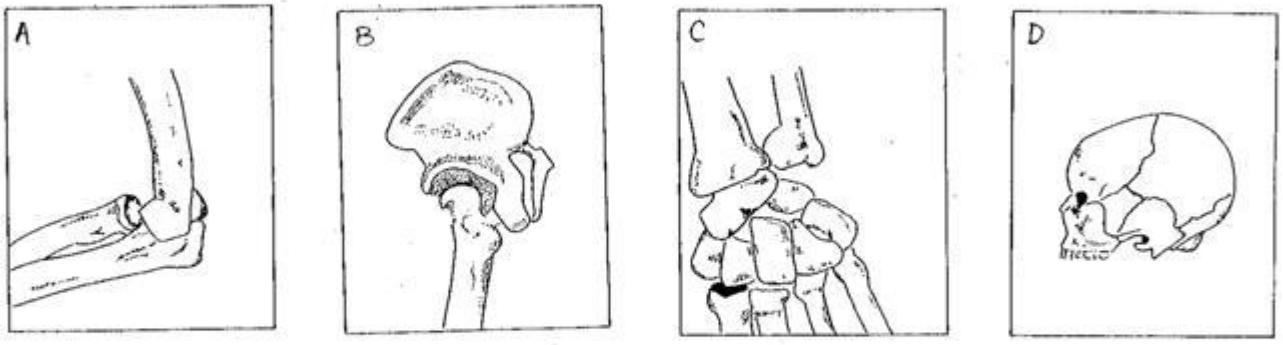
1. Use your notes and list the 6 types of joints
   1. _____
   2. _____
   3. _____
   4. _____
   5. _____
   6. _____
2. The elbow is an example of a hinge joint. Where else on the skeleton are hinge joints located?

3. More than half of the bones and joints of the skeleton are located in the hands and feet. Is this necessary? Explain.

4. The doctor says that John injured his radio-carpal joint. Where on his skeleton was John injured?

5. The joints between the phalanges are classified as hinge joints, but the joints between the metacarpals and the phalanges are different. Can you identify the latter set and explain the difference?

6. Label the 4 joint pictures below:



7. The joint between the femur and the hip is called a _____ joint.
8. Which joint allows movement in all directions? _____

9. Which kind of joint allows the elbow to swing back and forth? _____

10. Which kind of joint allows bone to slide? _____

11. A pivot joint allows you to turn your forearm so that the palm faces up. Between which two bones in the forearm is that pivot joint? _____

12. The tarsal bones are similar to the carpal bones in the hand. Which type of joint would you expect to find between the carpal bones? _____

Friction between two rubbing objects produces heat; that is why you can warm your hands a little by rubbing them briskly together. Most of the time, however, friction is harmful and is something to be avoided. The motor in your car, for example, would be damaged if its moving parts were not protected from friction by engine oil. At a joint, bones rub against one another; if they are not protected from friction, surrounding tissues will become inflamed, swollen, and painful. Fortunately, the ends of bones are covered by smooth tissue that acts like a bearing and reduces friction. This strong, flexible tissue is called "cartilage". Cartilage does not completely protect the joints from friction, and so nearly all joints are enclosed in sacs filled with a slippery liquid similar to egg white. This fluid is called "synovial fluid", and the sac that holds it is called the synovial sac. Synovial fluid helps in much the same way that oil protects your car's motor. When the synovial sac is intact, the fluid prevents the cartilage from wearing down and reduces friction between two bones to almost zero.

1. Friction between two rubbing objects produces _____.

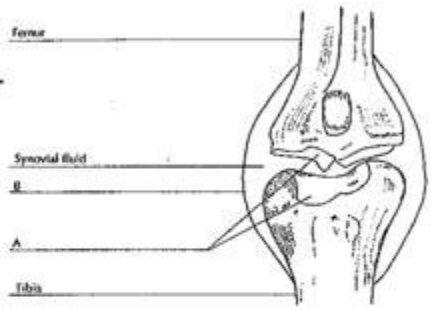
2. In what way can friction be useful?

   _____

3. In what way can friction be harmful?

   _____

4. What happens if bones are not protected from friction?



5. How does cartilage protect bones from friction?

6. The synovial sac also protects bones from friction. Describe its structure & contents.

7. The diagram on the right shows two bones being protected from friction. What structure does arrow A point to? _____

8. What does arrow B point to_____

9. A space shuttle has a backup system for each of its primary systems; in case one fails, the other goes into action. Is the synovial sac merely a backup system for the cartilage in a joint or are both needed? Explain.

10. When babies are born, they have a soft spot on the top of their head. This area allows the baby's head to fit through the mother's birth canal better. As the baby gets older, the soft spot closes up and the skill becomes more solid. Why is it important not to let a baby be hit on the head at the sot spot?

V. Fractures

Draw & briefly explain each of the 8 fracture types in the boxes below.

Simple	**Compound**	**Comminuted**	**Compression**
Depressed	**Impacted**	**Spiral**	**Greenstick**

VI. Disorders

The body uses calcium for things other than building bones; for regulating the cells, helping the muscles to contract, and helping to control the heart rate. Calcium is transported through the circulatory system. If the concentration of calcium in the blood gets too low, certain cells called "osteoclasts" release chemicals that dissolve the calcium in the bones and use it to restore the blood's calcium concentration to its normal level. If calcium is removed from the bones faster than it is replaced, the bones are weakened and they can break or be crushed. The fragile bones and the humped back that the elderly persons, especial women, sometimes have are caused by a gradual loss of calcium in the bones. This condition is called osteoporosis. Although the signs may not spear until old age, calcium loss may actually begin early in life. To help your skeleton to remain strong as you grow older, it is important for you, now, to eat a balanced diet that includes milk, cheese, green vegetables, yogurt, and ice cream. You will be building a storehouse of calcium for the future.

1. What are 4 things the body uses calcium for?

2. How is calcium carried through the body?

3. What can happen to your bones if they lose calcium?

4. How does the body restore the normal level of calcium in the blood?

5. Quite often, an elderly woman may say, "I was just standing in the middle of the floor when I fell and broke my hip!" Do you think the sequence of events may not be quite what she thinks it was? Explain your answer.

6. Rheumatoid arthritis is a crippling disease of the joints. Sometimes a sufferer from this disease will say that he or she can feel the ends of the bones rubbing together. What do you assume has happened?