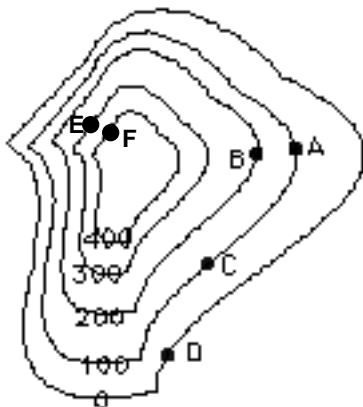


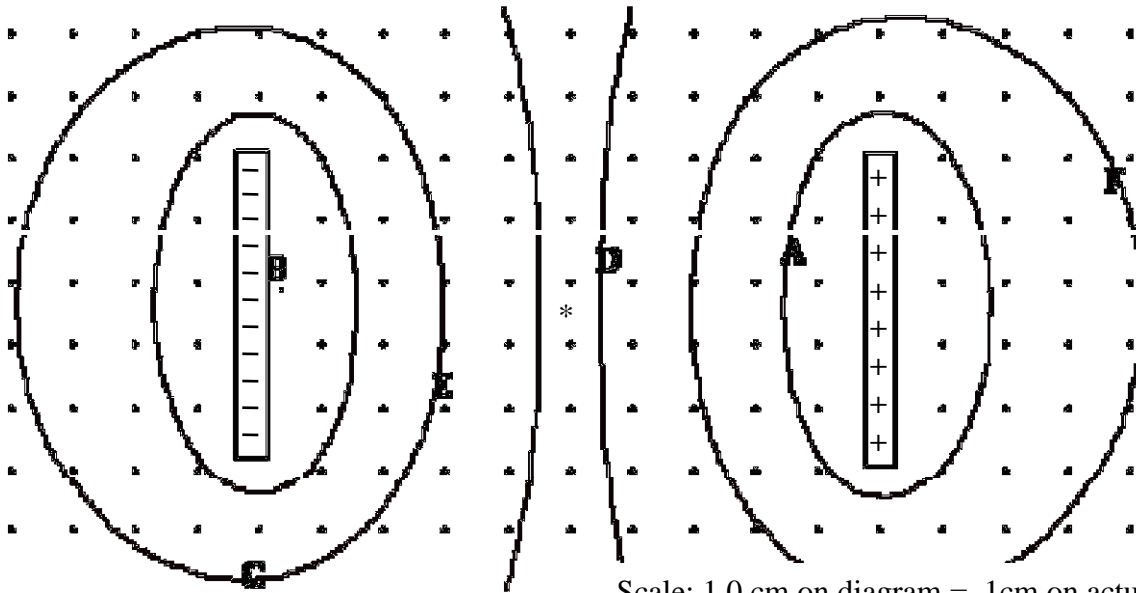
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E & M Unit II – Worksheet 2 Gravitational & Electrical Equipotential



A contour map of a large hill is shown to the left. Assume all heights given are in meters.

1. What do the contour lines on the map represent? How do you know?
2. Rank the points A,B,C, D, E and F in order of increasing gravitational potential.
3. Calculate the gravitational potential difference between:
 - a) point A and the base of the hill
 - b) point B and the base of the hill
 - c) point C and point A
 - d) point C and point E
4. Would a gravitational field gain more energy if an object was moved from D to A or from E to F? Why?
5. Describe the motion of a ball placed at point C and released.
6. How would a trip for a ball from B to A differ from F to E? How would they be alike? (Assume the ball was released from rest.)
7. What information does the spacing of the contour lines convey? Describe the behavior of a test mass when it is released in a region where the lines are:
 - a) closely spaced
 - b) widely separated.



Consider the diagram above in which charges were packed closely together to form parallel plates. Suppose also that the potential difference between the plates of charge is 7.0 volts and that the equipotential lines are at 1.0 volt intervals. Based on your experience in the activity, answer questions 8 - 12.

8. What do the lines in the diagram above represent? Explain.

9. Rank the points A, B, C, D, E and F in order of increasing electric potential, relative to the ground.

10. Calculate the electrical potential difference as you move between
 - A. point A and the negative plate
 - B. point B and the negative plate
 - C. point C and point A
 - D. point C and point B

- 11a. Describe the motion of a positive charge placed at point E and released. How do you know?
 - b. Describe the motion of a negative charge placed at point E. How do you know?

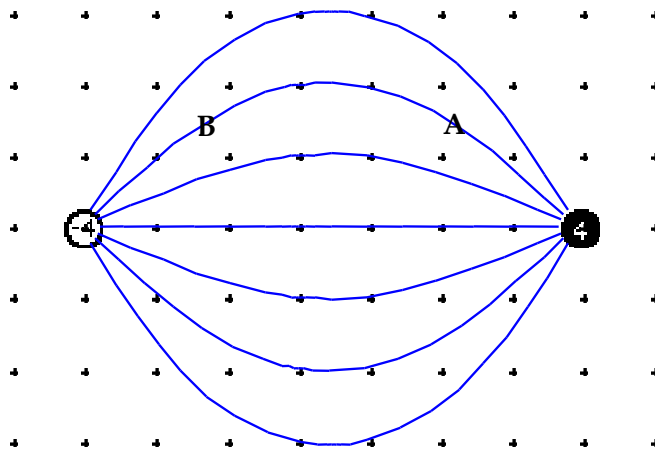
 - c. In general, can we say that if a charged object is free to move in an electrical field, it will move from an area of high potential to an area of low potential? Explain.

12. What is the approximate magnitude of the strength of the electric field at the location of the * in the center?
13. What information does the spacing of the equipotential lines convey?

Describe the behavior of a positive test charge when it is released in a region where the lines are:

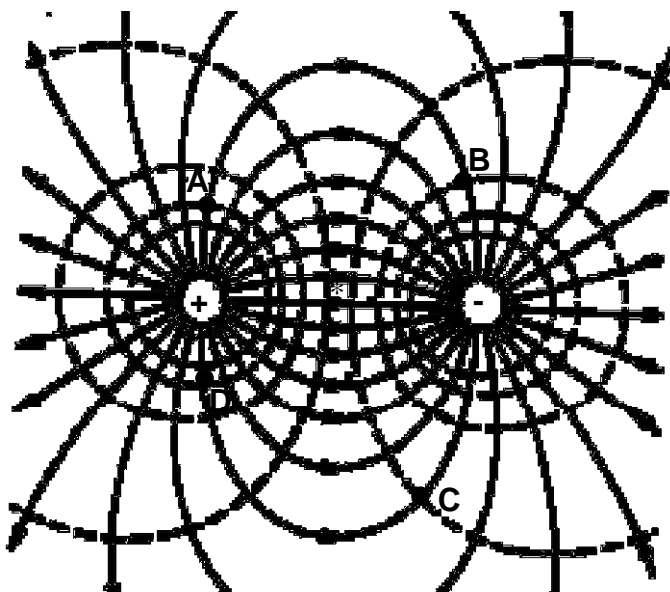
- closely spaced
- widely separated

14. Consider the diagram at left in which the field produced by two point charges is shown.



- Draw five equipotential lines on the diagram.
 - Draw the vector representing the force acting on a + particle placed at A.
15. If released at A would this particle follow the field line to B? Why or why not?

Use the diagram of the electric field produced by a dipole below to answer questions 16 – 20. The difference in potential for each equipotential line is 2 volts.



Scale: 1.0 cm on drawing = .01 cm actual dipole

16. What is the change in potential for a charged particle as it moves from A to D? Briefly explain.

17. Describe the “change in elevation” of a proton if it could “walk” along the field line from A to B.

18. What would be the change in the electrical potential energy stored in the electric field (in J and in eV) if a proton was moved from A to B?

19. What would be the change in the electrical potential energy stored in the electric field (in J and in eV) if an electron was moved from C to B?

20. Estimate the magnitude of the electric field strength at the location of the * in the center? Is this estimate likely to be as accurate as the value in question 12? Why or why not?