

CBSE Sample Paper 10

General Instruction:

1. Answer all questions
2. Internal choices are provided for some questions
3. Question numbers 1 to 8 are very short answer questions and carry 1 mark each.
4. Question numbers 8 to 18 are short answer questions and carry 2 marks each.
5. Question numbers 19 to 27 are also short answer questions and carry 3 marks each.
6. Question numbers 28 to 30 are long answer questions and carry 5 marks each.
7. Use log tables if necessary.
8. There is no overall choice. However, an internal choice has been provided in questions of five marks each. You have to attempt only one of the choices in such questions.

9. You may use the following values of physical constants wherever necessary:

$$c = 3 \times 10^8 \text{ ms}^{-1}$$

$$h = 6.626 \times 10^{-34} \text{ Js}$$

$$e = 1.602 \times 10^{-19} \text{ C}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ TmA}^{-1}$$

$$\text{Mass of electron } m_e = 9.1 \times 10^{-31} \text{ kg}$$

$$\text{Mass of neutron } m_n = 1.675 \times 10^{-27} \text{ kg}$$

$$\text{Boltzmann's constant } k = 1.381 \times 10^{-23} \text{ JK}^{-1}$$

$$\text{Avogadro's number } N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$$

$$\text{Radius of earth} = 6400 \text{ km}$$

Question 1

Define Magnetic Flux and Write it SI units?

Question 2

The electric potential inside a charged spherical conductor of radius R is given by $V = AQ/R$ and the potential outside is given by $V = AQ/r$. Derive the electric field

- (a) Inside
- (b) Outside this charge distribution.

Question 3

True and False

- a) Electric motive force represents Force
- b) Kirchoff's laws for electrical circuit are based on the conservation of energy

Question 4

Which is better potentiometer or voltmeter for measuring the EMF of the cell and why?

Question 5

What is the form of energy in current carrying inductor?

Question 6

What is the dimension of Planck's constant?

Question 7

Write down the following radiations in descending order of their wavelength

- a) Visible light
- b) Gamma rays
- c) Thermal radiations
- d) Ultra violets rays

Question 8

Draw symbols of p-n-p and n-p-n transistors?

Question 9

The total capacitance of two capacitors is $4\mu\text{F}$ when connected in series and $18\mu\text{F}$ when connected in parallel. Find the capacitance of each capacitor?

Question 10

State Ampere's Circuital law? Find the magnetic Field of long straight current carrying wire using the Ampere Circuital law

Question 11

Photo electrons are emitted from a metal surface with velocity $2.0 \times 10^5 \text{ m/s}$. Calculate the work function if the ray of 6000\AA is incident on the surface?

Question 12

Derive energy stored in the inductors. What is the form of energy in inductor and where does it reside in it

Question 13

An AC source (200 V - 50Hz) is applied across a resistance of 10 ohm and Capacitance of $50\mu\text{F}$ in series. What is the impedance and i_{rms} of the circuit?

Question 14

A uniformly wound solenoidal coil has Self Inductance L and Resistance R . It is placed across the battery of EMF E of negligible resistance. The time constant and steady state current is calculated, Now It is broken into two identical coils. These identical coils are placed in parallel across a same battery of EMF E of negligible resistance. Find out following

- 1) The time constant in both the cases
- 2) The steady state current in both the cases
- 3) What is the dimension of L/R

Question 15

Light of wavelength 180 nm ejects photoelectrons from a plate of metal whose work-function is 2 eV. If a uniform magnetic field of 5×10^{-5} T be applied parallel to the plate, what would be the radius of the path followed by electrons normally from the plate with maximum energy?

Question 16

True for false

- 1) Cathode rays are deflected both in Electric and Magnetic Field
- 2) Cathode rays do not penetrate through metal foils
- 3) Cathode rays possesses momentum
- 4) Cathode rays carry positive charges

Question 17

Why are some dark lines seen in the continuous spectrum of sunlight?

Question 18

The magnetic flux through a coil perpendicular to its plane and directed into paper is varying according to the relation

$$\phi = (10t^2 + 20t + 10) \text{ milliweber}$$

Calculate the emf induced in the loop at $t=5$ sec

Question 19

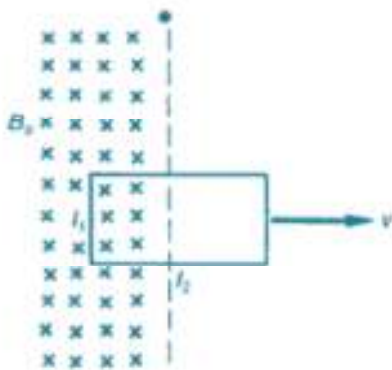
What is moving coil Galvanometer? Explain the working of Suspended coil Galvanometer?

Question 20

Two 1.50 V batteries – with their positive terminals in the same direction – are inserted in series with a lamp of resistance R . One battery has an internal resistance of 0.255Ω , the other an internal resistance of 0.153Ω . When the switch is closed, a current of 600 mA occurs in the lamp.

- (a) What is the lamp's resistance?
- (b) What fraction of the chemical energy transformed appears as internal energy in the batteries?

Question 21



A rectangular loop of sides $l_1=2\text{m}$ and $l_2=4\text{m}$ is being removed from magnetic field region with velocity 3m/s as shown in above figure. The region is having constant magnetic field $B_0=2\text{T}$ perpendicular to its plane as shown in figure. The net resistance of the loop is 4 Ohm . Calculate the EMF induced in the loop and current in the Loop. What will be current and EMF when the Loop is completely out of the magnetic field region.

Question 22

Explain how p-n junction diode acts as Half wave rectifier and Full wave Rectifier

Question 23

The electron in hydrogen atom moves around the proton with a speed of $2.2 \times 10^6\text{ m/s}$ in a circular orbit of radius $5.3 \times 10^{-11}\text{m}$. Determine

- Charge per unit time
- Equivalent dipole moment
- Magnetic field at the center of the orbit

Question 24

What is RADAR? Explain its construction and working?

Question 25

The focal length of a convex lens in air is 20 cm , what will be its focal length if it is immersed in a liquid of refractive index 1.35 ? Refractive index of glass is 1.50

Question 26

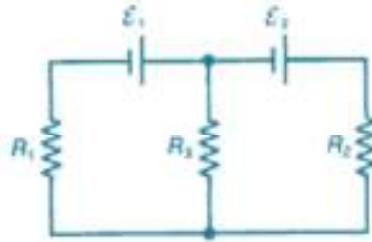
A copper rod of length L is moving with uniform velocity v_0 parallel to a long straight wire carrying a current I . The rod itself is perpendicular to the wire with its ends at distance a and b from it. Calculate the EMF induced in the rod

Question 27

- What is Kirchhoff's law of radiation and prove it
- Two bodies X and Y having same outer Surface Area S have thermal emissivities of $e_1=.01$ and $e_2=.81$ respectively. They emit total radiant energy at the same rate. The wavelength λ_Y corresponding to maximum spectral radiancy in the radiation of Y is

shifted from wavelength corresponding to maximum spectral radiancy in the radiation of X by 1.00μ . The temperature of X is 5802 K. What is the temperature of Y

Question 28



Find the current and voltage drop across each resistor

OR

- i) What are coherent sources? Can two sodium lamps act as coherent sources?
- ii) In a Young's double-slit experiment, $d = 2\text{mm}$ and $D = 2\text{m}$ and $\lambda = 500\text{nm}$. If the intensities of the two slits are I_0 and $9I_0$, then find the intensity at $y = 1/6 \text{ mm}$

Question 29

In an alternating current circuit, an inductance L , a capacitance C and a resistor R are connected in series. Derive the expression for the Impedance and phase angle of the circuit. ?

What is the Impedance at resonance?

Or

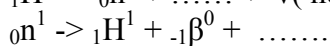
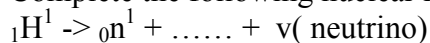
A circuit consists of a capacitor of $X_c = 30 \text{ ohm}$, a non inductive resistor of 44 ohm and a coil of inductive resistance 90 ohm and resistance 36 ohm in series is connected to 200 V , 60 Hz AC circuit

- a) Find the Impedance (Z) of the circuit
- b) Find the current in the circuit?
- c) Find the Impedance of the coil
- d) What is the value of $V_{\text{Coil}} + V_{\text{Res}} + V_{\text{Cap}}$

Question 30

Explain the emission of alpha and beta particles from the nucleus of the radioactive substance?

Complete the following nuclear reactions



OR

- a) Write the Rutherford and Soddy law of Radioactive Decay?

b) There is a stream of neutrons with a kinetic energy of .0327 e V. If the half life of neutron is 700 sec. What fraction of neutrons will decay before they travel a distance of 10 m.

Take mass of the neutron = 1.675×10^{-27} kg

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