9. A coil having 500 sq. loops of side 10 cm is placed normal to magnetic flux which (1) increases at a rate of 1 T/s induced emf is

(a) 0.1 V

(b) 0.5 V

(c ) 1 V

(d) 5 V

10. If the separation between the two slits is decreased in Young’s double slit experiment keeping the screen position fixed, the angular width of the fringe will

(a) Decreases (b) Increases (c ) Remains the same (d) doubles

11. What is the de Broglie wavelength of a proton accelerated through a potential (1)

Difference of 2 kV?

1. 0.65 x 10-13 m
2. 0.65 x 10-15 m
3. 0.65 x 10-11 m
4. 0.65 x 10-20 m

12. If 13.6 eV energy is required to ionize the hydrogen atom, then energy required to

Remove an electron from n = 2 is (1)

1. 10 2 eV
2. 0eV
3. 3.4 eV
4. 6.8 eV

13. Find the true statement (1)

(a) The nuclear force is dependent on the charge

(b) The nuclear force is weaker than the electromagnetic force.

(c ) The nuclear force is independent of charge

1. The nuclear force is weaker than the gravitational force

14. Which of the following graphs represents the correct variation of capacitive reaction (1)

Xc with frequency U?

Figure

15. Two identical coaxial coils P and Q carrying equal amounts of current in the same

Direction are brought nearer. The current in (1)

1. P increases while in Q decrease
2. Q increases while in P decrease
3. Both P and Q increases
4. Both P and Q decreases

Two statement are given – one labeled assertion (A) and the other labeled Reason (R)

Select the correct answer to Q no. 16 – 18 from the codes (a), (b), ( c) and (d) as given

Below.

1. Both A and R are true, and R is the correct explanation of A
2. Both A and R are true, and R is the correct explanation of A
3. A is true but R is false
4. A is false and R is also false.

16. Assertion: The diffusion current in a p-n junction is from the p-side to the n-side.

Reason: The diffusion current in a p-n junction is greater than the drift current

when the junction is forwad biased. (1)

17. Assertion: The photoelectrons produced by a monochromatic light beam incident

On a metal surface have a spread in their kinetic energies.

Reason: The work function of the metal is its characteristics property. (1)

**SECTION B**

19. The oscillating magnetic field in a plane electromagnetic wave is given by (2)

By = (8 x 10-6) sin [2 x 1011 t + 300πX]

1. Calculate the wavelength of the electro-magnetic wave.
2. Write down the expression for the oscillating electric field.

20 The figure shows the variation of intensity of magnetization I versus the applied

Magnetic field intensity H, for two magnetic materials A and B (2)

Figure

1. Identify the materials A and B
2. Why does the material B, have a larger susceptibility than A, for a given field

at constant temperature?

21. The ground state energy of a hydrogen atom is -13.6eV. What are the kinetic (2)

and potential energies of the electron in this state?

OR

A hydrogen atom initially in the ground level absorbs a photon, which excites

it to the n = 4 level. Determine the wavelength and frequency of photon.

22. How does the angle of minimum deviation of a glass prism of refractive index 1.5

Change, if it is immersed in a liquid of refractive index 1.3? (2)

23. Assuming that the two diodes D1 and D2 used in the electric circuit shown in the

Figure are ideal, find out the value of the current flowing through 2.5 Ω resistor. (2)

Figure

OR

In the given following diagram ‘S’ is a semiconductor. Would you increase or

Decrease the value of R to keep the reading of the ammeter A constant when S is

Heated? Give reason for your answer.

Figure

24. (a) Draw a diagram to show refraction of a plane wave front incident in a convex (2)

Lens and hence draw the refracted wave front.

1. A parallel beam of light of wavelength 600mm is incident normally on a slit of

Width ‘a’ If the distance between the slits and the screen is 0.8m and the

Distance of 2nd order maximum from the centre of the screen is 15mm,

Calculate the width of the slit.

25. The plot of the variation of potential difference across a combination of three

Identical cells in series, versus current is shown along the question. What is the

Emf and internal resistance of each cell? (2)

6V

V

0 1 A 11

**SECTION C**

26. (a) Explain the term ‘drift velocity’ of electrons in a conductor. Hence obtain the

for the current through a conductor in terms of ‘drift velocity’. (3)

(b) Plot a graph showing the variation of resistivity with temperature for metallic

Conductor.

27. (a) Define the term ‘self-inductance’ and write its S.I. unit. (3)

(b) Obtain the expression for the mutual inductance of two long coaxial solenoids

S1 and S2 would one over the other, each of length L and radii r1 and r2 and

Number of turns per unit length n1 and n2.

OR

1. What is the value of inductance L for which the current is maximum in a series

LCR – circuit with C = 10 µF and ⍵ = 1000 s-1?

1. A capacitor ‘C’, a variable resistor ‘R’ and a bulb ‘B’ are connected in series to the

ac mains in a circuit as shown. The bulb glows with some brightness. How will

the glow of the bulb change if.

Figure

1. A dielectric slab is introduced between the plates of the capacitor, keeping

Resistance R to be the same.

1. the resistance R is increased keeping the same capacitance?

28. (a) Draw a plot showing the variation of electric field (E) and electric potential (V)

With distance r due to a point charge Q

(b ) Find the charge on 5 µ F capacitor in the circuit given below (3)

Figure

29. Plot a graph showing the variation of stopping potential with the frequency of (3)

Incident radiation for two different photosensitive materials having work

Functions W1 and W2 (W1 > W2). On what factors does the

1. slope and
2. intercept of the lines depend?

OR

The given graph shows the variation of photocurrent for a photosensitive metal

Figure

1. Identify the variable X on the horizontal axis.
2. What does the point A on the horizontal axis represent?
3. Draw this graph for three different values of frequencies of incident

Radiation v1,v2 and v3 (v1>v2>v3) for the same intensity.

30. The ground state energy of a hydrogen atom is -13.6 eV. If an electron makes (3)

a transaction from an energy level -1.51 eV to -3.4 eV, calculate the wavelength

of the spectral line emitted.

**SECTION D**

31. (a) Define electric flux. Write its S.I. Unit (5)

(b) Using Gauss’ law deduce the expression for the electric field due to a

Uniformly charged spherical conducting shell of radius R at a point.

1. Outside and
2. Inside the shell

Plot a graph showing variation of electric field as a function of r>R and r<R

(r being the distance from the centre of the shell)

OR

1. Deduce the expression for the torque acting on a dipole of moment P in the

Presence of a uniform electric field E.

(b)Consider two hollow concentric spheres, S1 and S2, enclosing charges 2Q and 4Q

Respectively as shown in the figure.

40

S2

S1

1. Find out the ratio of the electric flux through them.
2. How will the electric flux through the sphere S1 change if a medium of

Dielectric constant ‘ℇr’ is introduced in the space inside S1, in place of air?

Deduce the necessary expression.

32. (a) Derive the expression for the torque on a rectangle current carrying loop

Suspended in a uniform magnetic field.

1. Two identical coils, each of radius ‘R’ and number of turns ‘N’ are lying

In perpendicular planes such that their centre coincide. Find the magnitude

and direction of the resultant magnetic field at the centre of the coils if

they are carrying currents ‘I’ and 3l respectively

(c ) A proton and a deuteron having equal moments enter in a region of uniform

Magnetic field at right angle to the direction of the field. Depict their

trajectories in the field.

OR

1. Explain briefly, with the help of a labeled diagram, the basic principle of the

Working of an a.c. generator. Draw graphs to show the ‘phase relationship’

Between the instantaneous (i) magnetic flux (ɸ) linked with the coil and

Induced emf (ℇ) in the coil.

1. In an a.c. generator, coil of N turns, and area A is rotated at u revolutions per

second in a uniform magnetic field B. Write the expression for the emf

produced.

(c )A 100 turn coil of area 0.1 m2 rotates at half a revolution per second. It is

placed in a magnetic field 0.01 T perpendicular to the axis of rotation of the coil

calculate the maximum voltage generated in the coil.

33. (a) Draw a labeled ray diagram of a refracting telescope. Define its magnifying

power and derive an expression for it.

(b) Write two important limitations of a refracting telescope over a reflecting type

of telescope.

OR

1. Draw the labeled ray diagram for the formation of iamge by a compound

Microscope.

1. Derive the expression for the total magnification of a compound microscope.

Explain why both the objective and the eyepiece of a compound microscope

must have short focal lengths.

**SECTION E**

34. Case study: Read the following paragraph and answer the questions.

For constructive interference, the path difference is equal to the integral (4)

multiple of wavelengths and resultant intensity will be maximum at that point.

while for destructive interference, the path difference is (n + ½) multiple of

wavelengths and where resultant intensity is zero. When light is passed around

the sharp edges of an obstacle it gets bended and may enter the geometrical shadow

of that obstacle such a phenomenon of light is called diffraction of light. In

interference, there are equally spaced alternate bright and dark bands. While in

diffraction, there is only one bright central Maxima and around both sides of the

central Maxima the intensity of the light decreases as we go away from that

central Maxima.

1. What is the effect on the interference fringes in Young’s double-slit experiment

if the separation between the screen and slits is increased?

1. How does the intensity of the central maximum change if the width of the slit

Is halved in a single-slit diffraction experiment?

1. What would happen if the path difference between the interfering beams that is

S2P – S1P became very large.

OR

Write the distinguishing features between a diffraction pattern due to a single

Slit and the interference fringes produced in Young’s double slit experiment.

35. Case Study: Read the follow paragraph and answer the questions.

When the diode is forward biased, it is found that beyond forward voltage V = Vk, (4)

Voltage, the conductivity is very high. At this value of battery biasing for p-n junction

The potential barrier is overcome and the current increase rapidly with increase in

forward voltage. When the diode is reverse biased, the reverse bias voltage produces a

very small current about a few microamperes which almost remains constant with

bias. This small current is reverse saturation current.

1. What happens to the width of the depletion layer of a p-n junction when it is

Forward biased?

1. Which type of biasing gives a semiconductor diode very high resistance?
2. Distinguish between an intrinsic semiconductor and extrinsic semiconductor.

OR

Name the important process that occur during the formation of a p – n junction.