ZIAUDDIN UNIVERSITY
EXAMINATION BOARD

EXAMINATION MATERIAL OF ZUEB 2021-2022

GRADE: XII **SUBJECT: PHYSICS**

SECTION # B

SHORT ANSWER QUESTIONS

CHAPTER # 11 HEAT

TOPICS	**Kinetic Molecular Theory of Gases** • Interpretation of Pressure on Kinetic theory of Gases
	Thermodynamics • First law of thermodynamics • Applications of first law of thermodynamics • Second law of Thermodynamics • The Carnot Engine

1. On the basis of kinetic molecular theory of gases, show that the absolute temperature of an ideal gas is directly proportional to the average translational kinetic energy of molecules

OR

$$\frac{1}{2} m v^2 = \frac{3}{2} K T$$

2. Calculate the temperature at which the root mean square speed of hydrogen molecules is 3300 m/s. give your answer in degree Celsius.($m = 3.32 \times 10^{-27}$ kg)

3. A system absorbs 1147 joules of heat, losses 233 joules of heat by conduction to the surroundings and delivers 614 joules of work , calculate the change in the internal energy of the system.

4. A heart engine performs 200 J of work in each cycle and has an efficiency of 30 percent. For each cycle of operation,(a) how much heat is absorbed? (b) How much heat is expelled?

5. The high temperature reservoir of a Carnot engine is at 200℃ and has an efficiency of 35%.To increase the efficiency to 45% by how many degrees should the temperature of cold reservoir be decreased if the temperature of the high temperature reservoir remains constant ?

CHAPTER # 12 ELECTROSTATICS

TOPICS	**Electric Field** • Electric field intensity
	Gauss's Law • Applications of Gauss's law • Field of uniform spherical surface charge at a distance r from its center. • Electric intensity due to an infinite sheet of charge
	Electric Potential • Relation between electric field and potential
	Capacitors • Parallel plate capacitor • Combinations of capacitors a) Parallel combination b) Series combination

1. Prove that $\frac{1\ Volt}{meter} = \frac{1\ Newton}{Coloumb}$, name the physical quantity

2. Derive mathematical relation between electric field intensity and electric potential.

3. Define potential difference and electromotive force. Both are measured in volts. What is the difference between these concepts.

4. A proton of mass $1.67 \times 10^{-27} kg$ and charge $1.6 \times 10^{-19} C$ is to be held motionless between two horizontal plates 10cm apart. Find the voltage required to be applied between the plates.

5. How many electrons should be removed from each of the two similar Spheres, each of mass 10 g so that electrostatic repulsion is balanced By the gravitational force? (Gravitational constant = G = 6.67 x 10^{-11} Nm^2/kg^2 and K = 9 x 10^9 Nm^2/C^2).

6. An α- particle of charge 3.2 x 10^{-19}C and mass 6.68 x 10^{-27} kg is held motionless between two horizontal parallel plates separated by 10 cm. find the potential difference between the plates.

7. Surface charge density on vertical metal plate is 25 x 10^{-6} c/m^2 find the force experienced by a charge of 2 x 10^{-10} c placed in front close to the sheet. ($\varepsilon_o = 8.85 \times 10^{-12}$ c / Nm^2)

8. A thin infinite sheet of uniformly distributed positive charge attracts a light sphere having a charge -5 x 10^{-6}C with a force of 1.695 N. calculate the Surface charge density of the sheet. ($\in_o$ = 8.85 x $10^{-12}C^2/Nm^2$)

9. Two Capacitors of capacitance 3μF and 6 μF are charged to the potential difference of 300V and 400V respectively. They are then connected in parallel. What will be the resultant potential difference and charge on each capacitor.

10. A capacitor of $12\mu F$ is charged to a potential difference 100V.its plates are then disconnected from the source and are connected parallel to another capacitor. The potential difference in this combination comes down to 60V.what is the capacitance of the second capacitor.

CHAPTER # 13 CURRENT ELECTRICITY

TOPICS	**Electric Resistance and Ohm's Law** • Ohm's law • Resistivity
	Combination of Resistors • Resistance is series • Resistance is parallel
	Electromotive force • Electromotive force (Emf)

1. How is resistance of a metallic conductor affected by variation of temperature.

2. Derive the expression for the equivalent resistance in series or parallel.

3. A resistor is made by using a 50 meter Nichrome wire of diameter 0.8mm at 0℃. Calculate its resistance at 50℃. (Given: resistivity $\rho = 1.1 \times 10^{-6}\Omega$-m and $\alpha = 0.0002℃^{-1} at\ 0℃$).

4. A rectangular bar of iron is 2cm x 2cm in cross section and 20cm long. What is the resistance of the bar at 500℃ if $\rho = 11 \times 10^{-8}\Omega - m$ and $\alpha = 0.0052K^{-1}$.

5. The resistance of a platinum resistance thermometer is 200 ohms at 0°C and 257.6 ohms when immersed in a hot bath. What is the temperature of the bath (α = 0.00392 / °C).

6. You are given three resistors each of 2 ohms. How would you arrange these to obtain equivalent resistance of:
(a) 1.33 ohms, (b) 3 ohms and (c) 6 ohms ? Verify the result

CHAPTER # 14 MAGNETISM & ELECTROMAGNETISM

TOPICS	**Magnetic Field due to current** • Force on a current carrying conductor in a uniform magnetic field • Torque on a current carrying rectangular coil placed in a magnetic field
	Ampere's law Applications of Ampere's law • Solenoidal Field • Toroidal Field
	Electromagnetic Induction • Faraday's law of electromagnetic induction • Lenz's law (a) Self-Induction (b) Mutual Induction

1. Derive an expression for the force experienced by a current-carrying conductor in uniform magnetic field.
2. Find the current required to produce a magnetic field of induction B =2.512 x 10^{-3} web/m^2 in a 50 cm long solenoid having 4000 turns of wire. ($\mu_o = 4\pi \times 10^{-7} web/Am$).

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4. An e.m.f. of 45 milli-volts is induced in a coil of 500 turns. When the current In a neighboring coil changes from 15 amps to 4 amps in 0.2 seconds,
   (a) What is the mutual inductance of the coil?
   (b) what is the rate of change of flux in the second coil?

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

6. An alternating current generator operates at 79Hz. The area of the coil is 500 cm^2. Calculate the number of turns in the coil when a magnetic field of induction 0.06 web/m^2 produces a maximum potential difference of 149 Volts.

7. A step-down transformer reduces 1100V to 220V. the power output is 12.5KW and the overall efficiency of the transformer is 90%.the primary winding has 1000 turns. How many turns does the secondary have? What is the power input? What is the current in each coil?

CHAPTER # 15 ELECTRICAL MEASURING INSTRUMENT

TOPICS	**Galvanometer** • Ammeter and Voltmeter • Wheatstone Bridge

1. A galvanometer, whose resistance is 50 ohms, deflects full scale for a Potential diff. of 100millivolts across its terminals. How can it be converted into a voltmeter of 50v range?

2. A voltmeter measuring up to 200 volts has a total resistance of 20,000 ohms. What additional series resistance must be connected to it to increase its range to 600 volts?

3. A galvanometer, whose resistance is 60 ohms, deflects full scale for a Potential diff. of 100 milli-volts across its terminals. What shunt resistance must be connected to convert. It into an ammeter of 5 ampere range?

4. Show that for the balanced Wheatstone bridge.

CHAPTER # 16 ELECTROMAGNETIC WAVES & ELECTRONICS

TOPICS	**Semiconductor Diode** • The p.n Junction of Semiconductor Diode
	Rectifiers • Semiconductor Diode (Crystal Diode) Rectifiers • Half wave rectifier • ii. Full wave rectifier

1. Describe the function of a PN-junction as a half-wave rectifier.
2. With the help of ray diagram, explain the working of a full wave rectifier.

CHAPTER # 17 ADVENT OF MODERN PHYSICS

TOPICS	**Special Theory of Relativity** • Consequences of special theory of relativity
	The Photo Electric Effect • Einstein's explanation of Photoelectric effect on the basis of quantum theory

1. Given m_oC^2=0.511 MeV. Fin the total energy 'E' and the kinetic energy 'K' of an electron moving with a speed of V = 0.85C. (m_0=9.1×10^{-3}1Kg, C=3×10^8 m/s)

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

3. Sodium surface is shine with light of wavelength 3 x 10^{-7} m. Find the Kinetic energy of the emitted photo electrons and the cutoff Wavelength of Sodium. Work function of sodium is 2.46 eV.

CHAPTER # 18 THE ATOMIC SPECTRA

TOPICS	**Bohr's Atomic Model** • Bohr's radius and energy for Hydrogen atom

1. Find the shortest wavelength of photon emitted in the balmer series and determine its energy in eV. ($R_H = 1.097 \times 10^7 m^{-1}$)

2. Calculate the energy of the longest wavelength radiation emitted in the Paschen series in hydrogen atom spectra.

3. ($R_H = 1.0968 \times 10^7\ m^{-1}$, h= 6.63×10^{-34} JS, C= 3×10^8 m/s)

4. Find the shortest wavelength of photo emitted in the Balmer series and determine its energy in eV. ($R_H = 1.097 \times 10^7 m^{-1}$)
5. Find the shortest and the longest wavelength of emitted photons in Hydrogen spectra in pfund series.
6. What is the wave length of 3rd spectral line od Paschen series in hydrogen atom. ($R_H = 1.097 \times 10^7 m^{-1}$)

7. A photon of what minimum energy is required to excite a hydrogen atom from n = 1 to n = 3 (R_H= 1.097 x 10^7 m^{-1}).

CHAPTER # 19 THE ATOMIC NUCLEUS

TOPICS	**Radioactivity** • The Disintegration of Radioactive Elements • The law of Radioactive Decay
	Nuclear Reactions • Nuclear Fission • Nuclear Fusion

1. What is nuclear fission. Explain fission chain reaction.

2. Explain why the photograph of the path of alpha particles in thick and made of continuous line whereas beta particles is thin and made up of broken lines in the Wilson cloud chamber.
3. Why does hydrogen spectrum contain a large number of spectral lines although it has only one electron.
4. Define nuclear fission and fusion reaction. How it controlled name the process which produce energy in the sun.
5. The number of atoms per gram of $_{88}Ra^{226}$ is 2.666 x 10^{21} and it decays with a half life of 1622 years. Find the activity and decay constant of the sample.

6. Find the binding energy and packing fraction (B.E. per nucleon) of $_{52}Te^{126}$. Given that: m_p = 1.0078 U ,m_n = 1.0086 U , m_{te} = 125.9033 U IU = 931.5 MeV

7. Find the binding energy and packing fraction (B.E. per nucleon) of $_{52}Te^{126}$. Given that: $m_p = 1.0078$ U $m_n = 1.0086$ U $m_{te} = 125.9033$ U IU = 931.5 MeV.

8. The half life of $_{104}p_0^{210}$ is 140 days. By what percent will its activity decrease per hour?

CHAPTER # 20 NUCLEAR RADIATION

TOPICS	**Wilson Cloud Chamber**
	Geiger Counter

1. Explain the construction & working of Geiger counter.
2. Explain the construction & working of Wilson cloud chamber.