CLASS XII
SAMPLE PAPER
PHYSICS

Time allowed: 3 hours Maximum marks: 70

General Instructions:

1. All questions are compulsory. There are 26 questions in all.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. Section A contains five questions of one mark each, Section B contains five questions of two marks each, Section C contains twelve questions of three marks each, Section D contains one value based question of four marks and Section E contains three questions of five marks each.

Q.1> Why high precision microscopes prefer an oil immersion objective.

Q.2> Which is bigger - a coulomb or a charge on an electron? How many electronic charges form one coulomb of charge?

Q.3> Which special characteristic of light is demonstrated only by the phenomenon of polarization?

Q.4> A parallel plate capacitor has 2 plates of area A each separated by distance d. It is storing a charge Q. What is the energy density inside it?

Q.5> An equiconvex lens has a focal length "f". It is now cut vertically along its centre. What will be the focal length of each piece?

Q.6> Twenty seven drops of same size are charged at 220 V each. They coalesce to form a bigger drop. Calculate the potential of the bigger drop.

Q.7> If the frequency of incident light on a metal surface is doubled, will the kinetic energy of the photoelectrons be doubled? Give reason .

Q.8> Sketch a graph to show how the charge Q acquired by a capacitor of capacitance C varies with increase in potential difference between its plates. How can we determine the capacitance from this graph?

Q.9> Describe the working principle of a solar cell.
(ii) Why are Si and GaAs preferred materials for solar cells?

Q.10> In a hydrogen atom, an electron moves in an orbit. This revolution of a charged particle leads to a current. Using the results of Bohr's theory, find the current in the Hydrogen atom.

OR

An electron has been excited to the 4^{th} shell. When it makes a transition, it emits visible light. Find its wavelength.

Q.11> A thin rod of length f/3 is placed along the optic axis of a concave mirror of focal length f such that its image which is real and elongated, just touches the rod. What will be the magnification?

Q.12> Define specific resistance. The external diameter of a 5 meter long hollow tube is 10 cm and the thickness of its wall is 5 mm. If the specific resistance of copper be 1.7×10^{-5} ohm-meter, then determine its resistance.

Q.13> One face of a prism of refracting angle 30° and refractive index 1.414 is silvered. At what angle must a ray of light fall on the unsilvered face so that after refraction into the prism and reflection at the silvered surface it retraces its path?

Q.14> Draw the wavefront diagrams when light from a distant object is incident on (a) Convex lens (b) Convex mirror

Q.15> A real image is formed by the lens at a distance of 20 cm from the lens. The image shifts towards the combination by 10 cm when a second lens is brought in contact with the first lens. Determine the power of the second lens.

Q.16> Using Biot Savart law, derive an expression for the magnetic field on the axis of a current carrying coil.

Q.17> Angular width of a central maximum in the fraunhoffer diffraction pattern of a slit is measured. The slit is illuminated by light of wavelength 600nm. When the slit is illuminated by light of another wavelength, the angular width decreases by 30%. Calculate the wavelength of this light. The same decrease in the angular-width of central maximum is obtained when the original apparatus is immersed in a liquid. Find refractive index of the liquid.

Q.18> Light is falling on two slits separated by a small distance. A pattern is being observed on the screen. Now one of the slits is closed. Mention two changes that would occur in the observed pattern
(b) Define coherent sources of light.

Q.19> Why is communication using line of sight mode limited to frequencies above 40 MHz?
(ii) A transmitting antenna at the top of a tower has a height 32 m and the height of the receiving antenna is 50 m. what is the maximum distance between them for satisfactory communication in line of sight mode?

OR

A message signal of frequency 10 KHz and peak voltage of 10 volts is used to modulate a carrier of frequency 1 MHz and peak voltage of 20 volts. Determine (a) modulation index, (b) the side bands produced.

Q.20> Draw a schematic of the EM wave clearly showing the orientation of electric and magnetic fields.
(b) Name the EM waves that are used to study crystal structure. Write their wavelength.

Q.21> Derive an expression for the frequency of oscillation of a magnetic dipole in an external magnetic field.

Q.22> Define self inductance. Name 2 factors on which it depends. What is the self-inductance of an air core solenoid 50 cm long and 2 cm radius if it has 500 turns?

Q.23> In the famous conversation, Rakesh Sharma, the first Indian Astronaut in the space, was asked by the Prime Minister as to how India looked from the space. To which he replied ''Sare Jahan Se Aacha''.
Answer the following questions based on the above passage:
(a) Which mode of communication was used by the Prime Minister to speak to the Astronaut? Which type of EM waves are used in this?
(b) Which values were displayed by the Prime Minister in expressing her desire to speak to the Astronaut and in the question asked by the Prime Minister?
(c) Which two values were reflected by the Astronaut in his reply?

Q.24> Define (i) Depletion region (ii) Potential barrier.
(b) How are they affected in case of (i) Forward biasing (ii) Reverse biasing
(c) Explain the statement "A diode offers a unidirectional flow of current"

OR

Using a circuit diagram, explain the working of the transistor amplifier
(b) Draw the input waveform and output waveform and write the phase difference
(c) Explain why a transistor cannot be called as a power generating device.

Q.25> What is "Q value". Briefly explain the reason for production of energy in a nuclear reaction.
We are given the following atomic masses:

(a) $^{238}U_{92}$ = 238.05079 u (b) $^{4}He_{2}$ = 4.00260 u (c) $^{1}H_{1}$ = 1.00783 u
(d) $^{234}Th_{90}$ = 234.04363 u (e) $^{237}Pa_{91}$ = 237.05121 u

(a) Calculate the Q Value of the alpha decay of Uranium
(b) Show that Uranium cannot spontaneously emit a proton

OR

Define the terms (i) half life and (ii) Average life .Find out their relationship between them
(b) A radioactive nucleus has a half life of 100 years. How long will a sample take to (i) reduce to 25% (ii) reduce by 25% of the original
(c) Give one example of a alpha decay reaction.

Q.26> Derive an expression for the impedance of the LCR circuit and the expression for the current and phase difference.
(b) Under what condition is the current in the circuit in phase with the voltage. Derive the expression for the source frequency in this case.

OR

Explain the working of the LC oscillation and write the expression for charge and current
(b) Show that the total energy remains conserved.
(c) Draw graph for Energy in capacitor, inductor and total energy.

For Solutions, write an email to

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