PHYS2002 – Practice Exam 1 – Spring 2016
(Ch. 18 – 20)

Name:_____

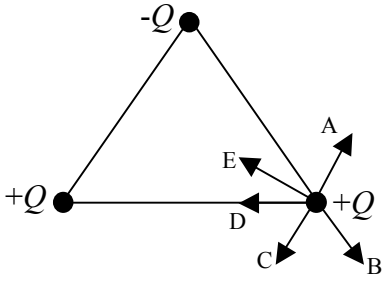
1. What is the total electric charge contained in 1.5 kg of electrons?

A. 1.60×10^{19} C
B. 1.44×10^{8} C
C. 8.98×10^{26} C
D. 1.65×10^{30} C
E. 2.64×10^{11} C

2. When two identical negative charges are separated by a distance of 6.2×10^{-10} m, the corresponding electrostatic force between them is 5.4×10^{-9} N. How many excess electrons reside on each charge?

A. 1
B. 3
C. 1.20×10^{5}
D. 2.08×10^{18}
E. 21

3. Three charges are fixed on the vertices of an equilateral triangle as shown below. Which arrow in the figure best represents the direction of the net electrostatic force acting on the $+Q$ charge at the lower right?



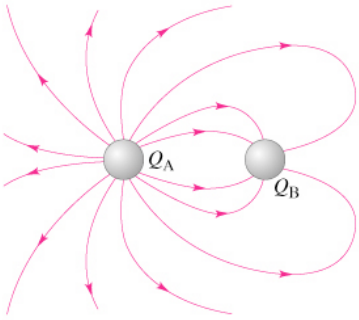
A. A
B. B
C. C
D. D
E. E

4. Two point charges of equal magnitude (and opposite sign) are 7.5 cm apart. At the midpoint of the line connecting them, their combined electric field has a magnitude of 45 N/C. What is the magnitude of each charge?

A. 1.41×10^{-11} C
B. 2.64×10^{-11} C
C. 7.04×10^{-12} C
D. 1.60×10^{-12} C
E. 3.52×10^{-12} C

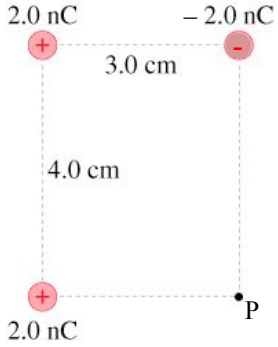
5. In the figure below, the electric field lines are shown for a system of two point charges. Which of the following choices could represent the magnitude and sign of Q_A and Q_B?

A. $Q_A = +q$, $Q_B = -q$
B. $Q_A = +7q$, $Q_B = -3q$
C. $Q_A = +3q$, $Q_B = -7q$
D. $Q_A = -3q$, $Q_B = +7q$
E. $Q_A = -7q$, $Q_B = +3q$



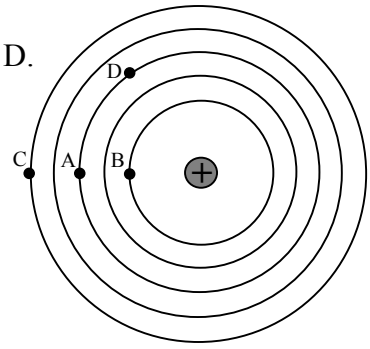
6. Three charges, equal in magnitude, are fixed to the vertices of a rectangle (side lengths of 3.0 and 4.0 cm) as shown in the figure below. Two of the charges are positive, and one is negative. The magnitude of each charge is 2 nC (2.0×10^{-9} C). What is the electric potential at point P?

A. 600 V
B. 360 V
C. 509 V
D. 450 V
E. 1400 V

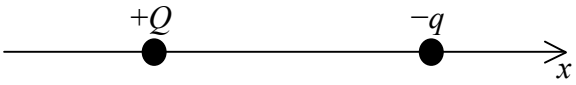


7. The figure below shows some of the equipotential surfaces surrounding a positive point charge. A proton is placed at position A. Which of the following is true?

A. Negative work is done on the proton when it moves from A to B.
B. Positive work is done on the proton when it moves from A to C.
C. The net work done on the proton is zero if it's moved from A to D.
D. All the above are true.
E. None of the above is true.

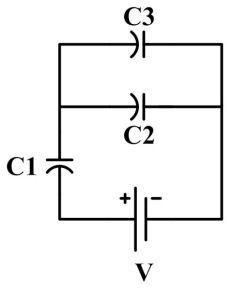


8. Charges of $+Q$ and $-q$ are located on the x-axis as shown, where the magnitude of Q is greater than the magnitude of q. Where on the axis could a third charge be placed, such that it feels no electrostatic force at all?



A. In between the two charges
B. To the right of the $-q$ charge.
C. To the left of the $+Q$ charge.
D. Anywhere, since a third charge would always feel no force.
E. Nowhere, since a third charge would always feel a force.

9. In the circuit shown in the figure, capacitor C1 has a value of 6.00 μF, C2 has a value of 2.00 μF, and C3 is 4.00 μF. What is the equivalent capacitance of the entire circuit?

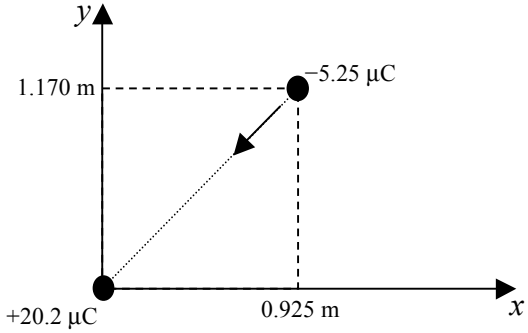


A. 12.00 μF
B. 0.33 μF
C. 3.00 μF
D. 6.17 μF
E. 2.50 μF

10. A 1,000-μF capacitor is fully charged with a 9.00-V battery. The capacitor is then disconnected from the battery and connected in series with a 5,000-Ω resistor. How long does it take the capacitor to discharge until only 448 μC of charge is left on the capacitor?

A. 20 s
B. 15 s
C. 10 s
D. 5 s
E. 0.25 s

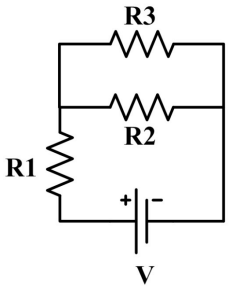
11. A charge of +20.2 μC is held fixed at the origin. A charge of −5.25 μC with mass 0.0032 kg is released from rest at the position $x = 0.925$ m, $y = 1.170$ m. What is the speed of the particle when it is half way to the origin?



A. 7 m/s
B. 10 m/s
C. 14 m/s
D. 20 m/s
E. 35 m/s

12. In the circuit shown in the figure resistor R1 has a value of 150 Ω, R2 has a value of 200 Ω, and R3 is 600 Ω. What is the equivalent resistance of the circuit?

A. 300 Ω
B. 125 Ω
C. 950 Ω
D. 150 Ω
E. 1200 Ω



13. A circuit with a 30-V battery connected to a 3.75-Ω resistor is used to melt a block of ice. How many seconds will this resistor take to melt 0.430 kg of ice at 0°C? The latent heat of fusion (L_F) for water is 33.5×10^4 J/kg. Recall that $Q = mL_F$.

A. 100 s
B. 300 s
C. 600 s
D. 1200 s
E. 1500 s

14. A parallel plate capacitor is constructed from two plates each of area 0.2 m^2 and separated by a distance of 0.025 mm. The volume between the two plates is filled with a dielectric. When there is a charge of 120 μC on the capacitor the voltage difference across the plates is 750 V. What is the value of the dielectric constant?

A. 0.442
B. 2.26
C. 4.52
D. 2260
E. 1.62

15. What is the resistance of a piece of circular copper wire with a diameter of 0.55 mm that is stretched between Baton Rouge and New Orleans – a distance of 70 miles (1.13×10^5 m)? The resistivity of copper is 1.72×10^{-8} Ω·m.

A. 2046 Ω
B. 8185 Ω
C. 13.8 Ω
D. 0.008 Ω
E. 0.002 Ω