Electromagnetism: Electric Field and Potential – Typical Questions

A-1	No
A-2	Yes
A-3	(a) Yes, (b) No
A-4	No
A-5	Due to electrostatic induction.
A-6	No
A-7	It is a way of quantifying electric lines of force and not 4π is an integer or not.
A-8	No
A-9	Yes
A-10	q_2 is (+)ve and q_1 is (-)ve.; $\frac{q_1}{q_2} = \frac{1}{3}$
A-11	No
A-12	Dipole moment of an electric dipole Distance of a point under consideration from mid- point of the two charges constituting dipole.
A-13	Potential barrier in conductors is thin while in insulators is large. Thus latter do not conduct electricity on application of potential difference across it
A-14	No
A-15	(c)
A-16	(d)
A-17	(a)

A-18	(d)
A-19	(a)
A-20	(d)
A-21	(a)
A-22	(c)
A-23	(a)
A-24	(a)
A-25	(c), (d)
A-26	None
A-27	(a)
A-28	(b), (d),
A-29	(b), (d)
A-30	(b)
A-31	(c)
A-32	$I^2M^{-1}L^{-3}T^4$
A-33	2.25×10^3 N; 4.5
A-34	424 m
A-35	2.3×10^{-4} C
A-36	230 N
A-37	5.9 cm from the larger charge in between the two charges.
A-38	34 cm from the larger charge on the line joining the charge in the side of the smaller charge.

A-39	2.3×10^{-24} N
A-40	3.35×10^{25}, 5.35×10^6 C
A-41	2.56×10^{25}N
A-42	1.2 N; Short range strong nuclear forces
A-43	2×10^{11}
A-44	3.05×10^{-9} N
A-45	1.24×10^{36}
A-46	(a) ML^3T^{-2}, L Nm^2, m^{-1} (b) 3.4×10^{-26} Nm^2
A-47	24.9 N at 30^0 with the extended sides from the charge under consideration
A-48	27.6 N along the extended diagonal of the square.
A-49	8.2×10^{-8}N
A-50	2.18×10^6m/s
A-51	4.95×10^5N

A-52	3.6×10^{-6}N
A-53	(a) 0.144 N (b) zero., 0.094 N away from other charge (c) 1.01 N, (d) (d) 0.94 m.s^{-2} perpendicular to the string and going away from the other charge
A-54	8.0 g, 8.0×10^{-2}N
A-55	4.17×10^{-8}C
A-56	$\frac{q^2 \cot\theta}{16\pi\varepsilon_0 g l^2 \sin^2\theta}$
A-57	5.64×10^{-9}C
A-58	$-(6-4\sqrt{2})Q$ between Q and 2Q at a distance $(\sqrt{2}-1)d$ from Q
A-59	3.6×10^{-6} m
A-60	Between $\pm 8.9 \times 10^{-8}$C
A-61	27 cm from bottom
A-62	$\frac{d}{2\sqrt{2}}$; $\frac{\mathbf{4qQ}}{\mathbf{3\sqrt{3}\pi\varepsilon_0 d^2}}$ or $3.08 \times \frac{Qq}{4\pi\varepsilon_0 d^2}$

A-63	(a) $\frac{Qqy}{2\pi\varepsilon_0\left(y^2+\frac{d^2}{4}\right)^{\frac{3}{2}}}$ (b) Proved (c) Charge of particle C is (-)q, (d) $\left[\frac{m\pi^3\varepsilon_0 d^3}{Qq}\right]^{\frac{1}{2}}$
A-64	(a) $\frac{\mathbf{qQd}}{\mathbf{2\pi\varepsilon_0}} \times \frac{x}{\left(\left(\frac{d}{2}\right)^2 - x^2\right)^2}$ **(b) Proved (c)** Time period $= \sqrt{\frac{\pi^3\varepsilon_0 d^3 m}{2qQ}}$
A-65	1.5×10^3N/C along the direction of the force.
A-66	(a) 49 cm from A along BA (b) 20 cm from A along BA and $\frac{20}{3}$ cm from A along AB
A-67	8.9×10^{-11}C
A-68	66.7 NC^{-1}, upward
A-69	Zero, 2.27×10^3 V
A-70	$\sqrt{\frac{\mathbf{16\pi^3\varepsilon_0 R^3 m}}{\mathbf{qQ}}}$
A-71	$\frac{Q}{2\pi L^2}$

A-72	5.2×10^7 N/C
A-73	$\frac{R}{\sqrt{2}}$
A-74	Zero
A-75	$\frac{QdL}{4\pi^2\varepsilon_0 a^3}$
A-76	$\frac{q}{4\pi\varepsilon_0 d^2}$ towards the charge q
A-77	8.8×10^{-4} N
A-78	$\frac{mu^2}{2qE}$
A-79	(a) 3.0 N,9.8×10^{-3}N (b) Yes (c) 1.6×10^{-2} s (d) 49 m/s (e) 1.2 J
A-80	(a) 1.4 N making an angle of 45^0 with $\vec{g}$ and $\vec{E}$ (b) Straight line along the resultant force (c) 28 m from the starting point on the line of motion

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