YEARLY IMPORTANT QUESTIONS OF XII YEAR PHYSICS

SESSION 2019 - 2020

IMPORTANT QUESTIONS FOR SECTION 'B'

CHAPTER # 1: HEAT

NUMERICALS

1. a) Determine the average value of the kinetic energy of the particles of an ideal gas at 0^0 C and at 50^0 C. b) What is the kinetic energy per mole of an ideal gas at these temperatures.
2. Find the final diameter and final volume of the Copper sphere of radius 0.6m when it is heated from 30^0 C to 100^0 C? ($\alpha = 19 \times 10^{-6} / {}^0C$).
3. In an Isobaric process when 2000J of heat energy is supplied to a gas in a cylinder, the piston of area 2×10^{-2} m^2 moves through 0.5m under a pressure of 1.01×10^5 N/m^2, Calculate the increase in internal energy.
4. Determine the root mean square speed of oxygen molecule at 800 K. ($k=1.38 \times 10^{-23} JK^{-1}$)
5. 540 calories of heat is required to vaporize 1gm of water at 100^0 C. Calculate the entropy change involved in vaporizing 5gm of water. (1 cal = 4.2 J)
6. Calculate the density of hydrogen gas, considering it to be an ideal gas, when the root mean velocity of hydrogen molecules is 1850 m/s at 0^0 C and 1 atmospheric pressure.
7. **Example # 5 (Textbook)**
8. **Problem # 2, 3, 9, 10 & 11 (Textbook)**
9. **Past Paper Numericals: 2008, 2009, 2010, 2006, 2012**

DERIVATION AND REASONS

1. State the basic assumptions of Kinetic Molecular Theory of gases and also Show that the average translational kinetic energy per molecule is directly proportional to the absolute temperature.
2. Define Linear Expansion. How does the concept of linear expansion help in the fabrication of bimetallic strips? Explain the working of bimetallic strip in thermostat.
3. What do you mean by the term entropy? Describe the Second Law of Thermodynamics In terms of entropy.
4. Define heat capacity, specific heat and molar specific heat. Write down the mathematical relations and their units. *Establish the equation of relation between the molar specific heat and common specific heat.*
5. Define Heat engine? Prove that the efficiency of a Carnot Engine is less than 100 per cent above absolute zero temperature of the sink.
6. When a sealed thermos bottle full of hot coffee is shaken, what are the changes, if any in:
   a) The temperature of the coffee b) The internal energy of the coffee
7. Write down two statements of Second Law of Thermodynamics & prove their equivalence?
8. Why is the specific heat of polyatomic gases higher than that of monoatomic gases? Calculate specific heat ratio (γ) of a monoatomic gases.
9. Is it possible to cool a room by keeping the door of a refrigerator open? Explain.
10. What happens to the temperature of the room in which an air conditioner is left running on the table in the middle of the room?
11. It is observed that when a mercury in a glass thermometer is put in a flame, the column of mercury first descends and then rises. Explain.
    OR Why the earth is not in thermal equilibrium with the sun?

CHAPTER # 2: ELECTROSTATICS

NUMERICALS

1. **Problem # 2, 5, 6, 9, 10, 11, 17, 19 (Textbook)**
2. A thin sheet of positive charge attracts a light charged sphere having a charge - 5×10^{-6} C with a force of 1.695 N. Calculate the surface density of the charge. **OR** The surface charge density on a vertical metal plate is 25×10^{-6} C/m^2. Find out the force experienced by a charge of + 2×10^{-10} C placed in front of it.
3. **Example 2, 9, 3 & 5 (Textbook)**

DERIVATION AND REASONS

1. Explain Electric Flux. Under what conditions will be the flux though the surface be?
   i. Zero ii. Maximum iii. Minimum
   OR
   State Coulomb's Law and give its mathematical relation for force between the charges when placed:
   i. In a free space ii. In a medium of relative permittivity (Ɛ)
2. Repulsion is the sure test of Electrification. Discuss.
3. Show that electric potential difference (ΔV) is the dot product of electric intensity ($\vec{E}$) and displacement ($\Delta\vec{r}$). **OR** Define Electric Intensity. Derive expression for the electric field intensity at a point near an isolated point charge.
4. Prove that $1\ \frac{volt}{meter} = 1\ \frac{Newton}{Coulomb}$; Name the physical quantity which has these units.
5. Explain why it is easier to remove an electron from an atom of higher atomic weight than to remove proton from it?
6. Derive an expression for the capacitance of Compound Capacitor.

CHAPTER # 3: ELECTRODYNAMICS

NUMERICALS

1. **Problem # 5, 10, 11, 15, 16, 17, 18, 19, 20 & 21 (Textbook)**
2. **Example 4, 13 & 7 (Textbook)**

DERIVATION AND REASONS

1. Discuss the effect of temperature on the resistance of the conductor.
2. Differentiate between EMF and Potential Difference of a battery. And also derive their relevant expression. **OR** Both p.d. and e.m.f. are measured in volts. What is the difference between these concepts.
3. Derive an expression for the Equivalent Resistance of the combination when three resistors are connected in Series or Parallel?

CHAPTER # 4: MAGNETISM AND ELECTRO-MAGNETISM

NUMERICALS

1. **Problem # 1, 4, 5, 6, 10, 11, 13, 14, 15 (Textbook)**
2. **Example # 5, 8, 9, 10 & 6 (Textbook)**
3. Find the current required to produce a magnetic field of induction $B = 2.512 \times 10^{-3}$ web/m^2 in a 50 cm long solenoid having 4000 turns of wire. ($\mu_0 = 4\pi \times 10^{-7}$ web/Am)

DERIVATION AND REASONS

1. Derive an expression for the force on a current – carrying conductor in a uniform magnetic field?
2. In what way is the motional emf, produced in a conductor placed in a magnetic field, translated into the relevant mathematical relation?
   OR Derive a relation for a torque due to a current – carrying coil in a uniform magnetic field?
3. Prove mathematically that the radius of circular path for a charge moving in a magnetic field is given as $r = \frac{mv}{qBsin\theta}$. where all symbol have their usual meanings.
4. Can an electron at rest be set in motion with a magnet?
5. What is the difference between magneto and A.C. Generator? What is meant by frequency of Alternating Current.
6. Define the following:
   a. Lenz's law b. Ampere's Law c. Gauss's Law
   d. Faraday's Laws of Electromagnetic Induction

CHAPTER # 5: ELECTRICAL MEASURING INSTRUMENTS

NUMERICALS

1. **Problem # 1, 2, 5, 7 (Textbook)**
2. A resistance of galvanometer is 50 ohms and it gives full scale deflection with a current of 1mA.
   (a) What should be the resistance of the parallel resistor used to convert it into an ammeter of 10A?
   (b) What should be the resistance of the series resistor used to convert it into a voltmeter of 10V?

DERIVATION AND REASONS

1. How can a galvanometer can be converted into ammeter? Explain with the help of diagram and also derive an expression of low resistance. Also discuss why must the ammeter must be connected in series to a circuit.
2. What is meant by the sensitivity of a galvanometer? On what factors does it depend. How can we have large sensitivity of moving coil galvanometer?

CHAPTER # 6: ELECTROMAGNETIC WAVES & ELECTRONICS

NUMERICAL & DERIVATIONS

3. How are p-type and n-type substances made? Explain it with the help of diagram the forward and reverse biasing of PN Junction diode.
4. Calculate the speed of the electromagnetic wave, given that:
   $\varepsilon_0 = 8.85 \times 10^{-12}\ C^2 / Nm^2$, $\mu_0 = 4\pi \times 10^{-7}\ Tm / A$
5. Differentiate between intrinsic and extrinsic semiconductors with the help of diagram. Describe the working of the half wave or full wave rectifier.
   OR What is PN Junction? Explain the formation of the potential barrier.
   OR Define Transistor? Explain the working of PNP or NPN transistor.

CHAPTER # 7: ADVENT OF MODERN PHYSICS

NUMERICALS

1. **Problem # 3, 6, 7, 11, 17, 12, 13, 15, 19 (Textbook)**
2. **Example # 3, 7, 8, 10, 12 & 14 (Textbook)**
3. Determine the mass of a particle with de Broglie wavelength 6.63×10^{-33}m , moving with a velocity of 1500 cm/s ($h = 6.63 \times 10^{-34}$ J.S.)
4. The range of visible light is 4000 $\dot{A}$ to 7000 $\dot{A}$. Will the photo-electrons be emitted by a copper surface of work function 4.4 eV, when illuminated by a visible light? Give the proof of your answer by calculation and also calculate stopping potential and velocity photo-electrons emitted.
5. Calculate the relativistic speed at which the length 'L' of an object becomes half of its rest length 'L_o'.

DERIVATION AND REASONS

1. Define the following :
   a. Photoelectric Effect   b. Compton Effect   c. Uncertainity Principle
2. What is meant by Photon and show the rest mas of photon is zero? Derive a relation for momentum of photon.
3. Explain Pair Production.

CHAPTER # 8: THE ATOMIC SPECTRA

NUMERICALS

1. **Problem # 1, 2, 3, 4, 5 & 8 (Textbook)**
2. **Example # 2 (also find the wavelength), 3, 4 (Textbook)**
3. Calculate the wavelength and energy of radiations emitted when hydrogen atom is ionized.
4. Find the value of the shortest and the longest wavelength of emitted photons in hydrogen spectra in Balmer **OR** Pfund**OR** Paschen Series, where $R_\alpha = 1.097 \times 10^7\ m^{-1}$.
5. An electron in the Hydrogen atom makes a transition from the 5^{th} to the 3^{rd} orbit. Find the wavelength, frequency and wave number of the radiation emitted.

DERIVATION AND REASONS

1. What is LASER? Discuss metastable state and population inversion in a lasing material? **OR** Differentiate between the principle of production of laser and light from an incandescent bulb. Also give their characteristics.
2. Why does Hydrogen spectrum contain a large number of spectral although it has only one electron?
3. Explain How X-rays differ from visible radiations? **OR** If Hydrogen gas is bombarded by electrons of energy 13.6 eV would you expect to observe all the lines of hydrogen spectrum.
4. In an X-ray photograph why do bones appear very clearly while the fleshy part seems very faint?

CHAPTER # 9: THE ATOMIC NUCLEUS

NUMERICALS

1. **Problem # 2, 5, 6, 7, 8 & 10 (Textbook)**
2. **Example # 4, 6 (Textbook)**
3. A deuteron (3.3431×10^{-27} kg) is formed when a proton (1.6724×10^{-27} kg) & a neutron (1.6748×10^{-27} kg) combine; Calculate the mass defect and binding energy (in MeV).

DERIVATION AND REASONS

1. Do α, β and γ-rays come from the same element. Why do we find all three in many radioactive elements?
2. Define Nuclear Fission and Nuclear Fusion reactions. How can the fission chain reaction be controlled? Name the process which produce energy in the sun and in nuclear reactor. **OR** It is more difficult to start a fusion reaction than fission, why?
3. State the Radioactive Law of Decay and give the relation between the decay constant and the half-life.

CHAPTER # 10: NUCLEAR RADIATIONS

DERIVATION AND REASONS

1. In how many ways can γ-rays produce ionization of atoms? Explain. **OR** Why is lead better shield against α, β and γ-radiations than an equal thickness of water column?
2. Explain the working of Geiger Muller counter.
3. Discuss the Properties of α, β and γ-rays.

Marked with **RED** are the MOST IMPORTANT.

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YEARLY IMPORTANT QUESTIONS OF XII YEAR PHYSICS

SESSION 2019 - 2020

IMPORTANT QUESTIONS FOR SECTION 'C'

DETAILED - ANSWER QUESTIONS

CHAPTER # 1: HEAT

- Derive the equation for pressure of an ideal gas on the basis of Kinetic molecular theory of gases.
- Differentiate between Real and Ideal gases. Derive an expression for the average translational kinetic energy of gas, Also derive Boyle and Charles' laws by using pressure gas equation.
- Using first law of thermodynamics in two isotherms of an ideal gas at different temperatures, show that $C_P - C_V = R$.
- Derive relation between coefficient of cubical and linear expansions.
- State and explain the First Law of Thermodynamics. On the basis of the 1st Law explain:
  1. Isothermal Process
  2. Isobaric Process
  3. Adiabatic Process
  4. Isochoric Process

CHAPTER # 2: ELECTROSTATICS

- State and apply a law to find the electric intensity at a point outside a uniformly charged sphere.
  OR State Gauss's Law. Apply it to determine the electric intensity at a point due to a *thin, infinite sheet of positive charge* or electric intensity between two oppositely charged plates.
- Derive an expression for the Absolute Electric Potential.
- What is a capacitor? Derive the expression for the capacitance of a parallel plate capacitor when:
  a. Air between the plates
  b. Space between the plates is partially filled by a dielectric medium

CHAPTER # 3: CURRENT ELECTRICITY

- State Ohm's Law. How is the resistance of the conductor related to its dimensions?
- Define the following and derive their relevant expressions:
  a. Resistivity of a wire
  b. Temperature coefficient of resistance of a wire
- Define electric potential difference between two points in an electric field. Derive the mathematical relation between electric potential difference and electric intensity.

CHAPTER # 4: MAGNETISM AND ELECTRO-MAGNETISM

- State Faraday's Laws of Electromagnetic Induction. Explain the phenomenon of Mutual or Self Induction, and derive an expression for Mutual or Self Inductance of two coils, also give its unit.
  OR Describe the Construction, Working and theory of A.C Generator.
- Describe the method for determining the ratio ($\frac{e}{m}$) of an electron. Derive the relevant mathematical expression.
- State Biot Savart and Ampere's Law, and derive an expression for the magnetic Field '**B**' of a long Solenoid **or** Toroid?
- State Coulomb's Law, Ampere's and Gauss's Laws and explain the phenomenon of mutual induction.
  OR On what principle does a transformer work?
  Give the working of a transformer with the help of a labelled diagram. Derive the relations between:
  1. EMF and Number of turns
  2. EMF and Current

CHAPTER # 5: ELECTRICAL MEASURING INSTRUMENTS

- Describe Wheatstone Bridge. Prove that for a balanced Wheatstone Bridge $\frac{R_1}{R_2} = \frac{R_3}{R_4}$.
- What is Moving Coil Galvanometer? Show how it can be converted into an ammeter and derive the formula for the shunt used in it.

CHAPTER # 7: ADVENT OF MODERN PHYSICS

- What is meant by the term **'Frames of Reference'**? Give the postulates of special theory of relativity and discuss the results drawn from it?
  OR Describe Photoelectric effect and explain Einstein's equation for Photoelectric effect and their results with the respective graphs?
- What is Compton Effect? Explain why it is not observable with visible light. Derive the relation for the Compton Shift and also show that at scattering angle of 90^0, shift in wavelength equals to $\frac{h}{m_o c}$.
- What are Black body and Black body radiations? State and explain the Law's governing the black body radiations.

CHAPTER # 8: THE ATOMIC SPECTRA

- Discuss metastable state and population inversion of lasing material. Describe the construction and working of Ruby Laser.
- What are X- rays? Discuss the production of X-rays and also explain Continuous and Characteristic Spectra?
- State the postulates of Bohr's atomic theory for Hydrogen atom. Derive an expression for the **Energy** of the electron in the n^{th} orbit of Hydrogen atom and the **Wavelength** of the photons emitted in the hydrogen spectrum.

CHAPTER # 9: THE ATOMIC NUCLEUS

- *Define Radioactivity? Explain the law of radioactive decay. Write the equations showing the change in parent nuclei of α, β and γ decay?*
- Define Nuclear Fission reaction. Explain fission chain reaction. How are moderators used to control fission in nuclear reactors.

CHAPTER # 10: NUCLEAR RADIATIONS

- Describe the Principle, Construction and Working of Wilson cloud chamber.

NOTE:

Are Marked as **MOST IMPORTANT**.

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