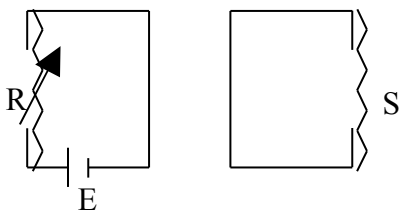


Q. 1 – 8 are 1 Mark, Q 9 – 18 are 2 Marks, Q 11 – 27 are 3 Marks, Q 28 – 30 are 5 Marks

- Why does the electric field inside a dielectric decreases when it is placed in an external electric field?
- Write main function of a modem.
- A light of intensity  $I$  passes through a Polaroid. What is the intensity of the light transmitted?
- If the resistance  $R$  in the circuit is decreased, show the direction of induced emf in coil  $S$ .



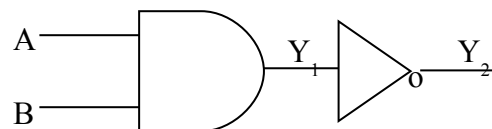
- Two metals A and B have work-functions  $2\text{eV}$ ,  $4\text{eV}$  respectively. Which metal has a lower threshold wavelength for photo electric effect?
- What is the impedance of this circuit when connected to a d c ?

7. Name the electromagnetic waves that have frequencies greater than that of ultraviolet rays and less than that of gamma rays?

8. Light of wavelength  $6000 \text{ \AA}$  enters glass of refractive index 1.5. what is the wavelength in glass?

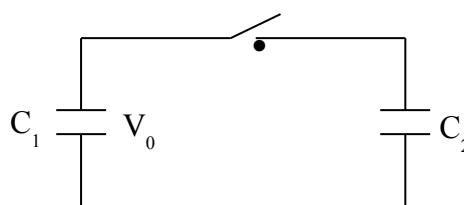
9. A circular brass loop of radius 9 m and resistance  $R$  is placed with its plane perpendicular to a magnetic field, which varies with time as  $B = B_0 \sin \omega t$ . Obtain the expression for the induced current in the loop.

10. Identify the logic gate 1 and 2 in the logic circuit given. Also write the truth-table for the final output for all possible combinations of the inputs A and B.



11. A capacitor  $C_1$  is charged to a p.d. of  $V_0$ . This charging battery is then removed and the capacitor is connected to another capacitor  $C_2$ .

- What is the final potential difference  $V$ , across combination?
- What is the stored energy before and after the switch is closed?



12. Two wires of same material having lengths in the ratio 1 : 2 and diameters in the ratio 2 : 3 are connected in series with an accumulator. Compute the ratio of the p.d. across the two wires.

(OR)

Show that the energy stored in an inductor  $L$ , when a current  $I$  is established through it, is  $\frac{1}{2} LI^2$ .

13. A ray of light is incident on a refracting surface of refractive index  $\mu$ . If  $f_1$  and  $f_2$  are the first and second focal lengths, show that  $f_2 + \mu f_1 = 0$ .

14. If the emitter and the base of a n-p-n transistor have same doping concentration, explain how will the collector and the base current be affected.

15. Use mirror formula to show that the virtual image formed by a convex mirror is always diminished in size and is located between the focus and the pole.

16. How much whiffs of energy is consumed in operating ten 50 w bulbs for 10 hours per day in a month of 30 days?

17. What is the impact parameter for scattering if  $\alpha$  particle by  $180^\circ$ ?

18. Electron and a proton enter perpendicular to a form magnetic field with the same speed what is the ratio of the radius of proton to the radon of elector. Assume that the mass of proton is  $184^\circ$  this the mass of an electron.

19. With the help of a diagram explain how can you find internal resistance of a primary cell.

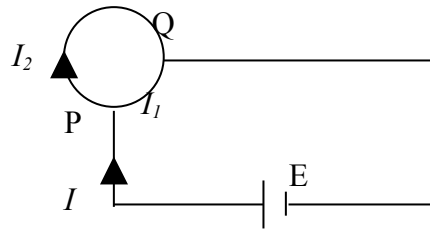
20. State and explain Huygen's theory. Name the type of wave front that corresponds to beam of light

(a) coming from a very far off source. (b) diverging radially from a point source.

21. The energy of an electron in the  $n^{\text{th}}$  orbit is given by  $E_n = -13.6/n^2 \text{ eV}$ . Calculate the energy required to excite an electron from ground state to the second excited state.

22. Explain ferromagnetism on the basis of domain theory of magnetism.

23. As shown in figure, a cell is connected across two points P and Q of a uniform circular conductor. Prove that the magnetic field at its centre is zero.



(OR)

A galvanometer having a resistance of  $50\Omega$  has 25 Divisions on scale. It is connected to a battery of p.d.

2 V through a series resistance of  $450\Omega$ . It shows full scale deflection. What is figure of merit of the galvanometer?

24. Prove that  $\rho = \frac{m}{ne^2\tau}$ , where  $m$  = mass of an electron,  $e$  = charge of an electron,  $n$  = number of electrons,  $\tau$  = relaxation time.

25. The wavelength of the incident light is  $6000 \text{ \AA}$ , if work function of the material is 1 eV, calculate the velocity of the emitted electron. (Take  $h = 6.64 \times 10^{-34} \text{ Js}$  and mass of electron =  $9.1 \times 10^{-31} \text{ kg}$ )

26. Draw a labeled circuit diagram, explain how a n-p-n transistor can be used as an oscillator in common-base configuration.

27. Give ray diagram for a astronomical telescope with final image at minimum distance of distinct vision.

28. Give construction and working of a transformer. What are the various losses in a real-transformer? How these can be minimized? (OR)

A battery having an emf of 12 V and internal resistance of 0.6 ohms is connected in series with an ammeter of negligible resistance, a  $1.4 \Omega$  resistor and a metal filament lamp. The ammeter reads 3 ampere. Find

- The resistance of the lamp.
- The potential difference across the lamp.
- What reading would you expect from a high resistance voltmeter connected across the battery terminal?
- What would be reading of ammeter if a resistance of  $3\Omega$  is connected in series with other given devices? Show the circuit diagram.

29. A parallel plate capacitor with air between and having plate area of  $6 \times 10^{-3} \text{ m}^2$  and separation between them 3 mm is connected to a 100 V supply. Calculate (charge on each plate of the capacitor. Explain what would happen when a 3 mm thick mica sheet (dielectric constant = 6) is inserted between the plates.

- While the voltage supply remains connected,
- After the supply is disconnected.

(OR)

With the help of circuit diagram, explain the use of n-p-n transistor as an amplifier.

30. Describe Davisson and Germer's experiment to establish the wave nature of electrons.

(OR)

- Derive an expression for the force acting on a straight current carrying conductor placed in a uniform magnetic field.
- A straight horizontal conducting rod of length 0.45 m and mass 60 g is suspended by two vertical wires at its ends. A current of 5.0 A is set up in the rod through the wire. What magnetic field should be set up normal to the conductor in order that the tension in the wire is zero?