Fill in your scantron form as follows:

- Write and bubble in your name in the upper left (last name first).
- Sign your form on the upper right. By so doing you verify that you are abiding by Creighton’s policy on academic honesty.

Multiple choice: As always, choose the best answer for each multiple-choice question.

Answer on your scantron form. Each question is worth 3 points.

1. Steroid hormones are released from the
   a. adrenal medulla.
   b. gonads.
   c. thyroid gland.
   d. Two of the above
   e. All of the above

2. Which of the following is not a common effect of hormones? (Note that “hormones” includes lipophobic and lipophilic hormones.)
   b. Activating or deactivating enzymes to influence biochemical pathways.
   c. Altering gene expression rates.
   d. Only one of the above is a common effect of hormones.
   e. All of the above are common effects of hormones.

3. Which of the following is not (as far as we know) a tropic hormone?
   a. Adrenocorticotropic hormone
   b. Gonadotropin releasing hormone
   c. Growth hormone
   d. Prolactin
   e. Thyroid stimulating hormone

4. One of the major effects of the hormone cortisol is to
   a. increase cardiac output.
   b. increase the strength of the immune response
   c. mobilize energy for use by the body.
   d. suppress anxiety.
   e. make money for people selling bogus cortisol blockers on late-night TV.
5. Thyroid hormones help to increase body temperature by
   a. increasing shivering rates.
   b. increasing vasoconstriction.
   c. increasing \(Na^+/K^+\) ATPase activity.
   d. increasing temperature setpoint.
   e. decreasing the rate of sweat production.

6. Which of the following best describes the process by which long bones, like your femur, grow in length at the epiphyseal plates?
   a. Chondrocytes lengthen the diaphysis (shaft) by producing cartilage on the side of the plate closest to the end of the bone; osteoblasts later replace the cartilage with bone.
   b. Chondrocytes lengthen the diaphysis by producing cartilage on the side of the plate closest to the end of the bone; osteoclasts later replace the cartilage with bone.
   c. Chondrocytes lengthen the diaphysis by producing cartilage on the side of the plate closest to the middle of the bone; osteoblasts later replace the cartilage with bone.
   d. Chondrocytes lengthen the diaphysis by producing cartilage on the side of the plate closest to the middle of the bone; osteoclasts later replace the cartilage with bone.
   e. Hint: Do not choose answer e. It is not correct.

7. Which of the following gives the correct sequence of muscle components ordered from smallest to largest?
   a. Sarcomere, thick filament, myofibril
   b. Sarcomere, myofibril, thick filament
   c. Myofibril, sarcomere, thick filament
   d. Thick filament, myofibril, sarcomere
   e. Thick filament, sarcomere, myofibril

8. Imagine a muscle fiber with a mutant form of troponin that never changes conformation from its non-activated state. Which of the following best describes the first problem that would be encountered when this muscle is stimulated by a motor neuron?
   a. The fiber would not be able to generate action potentials.
   b. The sarcoplasmic reticulum would not be able to release \(Ca^{2+}\).
   c. The \(Ca^{2+}\) would not reach the myofibrils.
   d. Cross-bridge cycling would not occur.
   e. The fiber would not be able to stop contracting.

9. During the cross-bridge cycle in muscles, which step occurs immediately before ATP attaches to myosin?
   a. The myosin head moves from the low- to high-energy conformation.
   b. The myosin head moves from high- to low-energy conformation.
   c. The ATP is hydrolyzed to form ADP and \(P_i\).
   d. The myosin attaches to actin.
   e. The myosin dissociates from actin.
10. Consider the following graph showing an isometric twitch contraction in a muscle, triggered by an action potential at time $t = 0$.

![Graph showing an isometric twitch contraction](image)

For this contraction, the contraction time is about

a. 0 ms.

b. **80 ms**.

c. 100 ms.

d. 260 ms.

e. 280 ms.

11. Consider a muscle required to lift differing amounts of weight during a twitch contraction under isotonic conditions. Which of the following best describes the expected pattern as the weights increase?

a. Shortening velocity increases, distance shortened decreases.

b. Shortening velocity increases, distance shortened remains constant.

c. **Shortening velocity decreases, distance shortened decreases.**

d. Shortening velocity decreases, distance shortened remains constant.

e. Shortening velocity remains constant, distance shortened remains constant.

12. Which of the following statements about motor units is false?

a. A motor unit is innervated by a single motor neuron.

b. All the fibers in a motor unit are activated at the same time.

c. It is not possible to activate some fibers in a motor unit and not others.

d. Motor units containing oxidative fibers are normally activated before ones with glycolytic fibers.

e. **Motor units with oxidative fibers generally have more fibers per motor unit than those with glycolytic fibers.**
13. Which of the following best describes the pattern as blood passes through the capillaries?
   a. Pressure averages about 100 torr; blood velocity is relatively fast
   b. Pressure averages about 100 torr; blood velocity is relatively slow.
   c. Pressure averages about 25 torr; blood velocity is relatively fast.
   d. Pressure averages about 25 torr; blood velocity is relatively slow.
   e. Pressure averages about 5 torr; blood velocity is relatively slow.

14. During a heartbeat, the closing of the atroventricular valves is caused by
   a. pressure generated by atrial filling of the ventricles.
   b. pressure generated by the ventricles at the start of ventricular contraction.
   c. pressure in the arteries as ventricular pressure drops during ventricular relaxation.
   d. contraction of smooth muscle in the atroventricular valves.
   e. insertion of a size 2 rubber stopper.

15. During a heartbeat in a person at rest, most of the movement of blood into the ventricles occurs during
   a. ventricular systole.
   b. ventricular diastole prior to atrial systole.
   c. atrial systole.
   d. I can’t think of any more possible answers.
   e. Wait, I’ll make one up – ventricular fantastole.

16. Which of the following substances normally moves across the capillary endothelium by vesicular transport (endocytosis and exocytosis)?
   a. Oxygen and carbon dioxide
   b. Na\(^+\) and K\(^+\)
   c. Water
   d. Steroid hormones
   e. Proteins other than plasma proteins

17. The movement of lymph through the lymphatic system is accomplished by
   a. peristaltic contraction of the lymphatic vessels.
   b. compression of the lymphatic vessels by the surrounding skeletal muscles.
   c. beating of the two-chambered lymphatic heart.
   d. Two of the above. (a and b)
   e. All of the above.

18. In the lungs, the major location of gas exchange with the blood is the
   a. trachea.
   b. bronchi.
   c. bronchioles.
   d. alveoli.
   e. More than one of the above is important in gas exchange.
19. An adult male’s tidal volume is 750 ml and his ventilation frequency is 20 breaths per minute. What is his approximate alveolar ventilation rate? [I hope you can calculate this by hand, but if you need a calculator please ask me. Do not use your own calculator without my okay.]
   a. 5000 ml/min
   b. 7500 ml/min
   c. 10000 ml/min
   d. **12000 ml/min**
   e. 15000 ml/min

20. During a forceful exhalation, which of the following muscles would be activated?
   a. The diaphragm
   b. **External intercostals**
   c. Internal intercostals
   d. *a and b*
   e. *a and c*