

Physics 104 Exam 1

Name _____ ID # _____

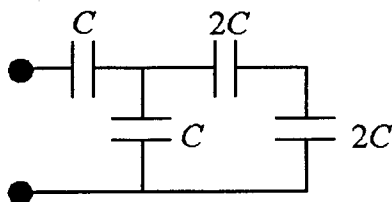
Section # _____ TA Name _____

Fill in your name, student ID # (not your social security #), and section # on the scantron sheet. Fill in the letters given for the first 5 questions on the scantron sheet. These letters determine which version of the test you took and are IMPORTANT to get right.

1. C
2. B
3. E
4. A
5. D
6. Two point charges, separated by 1.5 cm, have charges of $+2.0 \mu\text{C}$ and $-4.0 \mu\text{C}$, respectively. Suppose you determine that 10 field lines radiate out from the $+2.0 \mu\text{C}$ charge. If so, what might be inferred about the $-4.0 \mu\text{C}$ charge with respect to field lines?
 - a. 20 radiate in
 - b. 10 radiate in
 - c. 5 radiate out
 - d. 20 radiate out
 - e. 10 radiate out
7. An electron with a charge of $-1.6 \times 10^{-19} \text{ C}$ is moving in an electric field of 400 N/C . What force does the electron experience?
 - a. $2.3 \times 10^{-22} \text{ N}$
 - b. $1.9 \times 10^{-21} \text{ N}$
 - c. $6.4 \times 10^{-17} \text{ N}$
 - d. $4.9 \times 10^{-17} \text{ N}$
 - e. $3.2 \times 10^{-17} \text{ N}$
8. You have a hollow metallic sphere with charge $-5.0 \mu\text{C}$ and radius 5.0 cm. You insert a $+10 \mu\text{C}$ charge at the center of the sphere through a hole in the surface. What charge now rests on the outer surface of the sphere?
 - a. $+15 \mu\text{C}$
 - b. $-5 \mu\text{C}$
 - c. $+10 \mu\text{C}$
 - d. $+5 \mu\text{C}$
 - e. $-10 \mu\text{C}$

9. You wish to use a positively charged rod to charge a ball by induction. Which statement is correct?
- The ball must be an insulator that is connected temporarily to the ground.
 - The ball is charged as the area of contact between the two increases.
 - The ball must be a conductor.
 - The charge on the ball will be positive.
 - The ball must be an insulator.
10. The beam of electrons that hits the screen of an oscilloscope is moved up and down by:
- the electron gun.
 - electrical charges on deflecting plates.
 - a phosphorescent coating.
 - gravity.
 - electrical charges on the screen.
11. Two point charges of values $+3.4 \mu\text{C}$ and $+6.6 \mu\text{C}$ are separated by 0.10 m . What is the electrical potential at the point midway between the two point charges? ($k = 9 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$)
- $+0.9 \times 10^6 \text{ V}$
 - $+3.6 \times 10^6 \text{ V}$
 - $-0.9 \times 10^6 \text{ V}$
 - $+1.8 \times 10^6 \text{ V}$
 - $-1.8 \times 10^6 \text{ V}$
12. An electron in a cathode ray tube is accelerated through a potential difference of 5 kV . What kinetic energy does the electron gain in the process? ($q_e = -1.6 \times 10^{-19} \text{ C}$)
- $1.6 \times 10^{-16} \text{ J}$
 - $8.0 \times 10^{-16} \text{ J}$
 - $1.6 \times 10^{-22} \text{ J}$
 - $8.0 \times 10^{-22} \text{ J}$
 - $4.0 \times 10^{-16} \text{ J}$
13. Two capacitors with capacitances of 1.0 and $0.5 \mu\text{F}$, respectively, are connected in parallel. The system is connected to a 100 V battery. What electrical potential energy is stored in the $1.0 \mu\text{F}$ capacitor?
- $1.7 \times 10^{-3} \text{ J}$
 - $7.5 \times 10^{-3} \text{ J}$
 - $5.0 \times 10^{-3} \text{ J}$
 - $10.0 \times 10^{-3} \text{ J}$
 - $2.5 \times 10^{-3} \text{ J}$

14. In which case does an electric field do positive work on a charged particle?
- a positive charge completes one circular path around a stationary positive charge.
 - a positive charge completes one elliptical path around a stationary positive charge.
 - a positive charge is moved to a point of higher potential energy.
 - a negative charge moves opposite to the direction of the electric field.
 - a positive charge moves opposite to the direction of the electric field.
15. If $C = 36 \mu\text{F}$, determine the equivalent capacitance for the combination shown.
- $36 \mu\text{F}$
 - $32 \mu\text{F}$
 - $28 \mu\text{F}$
 - $24 \mu\text{F}$
 - $20 \mu\text{F}$

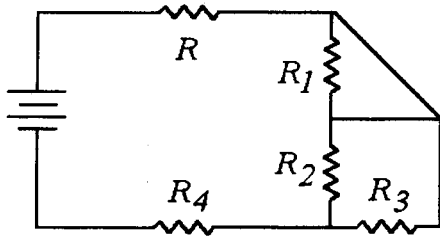


16. If a 500 W heater carries a current of 4.0 A, what is the resistance of the heating element?
- 31.3Ω
 - 11.2Ω
 - 42.8Ω
 - 85.7Ω
 - 62.6Ω
17. A 500 W heater carries a current of 4.0 amperes. How much does it cost to operate the heater for 30 minutes if electrical energy costs 6 cents per kW-hr?
- 18.0 cents
 - 36.0 cents
 - 9.0 cents
 - 1.5 cents
 - 3.0 cents

18. An electric clothes dryer draws 15 A at 220 V. If the clothes put into the dryer have a mass of 7 kg when wet and 4 kg dry, how long does it take to dry the clothes? (Assume all heat energy goes into vaporizing water, $L_{\text{vap}} = 2.26 \times 10^6 \text{ J/kg.}$)
- 20.0 min
 - 15.6 min
 - 34.2 min
 - 55.1 min
 - 26.4 min
19. When you flip a switch to turn on a light, the delay before the light turns on is determined by:
- the speed of the electric field moving in the wire.
 - the density of electrons in the wire.
 - the drift speed of the electrons in the wire.
 - the number of electron collisions per second in the wire.
 - none of these, since the light comes on instantly.
20. A platinum wire is utilized to determine the melting point of indium. The resistance of the platinum wire is 2Ω at 20°C and increases to 3.072Ω as the indium starts to melt. $\alpha_{\text{platinum}} = 3.92 \times 10^{-3}/^\circ\text{C}$. What is the melting temperature of indium?
- 351°C
 - 731°C
 - 157°C
 - 137°C
 - 430°C
21. Two resistors of values 6Ω and 12Ω are connected in parallel. This combination in turn is connected in series with a 3Ω resistor and a 21 V battery. What is the current in the 6Ω resistor?
- 12.0 A
 - 3.0 A
 - 2.0 A
 - 4.0 A
 - 6.0 A

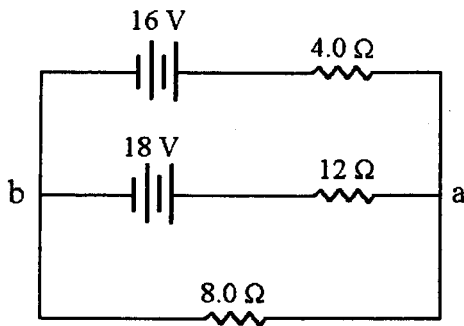
22. Which resistor is in series with resistor R ?

- a. R_1
- b. R_2
- c. R_3
- d. R_4
- e. none of the above



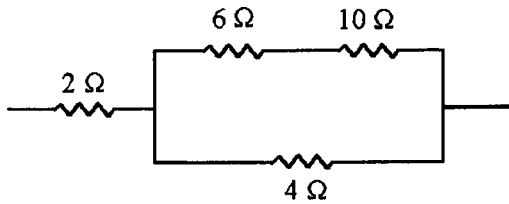
23. What is the current through the $8\ \Omega$ resistor?

- a. 1.0 A
- b. 0.5 A
- c. 1.5 A
- d. 2.0 A
- e. 3.0 A



24. What is the equivalent resistance for these resistors?

- a. 2.3Ω
- b. 2.25Ω
- c. 3.0Ω
- d. 22Ω
- e. 5.2Ω



25. Two resistors of values 6Ω and 12Ω are connected in parallel. This combination in turn is connected in series with a 3Ω resistor and a 21 V battery. What is the current in the 6Ω resistor?

- a. 12.0 A
- b. 3.0 A
- c. 2.0 A
- d. 4.0 A
- e. 6.0 A