PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

Radiations - CSIR NET Physics PYQs

Electromagnetism . All PYQs (2015-2025) with answer key

6 questions . Answer key included

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Q1. [Dec 2015] . 5.0 marks

Electromagnetism > Radiations

CSIR NET	2015 Dec	5 M

A dipole of moment $\vec{p}$, oscillating at frequency ω, radiates spherical waves. The vector potential at large distance is

$$\vec{A}(\vec{r}) = \frac{\mu_0}{4\pi} i\omega \frac{e^{ikr}}{r} \vec{p}$$

To order $\left(\frac{1}{r}\right)$ the magnetic field $\vec{B}$ at a point $\vec{r} = r\hat{n}$ is

1. $-\frac{\mu_0}{4\pi}\frac{\omega^2}{C}(\hat{n}\cdot\vec{p})\hat{n}\frac{e^{ikr}}{r}$
2. $-\frac{\mu_0}{4\pi}\frac{\omega^2}{C}(\hat{n}\times\vec{p})\frac{e^{ikr}}{r}$
3. $-\frac{\mu_0}{4\pi}\omega^2 k(\hat{n}\cdot\vec{p})\vec{p}\frac{e^{ikr}}{r}$
4. $-\frac{\pi_0}{4\pi}\frac{\omega^2}{C}\vec{p}\frac{e^{ikr}}{r}$

Q2. [Dec 2016] . 5.0 marks

Electromagnetism > Radiations

CSIR NET	2016 Dec	5M

A particle with charge $-q$ moves with a uniform angular velocity ω in a circular orbit of radius a in the xy-plane, around a fixed charge $+q$, which is at the centre of the orbit at (0,0,0). Let the intensity of radiation at the point $(0,0,R)$ be I_1 and at $(2R,0,0)$ be I_2. The ratio I_2/I_1, for $R \gg a$, is

1. 4
2. $\frac{1}{4}$
3. $\frac{1}{8}$
4. 8

Q3. [June 2017] . 5.0 marks

Electromagnetism > Radiations

CSIR NET	2017 June	5M

An electron is decelerated at a constant rate starting from an initial velocity u (where $u \ll c$) to $u/2$ during which it travels a distance s. The amount of energy lost to radiation is

1. $\frac{\mu_0 e^2 u^2}{3\pi m c^2 s}$
2. $\frac{\mu_0 e^2 u^2}{6\pi m c^2 s}$
3. $\frac{\mu_0 e^2 u}{8\pi m c s}$
4. $\frac{\mu_0 e^2 u}{16\pi m c s}$

Q4. [June 2018] . 5.0 marks

Electromagnetism > Radiations

CSIR NET	2018 June	5M

In the region far from a source, the time dependent electric field at a point (r, θ, ϕ) is

$$\vec{E}(r,\theta,\phi) = \hat{\phi} E_0 \omega^2 \left(\frac{\sin\theta}{r}\right) \cos\left[\omega\left(t - \frac{r}{c}\right)\right]$$

where ω is angular frequency of the source. The total power radiated (averaged over a cycle) is

1. $\frac{2\pi}{3}\frac{E_0^2\omega^4}{\mu_0 c}$
2. $\frac{4\pi}{3}\frac{E_0^2\omega^4}{\mu_0 c}$
3. $\frac{4}{3\pi}\frac{E_0^2\omega^4}{\mu_0 c}$
4. $\frac{2}{3}\frac{E_0^2\omega^4}{\mu_0 c}$

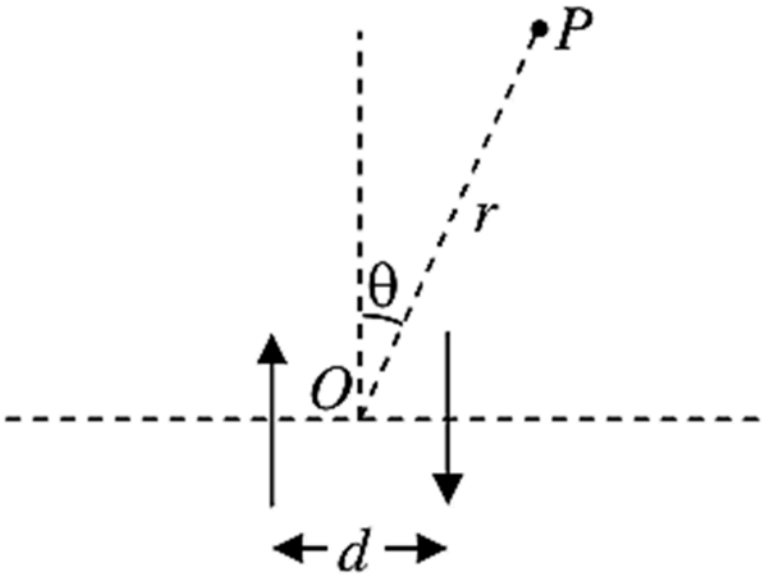
Q5. [Dec 2019] . 5.0 marks

Electromagnetism > Radiations

CSIR NET	2019 Dec	5M

The phase difference between two small oscillating electric dipoles, separated by a distance d, is π. If the wavelength of the radiation is λ, the condition for constructive interference between the two dipolar radiations at a point P when $r \gg d$ (symbols are as shown in the figure and n is an integer) is

1. $d\sin\theta = \left(n + \frac{1}{2}\right)\lambda$
2. $d\sin\theta = n\lambda$
3. $d\cos\theta = n\lambda$
4. $d\cos\theta = \left(n + \frac{1}{2}\right)\lambda$



Q6. [Dec 2023] . 5.0 marks

Electromagnetism > Radiations

CSIR NET	2023 Dec	5 M

The radius of a sphere oscillates as a function of time as $R + a\cos\omega t$, with $a < R$. It carries a charge Q uniformly distributed on its surface at all times. If P is the time averaged radiated power through a sphere of radius r, such that $r \gg R + a$ and $r \gg \frac{c}{\omega}$, then

1. $P \propto \frac{Q^2\omega^4 a^2}{c^3}$
2. $P \propto \frac{Q^2\omega^4}{c}$
3. $P = 0$
4. $P \propto \frac{Q^2\omega^6 a^4}{c^5}$

Answer Key

6 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Electromagnetism	Radiations	**2**
Q2	Electromagnetism	Radiations	**3**
Q3	Electromagnetism	Radiations	**None**
Q4	Electromagnetism	Radiations	**2**
Q5	Electromagnetism	Radiations	**1**
Q6	Electromagnetism	Radiations	**3**

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