Name: _____ Date: _____
Chapter 23 Practice Test-Electric Potential

1. The voltage between the cathode and the screen of a computer monitor is 12 kV. If we assume a speed of zero for an electron as it leaves the cathode, what is its speed just before it hits the screen?
   A) 8.8×10^7 m/s
   B) 6.5×10^7 m/s
   C) 4.2×10^{15} m/s
   D) 7.7×10^{15} m/s
   E) 5.3×10^7 m/s

2. The concept of difference in electric potential is most closely associated with
   A) the mechanical force on an electron.
   B) the number of atoms in one gram-atom.
   C) the charge on one electron.
   D) the resistance of a certain specified column of mercury.
   E) the work per unit quantity of electricity.

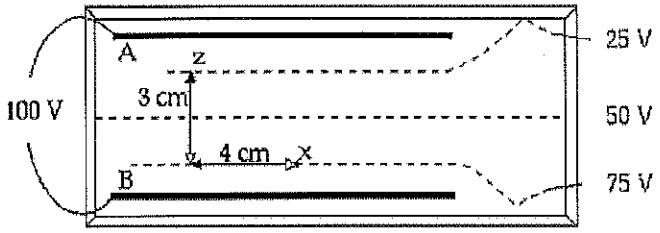
3. A charge of 5.0 mC is located in a uniform electric field of intensity 3.5×10^5 N/C. How much work is required to move this charge 50 cm along a path making an angle of 33° with the electric field?
   A) 0.27 J B) 0.16 J C) 0.54 J D) 0.73 J E) 7.3 mJ

4. When 5.0 C of charge moves at constant speed along a path between two points differing in potential by 12 V, the amount of work done is
   A) 2.4 J B) 0.42 J C) 5.0 J D) 12 J E) 60 J

5. Two parallel horizontal plates are spaced 0.60 cm apart in air. You introduce an oil droplet of mass 7.4×10^{-17} kg between the plates. If the droplet carries five electronic charges and if there were no air buoyancy, you could hold the droplet motionless between the plates if you kept the potential difference between them at
   A) 5.4 V B) 27 V C) 3.0 V D) 0.54 V E) 0.27 kV

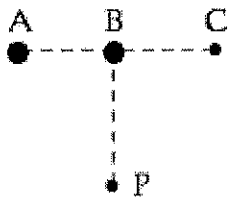
6. A uniform electric field exists between two parallel plates separated by 2.0 cm. The intensity of the field is 15 kN/C. What is the potential difference between the plates?
   A) 0.75 MV B) 30 kV C) 15 kV D) 0.30 kV E) 54 kV

7. The figure shows two plates A and B. Plate A has a potential of 0 V and plate B a potential of 100 V. The dotted lines represent equipotential lines of 25, 50, and 75 V. A positive test charge of 1.6×10^{-19} C at point x is transferred to point z. The energy gained or expended by the test charge is



A) 8×10^{-18} J, gained.
B) 8×10^{-18} J, expended.
C) 24×10^{-18} J, gained.
D) 24×10^{-8} J, expended.
E) 40×10^{-8} J, gained.

Use the following to answer questions 8-9:

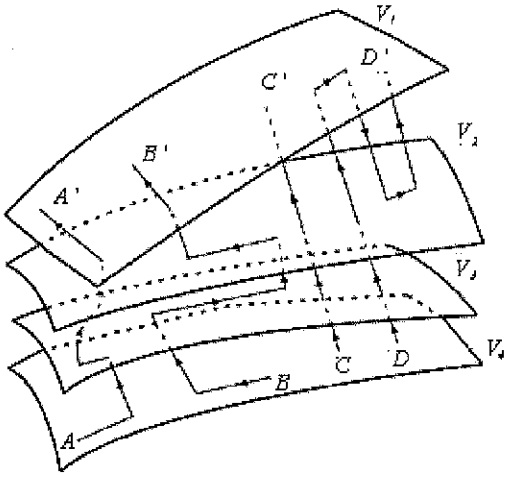


8. ABC is a straight line with AB = BC = 0.60 nm. BP is perpendicular to ABC and BP = 0.80 nm. Charges of $+3.2 \times 10^{-19}$ C are placed at A and B. The electric potential at P is approximately
A) 2.9 V B) 3.6 V C) 6.5 V D) 9.3 V E) 1.5 V

9. ABC is a straight line with AB = BC = 0.60 nm. BP is perpendicular to ABC and BP = 0.80 nm. Charges of $+3.2 \times 10^{-19}$ C are placed at A and C, and a charge of -3.2×10^{-19} C is placed at B. The magnitude of the electric field at P is approximately
A) 1.7×10^{7} N/C
B) 10×10^{7} N/C
C) 4.5×10^{7} N/C
D) 2.3×10^{7} N/C
E) zero

10. Two protons in a nucleus of ^{238}U are 6.0×10^{-15} m apart. The electrostatic potential energy of the pair is approximately
A) zero B) 4.7×10^{-34} J C) 4.3×10^{-24} J D) 3.8×10^{-14} J E) 2.4×10^{4} J

11. The figure shows portions of four equipotential surfaces whose potentials are related as follows: $V_1 > V_2 > V_3 > V_4$. The lines represent four paths (A → A', B→ B', C → C', D → D') along which equal test charges are moved. The work involved can be said to be

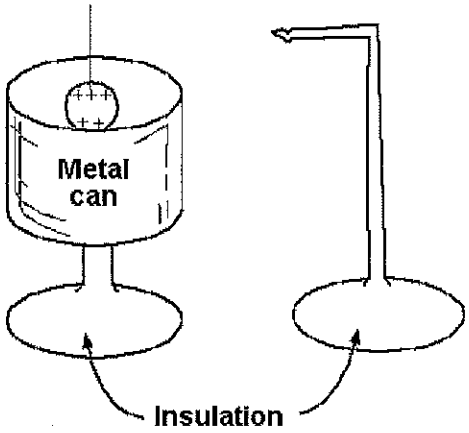


A) the greatest for path A → A'.
B) the greatest for path B → B'.
C) the greatest for path C → C'.
D) the greatest for path D → D'.
E) the same for all paths.

12. The metal sphere at the top of a small Van de Graaf generator has a radius of 10 cm. How much charge can be accumulated on this sphere before dielectric breakdown of the air around it occurs? (The dielectric strength of air is 3.0 MV/m.)
A) 67 μC B) 33 μC C) 13 μC D) 6.7 μC E) 3.3 μC

13. A solid spherical conductor of radius 15 cm has a charge $Q = 6.5$ nC on it. A second, initially uncharged, spherical conductor of radius 10 cm is moved toward the first until they touch and is then moved far away from it. How much charge is there on the second sphere after the two spheres have been separated?
A) 2.6 nC B) 2.2 nC C) 3.2 nC D) 3.9 nC E) 4.3 nC

14. A charged metal ball is lowered into an insulated metal can and permitted to touch the inside of the can. If the ball is withdrawn and hung on a stand, an uncharged ball will be attracted to



A) the outside of the can.
B) the inside of the can.
C) the outside and the inside of the can.
D) the metal ball and the inside of the can.
E) the metal ball, the inside of the can, and the outside of the can.

15. Dielectric breakdown occurs in the air at an electric field strength of $E_{max} = 3.0 \times 10^6$ V/m. If the maximum charge that can be placed on a spherical conductor is 2.0×10^{-3} C before breakdown, calculate the diameter of the sphere.
A) 6.0 m B) 4.9 m C) 1.2 m D) 2.5 m E) 3.0 m

16. A solid spherical conductor of radius 20 cm has a charge $Q = 25$ nC on it. A second, initially uncharged, spherical conductor of radius 12 cm is moved toward the first until they touch and is then moved far away from it. How much charge is there on the second sphere after the two spheres have been separated?
A) 15 nC B) 9.4 nC C) 25 nC D) 3.9 nC E) 2.1 nC

17. The potential on the surface of a solid conducting sphere of radius $r = 20$ cm is 100 V. The potential at r = 10 cm is
A) 100 V B) 50 V C) 25 V D) zero E) cannot be determined

18. Two charges Q_1 (= +6 μC) and Q_2 (= –2 μC) are brought from infinity to positions on the x-axis of $x = -4$ cm and $x = +4$ cm, respectively. How much work was done in bringing the charges together?
A) -1.80×10^6 J
B) -9.00×10^5 J
C) –16.9 J
D) –1.35 J
E) none of the above