Phy 2B 1/14

Wednesday, January 14, 2015 9:57 AM

Exam #1 → Wed 1/21

Ch 19 : sec 1-6

Ch 20 : sec 1-4

Worksheet p. 44

2) same

$W \rightarrow X$

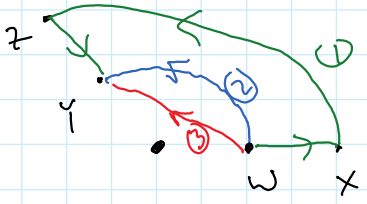
$W \rightarrow X \rightarrow Z$ (zero)

D) 1) $W_{W \rightarrow X} = -W_{Z \rightarrow Y}$

$W_{Net} = 0$

2) zero

3) zero



$W_{path\ 1} = 0$

$W_{path\ 2} = 0$

$W_{path\ 3} = 0$

P. 45 E) all the same

Conservative force (electric force)

III A 1) $W_{1.7q} > W_q$

2) $\frac{W_{1.7q}}{1.7q} = \frac{W_q}{q}$

potential : $\Delta V = -\frac{W_{field}}{q}$

P. 46 B) 1) positive

2) a) $K_w = 0$

$K_x = \frac{1}{2} m v^2 = \frac{1}{2} (3\times10^{-8}) (40)^2 = 2.4\times10^{-5}$ J

$\Delta K = K_x - K_w = 2.4\times10^{-5}$ J

b) $W = \Delta K = 2.4\times10^{-5}$ J

c) $\Delta V = V_x - V_w = -\frac{W_{field}}{q}$

E points to lower potential

So, $V_w > V_x$

ΔV must be negative

$\Delta V = -\frac{W_{field}}{q} = -\frac{2.4\times10^{-5}\ J}{2\times10^{-6}\ C}$

$$\Delta V = -\frac{W_{field}}{q} = -\frac{2.4 \times 10^{-5}\ J}{2 \times 10^{-6}\ C}$$

$$= -12 \text{ Volts}$$

d) equal

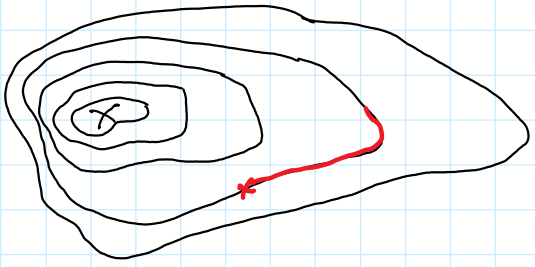
3) a) N_0

b) $\Delta V = -\frac{W}{q}$

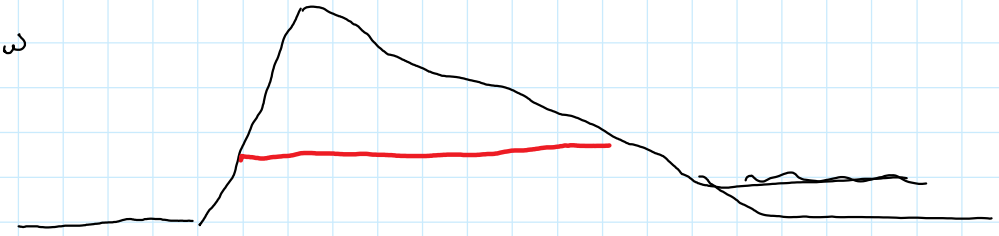
$$W = -q\Delta V$$

greater

Topo map



side view



Worksheet p. 52

1 $E_A < E_a$ $\quad E = \frac{kq}{r^2}$ point charge

2 $V_A - V_B < V_a - V_b$

3 $V_c - V_B = V_c - V_b$ both are zero

4 $Q < q$ $\quad q = 2Q$ count field lines

p.

1 $E_A < E_a$

2 $V_A - V_B < V_a - V_b$

3 $V_c - V_B = V_c - V_b$

4 $Q < q$

5 $E_B < E_A$

6 $E_B = E_c$

7 $E_b < E_a$

8 $V_A < V_a$

9 $E_A > E_b$

$E = \frac{kQ}{r^2}$ point charge

both are zero

$q = 2Q$ count field lines

$V = \frac{kq}{r}$ point charge

if $V = 0$ at $r = \infty$

q can be + or −

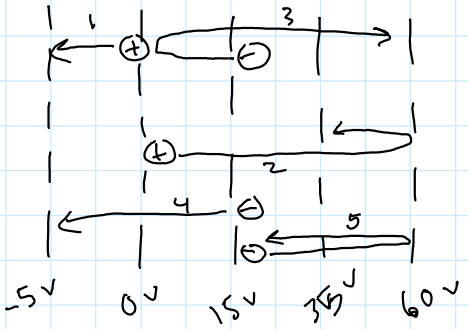
A b

$\frac{kQ}{r^2}$? $\frac{kq}{(4r)^2}$

$\frac{kQ}{r^2}$ $\frac{k(2Q)}{16r^2}$

E_A $\frac{1}{8} E_A$

Book Problems
20 - 47
(different numbers)



all charges are $|q| = 2\ \mu C$

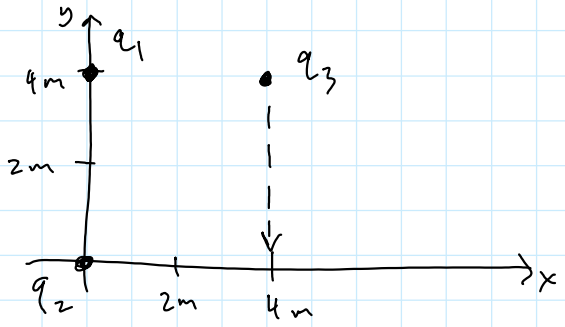
a) direction of $\vec{E}$: To the Left (to lower V)

b)

path	sign of Work on q by field	|Work| done on q
1	positive	$\|q\Delta V\| = (2\times10^{-6})(5) = 10\ \mu J$
2		

b)

1	positive	$\lvert q\Delta V\rvert = (2\times10^{-6})(5) = 10\ \mu J$
2	Negative	$(2\times10^{-6})(35) = 70\ \mu J$
3	positive	$(2\times10^{-6})(45) = 90\ \mu J$
4	Negative	$(2\times10^{-6})(20) = 40\ \mu J$
5	zero	$(2\times10^{-9})(0) = 0$



$q_1 = +1\ \mu C$

$q_2 = -2\ \mu C$

$q_3 = +3\ \mu C$

a) Find work done by the field in moving q_3 to infinity (starts and ends at rest)

$$W_{field} = -q\Delta V$$

$V_f = 0$ at infinity

$$V_i = V_{q_1} + V_{q_2}$$

$$= \frac{kq_1}{r_1} + \frac{kq_2}{r_2}$$

$$= \frac{(8.99\times10^9)(+1\times10^{-6})}{(4\ m)} + \frac{(8.99\times10^9)(-2\times10^{-6})}{\sqrt{2}(4)}$$

$$= 2247.5 - 3178.4\ V$$

$$= -931\ V$$

$$W_{field} = -q\Delta V$$

$$= -(+3\times10^{-6}\ C)\left[0-(-931)\right]$$

$$= -2.79\ mJ$$

b) Find work done by the field in moving q_3 to (4, 0) (starts and ends at rest)
(empty corner of the square)

$$W_{field} = -q\,\Delta V$$

$V_i = -931\ V$ same as part a

$$V_f = V_{q_1} + V_{q_2}$$

$$= \frac{k q_1}{r_1} + \frac{k q_2}{r_2}$$

$$= \frac{(8.99\times10^9)(+1\times10^{-6})}{\sqrt{2}\,(4)} + \frac{(8.99\times10^9)(-2\times10^{-6})}{4}$$

$$= 1589 - 4495$$

$$= -2906\ V$$

$$W = -q\,\Delta V$$

$$= -(3\times10^{-6})\left[-2906-(-931)\right]$$

$$= +5.93\ mJ$$