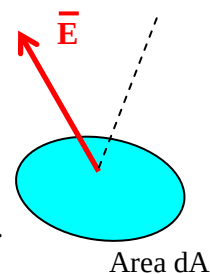
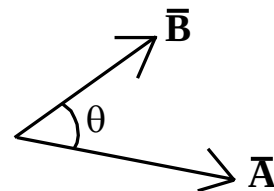


ELECTRIC AND MAGNETIC FIELDS ASSIGNMENT 6

THESE QUESTIONS ARE A REVISION OF THE FIRST ½ OF THE COURSE

1. For the two vectors shown, what is $\vec{A} \cdot \vec{B}$?
2. What is the magnitude of $\vec{A} \times \vec{B}$ and what is its direction?
3. Draw the x, y, and z axes, and show the orthogonal unit vectors $\hat{i}$, $\hat{j}$ and $\hat{k}$.
4. How is the Electric Field, $\vec{E}$, at a point in space defined?
5. What is the magnitude of the electric field at a distance r from a point charge Q?
6. Briefly explain the Principle of Superposition for the addition of electric forces or fields.
7. Where do electric field lines begin, and where do they end?
8. A uniform electric field $\vec{E}$ passes through a flat area ds as shown. What is the magnitude of the normal vector $d\vec{A}$, and what is its direction?
9. What is the expression for the Electric Flux through the area ds?
10. Is Electric Flux a scalar or a vector?
11. Write down the equation for Gauss's Law, and express its meaning in words.
12. Summarise the step-by-step procedure for using Gauss's Law.
13. For a spherically symmetric charge distribution, of total charge Q, what is the magnitude of the electric field at distance r, where r is outside the region where the charge exists?
14. What is the magnitude of the electric field inside a perfect conductor? Explain your answer.
15. If a conductor is not electrically neutral, where does the excess charge reside? Explain your answer.
16. At the surface of a conductor, what is the direction of $\vec{E}$? Explain your answer.
17. If a force F moves through a distance Δx , how much work is done?
18. If an electric charge q undergoes a displacement $\Delta \vec{x}$, in a uniform electric field $\vec{E}$, what is the change in its electrostatic potential energy?
19. Is potential energy a scalar or a vector?
20. What is the definition of the Electric Potential, V?
21. What are the SI units of V?
22. Is V is scalar or a vector?
23. Write down two equations giving the relationship between the potential and the electric field.
24. If a charge +e is moved through a potential difference of 100 V, how much work is done? Express the answer in eV and in Joules.
25. Summarise two different step-by-step methods for finding the potential (or potential difference), when given some charge distribution.
26. What is an equipotential surface?
27. If the zero of potential is at infinity, what is the potential at a distance r from a point charge, Q?
28. Point a is at a lower potential than point b. A negative charge is moved from a to b. Does external work need to be done on the charge to do this? Explain your answer.



Electric and Magnetic Fields

29. The electric field is conservative. Explain what this means in words, and write down an equation which implies the same thing.
 30. What is the electric field inside a closed empty cavity in a conductor?
 31. What is the total electric energy of a system of n point charges.
 32. What is the electric energy of a charged conductor, of charge Q , and potential V ?
 33. What is the formula for the energy density of the electric field, and what are the SI units of energy density?
 34. A sphere has electric charge distributed uniformly inside. What fraction of the total electric energy of this system resides in the space outside the sphere?
 35. Write down the step-by-step procedure for finding capacitance.
 36. Write down the equation which defines the dielectric constant, K .
 37. What is the dielectric constant of a perfect conductor?
 38. What is the formula for the total capacitance of two capacitors in series?
 39. What is the formula for the total capacitance of two capacitors in parallel?
 40. How is Gauss's Law modified in the case of a dielectric medium?
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More questions on other side