Electric Potential Practice Name:______________________________

1. Near a positive charge will the electric potential be positive or negative?

Positive

2. Near a negative charge will the electric potential be positive or negative?

Negative

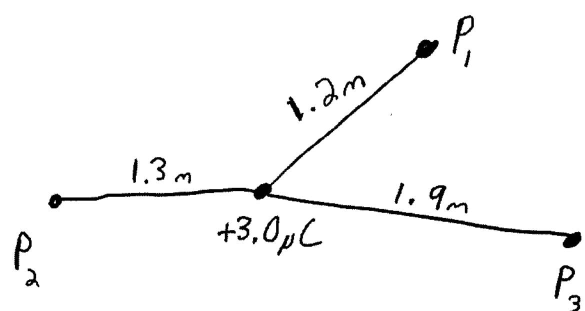
3. A 2.50 μC charge has 2.84 J of electric potential energy. What is the electric potential at the charge?

$$V = \frac{E_p}{q} = \frac{2.84 J}{2.50\times10^{-6} C} = 1.14\times10^{6} V$$

4. A -45.2 μC charge has 4.63 J of electric potential energy. What is the electric potential at the charge?

$$V = \frac{E_p}{q} = \frac{4.63 J}{-45.2\times10^{-6} C} = -1.02\times10^{5} V$$

5. What is the electric potential at each of the indicated points surrounding a $+3.0$ μC charge.



$$P_1: V = \frac{kq}{r} = \frac{8.988\times10^{9} \times 3\times10^{-6}}{1.2}$$

$= 22470 V$

$\approx 22000 V$

P_2: 20741V $\approx$ 21000V

P_3: 14191.6V $\approx$ 14000V

6. A $-260\ \mu C$ charge is fixed in place. What is the electric potential:
   a. 6.5 metres from the charge

   $V = \frac{kq}{r} = -359520V \simeq -360000V$

   b. 2.5 metres from the charge

   $-934752V \simeq -930000V$

   c. 0.25 metres from the charge

   $9347520V \simeq -9300000\ V$

7. What is the electric potential at a point 0.26 metres from a $+35\mu C$ charge and 0.76 metres from a $+26\ \mu C$ charge?

Potential from $+35\mu C$ charge

$= \frac{kq}{r} = \frac{8.988\times10^{9}\times35\times10^{-6}}{0.26} = 1.21\times10^{6}V$

Potential from $+26\mu C$ charge

$= 3.07\times10^{5}V$

Total $= 1.21\times10^{6}V + 3.07\times10^{5}V$

$= 1.5\times10^{6}V$

Electric Potential Practice Name:______________________________

8. What is the electric potential at a point 1.42 metres from a $+8.5\mu C$ charge and 1.96 metres from a $-9.6\ \mu C$ charge?

From $8.5\mu C$ charge: $\frac{kq}{r} = \frac{k \times 8.5 \times 10^{-6}}{1.42} = 53801\,V$

From $-9.6\mu C$ charge $= \frac{k \times -9.6 \times 10^{-6}}{1.96} = -44023\,V$

Total = **9800 V**

9. What is the electric potential difference between a point 2.5 metres away from a $+23\mu C$ charge compared to a point 0.11 metres away from the charge?

V at 2.5 m = ~~8226 8226~~ 82 689.6 V

V at 0.11 m = 1 879 309 V

Potential difference is 1 800 000 V

10. How much work is needed to move a $+1.2\ \mu C$ charge from a point with electric potential of 25 V to a point with electric potential of 65 V?

Change in potential $= V_f - V_i$

$= 65V - 25V$

$= 40V$

$W = q\Delta V$

$= 1.2 \times 10^{-6} C \times 40 V = 4.8 \times 10^{-5} J$

Electric Potential Practice Name:______________________________

11. A $-2.5\ \mu C$ charge is moved from a point with electric potential of -26 volts to a point with electric potential of +36 volts.
    a. Will the work done to the charge be positive or negative?

Change in potential is $36-(-26)=+62$
A negative charge will naturally move to higher potential so work is negative

    b. How much work done to the charge?

$$W = q\Delta V = -2.5\times10^{-6}C \times 62V$$
$$= -1.6\times10^{-4} J$$

12. A 0.19 kg, $-0.25\mu C$ object is accelerated from rest through a potential difference of 350 volts. What is its final speed?

$$\Delta E_p = q\Delta V = -(0.25\times10^{-6}C)(350V)$$
$$= -8.75\times10^{-5} J$$

E_p lost is E_K gained, $E_K = 8.75\times10^{-5} J$

$$V = \sqrt{\frac{2(8.75\times10^{-5})}{0.19}} = 0.030 m/s$$

Electric Potential Practice Name:______________________________

13. A 0.021 kg, $+1.7 \times 10^{-9}\ C$ charged object is accelerated from rest through a potential difference of -2500 volts. What is its final speed?

$$\Delta E_p = q\Delta v = 1.7\times10^{-9}C \times -2500$$
$$= -4.25\times10^{-6} J$$

$$v = \sqrt{\frac{2 \times 4.25\times10^{-6}}{0.021}} = 0.020 m/s$$

14. How much work is required to move a +65 μC object through a potential difference of 24 volts?

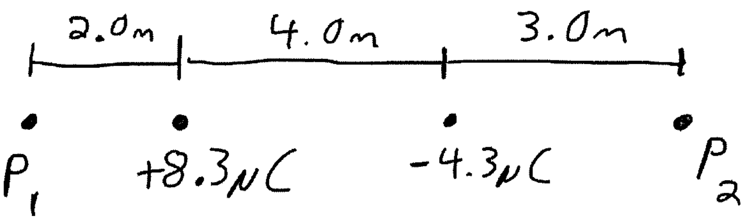
$$W = q\Delta V = 65\times10^{-6}C \times 24$$
$$= 0.0016 J$$

15. How much work is required to move a $-2.3\ \mu C$ charge through a potential difference of -85 volts?

$$W = q\Delta V = -2.3\times10^{-6}C \times -85V$$
$$= 0.00020 J$$

Electric Potential Practice Name:_______________________________

16. Consider the diagram shown.



a. What is the electric potential at P1 (consider the effect of both charges)?

From 8.3μC = $\frac{K \times 8.3\times10^{-6}}{2}$ = 37300.2 | From −4.3μC = $\frac{K \times -4.3\mu C}{6}$ = −6441

Total = 30858.6 V

b. What is the electric potential at P2 (consider the effect of both charges)?

From 8.3μC = ~~8289V~~ 10657 | total: ~~−4593.8 V~~ −2226V

from −4.3μC = −12883.

c. What is the electric potential difference between P1 and P2?

~~−4593.8~~ −2226 − 30858.6 = ~~−35452V~~ −33084

d. How much work is required to move a $-2.0\ \mu C$ charge from P1 to P2?

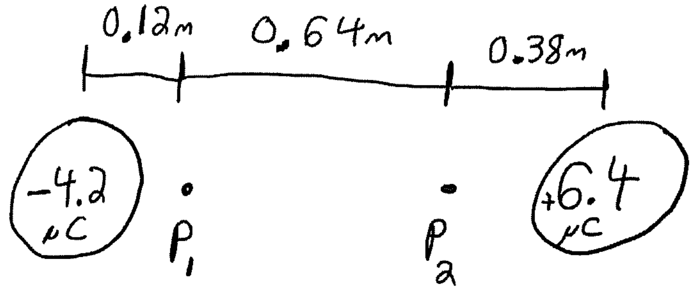
W = qΔV = -2×10^{-6} × ~~35452V~~ −33084

= ~~[illegible]~~

= ~~[illegible]~~ 0.066J

Electric Potential Practice Name:______________________________

17. Consider the diagram shown:



a. What is the electric potential difference between P1 and P2?

$P_1 = -314580 + 56395 = -258185\,V$

$P_2 = -49671 + 151377 = 101706$

Difference

$101706 - (-258185)$

$= 359891\,V$

b. $-1.0C$ of charge moves from P1 to P2, as it does so the lost potential energy is converted to other forms of energy by a complex apparatus, how much energy can be generated in this way?

Pot Energy lost $= -1C \times 359891\,V$

$= -359891\,J$

Energy to be used is **359891 J**

c. If it takes 2.0 seconds for the charge to move from P1 to P2, what is the power output?

$P = \frac{W}{t} = \frac{359891}{2} = 180000$ Watts

Electric Potential Practice Name:______________________________

19. A battery creates areas of high and low potential at either terminal. Electrons are then allowed to flow from the low potential terminal to the high potential terminal through a wire. A particular battery has a potential difference of 24 volts between its low and high potential terminals.

Aaron

a. If -2.0 C of charge is allowed to flow from the low potential terminal to the high potential terminal how much work is done to the **charge**?

$W = q\Delta V = -2.0C \times 24V = -48\ J$

b. If a lightbulb is connected to the wire, how much light energy can be created if all the energy lost from the charge is converted into light energy?

48 J

c. If a motor is connected to the wire, how much mechanical energy can be created if all the energy lost from the charge is converted into mechanical energy?

48 J