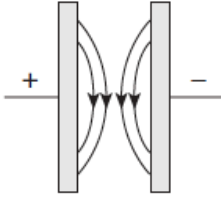


ELECTRICITY

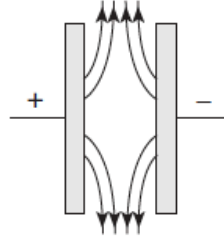
1.

Which diagram best illustrates the electric field between oppositely charged parallel plates?

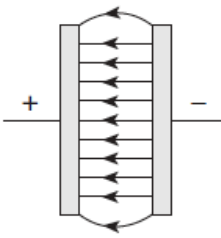
A.



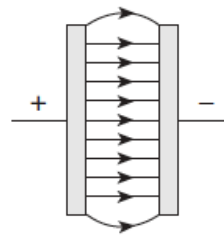
B.



C.



D.



2.

Three charges of identical magnitude are arranged as shown.

$Q_1 \oplus$

$Q_2 \oplus$

$\ominus Q_3$

What is the direction of the electric force on Q_2 ?

A.



B.



C.



D.



3.

Identical $12\mu\text{C}$ charges are placed at the ends of a metre stick.

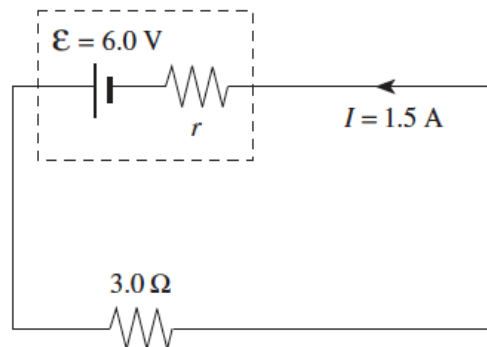


What is the electric potential at point P at the 60 cm mark on the metre stick?

- A. $9.0 \times 10^4 \text{ V}$
- B. $3.8 \times 10^5 \text{ V}$
- C. $4.5 \times 10^5 \text{ V}$
- D. $9.8 \times 10^5 \text{ V}$

4.

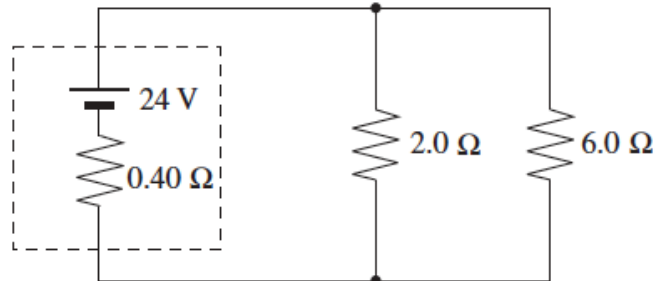
What is the internal resistance of the battery if it delivers 1.5 A when connected to a $3.0\ \Omega$ external load?



- A. $1.0\ \Omega$
- B. $3.0\ \Omega$
- C. $4.0\ \Omega$
- D. $7.0\ \Omega$

5.

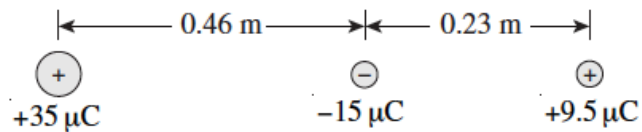
In the circuit below, what is the current through the $2.0\ \Omega$ resistor?



- A. 9.5 A
- B. 10 A
- C. 12 A
- D. 13 A

6.

Three point charges are arranged as shown below.

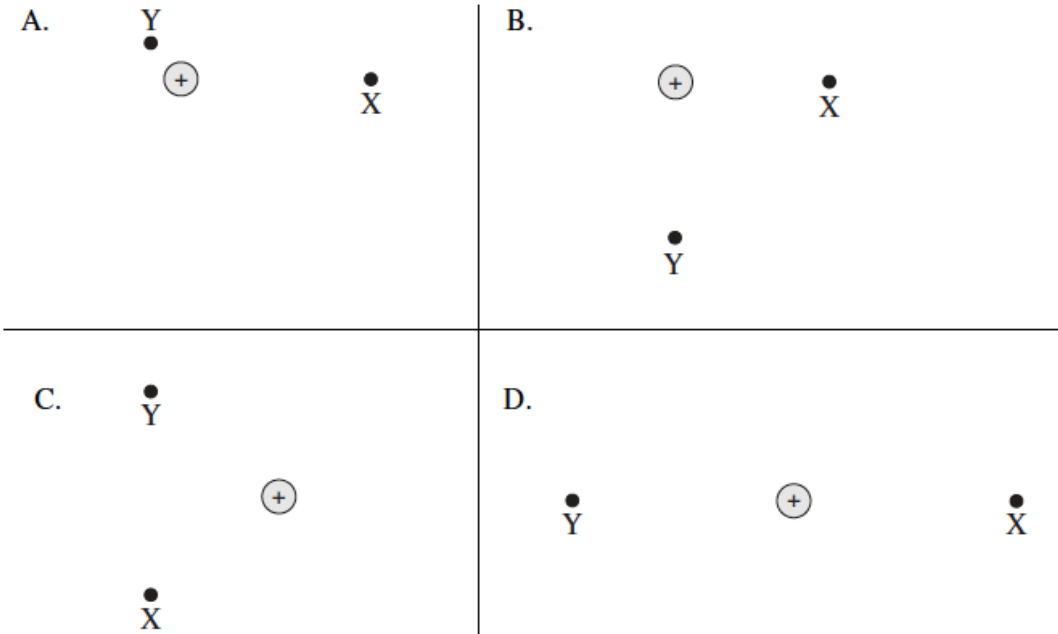


What are the magnitude and direction of the electric force on the $-15\ \mu\text{C}$ charge due to the other two point charges?

	MAGNITUDE OF ELECTRIC FORCE	DIRECTION OF ELECTRIC FORCE
A.	1.9 N	right
B.	1.9 N	left
C.	47 N	right
D.	47 N	left

7.

Each diagram shows two points X and Y in the electric field near a positive charge. In which case is the difference in the magnitudes of the electric field strengths for the two points greatest?



8.

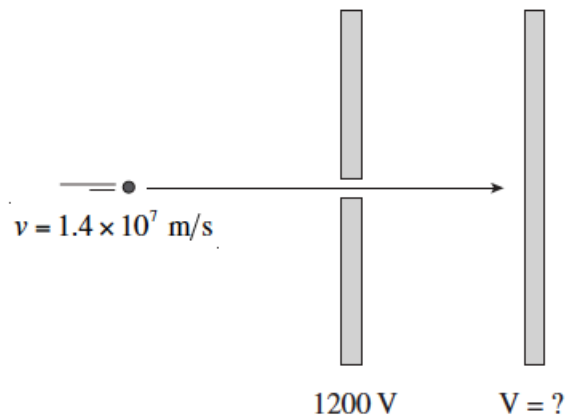
What is the change in potential energy of a $6.0 \mu\text{C}$ charge when it is moved 3.0 m closer to a $45 \mu\text{C}$ charge as shown?



- A. 0.49 J
- B. 0.73 J
- C. 1.2 J
- D. 1.7 J

9.

An electron travelling at 1.4×10^7 m/s enters the region between two charged parallel plates as shown.

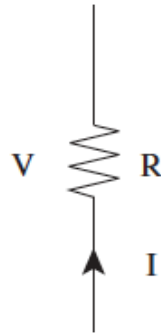


What voltage applied to the second plate would result in the electron just reaching this plate ($v_f = 0$ at second plate) and what is the direction of the electric field between the plates?

	VOLTAGE APPLIED TO SECOND PLATE	DIRECTION OF E-FIELD
A.	640 V	right
B.	640 V	left
C.	1800 V	right
D.	1800 V	left

10.

Consider the circuit element shown below.

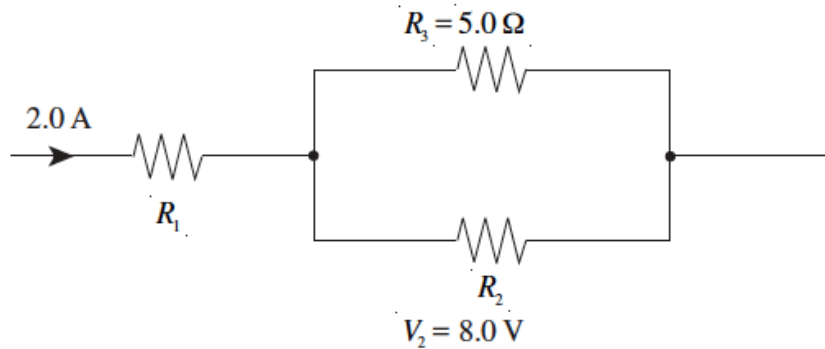


The voltage across the resistor increases from V to $2V$. The current remains the same. By what factor has the resistance changed?

- A. $\frac{1}{4}$
- B. $\frac{1}{2}$
- C. 2
- D. 4

11.

A current of 2.0 A flows through resistor R_1 as shown below.



What is the current flowing through the $5.0\ \Omega$ resistor?

- A. 0.40 A
- B. 1.0 A
- C. 1.2 A
- D. 1.6 A

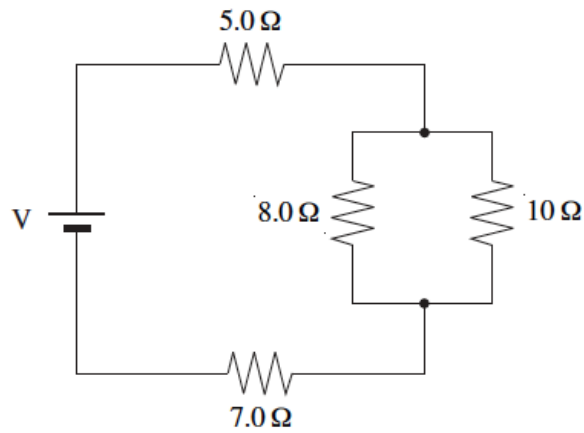
12.

An electric motor is being supplied with 4.2 A of current at 120 V. The resistance of the motor is 8.0Ω . How much power is the motor dissipating as heat?

- A. 15 W
- B. 1.4×10^2 W
- C. 5.0×10^2 W
- D. 1.8×10^3 W

13.

A power source is providing a constant voltage V to the circuit shown below.



If a 4.0Ω resistor is added to the circuit in series with the 5.0Ω what happens to the equivalent resistance of the circuit and the current through the 7.0Ω resistor?

	EQUIVALENT RESISTANCE OF THE CIRCUIT	CURRENT THROUGH 7.0Ω RESISTOR
A.	increases	decreases
B.	decreases	increases
C.	increases	increases
D.	decreases	decreases

14.

Alpha particles with a mass of 6.6×10^{-27} kg and a charge of 3.2×10^{-19} C are fired towards each other from a great distance.

$$\begin{array}{l} m = 6.6 \times 10^{-27} \text{ kg} \\ \oplus \longrightarrow \\ Q = 3.2 \times 10^{-19} \text{ C} \end{array}$$

$$\begin{array}{l} m = 6.6 \times 10^{-27} \text{ kg} \\ \longleftarrow \oplus \\ Q = 3.2 \times 10^{-19} \text{ C} \end{array}$$

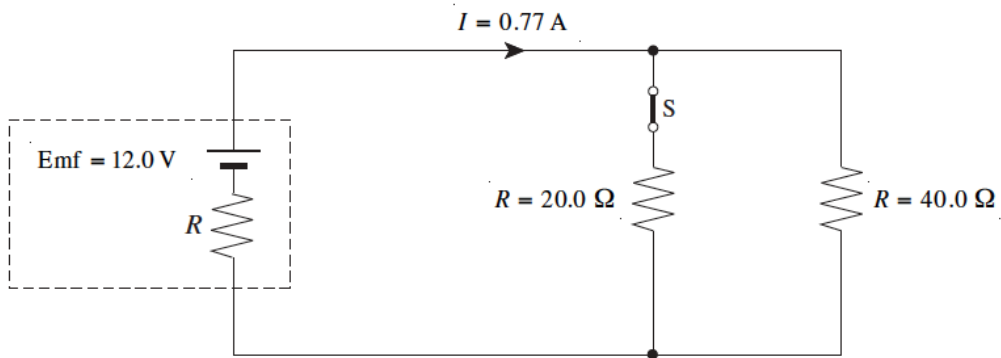
- a) If they each have a speed of 2.5×10^6 m/s to start with, what will be their minimum separation distance? **(4 marks)**

- b) Using energy principles, explain why the particles do not come any closer than this minimum separation distance. **(2 marks)**

15.

3. (6 marks)

A battery having an emf of 12.0 V is connected to the circuit as shown.

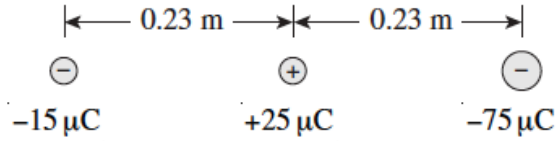


What is the terminal voltage of the battery?

Explain what happens to the terminal voltage of this battery when switch S is opened.

16.

Three point charges are arranged as shown below.

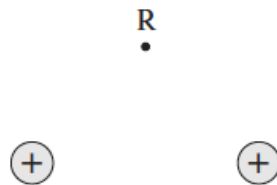


What are the magnitude and direction of the electric force on the $-15 \mu\text{C}$ charge due to the other two point charges?

	MAGNITUDE OF ELECTRIC FORCE	DIRECTION OF ELECTRIC FORCE
A.	16 N	Right
B.	16 N	Left
C.	110 N	Right
D.	110 N	Left

17.

Two equally charged particles are placed close together as shown below.



Which of the following shows the net electric field due to these two particles at point R?

A.

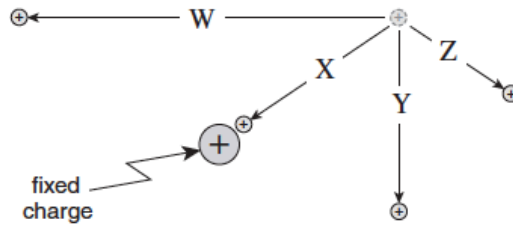
B.

C.

D.

18.

A small test charge is moved to several different locations near a larger fixed charge as shown.

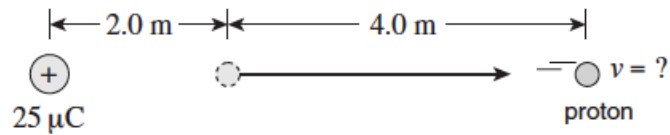


Which change in position of the smaller charge would require the most work?

- A. W
- B. X
- C. Y
- D. Z

19.

A proton initially held at rest 2.0 m away from a fixed $25 \mu\text{C}$ charge is released. The proton accelerates to the right as shown.

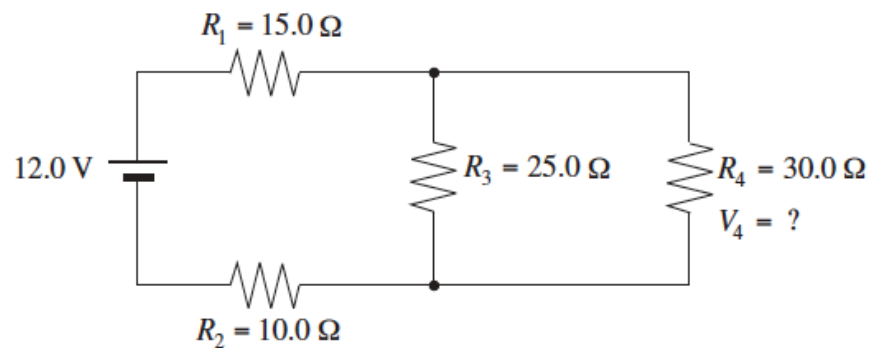


What is the speed of the proton when it is 6.0 m away from the $25 \mu\text{C}$ charge?

- A. $2.7 \times 10^6 \text{ m/s}$
- B. $3.3 \times 10^6 \text{ m/s}$
- C. $3.8 \times 10^6 \text{ m/s}$
- D. $4.6 \times 10^6 \text{ m/s}$

20.

A 12.0 V power supply is connected to 4 resistors as shown.



What is the potential difference, V_4 , across the 30.0Ω resistor?

- A. 2.12 V
- B. 4.24 V
- C. 9.32 V
- D. 12.0 V

21.

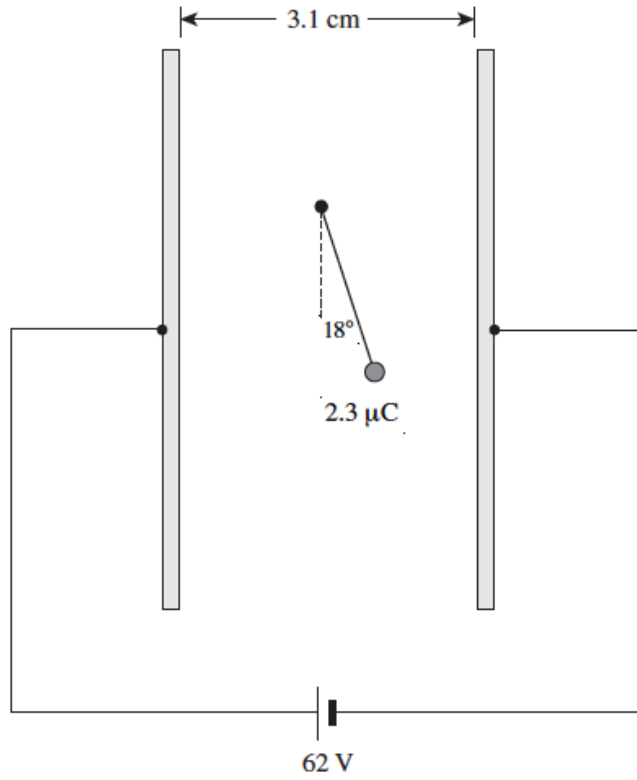
An electric motor is being supplied with 500 W of power at 120 V. The resistance of the motor is 8.0Ω . What current is being supplied to the motor?

- A. 4.2 A
- B. 7.9 A
- C. 15 A
- D. 63 A

22.

(5 marks)

A small sphere having a charge of $2.3 \mu\text{C}$ is suspended from a thread hanging between two charged plates as shown.



What is the mass of the small sphere?