



St. Xavier's College
Maitighar, Kathmandu

Send Up Examination 2014

Class: XII
Subject: Physics

Full Marks: 75
Pass Marks: 30
Time: 3 hrs

Candidates are required to give their answer in their own words as far as practicable.
All the questions are compulsory. Figures in the margin indicate the full marks.

Group 'A'

1. Answer in brief. (Any four)

[4 x 2 = 8]

- A current carrying solenoid tends to contract. Explain, why?
- Why are alloys constantan and manganin used to make standard resistors?
- At high frequencies, a capacitor becomes a short circuit and an inductor becomes an open circuit. Explain
- Does the thermo-electric effect obey law of conservation of energy?
- Why are strong current not preferred for electroplating?
- Ampere's circuital law can be applied to the certain case only. Justify.

2. Answer in brief. (Any four)

[4 x 2 = 8]

- It is asked to take off ornaments while taking X-ray image of the body. Why?
- Define antiparticles. Write quark combination of anti neutron.
- NAND gate is a universal gate. Explain.
- What are the roles of physics in the development of nation?
- What are radioisotopes? Also mention their applications.

3. Answer in brief. (Any one)

[1 x 2 = 2]

- Is there any limitation in the beat frequency that we observe?
- What is the change in the fundamental frequency of a tube open at both ends if half of its length is dipped in water?

Differentiate between plane and spherical wavefronts.

[1 x 2 = 2]

- Can Foucault's method be used to find the speed of light in water? Explain.

5. Answer in detail. (Any three)

Group 'B'

[3 x 4 = 12]

- Derive an expression for the current flowing through an ac circuit containing an inductor, a capacitor and a resistor in series. Obtain an expression of power factor of this circuit.
- What are the magnetic elements of the earth? Prove the relation $\cot^2 \delta = \cot^2 \delta_1 + \cot^2 \delta_2$
- Define AC generator. Describe construction and working of it.
- Discuss the mechanism of conduction of electricity in the conductor. Derive the relation $I = VenA$, where symbols have their usual meaning.

6. Answer in detail. (Any three)

[3 x 4 = 12]

- State and explain Einstein's mass-energy relation with example. How is energy released estimated in the nuclear fission reaction?
- Draw the complete circuit of simple regulated power supply and hence explain how it regulates.
- Derive Bragg's equation and explain how is this equation used to determine the crystal plane spacing?
- Discuss the theory of Millikan's oil drop experiment to determine the charge of an electron.

7. Answer in detail. (Any one)

[1x4= 4]

- What is the significance of Newton formula for the speed of sound in the gaseous medium? How Laplace corrected the Newton formula?
- What is pressure amplitude? Obtain a relation for it with suitable graphical representation.

Answer in detail. (Any one)

[1x 4 = 4]

- What is diffraction of light? How the phase difference between waves can be used to explain the diffraction pattern when a parallel beam of monochromatic light is incident on a single slit.
- What is polarized light? Explain the polarization by reflection of light.

Group 'C'

Solve the following. (Any two)

[2x4=8]

- An inductor of inductance 0.50H is in series with resistance of 100Ω with 200V and 50 Hz ac supply. Find the maximum current in the circuit. Also find the time lag between maximum voltage and maximum current.
- A steady potential difference of 1.62V is maintained across two platinum electrodes placed in a solution of CuCl_2 . At the end of 600 seconds, the mass of copper deposited on the cathode is 5.92gm. The back emf of the voltmeter is given to be 1.34V. Find the resistance of the voltmeter. ($E = 96500\text{C/mol}$, relative atomic mass of $\text{Cu} = 63.5$)
- A standard cell of 1.0185V when used in one meter long slide wire potentiometer balances at 60 cm. Calculate the percentage error in voltmeter which balances at 65 cm when reading is 1.1V.
- Two long straight parallel wires in which there are currents of 2.0A and 3.0A respectively in the same direction are at 0.1m apart. Calculate the magnetic field at a point midway between them.

Solve the following. (Any two)

[2x4 = 8]

- When the light of certain wavelength is incident on a metal surface, the kinetic energy of ejected electron is 0.8eV. If the light with wavelength one third of the previous one illuminates the same metal surface the kinetic energy of the ejected electron is 4.8 eV. Calculate the threshold wavelength of the metal.
- Energy required to remove one electron from neutral Helium atom is 24.6eV. Calculate the energy required to detach both electrons from any neutral Helium atom.
- The sun obtains its radiant energy from a thermonuclear fusion process. The mass of the sun is $2 \times 10^{30}\text{kg}$ and it radiates $4 \times 10^{26}\text{KW}$ at a constant rate. Estimate the life time for the sun in years, if 0.7% of its mass is converted into radiation during the fusion process and it losses energy only by radiation. (1 year = $3 \times 10^7\text{sec}$ and $c = 3 \times 10^8\text{m/s}$)

A train approaching a tunnel at 60km/hr is sounding a whistle, of frequency 1 KHZ. What will be the frequency heard by the driver? (Speed of sound = 340m/s) [4]

Coherent light that contains two wavelengths, 600nm and 470nm, passes through two narrow slits separated by 1mm, and the interference pattern is observed on a screen 5.0m from the slits. What is the distance on the screen between the first-order bright fringes for the two wavelengths? [3]
