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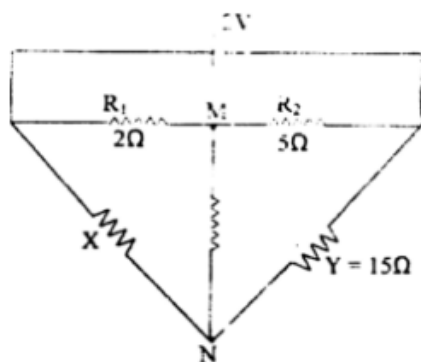
Previous Year Paper

Physics - 2009



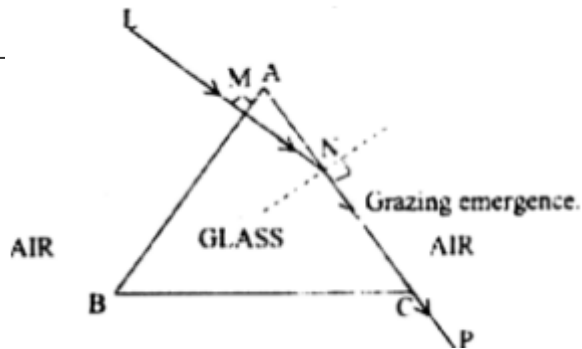
Short Answer Type

1. Explain the statement 'Relative permittivity of water is 81' [Answer](#)
2. Draw (at least three) electric lines of force due to an electric dipole.
[Answer](#)
3. Find the value of resistance X in the circuit below so that the junctions M and N are at the same potential: [Answer](#)
4. When the cold junction of a certain thermo-couple was maintained at 20°C , its neutral temperature was found to be 180°C . Find its temperature of inversion. [Answer](#)
5. State how the magnetic susceptibility of a ferromagnetic material changes when it is heated.
[Answer](#)
6. What is the value of power factor in a series LCR circuit at resonance?



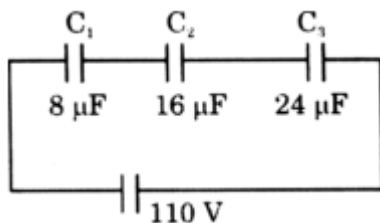
[Answer](#)

7. An a.c. generator generates an emf 'e' given by: $e = 311 \sin(100 \pi t)$ volt. Find the rms value of the emf generated by the generator. [Answer](#)
8. A ray LM of monochromatic light incident normally on one refracting surface AB of a regular glass prism ABC emerges in air from the adjacent surface AC as shown in Figure 2. Calculate the refractive index of the material of the prism. [Answer](#)
9. Describe the absorption spectrum of Sodium. [Answer](#)
10. A thin converging lens of focal length 15 cm is kept in contact with a thin diverging lens of focal length 20 cm. Find the focal length of this combination. [Answer](#)
11. Can two sodium vapour lamps act as coherent sources? Explain in brief. [Answer](#)
12. Why all over the world, giant telescopes are of reflecting type? State any one reason. [Answer](#)
13. A ray of ordinary light is incident on a rectangular block of glass at Brewster's angle. What is the angle between the reflected ray and the refracted ray of light?



Answer

14. Find the momentum of a photon of energy 3.0 eV. [Answer](#)
15. The half life of a certain radio active element is 8 hours. If a pupil starts with 32 g of this element, how much of the sample will be left behind at the end of one day? [Answer](#)
16. If a hydrogen atom goes from III excited state to II excited state, what kind of radiation (visible light, ultra violet, infra red, etc.) is emitted? [Answer](#)
17. Where in our universe is the thermo-nuclear energy being released naturally? [Answer](#)
18. In which of the solids (semi-conductors, conductors or insulators) do conduction band and valence band overlap? [Answer](#)
19. What is the symbol of a NOR gate? [Answer](#)
20. Find the electric charge Q_1 on plates of capacitor C_1 , shown in Figure 3 below:

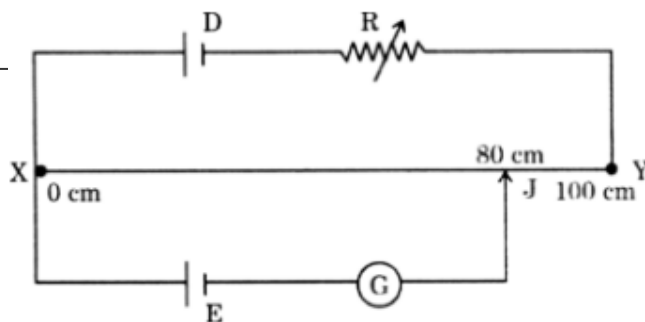


Answer

21. (i) What is meant by:
 - (1) Drift velocity and
 - (2) Relaxation time?
 (ii) A metallic plug AB is carrying a current I (see Figure 4 below). State how the drift velocity of free electrons varies, if at all, from end A to end B.

Answer

22. Figure below shows a uniform manganin wire XY of length 100 cm and resistance $9\ \Omega$, connected to an accumulator D of emf 4 V and internal resistance $1\ \Omega$ through a variable resistance R. E is a cell of emf 1.8 V connected to the wire XY via a jockey J and a central zero galvanometer G. It is found that the galvanometer shows no deflection when $XJ = 80$ cm. Find the value of R.



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[Answer](#)

23. Obtain an expression for magnetic flux density 'B' at the center of a circular coil of radius R and having N turns, when a current I is flowing through it. [Answer](#)

24. (i) State any two differences between a moving coil galvanometer and a tangent galvanometer.
(ii) What is the use of a Cyclotron?

[Answer](#)

25. What is meant by the time constant of an LR circuit? When the current flowing through a coil P decreases from 5A to 0 in 0.2 seconds, an emf of 60 V is induced across the terminals of an adjacent coil Q. Calculate the coefficient of mutual inductance of the two coils P and Q. [Answer](#)

26. When an alternating emf $e = 300 \sin(100\pi t + \pi/6)$ Volt is applied to a circuit, the current I through it is $I = 5.0 \sin(100\pi t - \pi/6)$ ampere. Find the :
(i) Phase difference between the emf and the current.
(ii) Average power consumed by the circuit.

[Answer](#)

27. Obtain an expression for resonant frequency ' f_0 ' of a series LCR circuit. [Answer](#)

28. In which part of the electromagnetic spectrum, do the following radiations lie:

- (i) Having wavelength of 20 nm
- (ii) Having frequency of 10 MHz

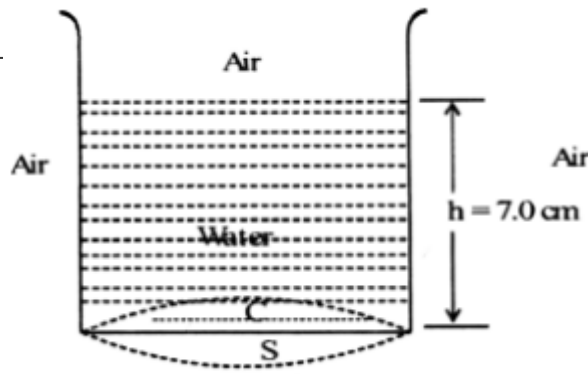
[Answer](#)

29. A thin convex lens which is made of glass (refractive index 1.5) has a focal length of 20 cm. It is now completely immersed in a transparent liquid having refractive index 1.75. Find the new focal length of the lens. [Answer](#)

30. Draw a labelled graph showing the variation in intensity of light with distance in a single slit Fraunhofer diffraction experiment. [Answer](#)

31. Give any two methods by which (ordinary) light can be polarised. [Answer](#)

32. A point source of monochromatic light 'S' is kept at the centre C of the bottom of a cylinder. Radius of the circular base of the cylinder is 15.0 cm. The cylinder contains water refractive index = $4/3$ to a height of 7.0 cm.



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Find the area of water surface through which light emerges in air.

[Answer](#)

33. An astronomical telescope consists of two convex lenses having focal length 80 cm and 4 cm. When it is in normal adjustment, what is its:

(i) Length,

(ii) Magnifying power?

[Answer](#)

34. A convex lens of focal length 5 cm is to be used as a simple microscope. Where should an object be kept so that image formed by the lens lies at least distance D of distinct vision ($D = 25$ cm)? Also calculate the magnifying power of this instrument in this set up. [Answer](#)

35. What are characteristic X rays? How are they different from continuous X rays? Give any one difference. [Answer](#)

36. Wavelength of the 1st line (H_α) of Balmer series of hydrogen is 656.3 nm. Find the wavelength of its 2nd line (H_β). [Answer](#)

37. Plot a labelled graph of $[V_s]$ where V_s is stopping potential of photoelectrons versus frequency ' f ' of incident radiation. How will you use this graph to determine the value of Planck's constant? Explain [Answer](#)

38. (i) Define 'unified atomic mass unit'.

(ii) Find the minimum energy which a gamma ray photon should possess so that it is capable of producing an electron — positron pair.

[Answer](#)

39. Fission of U - 235 nucleus releases 200 MeV of energy. Calculate the fission rate (i.e. no. of fissions per second) in order to produce a power of 320 MW. [Answer](#)

40. Draw a neatly labelled circuit diagram of a Full Wave rectifier using two junction diodes. [Answer](#)

41. A sinusoidal voltage $e = e_0 \sin (wt)$ is fed to a common emitter amplifier. Draw neatly labelled diagrams to show:

(i) Signal voltage

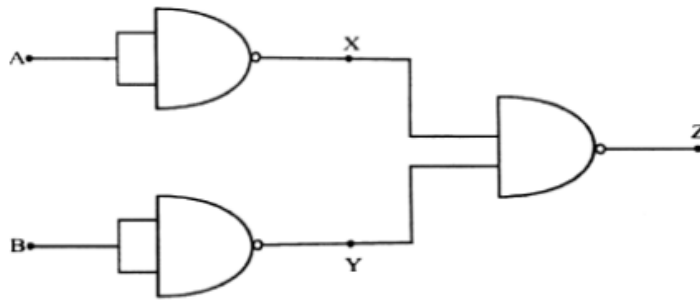
(ii) Output voltage of the amplifier

[Answer](#)

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42. Make truth table showing inputs at A and B and outputs at X, Y and Z for the combination of gates shown in figure below.

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Answer



Long Answer Type

43. With the help of a labelled diagram, obtain an expression for the electric field intensity 'E' at a point P in broad side position (i.e., equatorial plane) of an electric dipole. [Answer](#)
44. What is meant by 'Chromatic aberration'? A thin convex lens of focal length 30 cm and made of flint glass (dispersive power = 0.03) is kept in contact with a thin concave lens of focal length 20 cm and made of crown glass. Calculate the dispersive power of crown glass if the above said combination acts as an achromatic doublet. [Answer](#)
45. Electrons, initially at rest, are passed through a potential difference of 2 kV. Calculate their:
- Final velocity and
 - de Broglie wavelength.

[Answer](#)