FEDERAL UNIVERSITY OYE-EKITI
DEPARTMENT Of PHYSICS

1. Object **A** has a charge of +2μC, and object **B** has a charge of+6μC. Which statement is true about the electric forces on the objects?

   (a) $F_{AB} = -3F_{BA}$ (b) $F_{AB} = -F_{BA}$ (c) $3F_{AB} = -F_{BA}$ (d) $F_{AB} = 3F_{BA}$ (e) $F_{AB} = F_{BA}$

2. The electron and proton of a hydrogen atom are separated (on the average) by a distance of approximately 5.3×10^{-11}m. Find the magnitudes of the electric force.

   (a) 5.3×10^{-8}N (b) 9.6×10^{-8}N (c) 8.2×10^{-8}N (d) 11.4×10^{-6}N (e) 3.3×10^{-9}N

3. A test charge of+3μC is at a point P where an external electric field is directed to the right and has a magnitude of 4×10^{6}N/C. If the test charge is replaced with another test charge of -3μC, the external electric field at P

   (a) is unaffected (b) reverses direction (c) changes in a way that cannot be determined (d) goes up and down (e) increased in magnitude.

4. Two identical conducting small spheres are placed with their centers 0.300 m apart. One is given a charge of 12.0 nC and the other a charge of -18.0 nC. Find the electric force exerted by one sphere on the other

   (a) 8.5×10^{6}N (b) 6.5×10^{-6}N (c) 5.5×10^{-7}N (d) 7.1×10^{-6}N (e) 1.5×10^{-3}N

5. Two +2μC point charges are located on the x axis. One is at x = 1.00 m, and the other is at x = - 1.00 m. Determine the electric field on the y axis at y = 0.500 m.

   (a) 4.2×10^{6}N/C (b) 6.3×10^{4}N/C (c) 1.6×10^{4}N/C (d) 4.7×10^{4}N/C (e) 6.2×10^{6}N/C

6. The magnetic flux ϕ_B through the loop is given by _____

   (a) $\oint B.d\bar{A}$ (b) $\oint B.dE$ (c) $\nabla.D$ (d) $\nabla.E$ (e) $\oint E.dD$

7. The equation $F = q(E + V \times B)$ is termed as _____

   (a) Magnetic force (b) Electric force (c) Lorentz force law (d) Force square law (e) Electromotive Force

8. A circular coil of 160 turns has a radius of 1.90cm. What value of current result in magnetic dipole moment of $2.30Am^2$?

   (a) 1.134×10^{-2}A (b) 0.0805A (c) 12.78A (d) 1.3A (e) 5.67A

9. A circular coil of wire 6.5 cm in diameter has 12 turns and carries a current of 2.7A. The coil is in a region where the magnetic field is 0.56 T. What is the maximum torque on the coil?

   (a) 0.0698 Nm (b) 0.60890 Nm (c) 0.27353 Nm (d) 0.19698 Nm (e) 1.25Nm

10. Calculate the cyclotron frequency of an electron of mass 9.11×10^{-31}kg and charge 1.6×10^{-19}C circulating in a plane at right angle to a uniform magnetic field B of magnitude 2.0×10^{-4}T .

(a) 3.2×10^{-23}Hz (b) 5.72×10^{-30}Hz (c) 5.59×10^{6}Hz (d) 1.82×10^{-34}Hz (e) 1.59×10^{6}Hz

11. The electric potential difference between the ground and a cloud in a particular thunderstorm is 1.2×10^{9} V. The magnitude of the change in potential energy (in multiples of the electron-volt) of an electron that moves between the ground and the cloud is:

    (a) 4.8 GeV (b) 1.2 GeV (c) 2.4 GeV (d) 3.6 GeV (e) 6.2 GeV

12. An infinite nonconducting sheet has a surface charge density $\sigma = 0.10 \mu C/m^2$ on one side. How far apart are equipotential surfaces whose potentials differ by 50V?

    (a) 76mm (b) 58mm (c) 88mm (d) 95mm (e) 68mm

13. Two large, parallel conducting plates are 12 cm apart and have charges of equal magnitude and opposite sign on their facing surfaces. An electrostatic force of 3.9×10^{-15} N acts on an electron placed anywhere between the two plates (Neglect fringing). The electric field at the position of the electron and the potential difference between the plates respectively are:

    (a) 2.4×10^{4} Vm^{-1} and 2.9×10^{3} V (b) 3.5×10^{4} Vm^{-1} and 2.7×10^{3} V (c) 2.5×10^{5} Vm^{-1} and 2.5×10^{2} V

    (d) 4.5×10^{3} Vm^{-1} and 5.0×10^{3} V (e) 6.4×10^{4} Vm^{-1} and 5.9×10^{3} V

14. The electric potential at points in an xy plane is given by $V = 2x^2 - 3y^2$. The magnitude and direction of the electric field at the point (3.0 m, 2.0 m) respectively are:

    (a) 25Vm^{-1} and 45^{o} (b) 17 Vm^{-1} and 135^{o} (c) 38 Vm^{-1} and 150^{o} (d) 42 Vm^{-1} and 35^{o} (e) 45 Vm^{-1} and 75^{o}

15. The electric potential energy of two electrons separated by 2.0 nm is:

    (a) 1.15×10^{-19}J (b) 2.75×10^{-19}J (c) 17.25×10^{-19}J (d) 6.95×10^{-19}J (e) 4.75×10^{-19}J.

16. An air cored coil of self-inductance L has N turns of fine insulated copper wire wound on a former of cross section area A. If the area and number of turns are doubled and the core is a medium of relative permeability 1000, the self-inductance of the coil will be

    (a) 8000 L (b) 4000 L (c) 8×10^{-3} L (d) 4×10^{-3} L (e) L

17. Which of the following circuit element stores charges energies in term of magnetic field

    (a) Condenser (b) Inductance (c) Variable resistor (d) Resistance (e) Reactance.

18. The higher the self-inductance of a coil

    (a) the lesser it weber-turns (b) the lower the emf induced (c) the greater the flux produced by it

    (d) the longer the delay in establishing steady current through it (e) a and b

19. Mutual inductance between two magnetically coupled coil depend on

    (a) Permeability of the coil (b) The number of turns (c) Cross-sectional area of their common core

    (d) All of the above (e) a and b

20. The core of a coil has a length of 200 mm. The inductance of coil is 6 mH. If the core length is double doubled, all other quantities remaining the same. What is the inductance of the coil?

    (a) 3 mH (b) 12 mH (c) 24 mH (d) 48 mH (e) a and b

21. A coil of 10 turns and cross-sectional area $5cm^2$ is at right angles to a flux density 2×10^{-2}T which is reduced to zero in 10s. Find the induced e.m.f.

(a) 1.0×10^{-5}V (b) 10×10^{-5}V (c) 100×10^{-5}V (d) 1.0×10^{-5}A (e) 13×10^{-5}V

22. A 100 turn coil whose resistance is 6Ω encloses an area of 80 cm^2. How rapidly should a magnetic field parallel to its axis change in order to induce a current of 1mA in the coil?

    (a) 0.0075 Ts^{-1} (b) 75.0 Ts^{-1} (c) 0.75 Ts^{-1} (d) 0.0075 V (e) 0.0085 Ts^{-1}

23. A transformer connected to a 120V ac power line has 200 turns in its primary winding and 50 turns in its secondary winding. The secondary is connected to a 100Ω light bulb. How much current is drawn from the 120V power line?

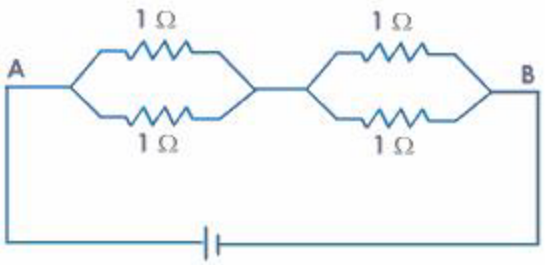
    (a) 0.075Ω (b) 0.075A (c) 0.0075A (d) 0.065A (e) 0.56A

24. How much energy is stored in a 20-mH coil when it carries a current of 0.2A?

    (a) 4×10^{-3}J (b) 4×10^{-4}J (c) 0.4×10^{-4}J (d) 6.4×10^{-6}J (e) 7×10^{-3}J

25. Calculate the inductance of a solenoid containing 250 turns if the length of the solenoid is 20.0cm and its cross-sectional area is $4.00 \times 10^{-4} m^2$.
    (a) 0.0157 mH (b) 15.7 mH (c) 0.157 mH (d) 0.157 H (e) 18.7 mH

26. The resistance across AB in the is circuit below is



    (a) 1 Ω (b) 2 Ω (c) 0.5 Ω (d) 4 Ω (e) 3 Ω

27. The $\int_0^t i\,dt$ gives ---------- through the plane or material in a time interval extending from 0 to t.

    (a) Resistance **(b)** quantity of charges (c) Current (d) Potential difference (e) Field

28. The $\int J\,dA$ represents --------- where J is the current density and A is the area.

    (a) Resistance (b) Potential difference **(c)** electric current (d) resistivity (e) Field

29. Which of these formulae is incorrect?

    (a) $\sigma = \frac{1}{\rho}$ (b) $\sigma = \frac{E}{J}$ (c) $E = \frac{V}{L}$ **(d)** $R = \frac{\rho L}{A}$ (e) $\sigma = \frac{EA}{J}$

30. Which of the following statements is not correct about the resistance of a wire?

    (a) The length of the wire increases as the resistance increases (b) The cross-sectional area increases as the resistance increases (c)Temperature increases as the resistance increases (d) The nature of material does not affect the resistance of a wire (e) none

31. A point charge -10^{-6}C is situated in air at the origin of a rectangular coordinate system, a second charge $+10^{-6}$C is situated at a distance of 50cm from the origin. Calculate the force on the second charge.

    (a) +3.6 N (b) -3.6 N (c) -10 N (d) +10 N (e) -4.6 N

32. An electron moves round a fixed proton at a distance of 5.29×10^{-11}m, calculate the potential the proton creates at this distance

(a) -13.6 V (b) +6.8 V (c) +27.2 V (d) +13.6 V (e) -6.8 V

33. An electric field with a magnitude of 160N/C exists at a spot that is 15cm away from a charge. At a place 45cm from this charge, calculate the electric field strength.

    (a) 53.3 N/C (b) 50 N/C (c) 36 N/C (d) 18 N/C (e) 19 N/C

34. Two electric fields E_1 = 3.00N/C and E_2 = 2.00N/C at right angles in a plane. Calculate the net electric field and direction at a point P in the plane

    (a) 3.61N/C and 33.7^0 (b) 3.61N/C and 42^0 (c) 5N/C and 33.7^0 (d) 5N/C and 42^0 (e) 5.61N/C and 22.7^0

35. Three point charges q1 = -4μC, q2 = +3μC and q3 = -7μC. If the separation between q1 and q2 is 20cm and between q2 and q3 is 15cm, calculate the net force on q2.

    (a) 8.4 N/C (b) 5.7 N/C (c) -2.7 N/C (d) 11.1N/C (e) 7.4 N/C

36. A positive test charge of 3.0 x 10^{-8}C is placed in a place where it experiences a force F = 6.0 x 10^{-8}N Calculate the electric field the charge experiences

    (a) 2 N/C (b) 18 N/C (c) 9 N/C (d) 6 N/C(e) 8 N/C

37. If the electric field in the region between the deflecting plates of a cathode ray oscilloscope is 30,000N/C, calculate the force on an electron in the region.

    (a) 4.8 x 10^{-18}N (b) 2.8 x 10^{-15}N (c) 4.8 x 10^{-15}N (d) 2.8 x 10^{-15}N (e) 6.8 x 10^{-18}N

38. Calculate the conductivity and resistance of a given uniform wire of length 2.0 m and resistivity 5.4 x 10^{-7} Ωm if the cross sectional area of the wire is 9.5 x 10^{-3} cm^2.

    (a) 1.85 x 10^6 $\Omega^{-1}m^{-1}$, 1.14 Ω (b) 3.70 x 10^6 $\Omega^{-1}m^{-1}$, 1.14 Ω (c) 1.85 x 10^6 $\Omega^{-1}m^{-1}$, 2.28 Ω (d) 3.70 x 10^6 $\Omega^{-1}m^{-1}$,2.28 Ω (e) 1.6 x 10^6 $\Omega^{-1}m^{-1}$, 3.14 Ω

39. For a given configuration of charges, a set of points where the electric potential V (r) has a given value and in which it takes no work to move a charged particle from one point to another is known as:

    (a) Inter parallel potential surface (b) Interpolar potential surface (c) Equipotential surface

    (d) Semipotential surface (e) Multi parallel potential surface

40. A particle initially moving north in a vertically downward magnetic field is deflected toward east. What is the sign of the charge on the particle?

    (a) Positive (b) Negative (c) Neutral (d) Electron (e) Oscillatory

41. Five point charges are enclosed in a cylindrical surface S. If the values of the charges are q_1=+3nC, q_2= -2nC, q_3= +2nC, q_4= +4nC and q_5= -1nC, find the total flux through S.

    (a) 200Vm (B) 678Vm (C) 260Vm (D) 700Vm (e) 760Vm

42. A magnetic field is given by the expression $\vec{B} = axz\hat{i} + byz\hat{j} + c\hat{k}$, use differential form of gauss law for magnetic field to find 'a'

    (a) a = b (b) a = c (c) a = -b (d) a = -c (e) a = 2b

43. Which of the following mathematical expression is a Lorentz equation for magnetic field

    (a) $F = qV \times \vec{B}$ (b) $F_B = qB \times \vec{V}$ (c) $F = qB \times \vec{V}$ (d) $F_B = qV \times \vec{B}$ (e) $F_B = qAB \times \vec{V}$

44. The magnetic flux through a loop increases according to the relation $\Phi = 6t^2 + 7t$ in milliweber and in seconds. Find the magnitude of the emf induced in the loop when t = 2seconds.
(a) 0.024V (b) 2400V (c) 0.020V (d) 200V (e) 0.094V

45. One of the following type of waves propagates via a material medium

(a) Sound wave (b) both transverse and longitudinal wave (c) transverse wave only (d) none of the above (e) Atomic wave

46. The total electric flux over any closed surface is

(a) ε_0 (b) q^2/ε_0 (c) ε_0/q (d) q/ε_0 (e) $q\varepsilon_0$

47. The total electric flux through a closed surface depends

(a) On the location of the charge only (b) on the shape of the closed surface only (c) on the value of the net charge only (d) on both the location of the charge and the shape of the surface (e) all of the above

48. Filtering out unwanted frequency signals is one of the applications of ……

(a) Resistor (b) Capacitor (c) Transistor (d) Inductor (e) insulator

49. How much work is required to carry an electron from the positive terminal of a 12-V battery to the negative terminal?

(a) 1.9×10^{-18}J (b) -1.9×10^{-18}J (c) 1.6×10^{-17}J (d) 1.2×10^{-18}J (e) 1.0×10^{-17}J

50. A capacitor of capacitance 3.0 μF is subjected to a 2000 V potential difference across its terminals. Calculate the energy stored in the capacitor.

(a) 18000 J (b) 6 J (c) 6000 J (d) 1.5 J (e) 150J