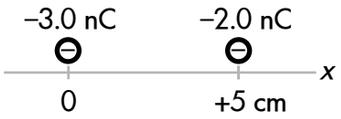
Closed book. Clearly circle your choice. No work needs to be shown for multiple-choice questions. No partial credit is given for multiple-choice questions.

1. [3.0 points.] Two point charges lie along the *x*-axis. A –3.0 nC charge is held at the origin, and a –2.0 nC charge is at $x = +5$ cm. In order to decrease their electric potential energy (make it a smaller positive number), the –2.0 nC charge should be moved to the:



(A) left.
(B) right.
(C) (Both of the above choices.)
(D) (Neither of the above choices; this change in electric potential energy is impossible.)
(E) (Not enough information is given.)

For questions (2)-(3), a 0.024 nF capacitor is made from two foil sheets with a plastic spacer between them. The foil sheets are connected to a 9.0 V battery.

2. [3.0 points.] The charge stored in this capacitor is:
(A) 3.8×10^{11} C.
(B) 2.2×10^{-10} C.
(C) 2.7×10^{-12} C.
(D) 9.8×10^{-10} C.

3. [3.0 points.] If the foil sheets of this capacitor are instead connected to a 15.0 V battery, its _____ would increase.
(A) capacitance.
(B) charge.
(C) (Both of the above choices.)
(D) (Neither of the above choices.)
(E) (Not enough information is given.)

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4. [3.0 points.] Electric potential is measured in units of:
(A) A (amperes).
(B) C (coulombs).
(C) F (farads).
(D) J (joules).
(E) N/C (newtons per coulomb).
(F) Ω (ohms).
(G) V (volts).
(H) W (watts).

5. [3.0 points.] The unit of J (joules) is a measure of:
(A) electric field.
(B) electric potential.
(C) electric potential energy.
(D) power.
(E) charge.
(F) current.
(G) resistance.
(H) capacitance.

Questions (5)-(10) are continued on the back of this page.

Equations and constants:

$$|e| = 1.602\times10^{-19}\ \text{C};\ k = 8.99\times10^{9}\ \frac{\text{N}\cdot\text{m}^2}{\text{C}^2};\ EPE = k\frac{q_1 q_2}{r};\ \Delta EPE = q(\Delta V);\ V = k\frac{Q}{r}.$$

$$C = \frac{Q}{\Delta V};\ C = \frac{A}{4\pi kd};\ \Delta V = -Ed;\ EPE = \frac{1}{2}Q(\Delta V).$$

Name (last, first):

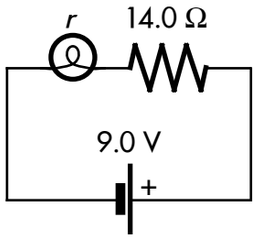
4-digit PIN:

Quiz 4

Closed book. Clearly circle your choice. No work needs to be shown for multiple-choice questions. No partial credit is given for multiple-choice questions.

This quiz continues from questions (1)-(5) on the other side of this page.

For questions (6)-(8), a light bulb (of unknown resistance *r*) and a 14.0 Ω resistor are connected to an ideal 9.0 V emf source. The current flowing through the light bulb is 0.59 A.

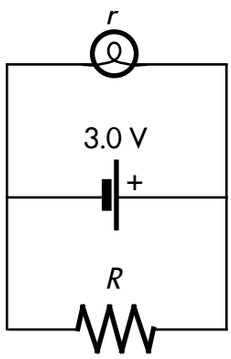


6. [3.0 points.] The current flowing through the resistor is _____ 0.59 A.
(A) less than.
(B) equal to.
(C) greater than.
(D) (Not enough information is given.)

7. [3.0 points.] The current flowing through the emf is _____ 0.59 A.
(A) less than.
(B) equal to.
(C) greater than.
(D) (Not enough information is given.)

8. [3.0 points.] The equivalent resistance of this circuit is _____ 14.0 Ω.
(A) less than.
(B) equal to.
(C) greater than.
(D) (Not enough information is given.)

For questions (9)-(10), a light bulb (of unknown resistance *r*) and a resistor (of unknown resistance *R*) are connected to an ideal 3.0 V emf source. The current flowing through the light bulb is 0.8 A, and the current flowing through the resistor is 1.4 A.



9. [3.0 points.] The current flowing through the emf source is:
(A) 0.51 A.
(B) 1.8 A.
(C) 2.2 A.
(D) 5.2 A.

10. [3.0 points.] The equivalent resistance of this circuit is:
(A) 0.51 Ω.
(B) 1.4 Ω.
(C) 2.1 Ω.
(D) 3.8 Ω.

Equations and constants:

$$I=\frac{\Delta q}{\Delta t};\ I=\frac{\Delta V}{R};\ P=I(\Delta V);\ \sum I_{in}=\sum I_{out};\ \sum_{loop}\Delta V_{rises}=\sum_{loop}\Delta V_{drops};\ R_{eq}=\sum R_i;\ \frac{1}{R_{eq}}=\sum\frac{1}{R_i}.$$