كلية العلوم
قسم الفيزياء

First Question:

Chose the correct answer

1) The electric potential at point A is V. What is the electric potential at point B if the distance of B is 4 times of A?

(A) 2 V (B) 4 V (D) $\frac{1}{2}$ V (E) $\frac{1}{4}$ V

2) The magnitude of the electric field at point A is E. What is the electric field at point B if the distance of B is 3 times of A?

(A) 3 E (B) 9 E (C) $\frac{1}{9}$ E (D) $\frac{1}{3}$ E

3) A uniform electric field is created by two parallel plates separated by a distance of 0.04 m. What is the magnitude of the electric field established between the plates if the potential of the first plate is +40V and the second one is -40V?

(A) 20 V/m (B) 200 V/m (C) 2,000 V/m (D) 20,000 V/m

4) Resistance of a wire is r ohms. The wire is stretched to double its length, then its resistance in ohms is

(A) r / 2 (B) 4 r
(C) 2 r (D) r / 4.

5) Kirchhoff's second law is based on law of conservation of

(A) charge (B) energy
(C) momentum (D) mass.

6) Ampere second could be the unit of

(A) power (B) conductance
(C) energy (D) charge.

7) Which of the following is not the same as watt?

(A) joule/sec (B) amperes/volt
(C) amperes x volts (D) (amperes $)^2$ x ohm.

8) An electric current of 5 A is same as

(A) 5 J / C (B) 5 V / C
(C) 5 C / sec (D) 5 w / sec.

9) A copper wire of length l and diameter d has potential difference V applied at its two ends. The drift velocity is v_d. If the diameter of wire is made d/3, then drift velocity becomes

(A) 9 v_d (B) v_d / 9
(C)v_d /3 (D)v_d.

10) Two resistances R_1 and R_2 give combined resistance of 4.5 ohms when in series and 1 ohm when in parallel. The resistances are

(A)3 ohms and 6 ohms (B)3 ohms and 9 ohms
(C)1.5 ohms and 3 ohms (D)1.5 ohms and 0.5 ohms.

11) We have three resistances of values 2 Ω, 3 Ω and 6 Ω. Which of the following combination will give an effective resistance of 4 Ω?

(A) All the three resistances in parallel
(B) 2 Ω resistance in series with parallel combination of 3 Ω and 6 Ω resistance
(C) 3 Ω resistance in series with parallel combination of 2 Ω and 6 Ω resistance
(D) 6 Ω resistance in series with parallel combination of 2 Ω and 3 Ω resistance.

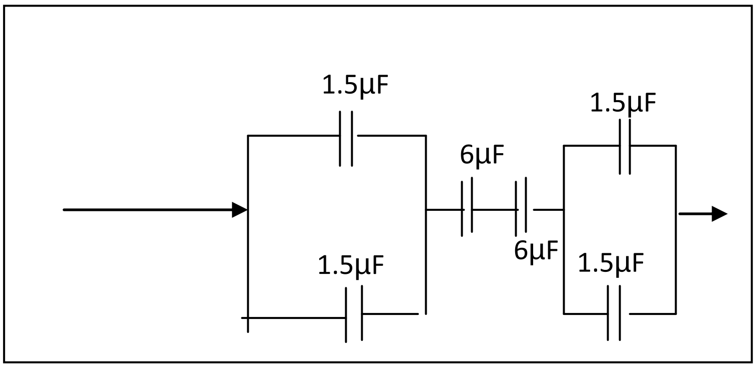
12) Four identical resistors are first connected in parallel and then in series. The resultant resistance of the first combination to the second will be

(A) 1 / 16 times (B) 1 / 4 times
(C) 4 times (D) 16 times.

13) The work done in moving a unit positive charge across two points in an electric circuit is a measure of .

(A) Current (B) Potential difference
(C) Resistance (D) Electric Field.

14) The equivalent capacitor of the following circuit is



(A) 18 μF (B) 6 μF (C) 3 μF (D) 1 μF

15) An electric dipole is

(A) two +ve charges of equal magnitude separated by a distance between them
(B) two +ve charges of not equal magnitudes separated by a distance between them
(C) two charges of opposite sign and same value separated by a distance between them
(D) two charges of opposite sign and not equal value separated by a distance between them

16) The ratio of the magnitude of the charge Q to the magnitude of the potential difference V is defined as:

(A) Resistance (B)Electric Field (C) Electric capacity (D)Magnetic Field

17) If E is the electric Field, Q the charge, J current density, R the resistance, and V is the potential difference then the resistivity ρ of the material is defined as:

(A) $\rho=E/V$ (B) $\rho=Q/V$ (C) $\rho=E/J$ (D) $\rho=Q/R$

18) The conductivity σ of a material is given by:

(A) $\sigma=1/\rho$ (B) $\sigma=1/C$ (C) $\sigma=V/\rho$ (D) $\sigma=\rho/V$

19) If μ_0 is the permeability ,I is the electric current, B is the magnetic field and ds is an area element then Ampere's law take the form

(A) $\oint B.ds = \frac{I}{\mu_0}$ (B) $\int B.ds = \mu_0 I$

(C) $\oint B.ds = \mu_0 I$ (D) $\oint B.ds = \mu_0 / I$

20) The radius of the circular orbit of patricle with mass (m) and carry a charge(q) moving in magnetic field(B) with velocity(v) is given by:

(A) r=mq/vB2 (B) r= mq/vB
(C) r=mv/qB (D) r==mB/qv

Second Question (يتم الإجابة على هذا السؤال فى ظهر ورقة الاختيارات الخاصة بالكهربية)

(A) Find the electric field of an electric dipole along the perpendicular bisection.

(B) Find the capacitance of a cylindrical capacitor.

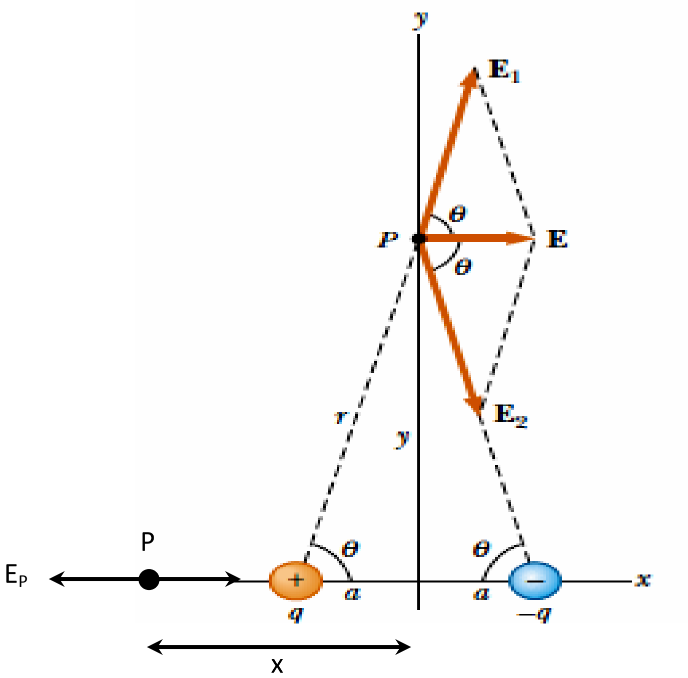
First Question Answer:

serial	a	b	c	d	serial	a	b	c	d
1	O	O	O	■	11	O	■	O	O
2	O	O	■	O	12	■	O	O	O
3	O	O	■	O	13	O	■	O	O
4	O	O	■	O	14	O	O	O	■
5	O	■	O	O	15	O	O	■	O
6	O	O	O	■	16	O	O	■	O
7	O	■	O	O	17	O	O	■	O
8	O	O	■	O	18	■	O	O	O
9	■	O	O	O	19	O	O	■	O
10	O	O	■	O	20	O	O	■	O

Second Question Answer

A.

The electric field at point P` is given by :



$$E_{p'} = E_1 \cos\theta + E_2 \cos\theta \tag{1.14}$$

but:

$$E_1 = E_2 = \frac{1}{4\pi\varepsilon_0}\frac{q}{a^2 + y^2} \tag{1.15}$$

$$\therefore E_{p'} = 2E_1 \cos\theta \tag{1.16}$$

From Fig.(1.2) we see that

$$\cos\theta = \frac{a}{\sqrt{a^2 + Y^2}} \tag{1.17}$$

Substituting the expression for E1 and for cos θ into that for E_p yields:

$$E_{P'} = \frac{2}{4\pi\varepsilon_0}\frac{q}{\left(a^2 + y^2\right)}\frac{a}{\left(a^2 + y^2\right)^{1/2}} \tag{1.18}$$

$$= \frac{1}{4\pi\varepsilon_0}\frac{2qa}{\left(a^2 + y^2\right)^{3/2}} \tag{1.19}$$

If y >> a

$$\therefore E_{p'} = \frac{1}{4\pi\varepsilon_0}\frac{2qa}{y^3} \tag{1.20}$$

We can rewrite the equation for E_{p}` along the perpendicular bisector as:

$$E_{p'} = \frac{1}{4\pi\varepsilon_0}\frac{P}{y^3} \tag{1.21}$$

b.

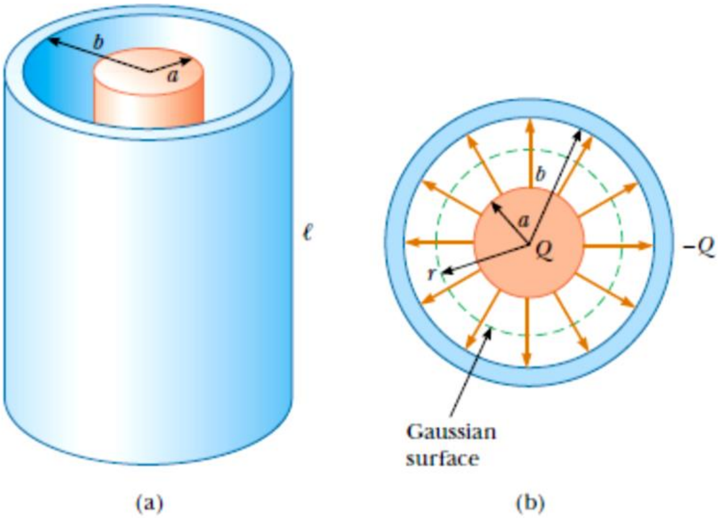


Fig. (2.10)

Solution :

This isn't a parallel – plate capacitor, so we can't use Eq.(2.31) Instead, we go back to the fundamental definition of capacitance, Eq. (2.27). To find the potential difference between the cylinders, we take V = 0 at the inner surface, the potential at any distance is given by :

$$V = -\int_b^a E dr = \int_a^b E dr \tag{2.34}$$

$$= \frac{q}{2\pi\varepsilon_0 \ell} \int_a^b \frac{dr}{r} \tag{2.35}$$

so, $$V_{ab} = \frac{\lambda}{2\pi\varepsilon_0} \ln \frac{b}{a} \tag{2.36}$$

Capacitance is charge Q divided by potential difference V_{ab}. The total charge Q in a length L is Q = λL, so the capacitance C of a length L is

$$C = \frac{Q}{V_{ab}} = \frac{\lambda L}{\frac{\lambda}{2\pi\varepsilon_0} \ln \frac{b}{a}} \tag{2.38}$$

so that $C = \frac{Q}{V_{ab}} = \frac{2\pi\varepsilon_0 L}{\ln\left(b/a\right)}$ (2.39)

The capacitance per unit length is

$$\frac{C}{\ell} = \frac{2\pi\varepsilon_0}{\ln\left(b/a\right)} \qquad (2.40)$$