PHYSICS 2014

Time: 20 Minutes Max. Marks: 17

SECTION "A" (MULTIPLE CHOICE QUESTION)

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

i. Resistance of a wire does not depend on the:
* Temperature * Length * Area * Electric Current

ii. Two capacitors of 3μF and 6 μF are connected in series. Their equivalent capacitance is:
* 9 μF * 2μF * $\frac{1}{2}$ μF * 3 μF

iii. de-Broglie wave length is:
(i) $\lambda=\frac{mv}{h}$ (ii) $\lambda=\frac{h}{mv^2}$ (iii) $\lambda=\frac{h}{mv}$ (iv) $\lambda=\frac{mh}{v}$

iv. The minimum energy required for a pair production is:
* 1.02 MeV * 102 MeV * 10.2 MeV * 1.02 Volt

v. Laser produces:
* A electron beam * A neutron beam
* A coherent beam of light * none of these

vi. The mathematical expression $\lambda_{max} \times T$ =constant is called: * Stefan's law * Rayleigh-Jeans law
* Wein's displacement law * planck's law

vii. This is not a scalar quantity:
* Electric flux * Electric Intensity
* E.M.F * Electric Potential

viii. Heat energy can not be measured in:
* Joule * B.T.U * Kelvin * Calorie

ix. When an A.C. generator is converted into D.C. generator, slip ring is replaced by:
* a dynamo * a split ring * a field coil * an inductor

x. The path of a neutron, moving perpendicularly through a magnetic field, is:
* Straight line * Circular * Oval * Sinusoidal

xi. Joule per coulomb is:
* Farad * Henry * Ampere * Volt

xii. The average internal energy of ideal gas is called:
* Pressure * Volume * Temperature * Heat

xiii. This is a high resistance instrument:
* Voltmeter * Ammeter * Galvanometer * Motor

xiv. Hole in a semiconductor is actually the:
* Electron * Positron
* Helium nucleus * vacancy in the valance bond

xv. The energy radiated per second per unit area from the surface of a block body is directly proportional to its absolute temperature raised to power:
* One * Two * Three * Four

xvi. The life time of the electron in excited state is:
* 10^8 sec * 10^{-8} sec * 10^{-3} sec * 10^3 sec

xvii. In this process no heat enters or leaves the system:
* Isochoric * Isobaric * adiabatic * Isothermal

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Time: 2 Hours 40 Minutes Marks: 68

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

NOTE: Answer any 10 questions from this section.

2.i. A galvanometer, having resistance 50Ω, deflects full scale for a potential difference of 100 mV across the terminals. What resistance should be connected to increase its range to 50 Volts?

ii. A rectangular bar of iron is 2 cm x 2 cm in cross section and 20 cm long. What will be its resistance at 500°C? If $\alpha = 0.0052k^{-1}$ and $\rho = 11\times10^{-8}$ Ωm.

iii. An iron core solenoid with 500 turns has a cross section of $5cm^2$. A current of 2.3 ampere passing through it produces of flux of B = 0.53 Telsa. How large an e.m.f is induced in it, if the current is turned off in 0.1 second? What is the self inductance of the solenoid?

iv. What will be the velocity and momentum of particle whose mass rest is m_o and kinetic energy is equal to twice of its rest mass energy.

v. Find the Binding energy and packing fraction in MeV of $_{52}Te^{126}$ given that m_p = 1.0078u, m_n = 1.0086u, m_{Te} =125.9033u and 1u = 931.5 MeV.

vi. Three resistors each of 50Ω can be connected in four different ways. Find the equivalent resistance for each combination.

vii. Calculate root mean square speed of Oxygen molecule at 800K. Its molar mass is 32 gm and universal gas constant R = 8.31 J/mole-K.

viii. A 10uF capacitor is charged to a potential difference of 220V. It is then disconnected from the battery. Its plates are then connected in parallels to another capacitor and it is found that the potential difference falls to 100V.What is the capacitance of the second capacitor?

ix. In a TV picture tube, an electron is accelerated by a potential difference of 12000v. Determine the de Broglie's wavelength given that h = 6.63 x 10^{-34} JS, e = 1.6 x 10^{-19} coulomb m_e = 9.11 x 10^{-31}kg.

x. Determine the longest and the shortest wavelength photons emitted in the Lyman series (R_H = 1.097 x 10^7/m).

xi. Prove mathematically that the radius of circular path for a charge moving in magnetic field is given by $r=\frac{mv\sin\theta}{qB}$

xii. What happens to the temperature of a room in which in air conditioner is left running on a table in the middle of the room?

OR Give the assumptions of special theory of relativity and discuss any one of the result obtained.

xiii. How can a galvanometer be converted in to an ammeter? Drive the relevant expression.

xiv. Discuss the Principle of production of laser light.

OR State Bohr's postulates for Hydrogen atom.

xv. Define Motional e.m.f and derive the relevant formula.

SECTION'C' (DETAILED- ANSWER QUESTIONS)

NOTE: Answer any Two questions from this section. Draw diagrams where necessary. (28)

3.(a) On the basis of kinetic theory of gasses, show that $P=\frac{1}{3}p\overline{V^2}$.

(b) State Gauss's law. Derive an expression for electric intensity at a point close to infinitely large sheet having uniform positive charge distribution.

4.(a) State Faraday's laws of electro-magnetic induction. Explain the phenomenon of mutual induction and derive the expression for coefficient of mutual inductance.

(b) What is Compton Effects? Derive expression for the Compton shift in wavelength.

OR What is a Carnot Cycle. Derive expression for its efficiency.

5.(a) State Ohm's Law. Show that for a balanced Wheatstone bridge $\frac{P}{Q}=\frac{R}{X}$

(b) Give the construction and working of Geiger counter, also draw the diagram.

OR What is Nuclear fission? Explain Fission chain reaction.