CLASS XII
SAMPLE PAPER
PHYSICS

Time allowed: 3 hours *Maximum Marks: 70*

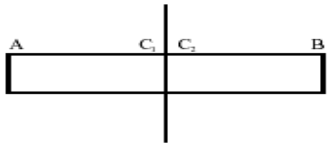
General Instructions

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.*
4. *.There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all the three questions of five marks weight age. You have to attempt only one of the choices in such questions.*
5. *You may use the following values of physical constants wherever necessary.*

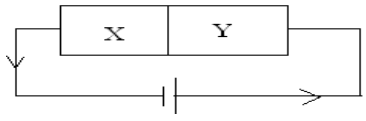
$c=3x10^8$ m/s $h=6.6 \times 10^{-34}$ Js $e=1.6 \times 10^{-19}$ C $N_A = 6.023 \times 10^{23}$ /mole $m_n = 1.67 \times 10^{-27}$ kg

SECTION A

1. A (hypothetical) bar magnet (AB) is cut into two equal parts. One part is now kept over the other, so that pole C2 is above C1. If M is the magnetic moment of the original magnet, what would be the magnetic moment of the combination so formed ?



2. Two intrinsic semiconductors X and Y are doped with As and In respectively and then connected as shown in figure: Identify the biasing and draw V-I curve for this biasing.



3. Name the characteristics of electromagnetic waves that (i) increases (ii) remains constant in the electromagnetic spectrum as one moves from radiowave region towards ultraviolet region.

4. Why must both the objective and the eyepiece of a compound microscope have short focal lengths?

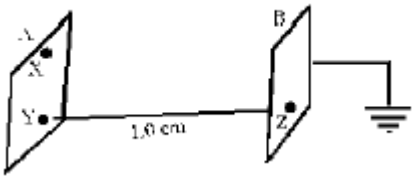
5. Draw the graph for the variation of (a) stopping potential with frequency and
   (b) Photoelectric current Vs anode potential keeping the intensity of incident radiations constant

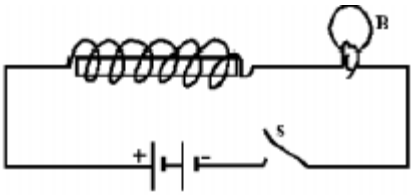
SECTION B

6. Keeping the voltage of the the charging source constant, what would be the percentage change in the energy stored in a parallel plate capacitor if the separation between its plates were to be decreased by 10%?

7. Two cells of emf E1 and E2 have internal resistance r1 and r2. Deduce an expression for equivalent emf of their parallel combination. **OR**
   A cell of emf (E) and internal resistance (r) is connected across a variable external resistance (R). Plot graphs to show variation of(i) E with R (ii) Terminal p.d. of the cell (V) with R

8. Two identical plane metallic surfaces A and B are kept parallel to each other in air separated by a distance of 1.0 cm as shown Surface A is given a positive potential of 10V and the outer surface of B is earthed. (i) What is the magnitude and direction of the uniform electric field between points Y and Z? (ii) What is the work done in moving a charge of 20C from point X to point Y?





9. Fig. Shows a light bulb (B) and iron-cored inductor connected to a DC battery through a switch (S).

(i) What will one observe when switch (S) is closed?
(ii) How will the glow of the bulb change when the battery is replaced by an ac source of rms voltage equal to the Voltage of DC battery? Justify your answer in each case.'

10. Give reasons for the following (a) Astronomers prefer to use telescopes with large objective diameters to observe astronomical objects. (b) Two identical but independent monochromatic sources of light cannot be coherent.

SECTION C

11. Light of wavelength 550 nm. is incident as parallel beam on a slit of width 0.1mm. Find the angular width and the linear width of the principal maxima in the resulting diffraction pattern on a screen kept at a distance of 1.1m from the slit. Which of these widths would not change if the screen were moved to a distance of 2.2m from the slit?
12. How the detection of Amplitude modulated wave is done. What is the function of rectifier in detection?

13. Derive the expression for the force per unit length between two parallel current carrying wires is separated by a distance. Define one ampere

14. An armature coil consists of 20 turns of wire, each of area A = 0.09m^2 and total resistance15Ω .It rotates in a magnetic field of 0.5T at a constant frequency of 150/π Hz. Calculate the value of (i) maximum (ii) average induced emf produced in the coil

15. Electromagnetic radiations with wavelength (i) λ_1 are used to kill germs in water purifiers. (ii) λ_2 are used in TV communication systems (iii) λ_3 plays an important role in maintaining the earth's warmth. Name the part of electromagnetic spectrum to which these radiations belong. Arrange these wavelengths in decreasing order of their magnitude .

16. Two capacitors with capacity C1 and C2 are charged to potential V1 and V2 respectively and then connected in parallel. Calculate the common potential across the combination, the charge on each capacitor, the electrostatic energy stored in the system and the change in the electrostatic energy from its initial value.

OR

Deduce an expression for electric potential due to an electric dipole at any point on its axis. Mention one contrasting feature of electric potential of a dipole at a point as compared to that due to a single charge.

17. Draw the input and output characteristics of a transistor in its common emitter configuration. Explain briefly the meaning of the term 'active region' in these characteristics. For what practical use, do we use the transistor in this 'active region'
18. What is satellite wave propagation? Which two communication methods make use of this mode of propagation? If the sum of the heights of transmitting and receiving antennae in line of sight of communication is fixed at h, show that the range is maximum when the two antennae have a height h/2 each.

19. Explain the origin of spectral lines of hydrogen using Bohr's theory. Mark transisitions corresponding Lyman and Balmer series The wavelength of the second line of the balmer series in the hydrogen spectrum is 4861 A^o .Calculate the wavelength of the first line.

20. When a circuit element 'X' is connected across an a.c. source, a current of 1 A flows through it and this current is in phase with the applied voltage. When another element 'Y' is connected across the same a.c. source, the same current flows in the circuit but it leads the voltage by π/2 radians. (i) Name the circuit elements X and Y.(ii) Find the current that flows in the circuit when the series combination of X and Y is connected across the same a.c.voltage.(iii) Plot a graph showing variation of the net impedance of this series combination of X and Y as a function of the angular frequency of the applied voltage.

21. Give reasons for the following:
(i) The Zener diode is fabricated by heavily doping both the p and n sides of the junction

(ii) A photodiode, when used as a detector of optical signals is operated under reverse bias.
(iii) The band gap of the semiconductor used for fabrication of visible LED's must at least be 1.8 eV.

22. Draw set up of Davission and Germer experiment. Expalin how wave nature was detected by the experiment.

SECTION D

23. Siddharth switched on the radio set to listen to his favourite music .But he found the reception was not clear. Apart from that, there was overlapping of signals. He had to adjust the tuner in the set to hear crisp and clear music.
(a)What are the components of the tuner in the radio set ? (b)Why is the tuner adjusted ?
(c) What value can be associated with the phenomenon involved in the adjustment of the tuner

SECTION E

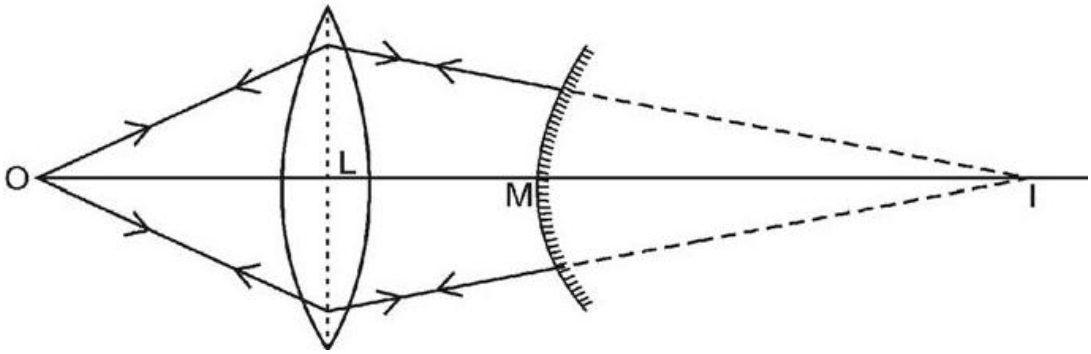
24. Two circular coils X and Y having radii R and R /2 respectively are placed in horizontal plane with their centers coinciding with each other. Coil X has a current I flowing through it in the clockwise sense. What must be the current in coil Y to make the total magnetic field at the common centre of the two coils, zero? With the same currents flowing in the two coils, if the coil Y is now lifted vertically upwards through a distance R, what would be the net magnetic field at the centre of coil Y?

OR

State Biot-Savart's Law. Using this law, derive the expression for the magnetic field due to current carrying circular loop of radius R, at a point, which is at a distance X from its center along the axis of loop. Consider two parallel co-axial circular coils of same radius R and number of turns N, carrying same current I in same direction, separated by a distance R Show that the field on the axis around the mid-point between the coils in uniform over a distance that is small as compared to R is given by

$$B = (0.72\mu_0 NI) / R$$

25. (i) Using the relation for refraction at a single spherical refracting surface, derive the lens maker's formula.
An object is placed at a distance of 15cm from a convex lens of focal length 10cm.On the other side of the lens, a convex mirror is placed such that its distance, from the lens, equals the focal length of the lens. The image formed by this combination is observed to coincide with the object itself. Find the focal length of the convex mirror.



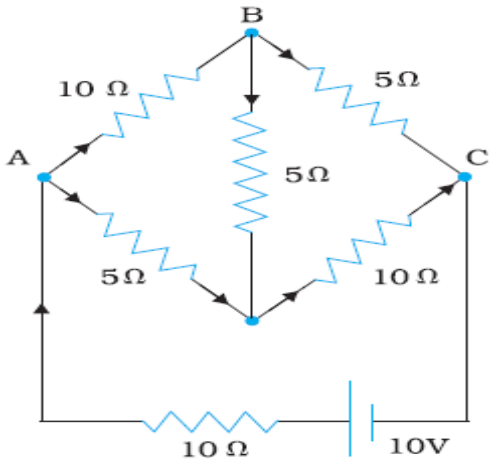
OR

Draw labeled diagram of astronomical telescope to see final image at near point. Derive the expression for the magnifying power.

(a) A giant refracting telescope at an observatory has an objective lens of focal length 15m. If an eyepiece of focal length 1.0cm is used, what is the angular magnification of the telescope?

(b) If this telescope is used to view the moon, what is the diameter of the image of the moon formed by the objective lens? The diameter of the moon is 3.48×10^6 m, and the radius of lunar orbit is 3.8×10^8 m.

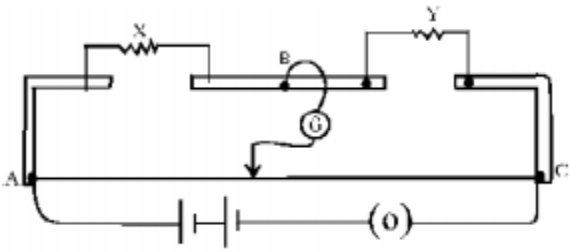
26. State Wheat stone bridge principle. Derive the condition to balance the bridge.
Determine the current in each branch of the network shown in



OR

Explain how the meter bridge calculates the specific resistance of a wire? What is the end error in a meter bridge?

The given figure shows the experimental set up of a metre bridge. The null point is found to be 60cm away from the end A with X and Y in position as shown.



When a resistance of 15Ω is connected in series with 'Y', the null point is found to shift by 10cm towards the end A of the wire. Find the position of null point if a resistance of 3Ω were connected in parallel with 'Y'.

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