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Previous Year Paper

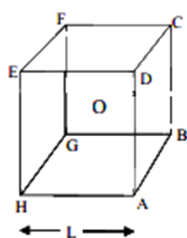
Physics - 2015

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Multiple Choice Questions

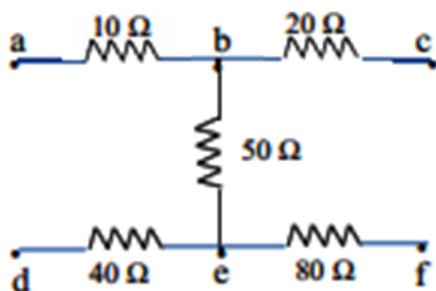
1. A short electric dipole (consists of two point charges $+q$ and $-q$) is placed at the centre O and inside a large cube ($ABCDEFGH$) of length L , as shown in the figure below. The electric flux, remaining through the cube is:



- A. $\frac{q}{4\pi\epsilon_0 L}$
- B. Zero
- C. $\frac{q}{2\pi\epsilon_0 L}$
- D. $\frac{q}{2\pi\epsilon_0 L}$

Answer

2. The equivalent resistance between points a and f of the network as shown in the figure below is:



- A. 24 ohm
- B. 110 ohm
- C. 140 ohm
- D. 140 ohm

Answer

3. A moving electron enters a uniform and perpendicular magnetic field. Inside the magnetic field, the electrons travels along,

- A. a straight line
- B. a parabola
- C. a circle
- D. a circle

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$$\mu = \frac{4}{3}$$

4. A fish which is at a depth of 12 cm in water ($\mu = \frac{4}{3}$) is viewed by an observer on the bank of a lake. Its apparent depth as observed by the observer is:

- A. 3 cm
- B. 9 cm
- C. 12 cm
- D. 12 cm

Answer

5. If E_p and E_k represent potential energy and kinetic energy respectively, of an orbital electron, then according to the Bohr's theory:

- A. $E_k = -E_p/2$
- B. $E_k = -E_p$
- C. $E_k = -2E_p$
- D. $E_k = -2E_p$

Answer



Short Answer Type

6. What is meant by the term Quantization of Charge?

Answer

7. A resistor R is connected to a cell of emf e and internal resistance r. Potential difference across the resistor R is found to be V. State the relation between e, V, R and r.

Answer

8. Three identical cells of emf 2V internal resistance 1 ohm are connected in series to form a battery. The battery is then connected to a parallel combination of two identical resistors, each of resistance 6 ohm. Find the current delivered by the battery.

Answer

9. State how magnetic susceptibility is different for the three types of magnetic material, i.e., diamagnetic, paramagnetic and ferromagnetic materials.

Answer

10. An emf of 2 V is induced in a coil when current in it is changed from 0A to 10 A in 0.40 sec. Find the coefficient of self-inductance of the coil.

Answer

11. How are electric vector **E**, magnetic vector **B** and velocity vector **c** oriented in an electromagnetic wave?

Answer

12. State two methods by which ordinary light can be polarised?

Answer

13. A monochromatic ray of light falls on a regular prism. What is the relation between angle of

Answer

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14. What type of lens is used to correct long-sightedness?

Answer

15. State any one advantage of using a reflecting telescope in place of a refracting telescope?

Answer

16. State Moseley's Law?

Answer

17. Wavelengths of the first lines of the Lyman series, Paschen series and Balmer series in hydrogen spectrum are denoted by λ_L , λ_P and λ_B respectively. Arrange these wavelengths in increasing order.

Answer

18. What is the significance of binding energy per nucleon of a nucleus of a radioactive element?

Answer

19. Write any one balanced equation representing nuclear fission.

Answer

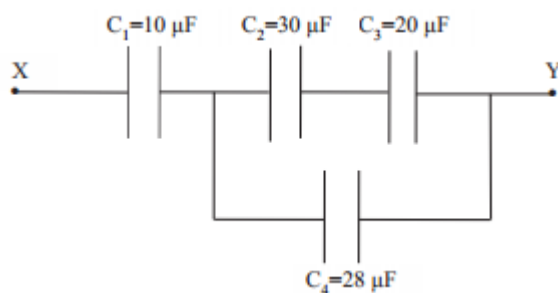
20. What is the difference between analogue signal and digital signal?

Answer

21. Two point charges of 10 C each are kept at a distance of 3 m in vacuum. Calculate their electrostatic potential energy.

Answer

22. Four capacitors C_1 , C_2 , C_3 and C_4 are connected as shown in the figure below. Calculate equivalent capacitance of the circuits between points X and Y.



Answer

23. Draw a labelled graphs to show how electrical resistance varies with temperature for:

- a metallic wire
- a piece of carbon

Answer

24. Two resistors $R_1 = 400 \text{ ohm}$ and $R_2 = 20 \text{ ohm}$ are connected in parallel to a battery. If heating power developed in R_1 is 25 W, find the heating power developed in R_2 .

Answer

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$$\frac{R_1}{R_2} = \frac{R_3}{R_4}$$

; have their usual meanings.

Answer

26. A 10 m long uniform metallic wire having a resistance 20 ohm is used as a potentiometer wire. This wire is connected in series with another resistance of 480 ohm and a battery of emf 5 V having negligible internal resistance. If an unknown emf e is balanced across 6 m of the potentiometer wire, calculate:

- the potential gradient across the potentiometer wire.
- the value of the unknown emf e .

Answer

27. i) Explain the term hysteresis.

- Name the three elements of the earth's magnetic field which help in defining earth's magnetic field completely.

Answer

28. Obtain an expression for magnetic flux density B at the centre of a circular coil of radius R , having N turns and carrying a current I .

Answer

29. A coil of self inductance 2.5 H and resistance 20 ohm is connected to a battery of emf 120 V having internal resistance of 5 ohm. Find:

- the time constant of the circuit
- the current in the circuit in steady state.

Answer

30. In a series LCR circuit, what is the difference between V_L and V_C where V_L is the potential difference across the inductor and V_C is the potential difference across the capacitor.

Answer

31. State any two difference between interference of light and diffraction of light.

Answer

32. Laser light of wavelength 630 nm is incident on a pair of slits which are separated by 1.8 mm. If the screen is kept 80 cm away from the two slits, calculate:

- fringe separation i.e., fringe width

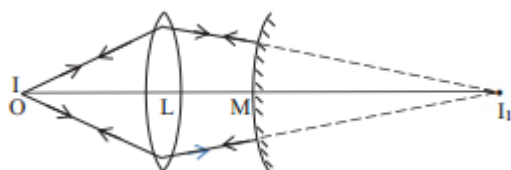
Answer

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33. Show graphically the intensity distribution in Fraunhofer's single diffraction experiment. Label the axis.

Answer

34. A point object O is placed at a distance of 15 cm from a convex lens L of focal length 10 cm as shown in figure below. On the other side of the lens, a convex mirror M is placed such that its distance from the lens is equal to the focal length of the lens. The final image formed by this combination is observed to coincide with the object O. Find the focal length of the convex mirror.



Answer

35. What is chromatic aberration? How can it be minimised or eliminated?

Answer

36. Draw a labelled ray diagram of an image formed by compound microscope, when the final image lies at the least distance of distinct vision (D).

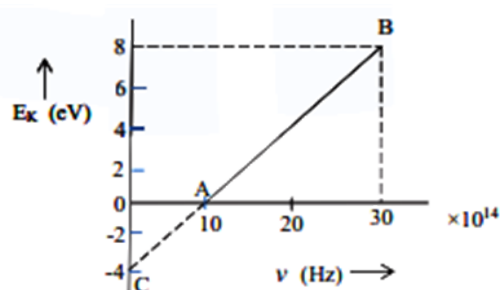
Answer

37. With regard to an astronomical telescope of refracting type, state how you will increase it's:

- i) magnifying power
- ii) resolving power

Answer

38. In an experiment of photoelectric effect, the graph of maximum kinetic energy E_k of the emitted photoelectrons versus the frequency ν of the incident light is a straight line AB as shown in the figure below.



Find:

- i) Threshold frequency of the metal

iii) Stopping potential for the photoelectrons emitted by the light of frequency $\nu = 3.0 \times 10^{14}$ Hz

Answer

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39. i) State how de Broglie wavelength (λ) of moving particles varies with their linear momentum (p).

ii) State any one phenomenon in which the moving particles exhibit wave nature.

Answer

40. On the basis of Bohr's theory, derive an expression for the radius of the n^{th} orbit of an electron of hydrogen atom.

Answer

41. Find the minimum wavelength of the emitted X-rays, when an X-ray tube is operated at 50 kV.

Answer

42. i) Define half-life of a radioactive substance.

ii) Using the equation, $N = N_0 e^{-\lambda t}$, obtain the relation between half-life (T) and decay constant (λ) of a radioactive substance.

Answer

43. With the help of a suitable example and an equation, explain the term pair production.

Answer

44. Draw a labelled diagram of a full wave rectifier. Show how output voltage varies with time, if input voltage is a sinusoidal voltage.

Answer

45. What is a NAND gate? Write it's truth table?

Answer

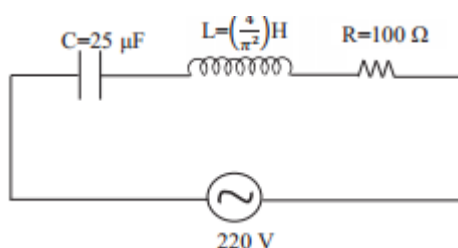


Long Answer Type

46. Derive an expression for intensity of electric field at a point in broadside position or on an equatorial line of an electric dipole.

Answer

47. Figure below shows a capacitor C, an inductor L and resistor R, connected in series to an ac supply of 220 V.



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iii) Average power consumed by the circuit.

[Answer](#)

48. On the basis of Huygen's wave theory of light, show that the angle of reflection is equal to the angle of incidence. You must draw a labelled diagram for this deviation.

[Answer](#)