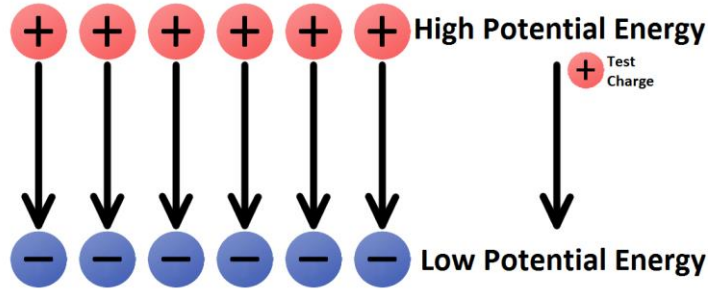**Electrostatic Potential Energy**
and **Electric Potential**
Problems Set 2020
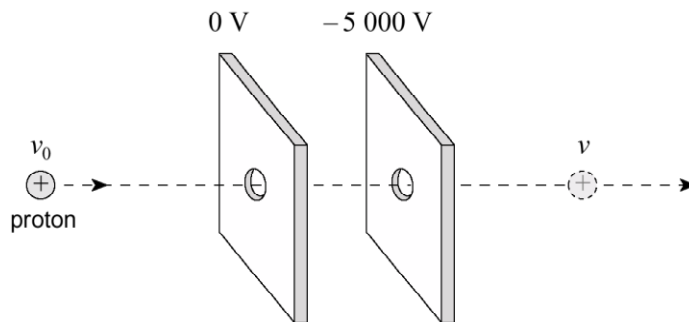

1.

A 0.16 C charge is moved in an electric field from a point with a potential of 25 V to another point with a potential of 95 V. How much work was done to move this charge?

A.   4.0 J
B.   11 J
C.   15 J
D.   19 J

2.

A moving proton has 6.4×10^{-16} J of kinetic energy. The proton is accelerated by a potential difference of 5 000 V between parallel plates.
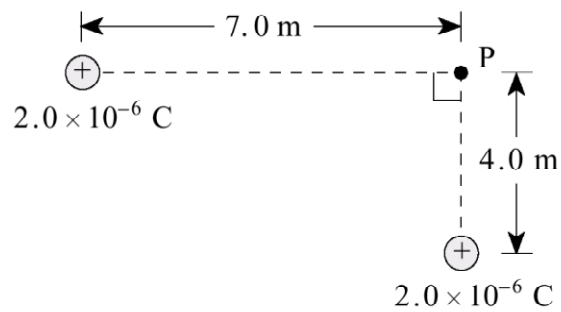
0 V   − 5 000 V

v_0

proton

v

The proton emerges from the parallel plates with what speed?

A. 8.8×10^5 m/s
B. 9.8×10^5 m/s
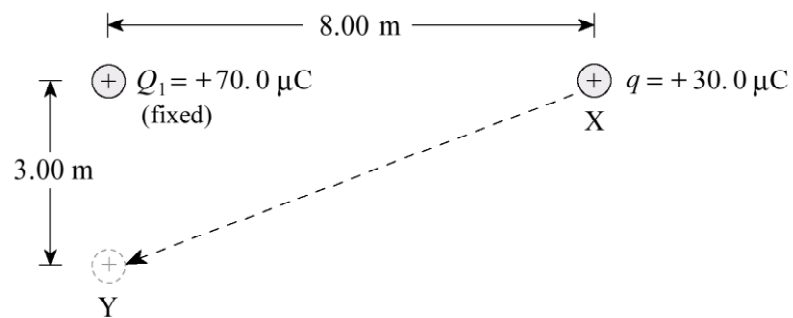C. 1.3×10^6 m/s
D. 1.8×10^6 m/s

3.

What is the electric potential at point P due to the two fixed charges as shown?

A. 1 200 V
B. 1 500 V
C. 5 200 V
D. 7 100 V

4.

A charge q of $30.0\ \mu C$ is moved from point X to point Y.

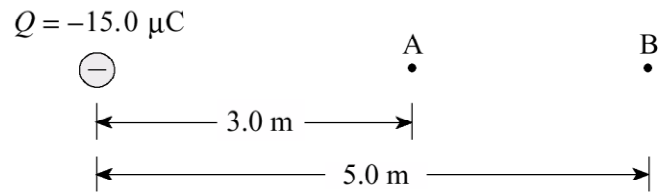How much work is done on the $30.0\ \mu C$ charge? $\left(1\ \mu C = 1 \times 10^{-6}\ C\right)$ **(7 marks)**

5.

a) Find the electric potential at point A and at point B. (Note: $1.0\ \mu C$ is 1.0×10^{-6} C)

(3 marks)

$Q = -15.0\ \mu C$

A   B

$\leftarrow$ 3.0 m $\rightarrow$

$\leftarrow$ 5.0 m $\rightarrow$

6.

A proton, initially at rest at point X, will have what speed at point Y?

(7 marks)

$+3.5 \times 10^{-6}$ C   Proton

$+$

Fixed charge   X   Y

$\leftarrow$ 1.0 m $\rightarrow$ $\leftarrow$ 2.0 m $\rightarrow$

7.

Charge Q_1 is located 5.0 m from charge Q_2 as shown.

$Q_1 = 2.0 \times 10^{-6}$ C $\qquad\qquad\qquad\qquad\qquad$ $Q_2 = 5.0 \times 10^{-6}$ C

$\oplus$ $\longrightarrow$ $\textcircled{+}$ $\qquad\qquad\qquad\qquad\qquad\qquad$ $\oplus$

|← 2.0 m →|← 3.0 m →|

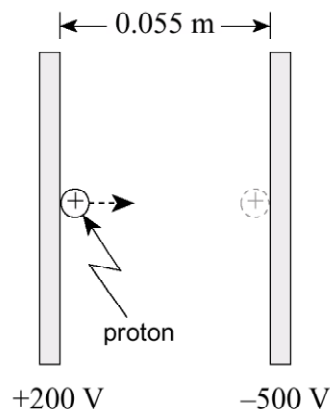|← 5.0 m →|
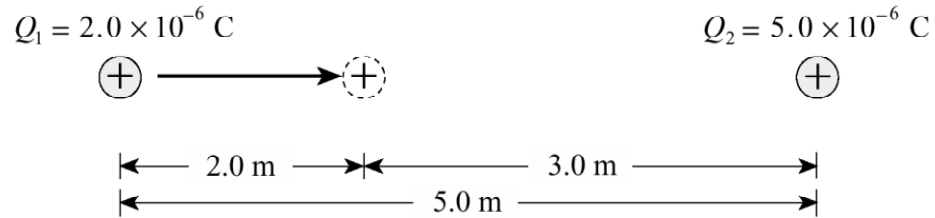
How much work must be done to move charge Q_1 2.0 m closer to charge Q_2?

A. 7.2×10^{-3} J

B. 1.1×10^{-2} J

C. 1.2×10^{-2} J

D. 2.0×10^{-2} J

8.

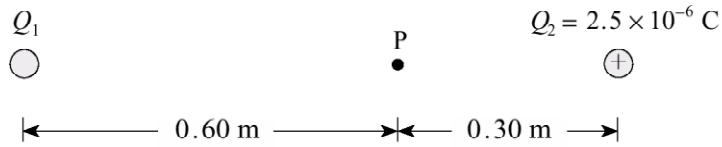A proton initially at rest is accelerated between parallel plates through a potential difference of 700 V.

|← 0.055 m →|

$\oplus$ --→

proton

+200 V $\qquad\qquad$ −500 V

What is the maximum speed reached by the proton?

A. 8.6×10^{4} m/s

B. 3.1×10^{5} m/s

C. 3.7×10^{5} m/s

D. 1.6×10^{6} m/s

9.

Two point charges Q_1 and Q_2 are arranged as shown in the diagram below.

Q_1

P

$Q_2 = 2.5 \times 10^{-6}$ C

|← ———— 0.60 m ————→|← — 0.30 m —→|

The electric potential at point P due to these charges is found to be 1.9×10^5 V. What are the magnitude and sign of charge Q_1? **(7 marks)**

10.

A proton initially held at rest 2.0 m away from a fixed 25 µC charge is released.
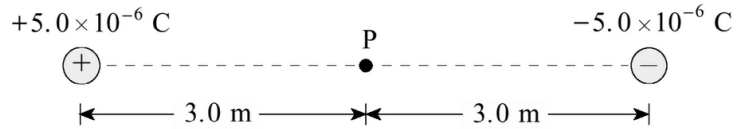The proton accelerates to the right as shown.

|← 2.0 m →|← ———— 4.0 m ————→|

25 µC   proton $v = ?$
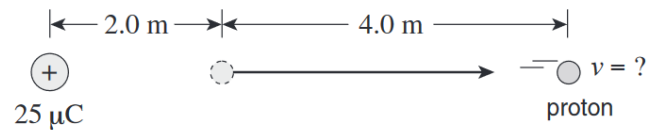
What is the speed of the proton when it is 6.0 m away from the 25 µC charge?

A. 2.7×10^6 m/s
B. 3.3×10^6 m/s
C. 3.8×10^6 m/s
D. 4.6×10^6 m/s

11.

What are the magnitudes of the electric field and the electric potential at point P midway between the two fixed charges?

$+5.0 \times 10^{-6}$ C   P -5.0×10^{-6} C

(+) - - - - - - - - - - - - - - - ● - - - - - - - - - - - - - - - (−)

|←——— 3.0 m ———→|←——— 3.0 m ———→|

	MAGNITUDE OF ELECTRIC FIELD	ELECTRIC POTENTIAL
A.	0 N/C	0 V
B.	0 N/C	30 000 V
C.	10 000 N/C	0 V
D.	10 000 N/C	30 000 V

Answers:

1. B
2. C
3. D
4. 3.94 J
5. -18000 V or +18000V
6. 2.0 x 10^6 m/s
7. C
8. C
9. 7.67 x 10^{-6} C
10. C
11. C