The electric potential difference between two points A and B is 42 V. What is the work done by an external agent in carrying a charge of 5.0×10−5C from A to B at constant speed?

a. 2.1×10^−3J

b. 8.4×10^−4J

c. 2.1×10^−4J

d. 8.4×10^−3J

While moving the charge against the electric field from location A to location B, work will have to be done on the charge by an external force. The work done on the charge changes its potential energy to a higher value; and the amount of work that is done is equal to the change in the potential energy. By definition, the electric potential difference is the difference in electric potential (V) between the final and the initial location when work is done upon a charge to change its potential energy. In equation form, the electric potential difference is

$$\Delta U = \frac{A}{q}$$

Therefore:

$$A = \Delta U q = 42V * 5 * 10^{-5}\ C = 2.1 * 10^{-3}\ J$$

Answer: a.