

Anat- omy

and

Physi- ology



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Anatomy & Physiology
Unit 1: Levels of Organization
Chapter 1: An Introduction to the Human Body

Interactive Link Questions

1. View this animation (<http://openstaxcollege.org/l/metabolic>) to learn more about metabolic processes. What kind of catabolism occurs in the heart?

Answer

Fatty acid catabolism.

2. Water concentration in the body is critical for proper functioning. A person's body retains very tight control on water levels without conscious control by the person. Watch this video (<http://openstaxcollege.org/l/H2Ocon>) to learn more about water concentration in the body. Which organ has primary control over the amount of water in the body?

Answer

The kidneys.

3. A CT or CAT scan relies on a circling scanner that revolves around the patient's body. Watch this video (<http://openstaxcollege.org/l/CATscan>) to learn more about CT and CAT scans. What type of radiation does a CT scanner use?

Answer

X-rays.

4. A patient undergoing an MRI is surrounded by a tube-shaped scanner. Watch this video (<http://openstaxcollege.org/l/MRI>) to learn more about MRIs. What is the function of magnets in an MRI?

Answer

The magnets induce tissue to emit radio signals that can show differences between different types of tissue.

5. PET relies on radioactive substances administered several minutes before the scan. Watch this video (<http://openstaxcollege.org/l/PET>) to learn more about PET. How is PET used in chemotherapy?

Answer

PET scans can indicate how patients are responding to chemotherapy

Review Questions

6. Which of the following specialties might focus on studying all of the structures of the ankle and foot?

Answer

C. regional anatomy

7. A scientist wants to study how the body uses foods and fluids during a marathon run. This scientist is most likely a(n) _____.

Answer

A. exercise physiologist

8. The smallest independently functioning unit of an organism is a(n) _____.

Answer

A. cell

9. A collection of similar tissues that performs a specific function is an _____.

Answer

A. organ

10. The body system responsible for structural support and movement is the _____.

Answer

D. skeletal system

11. Metabolism can be defined as the _____.

Answer

D. sum of all chemical reactions in an organism

12. Adenosine triphosphate (ATP) is an important molecule because it _____.

Answer

C. stores energy for use by body cells

13. Cancer cells can be characterized as “generic” cells that perform no specialized body function. Thus cancer cells lack _____.

Answer

A. differentiation

14. Humans have the most urgent need for a continuous supply of _____.

Answer

C. oxygen

15. Which of the following statements about nutrients is true?

Answer

A. All classes of nutrients are essential to human survival.

16. C.J. is stuck in her car during a bitterly cold blizzard. Her body responds to the cold by _____.

Answer

C. breaking down stored energy

17. After you eat lunch, nerve cells in your stomach respond to the distension (the stimulus) resulting from the food. They relay this information to _____.

Answer

A. a control center

18. Stimulation of the heat-loss center causes _____.

Answer

C. sweat glands to increase their output

19. Which of the following is an example of a normal physiologic process that uses a positive feedback loop?

Answer

B. childbirth

20. What is the position of the body when it is in the “normal anatomical position?”

Answer

D. None of the above

21. To make a banana split, you halve a banana into two long, thin, right and left sides along the _____.

Answer

C. midsagittal plane

22. The lumbar region is _____.

Answer

D. superior to the popliteal region

23. The heart is within the _____.

Answer

B. mediastinum

24. In 1901, Wilhelm Röntgen was the first person to win the Nobel Prize for physics. For what discovery did he win?

Answer

D. X-rays

25. Which of the following imaging techniques would be best to use to study the uptake of nutrients by rapidly multiplying cancer cells?

Answer

C. PET

26. Which of the following imaging studies can be used most safely during pregnancy?

Answer

C. ultrasound

27. What are two major disadvantages of MRI scans?

Answer

B. high cost and the need for shielding from the magnetic signals

Critical Thinking Questions

28. Name at least three reasons to study anatomy and physiology.

Answer

An understanding of anatomy and physiology is essential for any career in the health professions. It can also help you make choices that promote your health, respond appropriately to signs of illness, make sense of health-related news, and help you in your roles as a parent, spouse, partner, friend, colleague, and caregiver.

29. For whom would an appreciation of the structural characteristics of the human heart come more easily: an alien who lands on Earth, abducts a human, and dissects his heart, or an anatomy and physiology student performing a dissection of the heart on her very first day of class? Why?

Answer

A student would more readily appreciate the structures revealed in the dissection. Even though the student has not yet studied the workings of the heart and blood vessels in her class, she has experienced her heart beating every moment of her life, has probably felt her pulse, and likely has at least a basic understanding of the role of the heart in pumping blood throughout her body. This understanding of the heart's function (physiology) would support her study of the heart's form (anatomy).

30. Name the six levels of organization of the human body

Answer

Chemical, cellular, tissue, organ, organ system, organism.

31. The female ovaries and the male testes are a part of which body system? Can these organs be members of more than one organ system? Why or why not?

Answer

The female ovaries and the male testes are parts of the reproductive system. But they also secrete hormones, as does the endocrine system, therefore ovaries and testes function within both the endocrine and reproductive systems.

32. Explain why the smell of smoke when you are sitting at a campfire does not trigger alarm, but the smell of smoke in your residence hall does.

Answer

When you are sitting at a campfire, your sense of smell adapts to the smell of smoke. Only if that smell were to suddenly and dramatically intensify would you be likely to notice and respond. In contrast, the smell of even a trace of smoke would be new and highly unusual in your residence hall, and would be perceived as danger.

33. Identify three different ways that growth can occur in the human body.

Answer

Growth can occur by increasing the number of existing cells, increasing the size of existing cells, or increasing the amount of non-cellular material around cells.

34. When you open a bottle of sparkling water, the carbon dioxide gas in the bottle form bubbles. If the bottle is left open, the water will eventually “go flat.” Explain these phenomena in terms of atmospheric pressure.

Answer

In a sealed bottle of sparkling water, carbon dioxide gas is kept dissolved in the water under a very high pressure. When you open the bottle, the pressure of the gas above the liquid changes from artificially high to normal atmospheric pressure. The dissolved carbon dioxide gas expands, and rises in bubbles to the surface. When a bottle of sparkling water is left open, it eventually goes flat because its gases continue to move out of solution until the pressure in the water is approximately equal to atmospheric pressure.

35. On his midsummer trek through the desert, Josh ran out of water. Why is this particularly dangerous?

Answer

The primary way that the body responds to high environmental heat is by sweating; however, sweating requires water, which comes from body fluids, including blood plasma. If Josh becomes dehydrated, he will be unable to sweat adequately to cool his body, and he will be at risk for heat stroke as his blood pressure drops too much from the loss of water from the blood plasma.

36. Identify the four components of a negative feedback loop and explain what would happen if secretion of a body chemical controlled by a negative feedback system became too great.

Answer

The four components of a negative feedback loop are: stimulus, sensor, control center, and effector. If too great a quantity of the chemical were excreted, sensors would activate a control center, which would in turn activate an effector. In this case, the effector (the secreting cells) would be adjusted downward.

37. What regulatory processes would your body use if you were trapped by a blizzard in an unheated, uninsulated cabin in the woods?

Answer

Any prolonged exposure to extreme cold would activate the brain's heat-gain center. This would reduce blood flow to your skin, and shunt blood returning from your limbs away from the digits and into a network of deep veins. Your brain's heat-gain center would also increase your muscle contraction, causing you to shiver. This increases the energy consumption of skeletal muscle and generates more heat. Your body would also produce thyroid hormone and epinephrine, chemicals that promote increased metabolism and heat production.

38. In which direction would an MRI scanner move to produce sequential images of the body in the frontal plane, and in which direction would an MRI scanner move to produce sequential images of the body in the sagittal plane?

Answer

If the body were supine or prone, the MRI scanner would move from top to bottom to produce frontal sections, which would divide the body into anterior and posterior portions, as in “cutting” a deck of cards. Again, if the body were supine or prone, to produce sagittal sections, the scanner would move from left to right or from right to left to divide the body lengthwise into left and right portions.

39. If a bullet were to penetrate a lung, which three anterior thoracic body cavities would it enter, and which layer of the serous membrane would it encounter first?

Answer

The bullet would enter the ventral, thoracic, and pleural cavities, and it would encounter the parietal layer of serous membrane first.

40. Which medical imaging technique is most dangerous to use repeatedly, and why?

Answer

CT scanning subjects patients to much higher levels of radiation than X-rays, and should not be performed repeatedly.

41. Explain why ultrasound imaging is the technique of choice for studying fetal growth and development.

Answer

Ultrasonography does not expose a mother or fetus to radiation, to radiopharmaceuticals, or to magnetic fields. At this time, there are no known medical risks of ultrasonography.