

PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

Electrodynamics - CSIR NET Physics PYQs

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

14 questions . Answer key included

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Q1. [June 2015] . 5.0 marks

Electromagnetism > Electrodynamics

CSIR NET	2015 June	5 M
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A uniform magnetic field in the positive z direction passes through a circular wire loop of radius 1 cm and resistance 1Ω lying in the xy -plane. The field strength is reduced from 10 tesla to 9 tesla in 1 s . The charge transferred across any point in the wire is approximately

1. 3.1×10^{-4} coulomb
2. 3.4×10^{-4} coulomb
3. 4.2×10^{-4} coulomb
4. 5.2×10^{-4} coulomb

Q2. [Dec 2016] . 3.5 marks

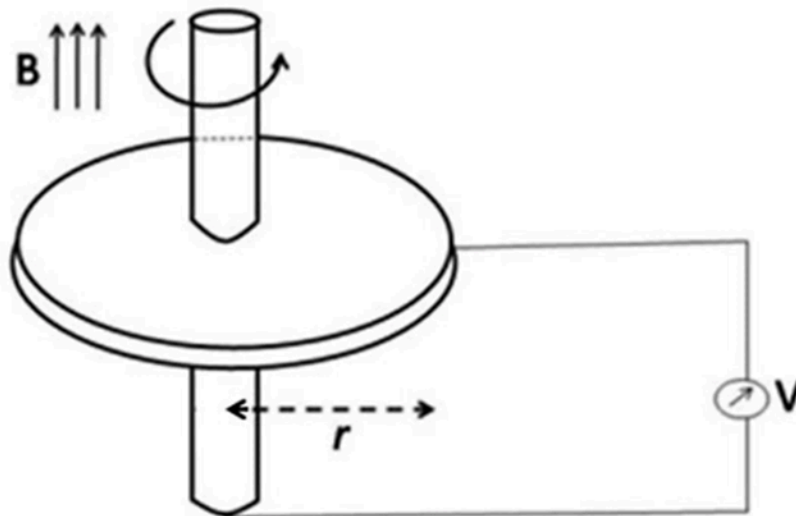
Electromagnetism > Electrodynamics

CSIR NET

2016 Dec

3.5M

A conducting circular disc of radius r and resistivity ρ rotates with an angular velocity ω in a magnetic field B perpendicular to it. A voltmeter is connected as shown in the figure below.



Assuming its internal resistance to be infinite, the reading on the voltmeter

1. depends on ω, B, r and ρ
2. depends on ω, B and r , but not on ρ
3. is zero because the flux through the loop is not changing
4. is zero because a current flows in the direction of B

Q3. [Dec 2016] . 5.0 marks

Electromagnetism > Electrodynamics

CSIR NET	2016 Dec	5M
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A parallel plate capacitor is formed by two circular conducting plates of radius a separated by a distance d , where $d \ll a$. It is being slowly charged by a current that is nearly constant. At an instant when the current is I , the magnetic induction between the plates at a distance $a/2$ from the centre of the plate, is

1. $\frac{\mu_0 I}{\pi a}$

2. $\frac{\mu_0 I}{2\pi a}$

3. $\frac{\mu_0 I}{a}$

4. $\frac{\mu_0 I}{4\pi a}$

Q4. [June 2016] . 3.5 marks

Electromagnetism > Electrodynamics

CSIR NET	2016 June	3.5M
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A magnetic field \mathbf{B} is $B\hat{z}$ in the region $x > 0$ and zero elsewhere. A rectangular loop, in the xy -plane, of sides l (along the x direction) and h (along the y -direction) is inserted into the $x > 0$ region from the $x < 0$ region at a constant velocity $\mathbf{v} = v\hat{x}$. Which of the following values of l and h will generate the largest EMF?

1. $l = 8, h = 3$
2. $l = 4, h = 6$
3. $l = 6, h = 4$
4. $l = 12, h = 2$

Q5. [Dec 2017] . 5.0 marks

Electromagnetism > Electrodynamics

CSIR NET	2017 Dec	5M
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A circular current carrying loop of radius a carries a steady current. A constant electric charge is kept at the centre of the loop. The electric and magnetic fields, \vec{E} and \vec{B} respectively, at a distance d vertically above the centre of the loop satisfy

1. $\vec{E} \perp \vec{B}$

2. $\vec{E} = 0$

3. $\vec{\nabla}(\vec{E} \cdot \vec{B}) = 0$

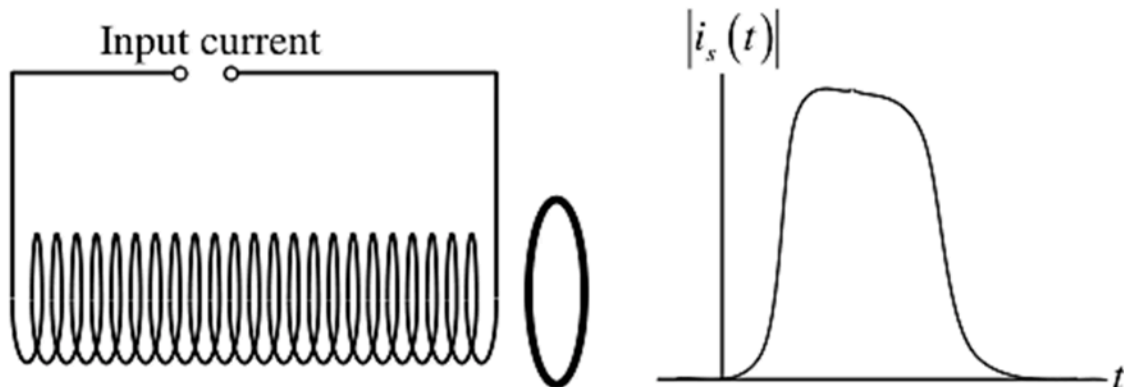
4. $\vec{\nabla} \cdot (\vec{E} \times \vec{B}) = 0$

Q6. [Dec 2019] . 3.5 marks

Electromagnetism > Electrodynamics

CSIR NET	2019 Dec	3.5M
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A circular conducting wire loop is placed close to a solenoid as shown in the figure below. Also shown is the current through the solenoid as a function of time.



The magnitude $|i(t)|$ of the induced current in the wire loop, as a function of time t , is best represented as

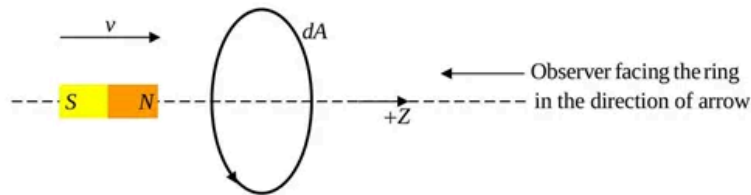
- 1.
- 2.
- 3.
- 4.

Q7. [June 2021] . 3.5 marks

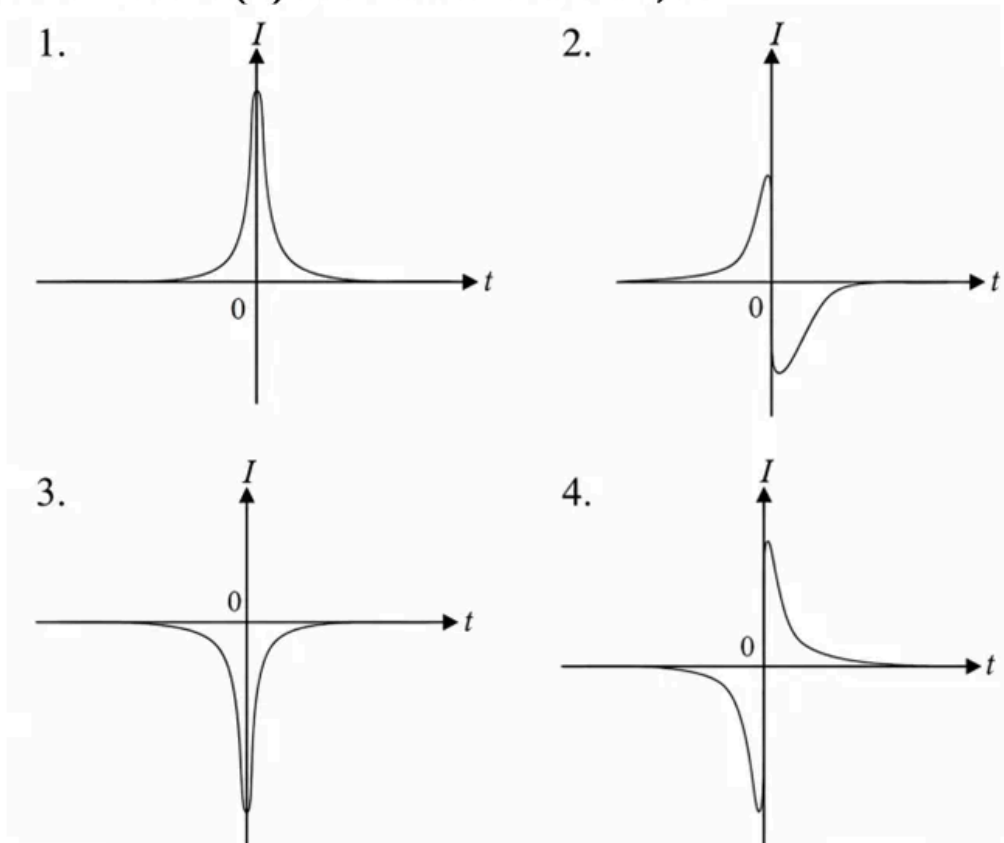
Electromagnetism > Electrodynamics

CSIR NET	2021 June	3.5M
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A conducting wire in the shape of a circle lies on the (x, y) -plane with its centre at the origin. A bar magnet moves with a constant velocity towards the wire along the z -axis (as shown in the figure below).



We take $t = 0$ to be the instant at which the midpoint of the magnet is at the centre of the wire loop and the induced current to be positive when it is counter-clockwise as viewed by the observer facing the loop and the incoming magnet. In these conventions, the best schematic representation of the induced current $I(t)$ as a function of t , is

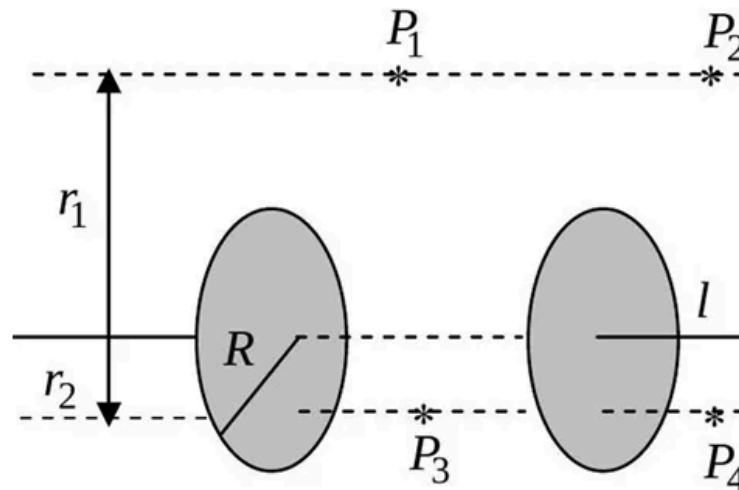


Q8. [June 2021] . 5.0 marks

Electromagnetism > Electrodynamics

CSIR NET	2021 June	5M
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The figure below shows an ideal capacitor consisting of two parallel circular plates of radius R . Points P_1 and P_2 are at a transverse distance, $r_1 > R$ from the line joining the centers of the plates, while points P_3 and P_4 are at a transverse distance $r_2 < R$.



If $B(x)$ denotes the magnitude of the magnetic fields at these points, which of the following holds while the capacitor is charging?

1. $B(P_1) < B(P_2)$ and $B(P_3) < B(P_4)$
2. $B(P_1) > B(P_2)$ and $B(P_3) > B(P_4)$
3. $B(P_1) = B(P_2)$ and $B(P_3) < B(P_4)$
4. $B(P_1) = B(P_2)$ and $B(P_3) > B(P_4)$

Q9. [June 2021] . 5.0 marks

Electromagnetism > Electrodynamics

CSIR NET	2021 June	5M
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A perfectly conducting fluid of permittivity ϵ and permeability μ flows with a uniform velocity \vec{v} in the presence of time dependent electric and magnetic fields \vec{E} and \vec{B} , respectively, if there is a finite current density in the fluid, then

$$1. \quad \vec{\nabla} \times (\vec{v} \times \vec{B}) = \frac{\partial \vec{B}}{\partial t}$$

$$2. \quad \vec{\nabla} \times (\vec{v} \times \vec{B}) = -\frac{\partial \vec{B}}{\partial t}$$

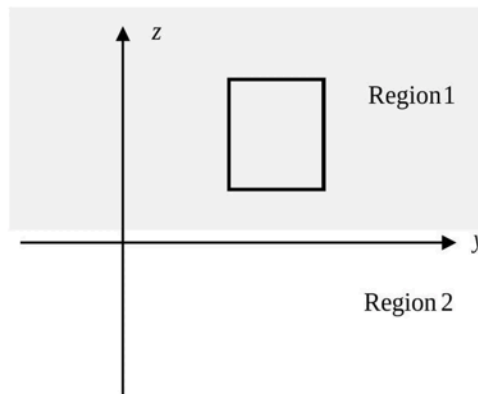
$$3. \quad \vec{\nabla} \times (\vec{v} \times \vec{B}) = \sqrt{\epsilon\mu} \frac{\partial \vec{E}}{\partial t}$$

$$4. \quad \vec{\nabla} \times (\vec{v} \times \vec{B}) = -\sqrt{\epsilon\mu} \frac{\partial \vec{E}}{\partial t}$$

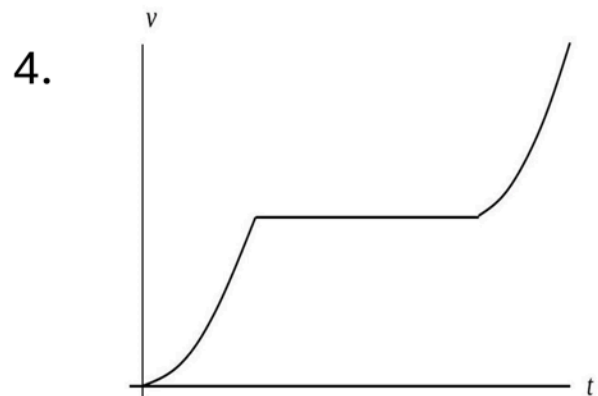
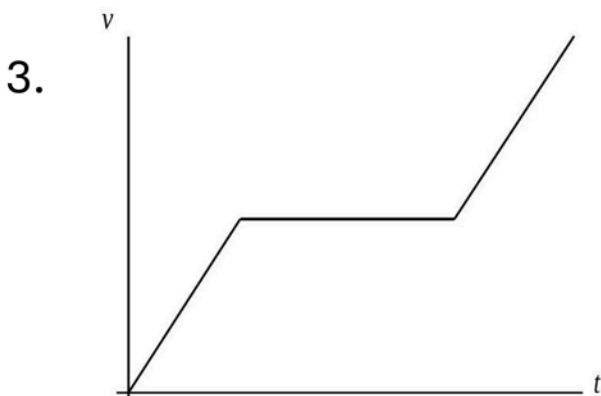
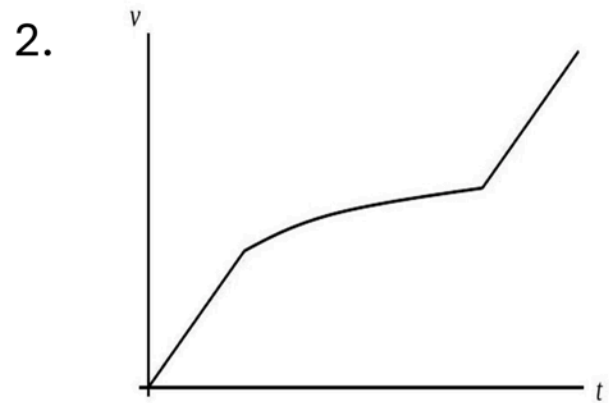
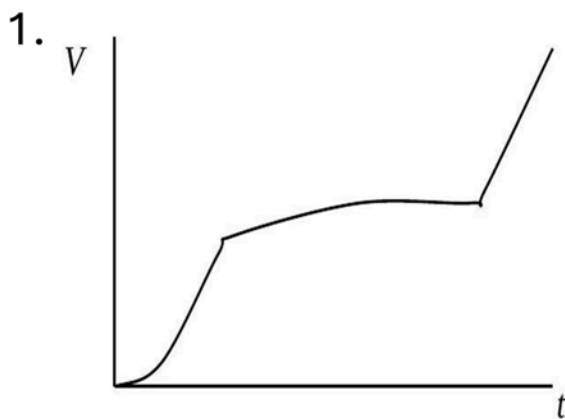
Q10. [June 2022] . 5.0 marks
 Electromagnetism > Electrodynamics

CSIR NET	2022 June	5M
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A square conducting loop in the yz -plane, falls downward under gravity along the negative z -axis. Region 1, defined by $z > 0$ has a uniform magnetic field $\vec{B} = B_0 \hat{i}$ while region 2 (defined by $z < 0$) has no magnetic field.



The time dependence of the speed $v(t)$ of the loop, as it starts to fall from well within the region 1 and passes into the region 2, is best represented by

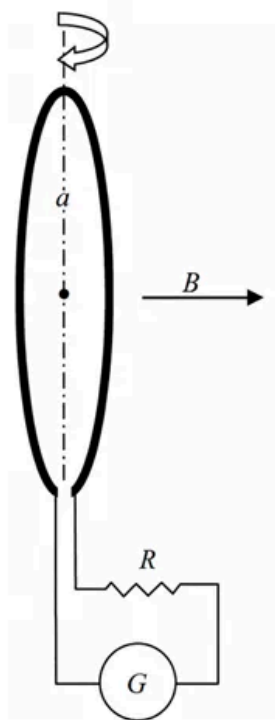


Q11. [June 2023] . 3.5 marks

Electromagnetism > Electrodynamics

CSIR NET	2023 June	3.5M
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A small circular wire loop of radius a and number of turns N , is oriented with its axis parallel to the direction of the local magnetic field \mathbf{B} . A resistance R and a galvanometer are connected to the coil, as shown in the figure.



When the coil is flipped (i.e., the direction of its axis is reversed) the galvanometer measures the total charge Q that flows through it. If the induced emf through the coil $\mathcal{E}_F = IR$, then Q is

1. $\pi Na^2 B / (2R)$
2. $\pi Na^2 B / R$
3. $\sqrt{2} \pi Na^2 B / R$
4. $2 \pi Na^2 B / R$

Q12. [June 2023] . 5.0 marks

Electromagnetism > Electrodynamics

CSIR NET	2023 June	5M
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An infinitely long solenoid of radius r_0 centred at origin which produces a time-dependent magnetic field $\frac{\alpha}{\pi r_0^2} \cos \omega t$ (where α and ω unit line charge density is placed, initially at rest, on the xy -plane with its centre on the z -axis. If $R > r_0$, the magnitude of the angular momentum of the loop is

1. $\alpha R(1 - \cos \omega t)$
2. $\alpha R \sin \omega t$
3. $\frac{1}{2} \alpha R(1 - \cos 2\omega t)$
4. $\frac{1}{2} \alpha R \sin 2\omega t$

Q13. [Dec 2025] . 5.0 marks

Electromagnetism > Electrodynamics

CSIR NET	2025 Dec	5M	EMT
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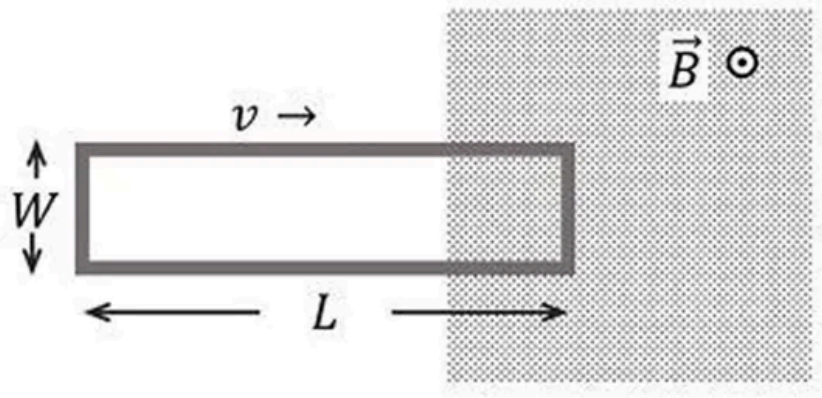
A long rectangular metallic loop of width W and length $L (\gg W)$ starts entering a region, where there is a uniform magnetic field B perpendicular to the plane of the loop. The resistance of the loop is R and its mass is M . If v_0 is the velocity of the loop just before entering the region, then neglecting the self-inductance effect, the velocity at a later time t is

$$1. v(t) = \frac{v_0}{1 + \frac{B^2 W^2}{MR} t}$$

$$2. v(t) = \frac{v_0}{1 + \left(\frac{B^2 W^2}{MR} t\right)^2}$$

$$3. v(t) = v_0 e^{-\frac{B^2 W^2}{MR} t}$$

$$4. v(t) = \frac{v_0}{1 + \ln\left(1 + \frac{B^2 W^2}{MR} t\right)}$$



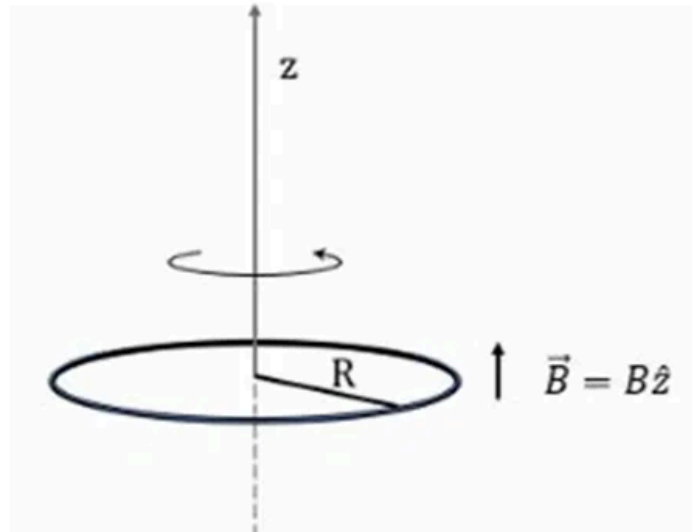
Q14. [June 2025] . 5.0 marks

Electromagnetism > Electrodynamics

CSIR NET	2025 June	5M	EMT
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A thin circular wire loop of mass M , having radius R , carries a static charge Q . The plane of the loop is held perpendicular to a uniform magnetic field \vec{B} along the z -axis passing through its centre, as shown in the figure. The loop, initially at rest, can freely rotate about the z -axis. When the magnetic field is switched off the loop starts rotating with an angular frequency

1. $\frac{QB}{M}$
2. $\frac{QB}{2M}$
3. $\frac{\pi QB}{M}$
4. $\frac{\pi QB}{2M}$



Answer Key

14 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Electromagnetism	Electrodynamics	1
Q2	Electromagnetism	Electrodynamics	2
Q3	Electromagnetism	Electrodynamics	4
Q4	Electromagnetism	Electrodynamics	2
Q5	Electromagnetism	Electrodynamics	4
Q6	Electromagnetism	Electrodynamics	4
Q7	Electromagnetism	Electrodynamics	4
Q8	Electromagnetism	Electrodynamics	3
Q9	Electromagnetism	Electrodynamics	1
Q10	Electromagnetism	Electrodynamics	2
Q11	Electromagnetism	Electrodynamics	4
Q12	Electromagnetism	Electrodynamics	1
Q13	Electromagnetism	Electrodynamics	3
Q14	Electromagnetism	Electrodynamics	2

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