Physics 4B
Fall 2022

Name: _____

Lab (circle one): 8:00 am 11:15 am 2:30 pm

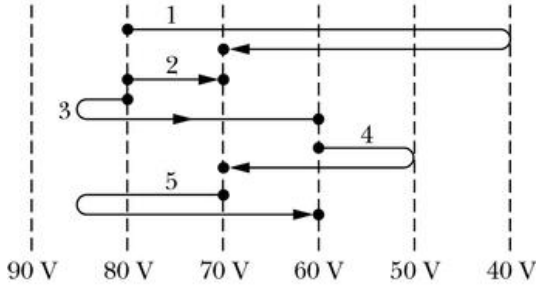
Quiz #4: Electric Potential

Problem 1 (2 points)
Two conducting spheres, one having twice the diameter of the other, are separated by a distance large compared to their diameters. The smaller sphere (1) has charge q and the larger sphere (2) is uncharged.

After the spheres are connected by a long thin conducting wire:

a) sphere 2 has twice the potential as sphere 1.
b) sphere 2 has half the potential as sphere 1.
c) sphere 2 has twice the charge as sphere 1.
d) spheres 1 and 2 have the same charge.
e) none of the above

Problem 2 (3 points)
The figure shows a family of parallel equipotential surfaces (in cross section) and five paths along which we shall move an electron from one surface to another.



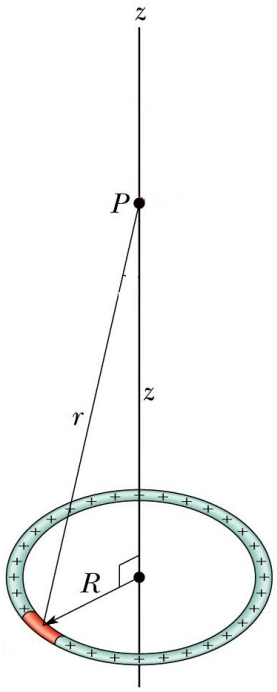
a) For which of the paths is the change in potential energy of the electron positive?

b) For which of the five paths is the work done by the electric field the greatest.

c) For which of the five paths is the work done by the electric field the least.

Problem 3 (5 points)

(a) Derive an expression for the electric potential at point P, which is a distance z above the center of a uniformly charged ring of charge Q.



Express your answer in terms of z, R (the radius of the ring), and Q (the total charge on the ring).

Note: you must show all steps.

(b) From the above result, derive an expression for the electric field magnitude E a distance z above the center of the ring.

Note: you must show all steps.