Questions

Physics

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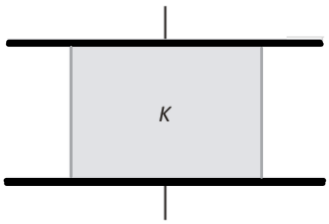
1. If the charge on a capacitor is doubled, the value of its capacitance C will be :

   a) Doubled
   b) Halved
   c) Remains Unchanged
   d) None of these

2. The maximum electric field that a dielectric medium of a capacitor can withstand without breakdown (of its insulating property) is called its :

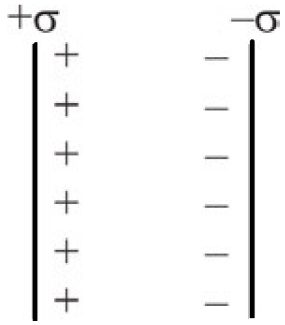
   a) *Polarization*
   b) *Capacitance*
   c) *Dielectric strength*
   d) *Dielectric constant*

3. Consider a parallel plate capacitor of 10 μF (microfarad) with air filled in the gap between the plates. Now, exactly one-half of the space between the plates is filled with a dielectric of dielectric constant 4, as shown in the figure.The capacity of the capacitor changes to :



   a) 25 μF
   b) 20 μF
   c) 40 μF
   d) 5 μF

4. Two large metal plates are placed parallel to each other. The inner surfaces of plates are charged by $+\sigma$ and $-\sigma$ C/m^2. The electric field between the plates and outside the plates :



   a) $\sigma/2\varepsilon_o$, σ/ε_o
   b) σ/ε_o , 0
   c) $\sigma/2\varepsilon_o$, 0
   d) $2\sigma/\varepsilon_o$, σ/ε_o

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5. Two identical capacitors C_1 and C_2 (equal in value) are connected in series with a battery of $e.m.f\ V_o$. They are fully charged. Now, a dielectric slab is inserted between the plates of C_2. The potential diff. across C_1 will :

a) Increase
b) Decrease
c) Remains Same
d) Depends on internal resistance of the cell

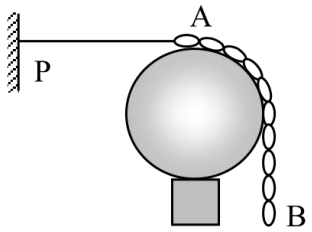
6. A smooth parabolic wire track lies in the vertical plane ($x - y\ plane$). The shape of track is defined by the equation $y = x^2/a$ (where a is constant). A bead of mass m which can slide freely on the wire track, is placed at the position $A(a, a)$. The track is rotated with constant angular speed ω about $y - axis$, such that there is no relative slipping between the ring and the track. Then ω is equal to :

a) $\sqrt{g/a}$
b) $\sqrt{2g/a}$
c) $\sqrt{g/2a}$
d) $\sqrt{\sqrt{2}g/a}$

7. A uniform circular ring of mass per unit length λ and radius R is rotating with angular velocity ω about its own axis in a gravity free space. Tension in the ring is :

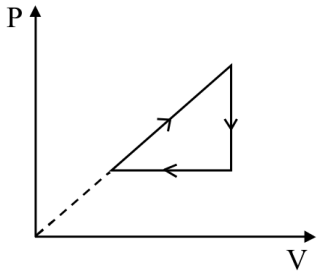
a) $Zero$
b) $\lambda\,\omega^2R^2/2$
c) $\lambda\,\omega^2R^2$
d) $2\lambda\,\omega^2R^2$

8. A chain of mass per unit length λ and length 1.5 m rests on a fixed smooth sphere of radius $R = (2/\pi)\ m$ such that end A of chain is at the top of sphere while the other end is hanging freely as shown. The chain is held stationary by a horizontal thread PA. The tension in this thread is :



a) $\lambda g\left(\frac{1}{2}+\frac{2}{\pi}\right)$
b) $\lambda g\left(\frac{\pi}{2}+\frac{2}{\pi}\right)$
c) $\lambda g\left(\frac{2}{\pi}\right)$
d) $None\ of\ These$

9. An ideal gas with adiabatic exponent $\gamma = 2$ goes through a cycle as shown in figure, in which absolute temperature varies $\tau = 4$ times. Find efficiency of this cycle :



a) $\frac{1}{9}$
b) $\frac{1}{8}$
c) $\frac{1}{6}$
d) $\frac{1}{5}$

10. The potential energy of a 4 kg particle free to move along the $x-axis$ is given by $U(x)=\frac{x^3}{3}-\frac{5x^2}{2}+6x+3$. Total mechanical energy of the particle is $17J$. Then the maximum kinetic energy is :

a) 10 J b) 2 J

c) 9.5 J d) 0.5 J

11. If a mercury droplet of radius R and surface tension S is broken into 8 smaller droplets of equal size. Then the work done by the external agency is :

a) $\frac{4}{3}\pi R^3 S$ b) $\pi R^2 S$

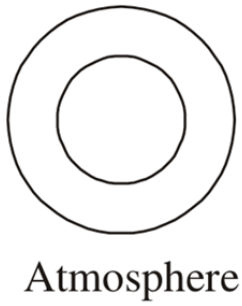
c) $8\pi R^2 S$ d) $4\pi R^2 S$

12. If n drops of a liquid, each with surface energy E, join to form a single drop then :

a) energy released in the process will be $E(n-n^{1/3})$ b) energy absorbed in the process will be $E(n-n^{1/3})$

c) energy released in the process will be $E(n-n^{2/3})$ d) energy absorbed in the process will be $E(n-n^{2/3})$

13. A soap bubble of radius R is surrounded by another soap bubble of radius $2R$, as shown. If surface tension $=$ S, then the pressure inside the smaller soap bubble, in excess of the atmospheric pressure, will be :



a) $4S/R$ b) $3S/R$

c) $6S/R$ d) *None of these*