St. Xavier's Sr. Sec. School
Delhi-54

Pre Board Examination 2016-17
Std. 12
16-01-2017

Set 2

Max. Marks : 70
Time : 3 hrs.

PHYSICS

INSTRUCTIONS:
- i) *Q. Nos. 1 to 5 carry 1 mark each.*
- ii) *Q. Nos. 6 to 10 carry 2 marks each.*
- iii) *Q. Nos. 11 to 22 carry 3 marks each.*
- iv) *Q. No. 23 carries 4 marks.*
- v) *Q. Nos. 24 to 26 carry 5 marks each.*
- vi) *Use pencil for the diagrams and graphs.*
- vii) *Answers should be to the point.*
- viii) *Use log tables if necessary*

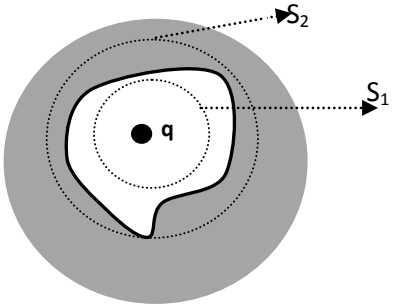
Section A

1. What is the function of a repeater in communication system? (1)

2. Give an example of material each for which temperature co-efficient of resistivity is
(i) Positive (ii) Negative. (1)

3. Though sun glasses have curved surfaces still the optical power is zero. Why? (1)

4. A metallic solid sphere consists of a cavity and a point charge 'q' is placed in the cavity as shown in the figure. What are the electric fluxes through the surfaces S_1 and S_2 (1)

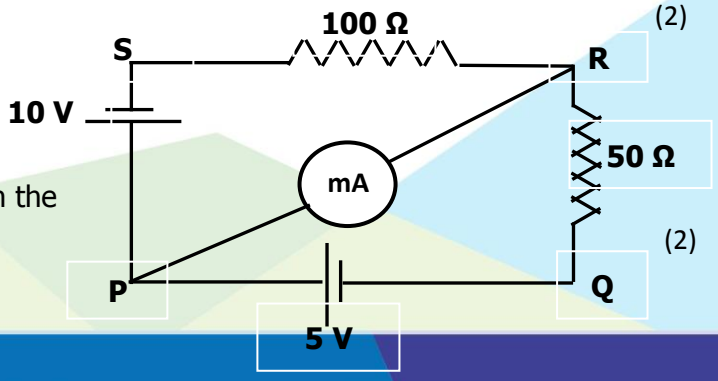


5. Define capacitive reactance. Show the variation of capacitive reactance with the angular frequency graphically. (1)

Section B

6. Explain how the nature and image distance varies as an object moves from infinity towards pole of a concave mirror. (2)

7. The network PQRS shown in the circuit diagram has a battery of 5V and 10V and negligible resistance. A milli ammeter of resistance 50Ω is connected between PQ. Calculate reading in the ammeter. (2)



8. Draw the energy band diagram of a p-type extrinsic semiconductor. How does the forbidden energy gap of an intrinsic semiconductor vary with increase in temperature? (2)

9. State Bohr's postulates of the atomic model. Show that the radius of an orbit in hydrogen atom varies as n^2, where n is the principal quantum no of electron. (2)

10. An electron is accelerated through a potential of V volts. Write the expression of its de-Broglie wave length. Plot the variation of it with accelerating potential V. Where does such beam used?

(OR)

A electromagnetic wave of wavelength λ is incident on a photosensitive surface of negligible work function. If the photoelectrons emitted form this surface have de-Broglie wavelength λ_1. Prove that $\lambda = (\frac{2mc}{h})\ \lambda_1^2$ (2)

Section C

11. Draw a labelled diagram of full wave rectifier circuit and briefly explain its working. Draw the input and wave forms of voltages. Name the device used to get rid of pulsating output. (3)

12. State the working principle of a moving coil galvanometer. The net force experienced by the galvanometer is zero still the coil experiences a torque. Explain. (3)

13. In an young's double slit experiment, the amplitude of light emitting from one slit is 3 times the amplitude of light emitting from other slit. Show that intensity of light due to interference at any point on the screen is $\boldsymbol{I = \frac{I_o}{4}(1+3cos^2\frac{\phi}{2})}$ Where I_o is maximum intensity and ☐ is phase difference. (3)

14. Explain why input and output of common emitter amplifier are in opposite phase. If the current amplification factor of a transistor is 100, find the base current and potential difference across base resistance of 1kΩ when the output current is 1mA. (3)

15. Complete the table with suitable data. (3)

Radiation	Wavelength	Use
Gamma Rays		
	10^{-8}m	
		Remote switches

16. Define the phenomenon mutual induction. A solenoid 'A' consists of total number of turns N_a wound over a length of 'L'. Each turn bounds an area 'a'. Another solenoid 'B" of total number turns N_b wound over the same length is placed inside the solenoid 'A' coaxially. Derive an expression for the coefficient of mutual induction of the solenoid 'B' due to 'A', if area bound by each turn of the coil 'B' is 'b'(b<a). (3)

17. Explain how wave theory of light failed to explain photo electric effect.
Work function of photo electrode in a phototube is 4.2 eV. How will the photo tube respond when a radiation of 330nm strikes on it? (3)

18. Draw a neat ray diagram of a compound microscope, when the final image is formed at least distance of distinct vision. Derive the formula for its magnifying power. (3)

19. Explain process of amplitude modulation of a signal with the help of suitable diagrams. Define modulation index. Why its value is kept preferably less than 1. (3)

20. a) Define the terms activity of a sample of radionuclide. Write expression for the law of radioactive decay in terms of activity of a given sample.

b) A radioactive isotope has half life of 'T' years. How long will take the activity reduce to 3.125% its original value?

(OR)

Distinguish between nuclear fusion and fusion. Explain briefly how energy is released in both cases. Calculate energy released in the following nuclear reaction.
${}_1^2H + {}_1^3H \rightarrow {}_2^4H + {}_1^3He + {}_0^1n$ Given that m $({}_{(1}^2H)$ = 2.014102u, m $({}_{(1}^3H)$ =3.016049, m $({}_{(2}^4H)$ = 4.002603, $({}_{(1}^2nH)$ = 1.008665u and 1amu≡ 931MeV

(3)

21. The distance between plates of a charged parallel plate capacitor is 5cm and electric field intensity is 300V/cm. A slab of dielectric constant 5 and 1cm wide is introduced between the plates. Determine the potential difference between the plates before and after the slab is introduced. If the slab is replaced by a metal slab so that final potential difference remains unchanged, what must be the thickness of the metallic plate. (3)

22. A potentiometer has a resistance wire of uniform cross-section and a length of 400cm and resistance of 15Ω. The potentiometer wire is connected in series with a resistance box provides a resistance of 15Ω. A battery maintains a potential difference of 4V across the combination of potential meter and the resistance box. Calculate the balancing length required to balance a primary cell of emf 1.36V, and also calculate the balancing length when the resistance box is removed and the connections are restored. (3)

Section D

23. A student happens to see a distribution transformer installed by BSES in his locality. There was a caution note 'DANGER' fixed on the transformer. The student finds a technician near the transformer and asked seriously about the caution note. The technician explained about the functions and importance of the transformer.

a) What is your answer as a science student of class 12?

b) What will be approximate values of input and output voltage of this transformer?

c) What are the values reflected in the behavior of the technician? (4)

Section E

24. a) State Ampere's circuital law and write its mathematical expression. A current of 'I' is passed through a thick conductor of radius of cross-section 'R'. Use Ampere's circuital law to derive an expression for magnetic field intensity at any point (i) outside the

conductor (ii) inside the conductor. Show the variation of magnetic field intensity with distance as measured from the center of cross-section of the wire.

b) Compare the magnetic field intensities between the two points at the distances of $\frac{R}{2}$ and $\frac{3R}{2}$ from the centre of the cross-section of the wire. (4+1)

(OR)

a) What are ac circuits? How they are different form dc circuits? An inductor of self inductance 'L', a capacitor of capacitance 'C' and an resistor of resistance 'R' are connected in series and the combination is connected across the source of alternating voltage. Draw a neat phasor diagram for the voltage across the different circuit elements and current and hence obtain the expression for impedance of the circuit.

b) Calculate the impedance of the series LCR circuit, if $X_L = 10\sqrt{3}\Omega$, $X_C = 5\sqrt{3}\Omega$ and $R=5\Omega$. What is phase difference of the current with respect to the voltage? (3½+1½)

25. a) State Huygens's principle, show with the help of a suitable diagram, how this principle is used to obtain the diffraction pattern by a single slit.

b) Show that angular width of the first diffraction fringe is half that of the central fringe.

c) Explain why the maxima at $\theta=(n+\frac{1}{2})\frac{\lambda}{a}$ becomes weaker and weaker with increasing 'n'. (3+1+1)

(OR)

a) A convex lens of focal length f_1 is kept in contact with another lens of focal length f_2. Find an expression for the effective focal length of the combination.

b) An equiconvex lens of refractive index n, focal length f and radius of curvature 'R' is immersed in a liquid medium of refractive index n_m. For (i) $n_m > n$ and (ii) $n_m < n$, draw the ray diagram in the two cases when the incident rays are parallel to the principal axis. Find the new focal length in both cases. (2+3)

26. A conducting spherical shell of radius R is given a charge Q.

a) Using Gauss's theorem, derive expression for electric filed at a point outside the shell;

b) Where is the field maximum and how much is it?

c) Obtain an expression for electric potential inside the shell. (2+1+2)

(OR)

Two charges q and 2q are held ar x=-d and x=d are placed on x axis respectively. A third charge 3q is released from rest on the y axis y=d. Find

a) Initial electric potential due to first two charges at the location of 3rd charge.

b) Initial potential energy of the system.

c) Kinetic energy of third charge when it has moved infinitely far away form the two charges. (1½+2+1½)

x-x-x-x-x-