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

1. What is the magnitude of the force on the -6 nC charge in this figure?
   - [ ] a. $6.5 \times 10^{-7}$ N
   - [ ] b. $3.2 \times 10^{-7}$ N
   - [ ] c. $2.3 \times 10^{-7}$ N
   - [ ] d. $0.32$ N

2. In the previous figure, what is the direction of the force on the -6 nC charge?
   - [ ] a. 45º below the +x axis
   - [ ] b. 45º above the +x axis
   - [ ] c. 30º from the -x axis
   - [ ] d. 135º CCW the +x axis

3. A charged sphere is stationary in an electric field of 1000 N/C; the electric field points downward. The sphere has a mass of 1.20 kg. What is the charge on the sphere?
   - [ ] a. -0.012 C
   - [ ] b. $-1.6 \times 10^{-19}$ C
   - [ ] c. $1.2 \times 10^{-5}$ C
   - [ ] d. 11.8 C
4. If the charge on q₁ has a magnitude of 3 nC, what is the charge on q₂?

a. -12 nC  

b. -9 nC  

c. 9 nC  

d. -18 nC  

e. 18 nC

5. Consider these 2 separate arrangements of insulating materials. If q₃ has a negative charge, what is the charge of q₁?

a. positive  

b. negative  

c. neutral  

d. not enough information

6. Two charges experience an electric force of 20 N. If the distance between the 2 charges is doubled, what is the new force on the charges?

a. 20 N  

b. 10 N  

c. 40 N  

d. 5 N
7. Consider these 2 charges. Where on the x-axis can a third positive charge be placed such that the net force on that charge is zero?

-Q
____________________
3Q

a. to the left of -Q  
   b. in between -Q and 3Q  
   c. to the right of 3Q  
   d. it is not possible

8. Which of these is not an allowable charge?

a. -1.6\times10^{-19} \text{ C}  
b. 8.0\times10^{-19} \text{ C}  
c. 2.4\times10^{-19} \text{ C}  
d. 25\text{ C}

9. Which vector in this figure best represents the direction of the electric field at the point P due to the two charges?

a. A  
b. B  
c. C  
d. D  
e. E
10. One electron-volt is the kinetic energy that an electron acquires when it accelerates across a potential difference of 1 V. What is the speed of an electron with an energy of 1 electron-volt?

- a. $5.9 \times 10^5$ m/s
- b. 52 m/s
- c. $3.5 \times 10^{11}$ m/s
- d. $1.6 \times 10^{-19}$ m/s

11. In this figure, an electron sits between two charged plates. The electron moves to the right in response to the electric field. What is the direction of the electric field in between the plates?

- a. to the right
- b. to the left
- c. up
- d. down

12. What is the potential at point B if $q_1 = 2 \mu$C and $q_2 = -2 \mu$C?

- a. 8100 V
- b. -900 V
- c. 0 V
- d. 3.2 V
13. A capacitor is hooked up to a battery with voltage of 12 V. After charging the capacitor, the battery is removed. What is the voltage across the capacitor if the area of the plates is doubled?

a. 6 V  
b. 18 V  
c. 12 V  
d. 24 V  
e. 0 V

14. These six charges are at the corner of an equilateral hexagon. What pair of statements best describes the electric field and potential at a point in the center of the hexagon, equidistant from each of the charges?

a. $E \neq 0$, $V \neq 0$  
b. $E = 0$, $V \neq 0$  
c. $E \neq 0$, $V = 0$  
d. $E = 0$, $V = 0$
15. The following graph is for potential (V) versus position (x). If a proton is released at point x=A, what direction will it move?

- a. it will be stationary
- b. it will oscillate around point A
- c. to the right
- d. to the left
- e. none of these

16. What is the equivalent capacitance of this circuit?

- a. 2 μF
- b. 5.7 μF
- c. 11 μF
- d. 2.5 μF
17. A capacitor of 3\(\mu\)F is hooked up to a 10V battery. How much energy does the capacitor have after charging completely?

a. 15 J  

b. 3x10\(^{-4}\) J  
c. 1.5x10\(^{-4}\) J  
d. 30 J

18. Three charged particles have a charge of +3 \(\mu\)C each and are arranged at the apexes of an equilateral triangle as shown. The sides of the triangle are 0.1 m in length. How much work is required to assemble these charges?

a. 1.2 J  

b. 4.3 J  
c. 3.1 J  
d. 2.4 J
19. What is the voltage across the circled capacitor in this figure?

![Diagram of capacitors](image)

- a. 3.33 V
- b. 10 V
- c. 5 V
- d. 1 V
- e. 2.5 V

20. Two wires, A and B, are made of the same metal and have equal length, but the resistance of wire A is four times the resistance of wire B. How do their diameters compare?

- a. \(d_A = 4d_B\)
- b. \(d_A = 2d_B\)
- c. \(d_A = d_B\)
- d. \(d_A = \frac{1}{2}d_B\)
- e. \(d_A = \frac{1}{4}d_B\)

21. Which of these has the greater resistance, a incandescent light bulb (60 W) or a bathroom heater?

- a. both the same
- b. bulb
- c. heater

22. A 1 volt potential difference is observed across a 10 \(\Omega\) resistor. What is the current through the resistor?

- a. 0.1 A
- b. 100 A
- c. 10 A
- d. 1 A
23. When you apply a potential of 3 V to a particular electrical device, the current is 2 A. When you apply 6 V, the current is 3 A. Is this device Ohmic or Non-Ohmic?
   a. Non-Ohmic
   b. Ohmic
   c. Neither
   d. Not enough information

24. A current of 20 A flows through a wire of length 1 m and cross-sectional area $7.85 \times 10^{-7}$ m$^2$. The potential across the wire is 1.4 V. From this table of resistivities, select the material of the wire:

<table>
<thead>
<tr>
<th>Material</th>
<th>Resistivity (Ohm-m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>$1.7 \times 10^{-8}$</td>
</tr>
<tr>
<td>Silver</td>
<td>$1.59 \times 10^{-8}$</td>
</tr>
<tr>
<td>Gold</td>
<td>$2.44 \times 10^{-8}$</td>
</tr>
<tr>
<td>Tungsten</td>
<td>$5.5 \times 10^{-8}$</td>
</tr>
<tr>
<td>Iron</td>
<td>$10.0 \times 10^{-8}$</td>
</tr>
</tbody>
</table>

   a. Copper
   b. Silver
   c. Gold
   d. Tungsten
   e. Iron

25. A $50 \Omega$ resistor is hooked up to a power supply of 150 V. What is the power dissipated across the resistor?

   a. 7500 W
   b. 450 W
   c. 3 W
   d. 0.33 W

26. The answer for this question is “C.” Bubble “C” for this question.
   a. A
   b. B
   c. C
   d. D
Exam 1--PHYS 102--Spring 2010
Answer Section

MULTIPLE CHOICE

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