PHY 105: Physics [Final Term: Spring 2021: Proposed Question Bank but not final]

Introduction to Electricity-Coulomb's law:

1. Write a short note on the concept of charge with example.
2. Discuss about the quantization and conservation of charge.
3. State the principal of conservation of charge and write down some applications of conservation of charge.
4. Discuss how an unknown charge is determined using electroscope.
5. What is conductor and insulator? What are the differences between conductor and insulator?
6. State and explain Coulomb's law of electrostatics.
7. Explain the Coulomb's law of electrostatics in vector form.
8. What are the applications of Coulomb's law? /Mention some uses of Coulomb's law.
9. State and explain the principle of superposition. /State the principle of superposition of forces. /What is superposition of forces? / State and explain superposition of forces.

Electric Potential:

10. Define electric potential and electric potential energy. What is the difference between electric potential and electric potential energy? Graphically show different electric potentials.
11. Derive an equation for the potential at a point in an electric field due to a point charge. Write down the equation for electric potential due to a group of point charges.
12. Derive an equation for electric potential energy due to a system of charged particles./Show that electric potential energy $U = \frac{1}{4\pi\epsilon_0}\frac{q_1 q_2}{r}$.
13. What is uniform electric field?
14. What is electric dipole and dipole moment? Show that for electric dipole moment $\vec{\tau} = \vec{p} \times \vec{E}$.
15. Derive an equation for electric potential due to an electric dipole.
16. Derive an equation for electric potential from electric field. /Show that $V = Ed = -Ed$.
17. Define potential gradient and graphically show the electric potential gradient.
18. What is equipotential surfaces? Explain it with proper graph or proper diagram.

19. What do you understand by horizontal and vertical alignment of electric dipole producing dipole moment?

Capacitance:

1. What is a capacitor? Write down three basic characteristics of capacitor.
2. Write down the uses of capacitors in different electronic circuits.
3. Explain the term capacitance. What do you mean by the charge of a capacitor?
4. What are active and passive elements? /What are the differences between two?
5. Write a short note on capacitors and dielectrics. /What is dielectric media?
6. What is an electron volt?
7. What is dielectric constant and dielectric strength? Give example.
8. State and explain the Gauss's law.
9. Deduce Coulomb's law from Gauss's law.
10. Derive an equation for the capacitance in a parallel plate capacitor.
11. Derive an equation for the capacitance of a cylindrical capacitor of length L formed by two coaxial cylinders of radii *a* and *b*.
12. Derive an equation for the capacitance of a spherical capacitor of radii *a* and *b*.
13. Explain capacitors combinations in series and parallel and also find out C_{eq} for series and parallel combinations**.**
14. Derive an equation for the energy stored in the electric field of a charged capacitor.
15. What is energy density? Obtain an equation for it.

Current, Resistance and EMF:

1. What is current? Discuss about the two types of current.
2. Write down the names of different types of DC voltage sources.
3. What is the difference between emf and terminal voltage of a battery?
4. What are series and parallel connections of battery (emf)? Explain with diagram.
5. Define and explain current and drift velocity. Define one coulomb.
6. Define charge density and current density.
7. Explain the terms current density and drift velocity of electrons inside a conductor. Show that the two are related by the relation $\vec{J} = ne\overrightarrow{v_d}$.
8. What is resistivity? Derive a relation for resistivity or Establish a relation among conductivity, current density, and electric field. /Show that $\vec{J} = \sigma\vec{E}$. /Show that $\rho = \frac{RA}{L}$.
9. Define resistance and resistivity. Show that $R = \frac{\rho L}{A}$ where the symbols have their usual meanings.
10. Discuss about the laws of resistance.
11. Define conductance and conductivity.
12. State and explain the ohm's law. Draw the I vs V graph.
13. What are Ohmic and non-Ohmic materials? Give example.
14. What are the necessity of color code of resistances? How can you determine resistance using color code?

15. Prove the series and parallel laws of combination of resistances./Show that $R_s=R_1+R_2+R_3$ and $\frac{1}{R_p}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$.
16. What are VDR and CDR rules? Explain.
17. State and explain Kirchoff's voltage law.
18. State and explain Kirchoff's current law.
19. What is electric power? Show that $P=\frac{V^2}{R}=I^2R$./ Show that $\bar{P}=\frac{1}{2}{I_o}^2R=\frac{1}{2}\frac{{V_o}^2}{R}=\overline{I^2R}$.
20. What is rms value of current and voltage?
21. What is electrical safety and the effect of various currents?

Particle properties of Wave:

1. What is photoelectric effect? What are the main features of photoelectric effect? Explain with proper diagram/graphical representation./ State laws of photoelectric effect./ Write Einstein's Photoelectric Equation and write Einstein's explanation about photoelectric effect.
2. What are work function and threshold frequency and threshold wave length? /What is stopping potential? /What is photocurrent, photoelectron and photoelectrode?
3. What is 1eV?/ How can you calculate 1eV?
4. What is one quantum of energy? Explain.
5. Draw a characteristics graph for Photoelectric effect./Draw Energy vs Frequency graph./Draw KE_{max} vs f graph./Draw ev vs f graph./ Draw I vs V graph./Draw current vs applied voltage graph./….