

Name:

Physics 2140: Example Exam Chapters 15-17.3

Real Exam Date 4 February 2004

20 multiple choice questions worth 5 points each.

- Two point charges are 4 cm apart. They are moved to a new separation of 2 cm. By what factor does the resulting mutual force between them change?
 - 1/2
 - 2
 - 1/4
 - 4
- Two point charges are separated by 10.0 cm and have charges of +2.00 and -2.00 μC , respectively. What is the electric field at a point midway between the two charges? ($k_e = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$)
 - $28.8 \times 10^6 \text{ N/C}$
 - $14.4 \times 10^6 \text{ N/C}$
 - $7.19 \times 10^6 \text{ N/C}$
 - zero
- Which of the following best characterizes electrical insulators?
 - charges on the surface don't move
 - high tensile strength
 - electric charges move freely
 - good heat conductors
- If the distance between two point charges is tripled, the mutual force between them will be changed by what factor?
 - 9.0
 - 3.0
 - 0.33
 - 1/9

5. When a glass rod is rubbed with silk, which of the following statements best describes what happens?
- a. electrons are removed from the rod
 - b. protons are removed from the silk
 - c. the silk is charged positively
 - d. the silk remains neutral
6. Electric field is dimensionally equivalent to which of the following?
- a. N-m/C
 - b. N/C
 - c. N-m²/C²
 - d. N/C²
7. The electric field in a cathode ray tube is supposed to accelerate electrons from 0 to 1.60×10^7 m/s in a distance of 2.00 cm. What electric field is required? ($m_e = 9.11 \times 10^{-31}$ kg and $e = 1.60 \times 10^{-19}$ C)
- a. 9 110 N/C
 - b. 18 200 N/C
 - c. 36 400 N/C
 - d. 72 800 N/C
8. A gold ball holds a charge of 3.2×10^{-8} C. What total number of singly charged gold ions does this represent? ($e = 1.6 \times 10^{-19}$ C is the magnitude of the electronic charge.)
- a. 4.0×10^{11}
 - b. 2.0×10^{13}
 - c. 2.0×10^{11}
 - d. 1.0×10^{10}

9. A proton ($+1.6 \times 10^{-19}$ C) moves 10 cm along the direction of an electric field of strength 3.0 N/C. The electrical potential difference between the proton's initial and ending points is:
- a. 4.8×10^{-19} V
 - b. 0.30 V
 - c. 0.033 V
 - d. 30 V
10. If three 4.0- μ F capacitors are connected in parallel, what is the combined capacitance?
- a. 12 mF
 - b. 0.75 mF
 - c. 8.0 mF
 - d. 0.46 mF
11. The quantity of electrical potential, the volt, is dimensionally equivalent to:
- a. force/charge
 - b. force-charge
 - c. electric field-distance
 - d. electric field/distance
12. Inserting a dielectric material between two charged parallel conducting plates, originally separated by air and disconnected from a battery, will produce what effect on the capacitor?
- a. increase charge
 - b. increase voltage
 - c. increase capacitance
 - d. decrease capacitance

- 13.** Find the electrical potential at 0.15 m from a point charge of $6.0 \mu\text{C}$. ($k_e = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$)
- a.** $5.4 \times 10^4 \text{ V}$
 - b.** $3.6 \times 10^5 \text{ V}$
 - c.** $2.4 \times 10^6 \text{ V}$
 - d.** $1.2 \times 10^7 \text{ V}$
- 14.** Two point charges of values $+3.4$ and $+6.6 \text{ mC}$, respectively, are separated by 0.20 m. What is the potential energy of this 2-charge system? ($k_e = 8.99 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$)
- a.** $+0.34 \text{ J}$
 - b.** -0.75 J
 - c.** $+1.0 \text{ J}$
 - d.** -3.4 J
- 15.** An electron in a TV picture tube is accelerated through a potential difference of 10 kV before it hits the screen. What is the kinetic energy of the electron in electron volts? ($1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$)
- a.** $1.0 \times 10^4 \text{ eV}$
 - b.** $1.6 \times 10^{-15} \text{ eV}$
 - c.** $1.6 \times 10^{-22} \text{ eV}$
 - d.** $6.25 \times 10^{22} \text{ eV}$
- 16.** A 0.25-mF capacitor is connected to a 400-V battery. What potential energy is stored in the capacitor?
- a.** $1.2 \times 10^{-12} \text{ J}$
 - b.** $1.0 \times 10^{-4} \text{ J}$
 - c.** 0.040 J
 - d.** 0.020 J

17. A parallel-plate capacitor has a capacitance of $20 \mu\text{F}$. What potential difference across the plates is required to store $7.2 \times 10^{-4} \text{ C}$ on this capacitor?
- a. 36 V
 - b. $2.2 \times 10^{-2} \text{ V}$
 - c. $1.4 \times 10^{-8} \text{ V}$
 - d. 68 V
18. A wire carries a steady current of 0.1 A over a period of 20 s. What total charge passes through the wire in this time interval?
- a. 200 C
 - b. 20 C
 - c. 2 C
 - d. 0.005 C
19. If a metallic wire of cross sectional area $3.0 \times 10^{-6} \text{ m}^2$ carries a current of 6.0 A and has a mobile charge density of $4.24 \times 10^{28} \text{ carriers/m}^3$, what is the average drift velocity of the mobile charge carriers? (charge value = $1.6 \times 10^{-19} \text{ C}$)
- a. $3.4 \times 10^3 \text{ m/s}$
 - b. $1.7 \times 10^3 \text{ m/s}$
 - c. $1.5 \times 10^{-4} \text{ m/s}$
 - d. $2.9 \times 10^{-4} \text{ m/s}$
20. In a certain material there is a current of 16 A flowing through a surface to the right, and there is an equal amount of positive and negative charge passing through the surface producing the current. How much negative charge passes through the surface?
- a. 8 C/s toward the right
 - b. 8 C/s toward the left
 - c. 16 C/s toward the right
 - d. 16 C/s toward the left