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Previous Year Paper

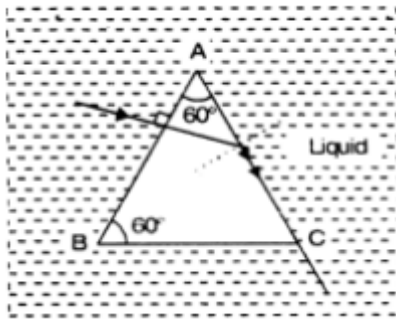
Physics - 2004

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Short Answer Type

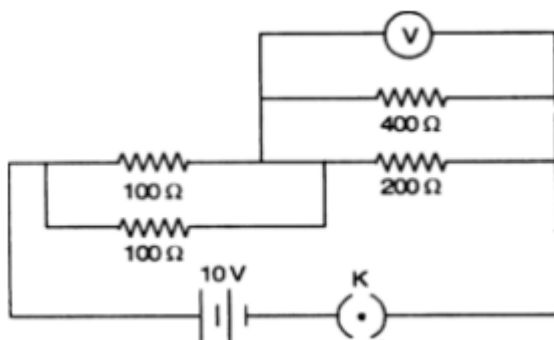
1. What is the locus of a point at which the electric field $\mathbf{E}$ due to an electric dipole is parallel to the line joining the charges $+q$ and $-q$ forming the dipole ? [Answer](#)
2. State one important difference between Peltier's Effect and Joule's Effect. [Answer](#)
3. Three bulbs of specifications 60 W/220 V, 100 W/220 V and 1000 W/220 V are connected in series. Which one will glow the brightest ? [Answer](#)
4. State one important property of a standard cell. [Answer](#)
5. A wire of resistance $20\ \Omega$ is bent in the form of a complete circle. Find the resistance between two diametrically opposite points. [Answer](#)
6. What will be the direction of current at the cold junction of a thermocouple thermometer in which iron and copper is being used. (Fe to Cu or Cu to Fe). [Answer](#)
7. A wire of length 10 cm, carrying 10 Amp of current is placed at an angle of 53° with respect to a magnetic field $\mathbf{B}$ of strength 0.1 Tesla. Find the force experienced by the wire [$\text{use } \sin 53^\circ = \frac{4}{5}$] [Answer](#)
8. Define 'HYSTERESIS'. [Answer](#)
9. Find the percentage increase in magnetic field intensity when a solenoid carrying current is filled with aluminium [x for $\mu_0 = 2.1 \times 10^{-3}$]. [Answer](#)
10. How is an ideal inductor obtained? [Answer](#)
11. Find the refractive index of the liquid if a ray of light strikes surface AB normally and then comes out from face AC at grazing emergence. [$\mu_g = 3/2$] [Answer](#)
12. Define the angular magnification of an optical instrument. [Answer](#)
13. In Young's double slit experiment, if white light is used in lieu of monochromatic light, what changes are observed in the interference pattern ? [Answer](#)
14. The refractive index of glass with respect to air is $3/2$. Find the angle of polarisation.



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Answer

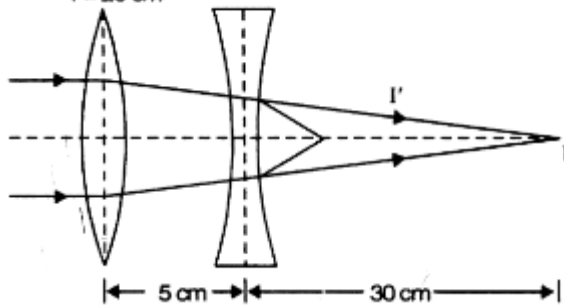
15. What is meant by remote sensing ? [Answer](#)
16. An electron is accelerated under a potential difference of 150 volts. What is De broglie's wavelength ? [Answer](#)
17. How can the work function of tungsten be increased ? [Answer](#)
18. What are Fraunhofer's Lines ? [Answer](#)
19. What is the role of control rods in a Nuclear Reactor ? [Answer](#)
20. Draw the symbol for NAND GATE. [Answer](#)
21. An ionized helium particle (+2e) is situated at the origin (0, 0). How much work is done in taking an electron from $x = 3$ cm to $x = 6$ cm? [Answer](#)
22. Given that the resistance of the voltmeter is $400\ \Omega$, find the voltmeter's reading.



Answer

23. Show that the radius of a charged particle entering perpendicularly in a magnetic field is directly proportional to its momentum. [Answer](#)
24. Find the inductance of a choke coil needed to run an arc lamp, with an a.c. source of 100 V supply at 50 Hz. The arc runs at 10 amp. current and has an effective resistance of $4\ \Omega$.
[Answer](#)
25. State any five electromagnetic waves and arrange them in the increasing order of their penetrating power. [Answer](#)
26. What type of wave front is produced by:
(i) Point source of light (ii) Line source of light
[Answer](#)
27. Define dispersive power. The dispersive power of an achromatic doublet is $\frac{2}{3}$ and the combined focal length of the combination is 30 cm. Find the focal length of each lens stating its nature.

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28.

Calculate the focal length of a concave lens with the help of the above ray diagram. Focal length of convex lens is 20 cm. [Answer](#)

29. A fish is located at a distance of 10 cm from the wall of a fish pond. The thickness of the glass wall is 2 cm. Find the apparent position of the fish. (Given ${}_a\mu_g = 3/2$ and ${}_a\mu_w = 4/3$)

[Answer](#)

30. Write short notes on radiocarbon dating. [Answer](#)
31. Draw the circuit diagram for a common emitter NPN transistor, stating the input and output wave form. [Answer](#)
32. What are logic gates. Give the electronic circuit for the realization of AND GATE. [Diode combination showing input and output with biasing]. [Answer](#)



Long Answer Type

33. State and prove Tangent law. [Answer](#)
34. A magnet makes 12 oscillations per minute in the earth's magnetic field alone and 15 oscillations per minute when a short magnet with its axis horizontal and its south pole pointing north is placed with its center 20 cm directly above the oscillating magnet. Find the magnetic moment of the magnet. (Given : $B_H = 0.36 \times 10^{-4}$ Tesla). [Answer](#)
35. What is meant by back e.m.f. of a motor ? The back e.m.f. of a motor delivering 5 kW is 100 V, while operating on 110 V supply. Find the current and resistance of the motor. [Answer](#)
36. What are the conditions necessary for sustained interference?

In Young's double slit experiment the distance of the 4th Bright fringe from the central zero is 1.5 mm. The distance between the slits and the screen is 1.5 m and the distance between the slits is 2 mm. Find the wavelength of light used. [Answer](#)

37. State one experiment to determine the velocity of light. Draw necessary ray diagram and derive the formula used. [Answer](#)
38. Derive the formula for angular magnification of a compound microscope, when the final image is formed at least distance of distinct vision. Draw the required ray diagram.

[Answer](#)

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39. Give the expression for the velocity of electron in the first orbit of Hydrogen atom and for the radius in the ground state of Hydrogen atom.

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Hence derive the expression for the kinetic energy of the electron.

Answer

40. In Millikan's oil drop experiment, a charged oil drop of density 880 kg/m^3 is held stationary between two parallel plates 6.0 mm apart at a potential difference of 1000 volts . When electric field **E** is switched off, the oil drop was observed to fall a distance of 2.0 mm in 35.7 seconds .

[4]

(i) Find the radius of oil drop.

Given :

η for air = $1.8 \times 10^{-5} \text{ poise}$

Density of air = 1.29 kg/m^3

Use $g = 9.81 \text{ m/s}^2$

Answer

41. What is photoelectric effect ? With the help of a suitable graph show the variation of photo current with,

- (i) The intensity of incident radiation.
- (ii) Voltage applied between cathode and anode.
- (iii) Frequency of incident radiation.

Answer

42. The potential difference across an x-ray tube is 12.4 kV and the current through the filament is 2 mA .

Calculate :

- (i) the number of electrons striking per second on the anode.
- (ii) The speed with which the electron strikes the target.
- (iii) The shortest wavelength of X-rays emitted.

Answer