Prince Sultan University
Department of Mathematical Sciences
PHY 205
Second Semester 2011   **14/5/2011**
**Second Exam**   H.S.

NAME (Please Print)_____

Part 1.
Please circle the correct answer, to the nearest number for the
quantitative questions. *Each Question worth's 1 point.*

1. For an electron moving in a direction opposite to the electric field

(A) its potential energy increases and its electric potential decreases.
(B) its potential energy increases and its electric potential increases.
(C) its [potential energy decreases and its electric potential increases
(D) its potential energy decreases and its electric potential decreases.
(E) both its potential energy and it electric potential remain constant.

2. The equipotential surfaces between two spherical conductors are shown in the Figure
below, with the value of the potential marked for each line. What is the direction of the
electric field at point **F**?

(A) towards E
(B) towards A
(C) towards D
(E) towards G
(D) none of the above
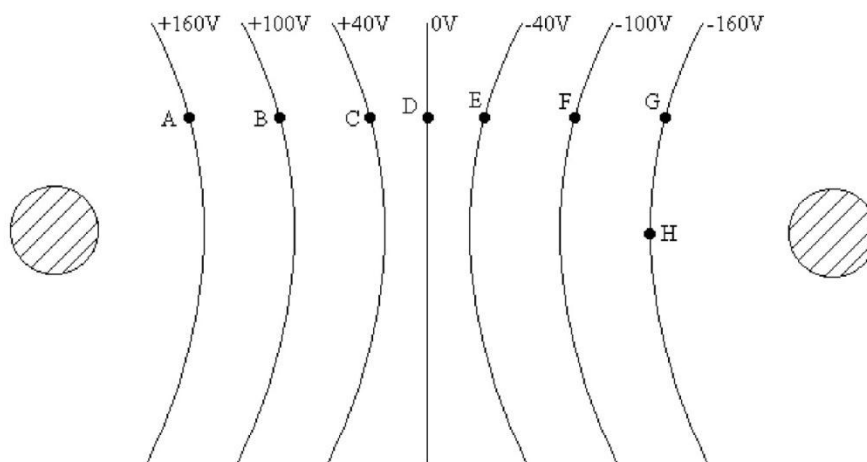
3. Which of the following is the correct unit for capacitance of a capacitor?

(A) J/C   (B) C/J^2 (C) C^2/J (D) C/J .   (E) N.m/C

4. The electric potential at the origin of an *xy*-coordinate system is **40 V**. A **-8.0-µC**
charge is brought from $x = +\infty$ to that point. What is the electric potential energy of this
charge at the origin?

(A) 3.2×10^{-4} J   (B) -3.2×10^{-49} J   (C) -40 µJ
(D) 40 µJ   (E) 80 µJ

5. An electron, initially at rest is accelerated through a potential difference of **550 V**. What is the speed of the electron due to this potential difference?

   (A)13.9×10^6 m/s   (B)1.44×10^6 m/s   (C) 1.59×10^6 m/s
   (D) 6.10×10^6 m/s   (E) 18.7×10^6 m/s

6. The potential difference between the plates of a parallel plate capacitor is **35 V** and the electric field between the plates has a strength of **750 V/m**. If the plate area is 4.0×10^{-2}**m^2**, what is the capacitance of this capacitor?

   (A) 7.6×10^{-14} F   (B) 7.6×10^{-11} F   (C) 7.6×10^{-10} F
   (D) 7.6×10^{-12}F   (E) None of the above.

7. The length of a certain wire is doubled while the radius is reduced by a factor of 4. What is the change in the resistance of this wire?

   (A) It is quadrupled.   (B) It stays the same.
   (C) It is increased by a factor of 32.   (D) It is increased by a factor of 16.
   (E) It is increased by a factor of 8.

8. Kirchhoff's junction rule is a statement of

   (A) the law of conservation of momentum.   (B) the law of conservation of mass.
   (C) the law of conservation of energy.   (D) Newton's 2nd Law.
   (E) the law of conservation of charge.

9. The power rating of a resistor is **0.80 W**. If the value of the resistor is **400 Ω**, what is the maximum current it can draw?

   (A) 18 mA   (B) 4.4 mA   (C) 2.0 mA   (D) 45 mA   (E) none of the above

10. A **100 V DC** signal is applied to four resistors as shown in the Figure below. The values of the resistors are **20 Ω, 40 Ω, 60 Ω**, and **80 Ω** What is the voltage across the **40 Ω** resistor??
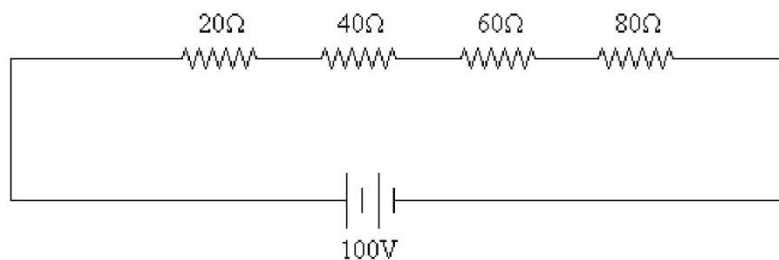
   (A) 40 V
   (B) 60 V
   (C) 80 V
   (D) 100 V
   (E) 20 V

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11. A **4.0-µC** charge is situated at the origin of an *xy*-coordinate system. What is the potential difference between a point $x_1 = 2.0$ m and another point $x_2 = 5.0$ m because of this charge?

(A) - 11×10^3 V   (B) - 33×10^3 V   (C) 0 V
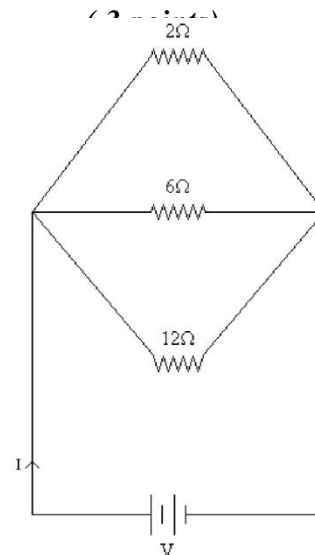
(D) + 33×10^3 V   (E) 11 x 10^3 V.

Part 2 . *Please show your work in the space provided.*

1. Three resistors of values **2 Ω, 6 Ω and 12 Ω** are connected across a **DC voltage** source as shown in the Figure below. If the total current through the circuit is $I = 5.0$ A, what is the current through the **12 Ω** resistor?

Answer (with units)_____

12. The figure shows a simple RC circuit consisting of a **100.0-V** battery in series with a **10.0-µF** capacitor and a resistor. Initially, the switch *S* is open and the capacitor is uncharged. **Two seconds** after the switch is closed, the voltage across the resistor is **37 V**. Determine the numerical value of the resistance *R*.   *(3 points)*