11. $\phi = \frac{kq}{r} = V$

$\phi' = \frac{kq}{2r} = V/2$

EXAM 1
Post mortem

5. $F = \frac{kq_1q_2}{r^2}$

r → |← D-x →|
|— D —|

6. ⊕ ⟷ ⊕

$E = \frac{-kq}{(D-x)^2} + \frac{kq}{x^2}$

$= 0$ at $x = D/2$

7. $E = \frac{k\varphi}{r^2}$ $\varphi = 2e$

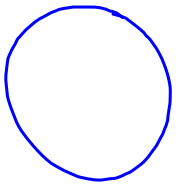
8. (−) ⟵ (+)

10. ⟵ E

|— s —|

$\frac{W}{q} = \frac{F}{q} \cdot s$

$V = Es$

12. 

change in pot'l on equipotential surface $= 0$

$\frac{W}{q} = \frac{F}{q} \cdot s$

$V = E \cdot s$

13. V { ↑ 0.1m ↓

$E = \frac{V}{s} = \frac{12V}{0.1m} = 120 \frac{V}{m}$

14. $C = \frac{Q}{V}$ $\quad C_A = \frac{50C}{25V} = 2F$

$C_B = \frac{5C}{0.1V} = 50F$

$C_B > C_A$

15. $C = \epsilon_0 \frac{A}{d} = 8.85 \times 10^{-12} \frac{(1m)}{0.01}$

$= 8.85 \times 10^{-10} F$

16. $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$ $\quad C_{eq} = \frac{1}{3}$

$= \frac{1}{1} + \frac{1}{.5} = 3$

17. $C_{eq} = C_1 + C_2$

$= 1 + 0.5 = 1.5F$

18. $\mathcal{E} = \frac{1}{2}CV^2$

$\mathcal{E}' = \frac{1}{2}C(2V)^2 = \frac{1}{2}C \cdot 4V^2 = 4\mathcal{E}$

$= 4.(4J) = 16J$

19. $u = \frac{1}{2}\epsilon_0 E^2$

$E = \sqrt{\frac{2u}{\epsilon_0}} = \sqrt{\frac{2(.01J/m^3)}{8.85 \times 10^{-12} C^2/Nm^2}}$

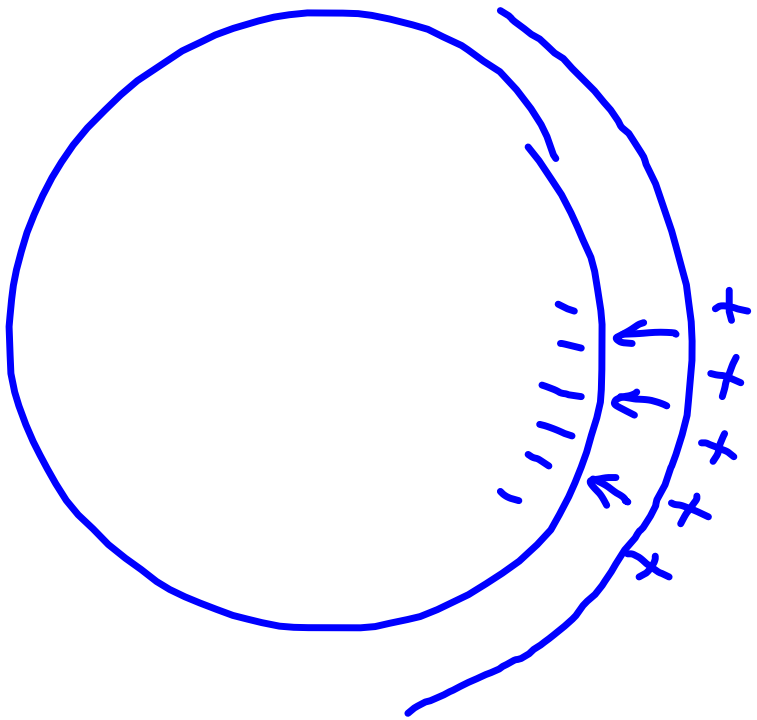
$= \sqrt{2.12 \times 10^{10}}$

$= \sqrt{.24 \times 10^{10}}$

$= \sqrt{24 \times 10^8} =$

$= 4.8 \times 10^4 N/C$

20.



D.C. Circuits

Current = $\frac{\text{charge that flows past}}{\text{time required to flow past}}$

$= \frac{\Delta q}{\Delta t}$

Current is defined as the flow of positive charge (even though charges flowing in conductors are negative)

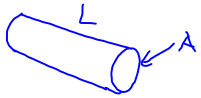
Unit of current = Ampere = $\frac{1 \text{ Coulomb}}{\text{sec}}$

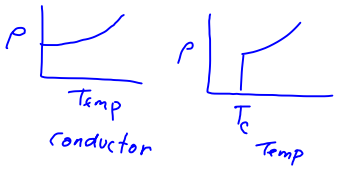
Symbol of current: I

Resistance

$I = \frac{1}{R}V = \frac{V}{R}$ $\quad \boxed{I = \frac{V}{R}}$ Ohm's Law

$R = \rho \frac{L}{A}$ $\quad \rho$ = resistivity ("like trad density")





$IR = V$

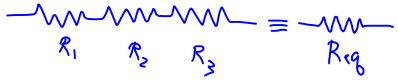
$R = \frac{V}{I}$

Units of resistance = Ohm = $\frac{1 \text{ Volts}}{\text{Ampere}}$

Circuit symbol = Ω

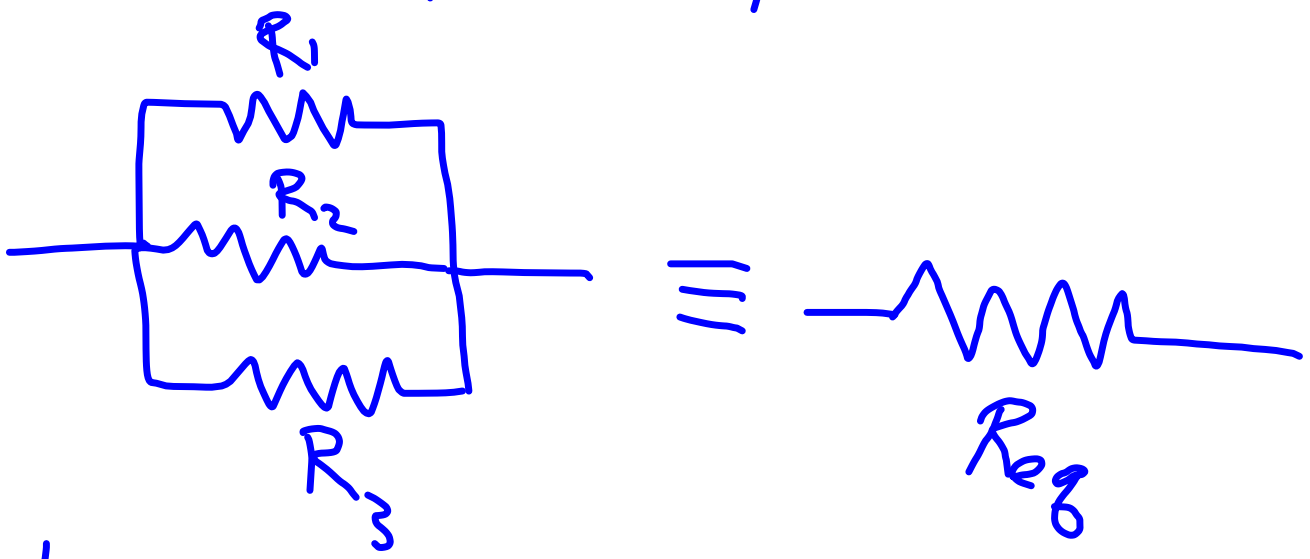
for resistor: 

Resistors in Series



$R_{eq} = R_1 + R_2 + R_3$

Resistors in Parallel



$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$