1. The electrostatic potential at a point 10 cm away from a point charge of +2 microcoulomb in air is:

(a) 1.8×10^5 V
(b) 2.4×10^5 V
(c) 3.6×10^5 V
(d) 4.5×10^5 V

Answer: (a) 1.8×10^5 V
Explanation:
Potential $V = (9 \times 10^9) \times (2 \times 10^{-6}) / 0.1 = 1.8 \times 10^5$ V

2. Which of the following statements is correct for electrostatic potential?

(a) It is a scalar and always positive
(b) It is a scalar and can be positive or negative
(c) It is a vector and always negative
(d) It is a vector and can be positive

Answer: (b) It is a scalar and can be positive or negative
Explanation:
Electrostatic potential is a scalar quantity. Its sign depends on the nature of the source charge.

3. The electrostatic potential inside a charged conducting sphere is:

(a) Zero
(b) Constant and equal to surface potential
(c) Varies linearly with radius
(d) Varies inversely with square of radius

Answer: (b) Constant and equal to surface potential
Explanation:
Inside a conductor, the electric field is zero, so potential remains constant and equal to that on the surface.

4. A parallel plate capacitor is charged and disconnected from the battery. If the plates are pulled apart, the potential difference between the plates:

(a) Increases
(b) Decreases

(c) Remains constant
(d) First increases then decreases

Answer: (a) Increases
Explanation:
Since charge remains constant and capacitance decreases, potential increases using $V = Q / C$.

5. A capacitor is connected to a battery. If the separation between the plates is increased, then:

(a) Capacitance increases
(b) Charge remains same
(c) Energy stored decreases
(d) Potential difference increases

Answer: (c) Energy stored decreases
Explanation:
Battery keeps potential constant. As distance increases, capacitance decreases, so energy $U = 0.5 \times C \times V^2$ decreases.

6. A spherical conductor of radius R is given a charge Q. The electric potential at its surface is:

(a) $Q / (4 \times \pi \times \epsilon_0 \times R)$
(b) $Q / (4 \times \pi \times \epsilon_0 \times R^2)$
(c) $Q^2 / (4 \times \pi \times \epsilon_0 \times R)$
(d) $Q / (2 \times \pi \times \epsilon_0 \times R)$

Answer: (a) $Q / (4 \times \pi \times \epsilon_0 \times R)$
Explanation:
For a point outside or on the surface of a charged sphere, $V = (1 / 4 \times \pi \times \epsilon_0) \times Q / R$

7. The unit of electric potential is:

(a) Newton
(b) Joule
(c) Volt
(d) Coulomb

Answer: (c) Volt

Explanation:
Electric potential is work done per unit charge: $V = W / Q$.
So its unit is Joule / Coulomb = Volt.

8. If a 4 microfarad capacitor is charged to 300 volts, the energy stored in it is:

(a) 0.09 J
(b) 0.18 J
(c) 0.36 J
(d) 0.54 J

Answer: (a) 0.18 J
Explanation:
Energy $U = 0.5 \times C \times V^2 = 0.5 \times 4 \times 10^{-6} \times (300)^2 = 0.18$ J

9. If two capacitors of capacitance 3 microfarad and 6 microfarad are connected in series, the equivalent capacitance is:

(a) 9 microfarad
(b) 4.5 microfarad
(c) 2 microfarad
(d) 1 microfarad

Answer: (c) 2 microfarad
Explanation:
$1 / C_{eq} = 1 / 3 + 1 / 6 = (2 + 1) / 6 = 3 / 6 \rightarrow C_{eq} = 2$ microfarad

10. The work done in moving a charge of 2 microcoulomb through a potential difference of 12 V is:

(a) 12 microjoule
(b) 24 microjoule
(c) 6 microjoule
(d) 2 microjoule

Answer: (b) 24 microjoule
Explanation:
$W = q \times V = 2 \times 10^{-6} \times 12 = 24 \times 10^{-6}$ J = 24 microjoule

11. Two charges +4 microcoulomb and -4 microcoulomb are placed 2 cm apart. The electric potential at the midpoint is:

(a) Zero
(b) 1.8×10^6 V
(c) 9×10^6 V
(d) Infinite

Answer: (a) Zero
Explanation:
Equal and opposite charges placed symmetrically cancel each other's potential at midpoint: $V = V_1 + V_2 = 0$

12. A 10 microfarad capacitor is charged to 100 V. It is then connected to an uncharged 30 microfarad capacitor. The final potential across both is:

(a) 25 V
(b) 50 V
(c) 75 V
(d) 100 V

Answer: (a) 25 V
Explanation:
Total charge = $C_1 \times V_1 = 10 \times 100 = 1000$ microC
Total capacitance = 10 + 30 = 40 microF
Final V = Total Q / Total C = 1000 / 40 = 25 V
(✔ Correction: Answer is (a) 25 V .

13. The energy stored in a capacitor is proportional to:

(a) Square of capacitance
(b) Square of potential difference
(c) Inverse of capacitance
(d) None of these

Answer: (b) Square of potential difference
Explanation:
$U = 0.5 \times C \times V^2 \rightarrow$ directly proportional to V^2

14. The dielectric constant of a medium is 4. What will be the capacitance of a capacitor filled with this medium compared to the vacuum?

(a) 1/4 times
(b) Same
(c) 4 times
(d) 16 times

Answer: (c) 4 times
Explanation:
$C = K \times C_0$ → Capacitance increases K times if dielectric constant is K

15. Which of the following quantities remain unchanged when a dielectric slab is inserted between plates of an isolated charged capacitor?

(a) Capacitance
(b) Charge
(c) Potential
(d) Energy

Answer: (b) Charge
Explanation:
In an isolated capacitor, total charge remains constant. Capacitance increases, potential decreases.

16. The potential at a distance r from a point charge Q is V. What will be the potential at a distance 2r?

(a) V
(b) V/2
(c) V/4
(d) 2V

Answer: (b) V/2
Explanation:
$V = kQ / r$ → At 2r, $V' = kQ / 2r = V / 2$

17. A capacitor of capacitance 5 μF is connected to a 10 V battery. The energy stored in the capacitor is:

(a) 0.25 mJ
(b) 0.5 mJ
(c) 1.0 mJ
(d) 2.5 mJ

Answer: (b) 0.25 mJ
Explanation:
$U = 0.5 \times C \times V^2 = 0.5 \times 5 \times 10^{-6} \times (10)^2 = 0.25 \times 10^{-3}$ J = 0.25 mJ

18. Two point charges +Q and –Q are placed 2a distance apart. The potential at the midpoint is:

(a) Zero
(b) Infinite
(c) 2kQ/a
(d) kQ/a

Answer: (a) Zero
Explanation:
At midpoint, the potentials due to +Q and -Q cancel each other → Net V = 0

19. Capacitance of a parallel plate capacitor is directly proportional to:

(a) Distance between plates
(b) Square of distance
(c) Area of plates
(d) None of these

Answer: (c) Area of plates
Explanation:
$C = \varepsilon_0 A / d$ → Capacitance increases with plate area A

20. What happens to the energy stored in a capacitor when a dielectric is inserted, keeping the charge constant?

(a) Increases
(b) Decreases
(c) Remains same
(d) Becomes zero

Answer: (b) Decreases
Explanation:
$U = Q^2 / (2C)$. Capacitance increases due to dielectric → energy decreases

21. A capacitor is charged and then disconnected from the battery. What happens if the plates are pulled apart?

(a) Capacitance increases
(b) Voltage decreases
(c) Voltage increases
(d) Charge increases

Answer: (c) Voltage increases
Explanation:
Q = constant, C = decreases → V = Q / C → V increases

22. What is the equivalent capacitance of three 6 μF capacitors connected in parallel?

(a) 6 μF
(b) 2 μF
(c) 18 μF
(d) 12 μF

Answer: (c) 18 μF
Explanation:
$C_{eq} = C_1 + C_2 + C_3 = 6 + 6 + 6 = 18$ μF

23. The SI unit of capacitance is:

(a) Volt
(b) Coulomb
(c) Farad
(d) Henry

Answer: (c) Farad
Explanation:
Capacitance is charge per unit potential difference → SI unit is Farad (F)

24. What is the potential energy of a system of two equal point charges +Q placed a distance r apart?

(a) Zero
(b) kQ^2/r
(c) $-kQ^2/r$
(d) $2kQ^2/r$

Answer: (b) kQ^2/r
Explanation:
$U = kQ_1Q_2 / r = kQ^2 / r$ (both charges are +Q)

25. Which combination gives the least capacitance?

(a) Parallel
(b) Series
(c) Mixed
(d) Cannot say

Answer: (b) Series
Explanation:
In series: $1/C_{eq} = 1/C_1 + 1/C_2$... so equivalent capacitance is less than smallest capacitor.

26. Which of the following factors does not affect the capacitance of a parallel plate capacitor?

(a) Area of plates
(b) Distance between plates
(c) Dielectric constant
(d) Charge on plates

Answer: (d) Charge on plates
Explanation:
Capacitance depends on geometry and material, not on the charge stored.

27. A capacitor blocks:

(a) DC only

(b) AC only
(c) Both
(d) Neither

Answer: (a) DC only
Explanation:
Capacitor offers infinite resistance to DC → it blocks DC current.

28. What is the work done in moving a 1 μC charge between two points with potential difference of 5 V?

(a) 1 μJ
(b) 5 μJ
(c) 10 μJ
(d) 0 μJ

Answer: (b) 5 μJ
Explanation:
$W = q \times V = 1 \times 10^{-6} \times 5 = 5\ \mu J$

29. A capacitor is said to be fully charged when:

(a) Voltage across it is zero
(b) Current is maximum
(c) Voltage equals battery EMF
(d) Electric field becomes zero

Answer: (c) Voltage equals battery EMF
Explanation:
Charging stops when capacitor voltage = battery voltage

30. What is the effect of inserting a conductor between plates of a capacitor (without touching plates)?

(a) Capacitance increases
(b) Capacitance decreases
(c) No effect
(d) Capacitance becomes zero

Answer: (a) Capacitance increases

Explanation:
Conductor acts like a grounded shield and redistributes field, increasing effective capacitance.

31. Two capacitors of 4 μF and 6 μF are connected in series. What is the equivalent capacitance?

(a) 2.4 μF
(b) 10 μF
(c) 5 μF
(d) 24 μF

Answer: (a) 2.4 μF
Explanation:
$1/C_{eq} = 1/4 + 1/6 = (3 + 2)/12 = 5/12$
$C_{eq} = 12/5 = 2.4$ μF

32. The energy stored per unit volume in the electric field of a capacitor (energy density) is given by:

(a) $\frac{1}{2} \varepsilon_0 E^2$
(b) $\varepsilon_0 E^2$
(c) $E^2 / 2\varepsilon_0$
(d) $Q^2 / 2CV$

Answer: (a) $\frac{1}{2} \varepsilon_0 E^2$
Explanation:
Energy density (u) = U / volume = $(\frac{1}{2} CV^2) / (Ad)$
Since $V/d = E$, we get $u = \frac{1}{2} \varepsilon_0 E^2$

33. The potential of a conductor is 200 V and it carries a charge of 10 μC. What is its capacitance?

(a) 2 μF
(b) 5 μF
(c) 20 μF
(d) 0.5 μF

Answer: (b) 5 μF
Explanation:
$C = Q / V = (10 \times 10^{-6}) / 200 = 5 \times 10^{-6}$ F = 5 μF

34. A parallel plate capacitor has plates of area A and separation d. If both area and separation are doubled, what happens to its capacitance?

(a) Remains same
(b) Doubles
(c) Becomes half
(d) Becomes one-fourth

Answer: (a) Remains same
Explanation:
$C = \varepsilon_0 A/d \rightarrow$ New $C = \varepsilon_0(2A)/(2d) = \varepsilon_0 A/d$ (same)

35. The capacitance of a spherical capacitor with inner radius R_1 and outer radius R_2 is:

(a) $4\pi\varepsilon_0 R_1$
(b) $4\pi\varepsilon_0 R_2$
(c) $4\pi\varepsilon_0 R_1 R_2 / (R_2 - R_1)$
(d) $\varepsilon_0 A / d$

Answer: (c) $4\pi\varepsilon_0 R_1 R_2 / (R_2 - R_1)$
Explanation:
This is the standard formula for spherical capacitor.

36. Which one is a correct statement about equipotential surfaces?

(a) They are always spherical
(b) Electric field is tangential to them
(c) Electric field is always perpendicular to them
(d) No work is done when moving along normal to the surface

Answer: (c) Electric field is always perpendicular to them
Explanation:
Equipotential surfaces are at constant potential. No work is done moving along the surface, hence $E \perp$ surface

37. When a dielectric slab is fully inserted into a charged isolated capacitor, what happens to the energy stored?

(a) Increases
(b) Decreases
(c) Remains constant
(d) Becomes zero

Answer: (b) Decreases
Explanation:
$U = Q^2 / 2C$ → C increases → U decreases

38. What is the net electric field inside a conductor in electrostatic equilibrium?

(a) Infinite
(b) Maximum
(c) Zero
(d) Depends on shape

Answer: (c) Zero
Explanation:
In electrostatic equilibrium, electric field inside a conductor is always zero

39. Which of the following arrangements has maximum capacitance using three capacitors: 1 μF, 2 μF, 3 μF?

(a) Series
(b) Parallel
(c) Any order gives same result
(d) Not possible to compare

Answer: (b) Parallel
Explanation:
C_{eq} (parallel) = $C_1 + C_2 + C_3 = 6\ \mu F$
In series, C_{eq} is always less than the smallest → Parallel gives max capacitance

40. What will be the capacitance if a dielectric constant K is inserted fully between plates of vacuum capacitor of capacitance C?

(a) C/K
(b) K/C
(c) C × K

(d) C + K

Answer: (c) C × K
Explanation:
C_new = K × C (dielectric increases capacitance K times)

41. The main purpose of a capacitor in an electronic circuit is to:

(a) Store charge
(b) Produce current
(c) Block AC
(d) Reduce resistance

Answer: (a) Store charge
Explanation:
Capacitors are used to store and release electrical energy in circuits

42. Two capacitors 5 μF and 10 μF are charged to same potential. Which stores more energy?

(a) 5 μF
(b) 10 μF
(c) Both same
(d) Cannot say

Answer: (b) 10 μF
Explanation:
$U = \frac{1}{2} CV^2$ → If V is same, energy ∝ C → 10 μF stores more energy

43. The capacitance of a parallel plate capacitor is independent of:

(a) Area of plates
(b) Separation of plates
(c) Medium between plates
(d) Shape of plates

Answer: (d) Shape of plates
Explanation:
$C = \varepsilon_0 A/d$ → Depends on A, d, and medium (ε)

Not on shape if area is fixed.

44. In a capacitor network, the charge on each capacitor in series is:

(a) Same
(b) Different
(c) Zero
(d) Depends on capacitance

Answer: (a) Same
Explanation:
In series, all capacitors carry same charge because current is same in the path.

45. Which is correct regarding energy stored in capacitors?

(a) Energy $\propto V$
(b) Energy $\propto 1/V$
(c) Energy $\propto V^2$
(d) Energy independent of voltage

Answer: (c) Energy $\propto V^2$
Explanation:
$U = \frac{1}{2} CV^2$ → Energy is directly proportional to square of voltage