1. Consider this diagram for the next set of questions:

Which of these is called the auricle?

a. (1)  
b. (3)  
c. (4)  
d. (6)  
e. (7)  

2. From the above diagram, which part helps to equalize to atmospheric pressure?

a. (1)  
b. (2)  
c. (3)  
d. (5)  
e. (7)  

3. From the above diagram, which part acts as a type of lever?

a. (1)  
b. (2)  
c. (3)  
d. (4)  
e. (6)  

4. From the above diagram, which part helps a person to maintain balance?

a. (3)  
b. (4)  
c. (6)  
d. (7)  
e. (8)  

5. Damage to the cochlea is usually the result of

a. excessive pressure in the cochlea chamber  
b. electrical shock of the auditory nerve  
c. perforation of the basilar membrane  
d. loss of hair cells  

6. Which of these is not part of the middle ear?

a. ossicles  
b. incus  
c. tympanic membrane  
d. auricle  

7. What is the lowest frequency sound heard by most people?

a. 2 Hz  
b. 20 Hz  
c. 200 Hz  
d. 2,000 Hz  
e. 20,000 Hz  

8. Which of these is the lowest intensity of sound a person can hear?

a. 10 dB  
b. 1 W/m²  
c. $10^{-12}$ W/m²  
d. 10 W/m²
9. Which of these statements about sound waves is/are correct?
   I. Sound waves do not require a medium.
   II. Sound waves are transverse waves.
   III. The wavelength of a sound wave changes when entering a different medium.
   IV. The pitch of a sound wave is characterized by its amplitude.
   a. III & IV
   b. III only
   c. I & III
   d. II and IV
   e. None of these are correct

10. A sound wave travels at a speed of 1000 m/s in a solid medium. If the wavelength is 0.5 m, what is the frequency of the wave?
   a. 250 Hz
   b. 4000 Hz
   c. 10,000 Hz
   d. 500 Hz
   e. 2000 Hz

11. For sound waves, pitch is dependent on ______ and volume is dependent on ______.
   a. condensation, rarefaction
   b. frequency, amplitude
   c. equilibrium, wavelength
   d. amplitude, velocity

12. The speed of a sound wave is dependent on which of these:
   I. medium
   II. wavelength
   III. frequency
   IV. amplitude
   a. II & III
   b. all of these
   c. I only
   d. I, II, and III

13. The resolution of an ultrasound imager is given by ______.
   a. the distance between the speaker and subject
   b. the number of waves emitted by the ultrasound speaker
   c. the frequency of the sound wave
   d. the wavelength of the sound wave

14. Consider this figure. What best describes the part labeled (1)?

15. Vibration of the vocal cords is caused by which of these phenomena?
   a. Pascal’s principle
   b. Bernoulli effect
   c. Boyle’s Law
   d. Resonance

16. The glottal stop is ______.
   a. a closing of the glottis
   b. relaxing of the vocal cords
   c. a technique to increase the loudness of your voice
   d. folding of the vocal folds

17. Which of these is primarily responsible for forcing air through the vocal cords?
   a. vocal cords
   b. diaphragm
   c. trachea
   d. thoracic cavity
   e. larynx
18. Longitudinal waves cause the medium to move  
   a. not at all  
   b. back and forth  
   c. in a circular path  
   d. up and down  

19. Consider these 3 waves. Which has the higher frequency?  
   a. A  
   b. B  
   c. C  
   d. all the same  
   ![Waves](image_url)

20. Consider the 3 waves in the previous problem. Which has the longer wavelength?  
   a. A  
   b. B  
   c. C  
   d. all the same  

21. What is the difference between a transverse and longitudinal wave?  
   a. the magnitude of the wavelength  
   b. how the medium moves in response to the wave  
   c. how the pressure changes with time  
   d. the elasticity of the medium  

22. A sodium atom has 11 protons. How many electrons does the sodium cation have?  
   a. 10  
   b. 11  
   c. 12  
   d. it depends on the number of neutrons  

23. To make an uncharged object have a negative charge we must:  
   a. add some atoms  
   b. remove some atoms  
   c. add some electrons  
   d. remove some electrons  
   e. write down a negative sign  

24. An electrical insulator is a material:  
   a. containing no electrons  
   b. must be a crystal  
   c. that has more electrons than protons on its surface  
   d. through which electrons do not flow easily  
   e. cannot be a pure chemical element  

25. Which of these has units of newtons per coulomb?  
   a. potential energy  
   b. electric potential  
   c. potential difference  
   d. electric forces  
   e. electric fields  

26. A positive and a negative particle experience a force that is  
   a. attractive  
   b. repulsive  
   c. non-existent  
   d. it depends on the magnitude of the charges
27. The diagram shows two pairs of heavily charged plastic cubes. Cubes 1 and 2 attract each other and cubes 1 and 3 repel each other.

Which of the following illustrates the forces of cube 2 on cube 3 and cube 3 on cube 2?

![Diagram of cubes and forces]

- a. A
- b. B
- c. C
- d. D
- e. E

28. Two charges, separated by distance d, experience a force of magnitude F. You decrease the distance to d/2. What is the new force on the charges?

- a. F/4
- b. F/2
- c. F
- d. 2F
- e. 4F

29. Consider this diagram of nerve cell in its resting potential state. More positive charges are outside of the cell; more negative cells are inside of the cell. The electric force would cause a positive potassium ion (K+) to move in which direction?

- a. into the cell
- b. out of the cell
- c. remain stationary
- d. stay in the middle of the membrane

30. Consider this plot that shows the membrane potential as a function of time. The point at a potential of -55 millivolts is known as the

![Graph of membrane potential vs. time]

- a. depolarization
- b. resting potential
- c. action potential
- d. threshold potential
31. Consider the plot in the previous question. The point at a potential of -70 millivolts is known as the _________.
   a. action potential
   b. threshold potential
   c. depolarization
   d. resting potential

32. Consider this figure of a neuron.

Which part of the neuron passes on an electrical signal to another neuron?
   a. (1)
   b. (2)
   c. (3)
   d. (4)

33. In which part of the neuron does the action potential propagate?
   a. (1)
   b. (2)
   c. (3)
   d. (4)

34. Which part of the neuron controls the electrical signal that passes through the neuron?
   a. (1)
   b. (2)
   c. (3)
   d. (4)

35. Neurons have two types of extensions. They are dendrites and _________.
   a. myelins
   b. glands
   c. axons
   d. membranes

36. The two main parts of the nervous system are the ________ and ________ nervous systems.
   a. electrical and magnetic
   b. upper and lower
   c. central and peripheral
   d. periodontic and pulmonary
   e. periphrastic and locomotive

37. The InBody 230, a direct segmental multi-frequency bioimpedance analysis device, measures what property of the body?
   a. electric potential energy
   b. electric potential
   c. electrical current
   d. electrical resistance

38. The e-meter, used by Scientologists, sends a ________ through the body in order to measure the body’s _________.
   a. charge, potential
   b. wave, voltage
   c. current, resistance
   d. bug, susceptibility

39. Electric potential is a measure of _________.
   a. force per charge
   b. energy per charge
   c. voltage per charge
   d. force

40. This positive particle sits between two charged plates. The plate on the left has a high potential, and the right plate has a low potential. What will happen to the particle?
   a. it will move to the right
   b. it will move to the left
   c. it will remain stationary
41. Generally, electric charges will move in such a way that their potential energy __________.
   a. increases
   b. decreases
   c. remains the same

42. Which of these are possible units for potential?
   I. volts
   II. joules/coulomb
   III. newtons/coulomb
   IV. ohm-meters
   a. III & IV
   b. I & II
   c. I
   d. I & III

43. Devices with a high power rating, such as a hair dryer, have very large currents flowing through them. How does the resistance of a high-power device compare with a low-power device?
   a. the high-power device has a larger resistance
   b. the high-power device has a smaller resistance
   c. they have the same resistance

44. Current is best described by which of these relationships:
   a. energy/charge
   b. work/time
   c. charge/time
   d. force/charge
   e. voltage/time

45. Which of these household devices has a higher power rating?
   a. clock radio
   b. bathroom heater
   c. washing machine
   d. desktop computer

46. A circuit consists of a battery and resistor. If I increase the resistance of the resistor, what happens to the current in the circuit?
   a. the current increases
   b. the current decreases
   c. the current remains the same
   d. it depends on the voltage of the battery

47. Consider this circuit. What is the current through the circuit?

   ![Circuit Diagram]

   a. 12 A
   b. 3 A
   c. 0.25 A
   d. 4 A
   e. 36 A

48. A capacitor serves which of these functions:
   I. Resist the flow of electricity
   II. Cause current to flow in a circuit
   III. Store charge.
   IV. Store electrical energy.
   a. I & II
   b. III & IV
   c. I & III
   d. III

49. A capacitor consists of 2 metal plates. Do these plates come into contact, while the capacitor is functioning properly?
   a. Yes, they always touch.
   b. No, they never touch.
   c. Sometimes.

50. A capacitor consists of 2 metal plates of area, A, and separation, d. If the plates are separated by a distance 2d, by what amount is their capacitance changed?
   a. 1/4
   b. 1/2
   c. 2
   d. 4
MULTIPLE CHOICE

1. ANS: A  PTS: 1  REF: S16
2. ANS: D  PTS: 1  REF: S16
3. ANS: C  PTS: 1  REF: S16
4. ANS: E  PTS: 1  REF: S16
5. ANS: D  PTS: 1  REF: S16
6. ANS: D  PTS: 1  REF: S16
7. ANS: B  PTS: 1  REF: S16
8. ANS: C  PTS: 1  REF: S16
9. ANS: E  PTS: 1  REF: S16
10. ANS: E  PTS: 1  REF: S16
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13. ANS: D  PTS: 1  REF: S16
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20. ANS: C  PTS: 1  REF: S16
21. ANS: B  PTS: 1  REF: S16
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23. ANS: C  PTS: 1  REF: S16
24. ANS: D  PTS: 1  REF: S16
25. ANS: E  PTS: 1  REF: S16
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37. ANS: D  PTS: 1  REF: S16
38. ANS: C  PTS: 1  REF: S16
39. ANS: B  PTS: 1  REF: S16
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