1. The negative derivative of electric potential with respect to radius is equal to

   A) charge

   B) electric force

   C) electric field

   D) capacitance

   E) potential energy

2. What is the potential due to a spherical shell of radius R for $r > R$?

   A) kQ/r

   B) kQ/r^2

   C) kQ^2/r

   D) kQ/R

   E) kQ^2/R

3. What is the potential due to a spherical shell of radius R for $r < R$?

   A) kQ/r

   B) kQ/r^2

   C) kQ^2/r

   D) kQ/R

   E) kQ^2/R

4. What is the ratio of potential due to a spherical shell of radius R and a solid conducting sphere of radius R, for $r < R$?

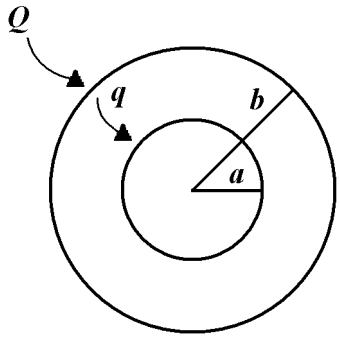
   A) 1:1

   B) 1:2

   C) 2:1

   D) –1:1

   E) –1:2

5. 

   The figure above shows two concentric, conducting, thin spherical shells of radii a and b, and charges q and Q. What is the work required to bring a test charge of q_0 from the outer shell to the inner shell?

   A) $kQq(a\text{-}b)$

   B) $kQq(b\text{-}a)$

   C) $kQq(1/a\text{-}1/b)$

   D) $kQq/(b\text{-}a)^2$

   E) $kQq/(b\text{-}a)$

6. What is the electric potential of a very long conducting cylinder of radius R and a uniform linear charge density λ a distance r away from the center of the cylinder?

   A) $k\lambda\ln(R/r)$

   B) $2k\lambda\ln(R/r)$

   C) $4k\lambda\ln(R/r)$

   D) $2k/\lambda\ln(R/r)$

   E) $k/\lambda\ln(R/r)$

7. The electric potential a distance r away from a cylinder can be calculated by dividing a charge q into

   A) the work done on the magnetic field as a charge q moves from a point on the cylinder to a point outside the cylinder.

   B) the work done on the magnetic field as a charge q moves from a point on the cylinder to a point inside the cylinder.

   C) the work done on the electric field as a charge q moves from a point on the cylinder to a point outside the cylinder.

   D) the work done on the electric field as a charge q moves from a point on the cylinder to a point inside the cylinder.

   E) the force on a charge q as it moves from a point on the cylinder to a point inside the cylinder.

8. A conducting spherical shell of radius R carries a charge Q. What is the potential inside the sphere a distance r away from the center?

   A) KQ/r

   B) KQ/R

   C) KQ/r^2

   D) KQ/R^2

   E) $KQ/2R$

9. All of the following about a sphere of charge that has spherical symmetry are true **EXCEPT**

   A) The electric field and the potential outside of the distribution is the same as if all the charge was concentrated at the center of the sphere

   B) A charged metal shell produces the field of an ordinary point charge

   C) Inside a charged metal shell the electric field and the potential are equal to zero

   D) All of the charge on a solid metal sphere resides on the surface

   E) The electric field inside a solid metal sphere is zero and the potential is constant

10. All of the following are true about an infinitely long cylindrically symmetric distribution of charge **EXCEPT**

    A) The electric field is perpendicular to the axis of the cylinder

    B) For a positive charge, the electric field points away from the cylinder axis

    C) For a positive charge, the potential decreases as the distance to the cylinder axis increases

    D) The potential difference between two points outside the distribution is the derivitave of the electric field

    E) For a negative charge, the electric field points towards the cylinder axis

11. What is the potential due to a spherical shell with charge Q of radius R for $r = R$?

    A) 0

    B) kQ/R

    C) kQ^2/R

    D) $-kQ/R$

    E) $-kQ/R^2$

Base your answers to questions **12** through **14** on the information below.

A conducting cylindrical shell of inner radius a and outer radius b initially has a charge of $+Q$. A wire of the same length as the cylindrical shell with charge $-Q$ is then inserted along the axis of the cylindrical shell.

12. What is the charge on the cylindrical shell after the wire is put inside it?

    A) 0

    B) Q/a

    C) Q/b

    D) $Q/2$

    E) Q

13. What is the electric field at a distance of r < a?

A) 0

B) kQ/a^2

C) kQ/r^2

D) $-kQ/r^2$

E) $-kQr/(a^2 + b^2)^{3/2}$

14. If the charge on the wire were changed to $+Q$, what is now the charge on the outer surface of the cylinder?

A) 0

B) $-Q$

C) $-2Q$

D) $+Q$

E) $+2Q$

---

15. The potential at a point outside of a very long conducting cylinder of radius R and uniform charge density λ relative to the potential on the cylinder is given by the equation $V(r) = 2k\lambda\ln(R/r)$. What is the electric field at some distance r from the center of the cylinder?

A) $-k\lambda/2r$

B) $-k\lambda/r$

C) $-2k\lambda/r$

D) $-4k\lambda/r$

E) $-\lambda/r$

16. The potential difference due to a finite rod along the x-axis is given by the equation $V(x) = C[\ln(x + L) - \ln(x)]$, where C and L are constants. What is the electric field due to this rod?

A) $-C/x$

B) $-C[1/(x + L) - 1/x]$

C) $-C/(x + L)$

D) $-C/L$

E) $1/(x + L) - 1/x$

17. If the electric potential of a system is given by the equation $V(r) = 5ln(r^2)$, what is the equation for the electric field in this system?

A) $5ln(r^2)/r$

B) $-5rln(r^2)$

C) $5/r^2$

D) $-10/r$

E) $10/r^2$

18. The negative integral of electric field with respect to radius is which of the following?

A) electrostatic force

B) electric potential

C) electric potential energy

D) charge

E) capacitance

19. The potential of a non-uniform cloud of charge is given by $V(r) = Kr^2$, where r is the distance from the center of the cloud. What is the electric field as a function of r?

A) $-2Kr$

B) $2Kr$

C) $Kr^3/3$

D) $-Kr$

E) $-Kr^2$

20. The potential of a point-charge is given by the equation $V(r) = kq/r$. Determine the electric field at some distance r from q.

A) $-kq/r^2$

B) kq/r^2

C) kqr

D) $-kqr$

E) $-kq/r$

Answer Key
Voltage Diff Geometry MC Questions [Mar 28, 2011]

1. C
2. A
3. D
4. A
5. C
6. B
7. C
8. B
9. C
10. D
11. B
12. E
13. D
14. E
15. C
16. B
17. D
18. B
19. A
20. B

Name _____ Class _____ Date _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____