/19

1. The figure below shows four point charges and the cross section of a Gaussian Surface(shape below), which of the following statements is true?

(1 mark)

P

Q1

Q4

Q2

Q3

1. The net electric flux through the Gaussian Surface depends on all four charges shown, but the electric field at point P depends only on charges Q2 and Q3.
2. The net electric flux through the Gaussian surface depends only on charges Q2 and Q3, but the electric field at point P depends on all four charges.
3. The net electric flux through the Gaussian surface depends only on charges Q2 and Q3, and the electric field at point P depends only on charges Q2, Q3 and Q4.
4. The net electric flux through the Gaussian surface depends only on charges Q1 and Q4, and the electric field at point P depends only on charges Q2 and Q3.
5. Both the net electric flux through the Gaussian surface and the electric field at point P depend on all four charges.
6. Deduce the magnitude of the electric field for a non-conducting sphere of radius R and a total charge –Q uniformly distributed throughout its volume (volume charge density p is constant.) (2 marks)

1. Use Gauss’s Law to derive the electric field of one infinitely large plate (assuming an uniform area charge density ) at a distance d away from the plate. Hence calculate the electric potential at a point, which is a distance d away from the plate. Given the formula for capacitance is C=, write the capacitance of a capacitor which composes of two parallel plates, each with area A and separated at a distance d with area charge density of (in terms of d, A and ). (3 marks)
2. Which of the following statements is/are true? (1 mark)
3. If the electric field at a certain point is zero, tehn the electric potential at the same point is also zero.
4. If the electric potential at a certain point is zero, then the electric field at the same point is also zero.
5. The electric potential is inversely proportional to the strength of the electric field.
6. I only
7. II only
8. I and II only
9. I and III only
10. None are true
11. If the electric field does negative work on a negative charge as the charge undergoes a displacement from position A to position B within an electric field, then the electric potential energy (1mark)
12. is negative
13. is positive
14. increases
15. decreases
16. cannot be determined from information given
17. Negative charges are accelerated by electric fields toward points (1 mark)
18. at lower electric potential
19. at higher electric potential
20. where electric field is zero
21. where the electric field is weaker
22. where the electric field is stronger
23. In the figure shown, all four charges are situated at the corners of a square with sides s. (6 marks)

a

1. what is the electric potential energy of this array of fixed charges? (1 mark)
2. What is the electric field at the center of the square? (1mark)
3. What is the electric potential at the center of the square?

(1 mark)

1. Sketch the equipotential surface that lies in this figure and passes through the center of the square

(1 mark)

1. How much work would electric field perform on a charge q as it is moved from midpoint of right side to the midpoint of top side (2 marks)

-Q

-Q

+Q

+Q

1. A solid conducting sphere of radius a carries an excess charge of Q. (4 marks)
2. determine the electric field magnitude, E(r), as a function of r, the distance of the sphere’s center. (1marks)
3. determine the potential, V(r), as a function of r. Take the potential of zero to be at an infinite distance. (1mark)
4. Sketch E(r) and V(r) and label 2 appropriate points in each (2 marks)