**Worksheet – Equipotential Lines and more Electric Potential!**

1. When +3.0 C of charge moves from point A to point B in an electric field, the potential energy is decreased by 27 J. It can be concluded that point B is:
	1. 9.0 V lower in potential than point A.
	2. 9.0 V higher in potential than point A.
	3. 81 V higher in potential than point A.
	4. 81 V lower in potential than point A.
2. Four charges are arranged on the four corners of a square as shown in the diagram. If the electric potential is defined to be zero at infinity then it is also zero at:
	1. point V only
	2. points II and IV and V
	3. pointes I and III
	4. none of the labeled points.
3. A small positive charge q is brought from far away to a distance r from a positive charge Q. In order to pass through the same potential difference a charge 2q should be brought how close to charge Q.
	1. a distance r/2
	2. a distance r
	3. a distance 2r
	4. a distance 4r
4. Illustrate how equipotential lines are drawn to represent the properties of the electric potential by drawing equipotential lines for the following charge configurations:
	1. A small sphere for radius r and positive charge +q.
	2. a small sphere with radius r and negative charge –q a distance 8r from a sphere of radius r with a charge of 3q.
5. A gold nucleus has a radius of 3.0 x 10-15 m and carries a charge of 79 electrons.
	1. What is the electric field strength at its surface (let’s pretend atoms have surfaces ☺)?
	2. What is the potential at its surface (☺)?
	3. How much energy (in joules) would be required to bring a proton from a large distance (infinity) up to the surface (☺) of the gold nucleus?
	4. What would the initial velocity of the proton need to be in order to come close to the gold nucleus.

Answers:

1. (a) lower since a positive charge has decreased its potential energy
2. (b) these points lie halfway between the positive and negative charges
3. (b) electric potential difference depends only on the charge Q, not on the charge moving through it
4. See below

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| --- | --- |
| a. | b. |
|  |  |

1. See below.
	1. 1.3 x 1022 N/C directed away from the nucleus
	2. 3.8 x 107 V
	3. 6.6 x 10-12 J
	4. 8.5 x 107 m/s