Multiple Choice
Identify the choice that best completes the statement or answers the question.

1. Doug rubs a piece of fur on a hard rubber rod, giving the rod a negative charge. What happens?
   a. Electrons are added to the rod.
   b. Protons are removed from the rod.
   c. The fur is left neutral.
   d. The fur is also charged negatively.

2. A metallic object holds a charge of \(-3.8 \times 10^{-6}\) C. What total number of electrons does this represent?
   a. \(2.4 \times 10^{13}\)
   b. \(1.6 \times 10^{14}\)
   c. \(6.1 \times 10^{13}\)
   d. \(4.2 \times 10^{14}\)

3. Which of the following best characterizes electrical conductors?
   a. Electric charges move freely
   b. Poor heat conductors
   c. Low mass density
   d. High tensile strength

4. What happens when you bring a negatively charged plastic rod near to but do not touch the end of a neutral copper wire that is able to rotate about its center (as in this figure)?
   a. The wire will be attracted to the plastic rod
   b. The wire will move away from the rod
   c. Nothing will happen unless the two objects touch
   d. It depends on the length of the wire.

5. Two charged balls are repelling each other as they hang from the ceiling. What can you say about their charges?

   a. one is positive, one is negative
   b. both are positive
   c. both are negative
   d. either both are positive or both are negative

6. In this figure, a -Q charge sits in the middle of a square that has 4 charges at each corner. The net force vector on the -Q charge lies in which of the quadrants?

   a. I
   b. II
   c. III
   d. IV
   e. There is no net force
7. If the distance between 2 negatively charged ions is doubled, the force on one of them due to the other will:
   a. increase by a factor of 2
   b. remain the same
   c. decrease by a factor of 2
   d. decrease by a factor of 4
   e. increase by a factor of 4

8. What is the magnitude of the force on the 5 nC charge in this figure?

   ![Image](image_url)
   a. 2.1 N
   b. 1.8x10^{-8} N
   c. 4.5x10^{-7} N
   d. 9.0x10^{-8} N

9. For the figure in the previous question, what is the direction of the force on the 5 nC charge?
   a. 53° above the +x axis
   b. 45° from the +y axis
   c. 53° below the +x axis
   d. 37° above the +x axis
   e. 37° below the -x axis

10. This figure shows 3 charged particles. What is the force on q₁?

    ![Image](image_url)
    a. 0 N
    b. 0.45 N
    c. 0.675 N
    d. -1.125 N

11. The diagram shows three heavily charged plastic cubes. The net force on cube #3 is shown. If cube #3 is positively charged, what are the charges on cubes 1 and 2, respectively?

    ![Image](image_url)
    a. cube 1 is positive; cube 2 is negative
    b. cube 1 is positive; cube 2 is positive
    c. cube 1 is negative; cube 2 is positive
    d. cube 1 is positive; cube 2 is negative
    e. cube 1 and cube 2 are both positive
12. A proton is 3 m from a 1 nC charge. What initial acceleration does it experience?

- a. 300,000,000 m/s²
- b. 100,000 m/s²
- c. 100,000,000 m/s²
- d. 200,000 m/s²

13. For this figure, what is the magnitude of the electric field at point A?

![Diagram of electric field lines]

- a. 11.3 N/C
- b. 12.1 N/C
- c. 10.4 N/C
- d. 12.8 N/C
- e. 15.2 N/C

14. Consider these two charges and their resultant electric field lines. If q₂ has a charge of +2 C, what is the charge on q₁?

![Diagram of charges and field lines]

- a. +2 C
- b. -16 C
- c. +8 C
- d. +16 C

15. A charge of +2 C is at the origin. When charge Q is placed at 2 m along the positive x axis, the electric field at 2 m along the negative x axis becomes zero (where x marks the spot). What is the value of Q?

![Diagram of charges and field lines]

- a. −8 C
- b. −6 C
- c. −3 C
- d. −7 C
16. A 4.00 C charge, whose mass is 5.00 kg, is at rest and then released in an electric field of magnitude 50.0 N/C. The charge begins to move. How fast does it move after 2 seconds?

a. 2000 m/s  
b. 10 m/s  
c. 80 m/s  
d. 5.0 m/s

17. Which of these is not a unit for the electric field?

a. $\frac{N}{C}$  
b. $\frac{V}{m}$  
c. $\frac{kg \cdot m}{s^2 \cdot C}$  
d. all of these are units for the electric field

18. This diagram shows two charges and their electric field lines. At what point is the magnitude of the electric field the largest?

a. A  
b. B  
c. C  
d. D  
e. the E-field is the same at all points

19. You are sitting a certain distance from a point charge, and you measure an electric field of $E_o$. If your distance from the charge is halved, what is the new electric field that you measure?

a. $E_o$  
b. $E_o/4$  
c. $E_o/8$  
d. $4 E_o$  
e. $8 E_o$

20. This figure shows three charges at three corners of a square. What is the potential at point P?

-20 nC  
+10 nC  
+20 nC

a. 424 V  
b. 45 V  
c. 64 V  
d. 0 V

21. Which of these is a conservative force?

I. Electric force  
II. Frictional force  
III. Gravitational force  
IV. Electric potential

a. I & III  
b. II  
c. I, III, & IV  
d. all of these
22. This diagram shows a collection of charges. At which point is the potential equal to zero?

![Diagram of charges]

a. a  
b. b  
c. c  
d. d  
e. e

23. A negative charge moves along an equipotential line. Which of these statements is true?

a. the force on the charge is opposite the equipotential line because it is negative
b. zero work is required to move the charge along this line
c. the charge experiences a greater change in potential than a positive charge
d. the potential the charge experiences continuously decreases

24. Electric potential is a measure of:

a. momentum/charge  
b. force  
c. energy/charge  
d. force/charge

25. Negative charges move from...

a. high potential to low potential  
b. low potential to high potential  
c. remain in place  
d. it depends on the magnitude of the charge and potential

26. Who is Dr. Young’s favorite student?

a. Jeff Thibodeaux  
b. Jessica Gauthreaux  
c. Riley Griffin  
d. Taylor Hebert  
e. Me!
MULTIPLE CHOICE

1. ANS: A  PTS: 1  REF: S15
2. ANS: A  PTS: 1  REF: S15
3. ANS: A  PTS: 1  REF: S15
4. ANS: A  PTS: 1  REF: S15
5. ANS: D  PTS: 1  REF: S15
6. ANS: B  PTS: 1  REF: S15
7. ANS: D  PTS: 1  REF: S15
8. ANS: B  PTS: 1  REF: S15
9. ANS: C  PTS: 1  REF: S15
10. ANS: A  PTS: 1  REF: S15
11. ANS: C  PTS: 1  REF: S15
12. ANS: C  PTS: 1  REF: S15
13. ANS: C  PTS: 1  REF: S15
14. ANS: C  PTS: 1  REF: S15
15. ANS: A  PTS: 1  REF: S15
16. ANS: C  PTS: 1  REF: S15
17. ANS: D  PTS: 1  REF: S15
18. ANS: B  PTS: 1  REF: S15
19. ANS: D  PTS: 1  REF: S15
20. ANS: B  PTS: 1  REF: S15
21. ANS: A  PTS: 1  REF: S15
22. ANS: B  PTS: 1  REF: S15
23. ANS: B  PTS: 1  REF: S15
24. ANS: C  PTS: 1  REF: S15
25. ANS: B  PTS: 1  
26. ANS: E  PTS: 1