Physics II

Chapters 16 and 17 Test I Practice

Fall 2016

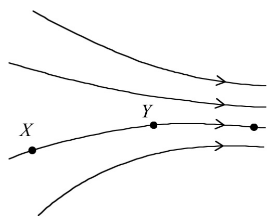
IMPORTANT: Except for multiple-choice questions, you will receive no credit if you show only an answer, even if the answer is correct. Always show in the space on your answer sheet some sketches, words, or equations which clearly justify your answer. Show the equations you use and the values substituted into them whenever equations are necessary. If you go from a formula directly to an answer without showing the values used, you will lose points. Points will also be deducted for missing or erroneous units.

Each individual answer is weighted roughly evenly throughout the exam.

Name ____

1. The strength of the electric field between two oppositely charged parallel plates is

   (a) greatest midway between the plates.
   (b) greatest near the plates.
   (c) constant between the plates (except near the edges).
   (d) zero midway between the plates.



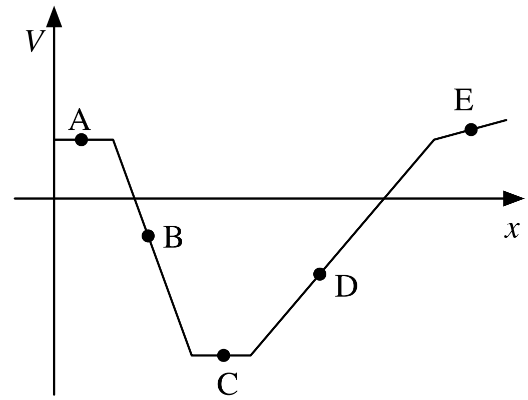
2. The diagram shows a pattern of electric field lines in which X, Y and Z are points marked on one of the field lines. It would be correct to say that

   (1) X is at a higher potential than Z.
   (2) a negative charge placed at Z would accelerate to the left along the tangent to the field line at Z.
   (3) the force exerted on a charge at Y would be greater than if the charge were placed at X.

   (a) (1), (2) and (3)
   (b) (1) and (2) only
   (c) (2) and (3) only
   (d) (1) only
   (e) (3) only

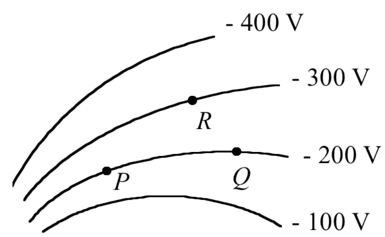
3. How much potential energy would be lost if a proton travels from a location with potential = 100 V to a position at 0 V of potential?

   (a) 100 J
   (b) 1.6×10^{-17} J
   (c) 1.6×10^{-21} J
   (d) 3.2×10^{-22} J



4. The graph above shows the electric potential V in a region of space as a function of position along the x-axis. At which of the labeled points would a charged particle experience the force of greatest magnitude?

   (a) A
   (b) B
   (c) C
   (d) D
   (e) E



5. The diagram shows points of equal potential joined as equipotential lines. Which of the following statements is/are correct?

   (1) The electric field at P is in a direction tangential to the line passing through P.
   (2) The electric field is the same at the points P and Q.
   (3) Work has to be done in moving an electron from point P to point R.

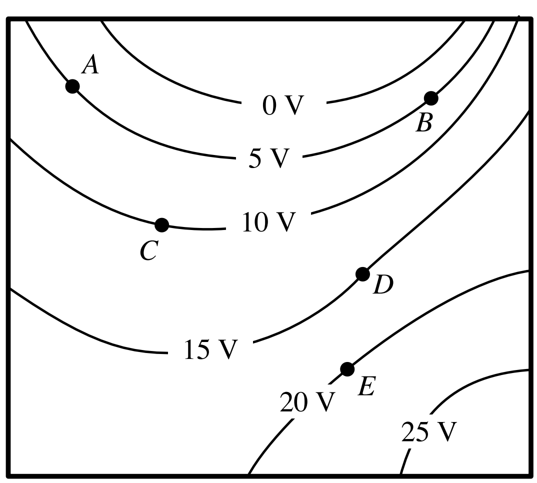
   (a) (1), (2) and (3)
   (b) (1) and (2) only

(c) (2) and (3) only
(d) (1) only
(e) (3) only

6. A dust particle contains an excess of ten electrons. If this particle, when placed in an electric field, accelerates to the left, we can conclude that the electric field must be pointing to the right. **T / F**

7. The strength of the electric field between two oppositely charged parallel plates is
   (a) greatest midway between the plates.
   (b) greatest near the plates.
   (c) constant between the plates (except near the edges).
   (d) zero midway between the plates.

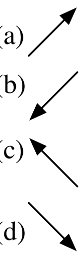
For the next three questions



The diagram above shows equipotential lines in a plane produced by a distribution of electric charge. Points A, B, C, D, and E are all in the same plane as these equipotentials.

(e) Which vector below best indicates the direction of the electric field at point A?

(a)
(b)
(c)
(d)



(e) None of the above; the field is zero.

(f) At which labeled point does the electric field have the greatest magnitude (strength)?
   i. A
   ii. B
   iii. C
   iv. D
   v. E

(g) How much work must be done by some external system to move a particle carrying a charge of $-1\ \mu$C from rest at point C to rest at point E?
   i. $-20\ \mu$J
   ii. $-10\ \mu$J
   iii. $10\ \mu$J
   iv. $20\ \mu$J
   v. $30\ \mu$J

(h) A particle carries an electric charge of $-4\ \mu$C. It is at a location in an electric field at which the electric potential is 20 V. How much potential energy is associated with this arrangement?
   i. 5×10^{-6} J
   ii. 5×10^{6} J
   iii. 8×10^{-6} J
   iv. 8×10^{6} J
   v. 8×10^{-5} J

For the next four items

Two large parallel plates are separated by 5×10^{-2} m. They are hooked up to a power supply that establishes a 100 V potential difference between them.

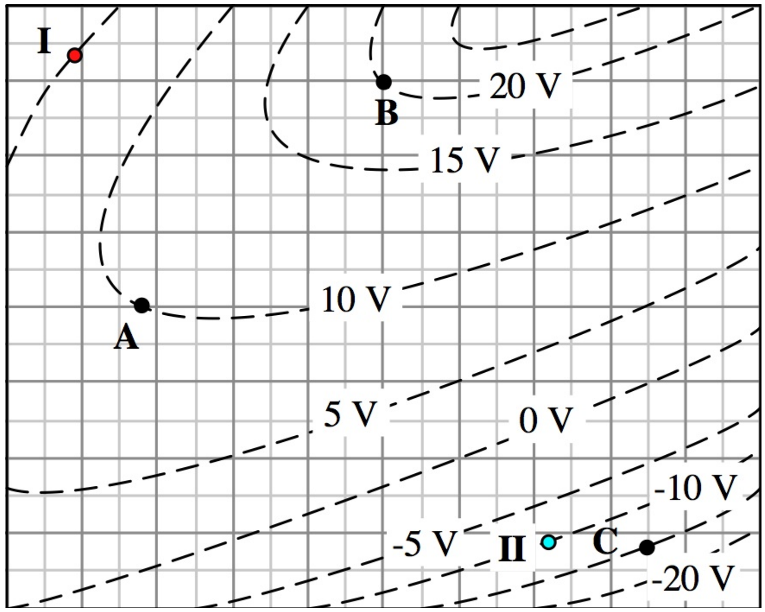
8. What is the strength of the electric field between these plates?
   (a) 20 V/m
   (b) 0.05 V/m
   (c) 5×10^{-4} V/m
   (d) 2000 V/m
   (e) 5 Vm

9. How much potential energy would be lost if an electron travels from the negative plate (at 0 V) to the positive plate (at 100 V)?
   (a) 2000 eV
   (b) 200 eV
   (c) 100 eV
   (d) 5 eV

10. How much potential energy would be lost if a proton travels from the positive plate (at 100V) to the negative plate (at 0 V)?
    (a) 100 J
    (b) 1.6×10^{-17} J
    (c) 1.6×10^{-21} J
    (d) 3.2×10^{-22} J

11. The strength of the electric field between these plates can be increased by
    (a) decreasing the distance between the plates.
    (b) increasing the area of the plates.
    (c) reducing the potential difference between the plates.
    (d) increasing the distance between the plates.

1. The diagram below is shown to scale on a centimeter grid with 0.5 cm divisions. It shows a plot of equipotential lines arising from a distribution of electric charge that is not shown on this diagram. Particles **I** and **II** carry small electric charges that have little effect on this plot.



(a) What is the potential at point **C**?

(b) At which point, **A**, **B**, or **C**, is the strength of the electric field the greatest?

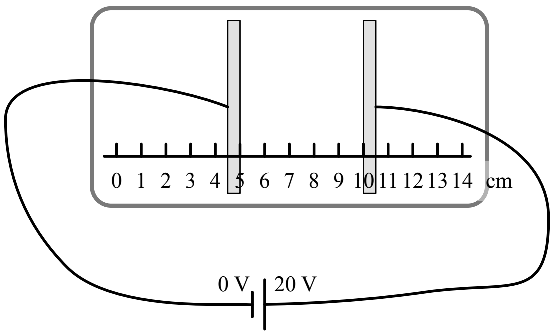
(c) What is the approximate strength of the electric field at point **C**?

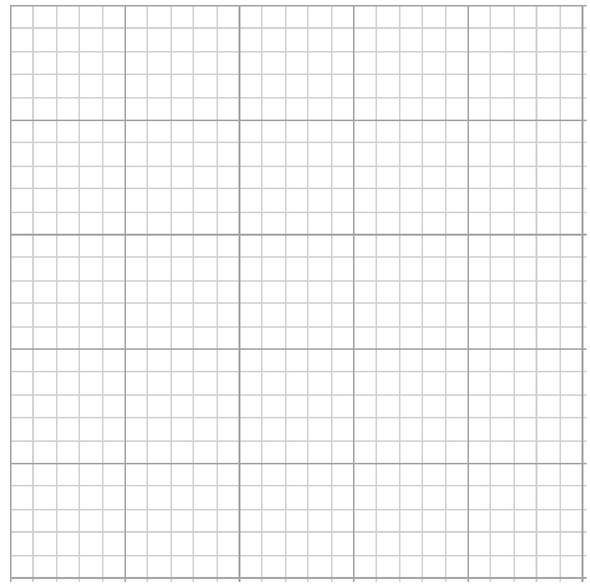
(d) Use short arrows on the diagram to indicate the approximate directions of the electric field at points **A**, **B**, and **C**.

(e) Particle **I** has an electric charge of +2 nC. How much work is required to move Particle **I** from its position shown above to point **B**?

(f) Particle **II** has an electric charge of −3 nC. How much work is required to move Particle **II** from its position shown above to point **A**?

2. Roughly construct a V *vs* x graph on your answer sheet for the arrangement shown here. You may use the back of your answer sheet if you need to. It consists of two parallel copper plates sitting in a dish of water and hooked up to a 20 V power supply.





3. Robert Millikan measured the radius of an oil drop to be 5×10^{-7} m. The density of the oil he used was 918 kg/m^3. The separation between the top and bottom plate of his oil drop apparatus was 0.016 m. Millikan found that he could get this drop to be balanced when the potential difference between the top and bottom plate was 157 V.

   (a) What was the mass of the oil drop?

   (b) What was the size of the gravitational force on this drop?

   (c) What was the strength of the electric field between the plates?

   (d) How much electric charge did this drop possess?