Module 3: Electric Potential and Potential Energy

Q1. Electric potential is defined as the amount of:

A force per charge
B electric potential energy per charge **(BRAVO!)**
C force acting on a charge
D electric potential energy

A,C,D prompt: (Incorrect, review lecture 3.1_Electric Potential)

Q2. A spherical metal shell carries a uniform negative charge. Which statement is true?

A the potential is highest at the center of the shell volume
B the potential is lowest at the center of the shell volume
C the potential at the center of the shell volume is lower than that on the shell surface
D the potential at the center of the shell volume is the same as that on the shell surface **(BRAVO! there is zero electric field inside the shell)**
E the potential at the center of the shell volume is higher than that on the shell surface

A,B,C,E prompt: (False, review lectures 3.1_Electric Potential and 3.1.1_Electric Potential-Point Charges)

Q3. An electron is pushed in an electric field from one location to another where it gains a 1 V electrical potential. If two electrons are pushed instead of one electron, the electrical potential gained by the two electrons is

A 4 V
B 2 V
C 1 V **(BRAVO! electrical potential is independent of the amount of charge carried by the particle)**
D 0.5 V
E 0.25 V

A,B,D,E prompt: (Incorrect, review lectures 3.1_Electric Potential)

Q4. A -2 mC particle is placed in a region with an electric field of 1.5 N/C. Describe the motion of the particle.

A the particle will accelerate along the direction of the electric field. Its potential energy will decrease during the motion.

B the particle will accelerate in a direction parallel to the electric field vectors, but in the opposite direction. Its potential energy will decrease during the motion. **(BRAVO!** $\vec{F} = q\vec{E}, U = -qEd$ **)**

C the particle will move at constant velocity in a direction perpendicular to the electric field vector. Its potential energy will not change during this motion.

D the particle will remain at rest. Its potential energy will increase over time.

A,C,D prompt: (Incorrect, review lecture 3.1_Electric Potential)

Q5. Two isolated metallic spheres, one with a radius r and another with a radius 3r, each carries a charge Q uniformly distributed over the entire surface. Which sphere stores more electric energy?

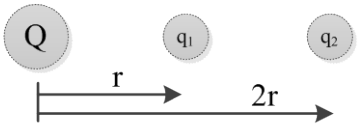
A the smaller sphere **(BRAVO! $U = QV$, V is inversely proportional to radius $V = \frac{kQ}{r}$)**

B the larger sphere

C needs more information

B,C prompt: (Incorrect, review lectures 3.1_Electric Potential, 3.1.1_Electric Potential-Point Charges and 3.1.4_Electric Potential Example)

Q6. A charge Q is at the origin. Charge $q_1 = q$ and charge $q_2 = 2q$. If all charges are positive, which charge (q_1 or q_2) is at the higher potential?



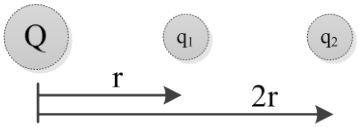
A q_1 **(BRAVO! electrical potential of a point charge (Q) is inversely proportional to the distance)**

B both are at the same potential

C q_2

B,C prompt: (Incorrect, review lecture 3.1.4_Electric Potential Example)

Q7. Charge $q_1 = +q$ and charge $q_2 = +2q$. Which charge (q_1 or q_2) has the higher electrostatic potential energy?



A q_1

B both have the same potential energy **(BRAVO!** $(q_1) = \frac{Qq}{4\pi\varepsilon_o r}$, $U(q_2) = \frac{Q2q}{4\pi\varepsilon_o 2r} = \frac{Qq}{4\pi\varepsilon_o r}$ **)**

C q_2

A,C prompt: (Incorrect, review lecture 3.1.4_Electric Potential Example)

Q8. A 10 mC particle is moved from infinity to a point where the electric potential energy is 5 J. What is the electric potential at the particle's destination?

A 2 mV

B 2 V

C 50 mV

D 500 V **(BRAVO!** $V = \frac{U}{q}$ **)**

E need additional information.

A,B,C,E prompt: (Incorrect, review lecture 3.1.4_Electric Potential Example)