Section-A
(Multiple Choice Questions (MCQ's)

Q.1 Choose the correct answer for each from the given options:

(i) 212°F is equal to _____
(a) 0K (b) 100K (c) 37°C (d) 100°C

(ii) A device which is based on thermodynamic properties of matter is called _____
(a) Calorimeter (b) Thermometer (c) Heat engine (d) Kelvin meter

(iii) What will happen to the force, if the distance between two points charges is tripled?
(a) 1/9 F (b) ½ F (c) ¼ F (d) 1/6 F

(iv) A semi conductor diode is also known as _____
(a) Crystal diode (b) Photo diode (c) Light emitting (d) All of these

(v) According to quantum theory energy of electromagnetic radiation is directly proportional to _____
(a) Frequency (b) Wavelength (c) Amplitude (d) None of these

(vi) Resistors 4.052, 8.052, 24.052 are connected in parallel in a circuit equivalent resistance of combination becomes _____
(a) 3652 (b) 2.52 (c) 2.452 (d) 2452

(vii) Momentum of a photon of energy E is _____
(a) E/c (b) mc^2 (c) E/c^2 (d) Ec

(viii) The nuclei of same element which have same atomic number but different mass number are called _____
(a) Isotopes (b) Isobars (c) Ionized particles (d) all of these

(ix) The unit of mutual inductance is _____
(a) Faraday (b) Henry (c) Weber (d) Ohm

(x) Solid state detector operate as _____
(a) Forward bias (b) Rectifier (c) Reverse bias (d) Modulator

(xi) Decay constant of a radioactive element is inversely proportional to _____
(a) Half life (b) Activity (c) Mean life (d) Wavelength

(xii) Which condition is correct for step-down transformer.
(a) Ns > Np (b) Vs > Vp (c) Ns < Np (d) Is > Ip

(xiii) When a stationary electron is scattered by the interaction of an x-ray photon, the phenomenon is called _____
(a) Photoelectric effect (b) Pair production (c) Compton effect
(d) Zeeman effect

(xiv) The equivalent capacitance of a number of capacitors connected in series is _____
(a) Greater than capacitance of individual capacitors
(b) Less than capacitance of individual capacitors
(c) Zero (d) None of these

(xv) In nuclear reactor, we have conservation of _____
(a) Mass (b) Energy (c) Momentum (d) All of these

(xvi) Which of the following is not correct for laser light?
(a) Monochromatic (b) Coherent (c) Collimated (d) Chromatic

(xvii) A meter bridge is used to measure _____
(a) Voltage (b) Inductance (c) Capacitance (d) Resistanc

Section-B
(Short Answer)

Note: Answer any EIGHT of the following questions. Each questions carries 05 marks.

Q.2 How can we increase the efficiency of a heat engine? Can we get 100% efficiency? If yes, how?

Q.3 Calculate the electric flux passing through an imaginary sphere due to a point charge "q" lying at its centre.

Q.4 A current of 5A is drawn from a 120 V line. What power is being developed? How much energy in K Wh is expended, if the current is drawn steadily for one week.

Q.5 What do you mean by a toroid? For a toroid, show that $B = \frac{\mu_o NI}{2\pi r}$

Q.6 Calculate the energy of a photon in eV whose frequency is 20 MHz.

Q.7 A particle of mass 'm' and charge 'q' accelerated from rest through a potential difference V, find its de Boggle wavelength.

Q.8 If a neutron would entirely converted into energy how much energy would be produced? Express your answer in MeV.

Q.9 Total energy of a particle is exactly twice its rest mass energy, calculate its speed.

Q.10 What are the characteristics of laser light?

Q.11 What are the biological advantages and disadvantages of radiations?

Q.12 What do you mean by potential barrier or junction barrier? What will happen to it if p.n junction is revere biased?

Q.13 A Galvanometer gives a full scale deflection for a current of 20 milliamperes and has a resistance of 10052. How it can be converted into an ammeter of range 10 Amperes?

Section-C
(Descriptive Answer)

Note: Answer any TWO of the following questions. Each question carries 14(7+7) marks.

Q.14 (a) Derive an expression for the change in wavelength of x-rays due to their interaction with matter.

(b) Derive an expression for pressure of an ideal gas using kinetic molecular theory.

Q.15 (a) Explain law of conservation of energy for a thermodynamic system and apply it to Isobaric and Isochoric processes.

(b) Describe an experiment to verify de Broglie hypothesis.

Q.16 Write notes on any TWO of the following:

Post Office Box - Transformer - Amperes Law - Solar Cell