PHYSICS 2019

Time: 2 Hours 40 Minutes Marks: 68

SECTION 'B' (SHORT-ANSWER QUESTIONS)(40)

NOTE: Answer any 10 questions from this section.

2.(i) Name the device used to increase or decrease output A/C voltage. Describe any two factors affecting its efficiency.

(ii) If the number of atoms per gram of $_{88}Ra^{226}$ is 2.666×10^{21} and itr decays with the half-life of 1622 years, find the decay constant and activity of the sample (1 year = 3.15×10^{7}s).

(iii) A coil of 400 turns in ac generator having an area of $0.1m^2$ is rotating in a magnetic field of 50 T. In order to generate a maximum voltage of 220 volts, how fast is the coil to be rotated? Express your answer in revolutions / second.

(iv) What is meant by conduction band and forbidden gap? Why does the resistance of a semiconductor decrease with temperature?

(v) Describe the construction and working of Wilson closed chamber.

(vi) What is the wavelength of 3rd spectral line of Paschen series in hydrogen atom? ($R_n = 1.097 \times 10^{7}\ m^{-1}$).

(vii) What is meant by equipotential surface? Describe two properties of equipotential surface?

(viii) A rectangular bar of iron is 2cm x 2cm in cross section and 20cm iong. What will be its resistance at 500oC? ($\alpha = 0.0052K^{-1}$ and $p = 11 \times 10^{-8}\Omega m$)

(ix) Two capacitors of 2μF and 4μF are connected in series to a 40 volt battery. Calculate the charge on these capacitors and potential difference across each.

(x) Find the change in volume of an alumimum sphere of 0.4m radius when it is heated from 0°C to 100°C. ($\alpha = 24 \times 10^{-6}\ °C^{-1}$)

(xi) Describe the radioactive decay law. Give the relevant mathemativa expression.

(xii) What is thermal expansion? Show that $\alpha = \frac{1}{3}\beta$.

(xiii) How can a galvanometer be converted into a voltmeter? Derive the relevant mathematical expression.

(xiv) What is a perfect black body? What are Max Planck's assumptions to explain blaci body radiation? Also write Planck's law of black body radiation.

(xv) What will be the velocity and momentum of a particle whese rest mass inmo and kinetic energy is equal to twice of its rest mass energy?

SECTION'C' (DETAILED- ANSWER QUESTIONS)

NOTE: Answer 2 questions from this section. (28)

3.(a) What is Carnot engine? Give its construction & working. Also derive mathematical expressions its efficiency.

(b) Staee Ampere's law. Derive the expression for magnetic field of induction B inside a current carrying solenoid.

4.(a) Describe the construction and working of moving oil galvanometer. Also show that the deflection produced in the coil proportional to the current passing through it.

(b) What is photoelectric effect? What is meant by the terms. (i) threshold frequency (ii) Work function (iii) Saturation current (iv) stoping potential

5.(a) Exdplain the term capacitance of a rapacitor and give its S.I unit. Derive the expressions for the capacitance of a paralled plate capacitor with:

(i) Free space between the plates.

(ii) A delectrc medium between the plates.

(b) Give the postulates of Bohr's atomic theory. Derive expression for the :

(i) radius of nth orbit of hydrogen atom.

(ii) total energy of electron in nth orbit of hydrogen.