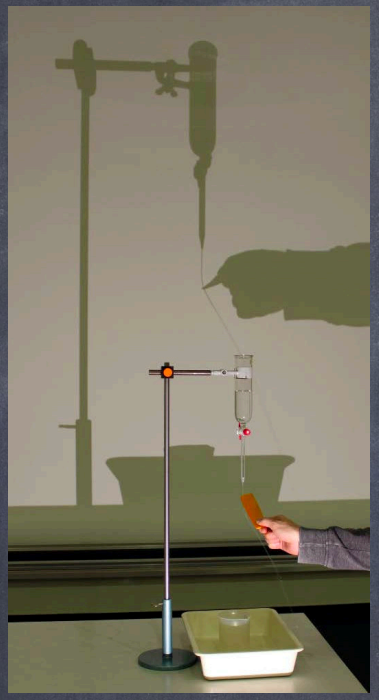
PHY 117 HS2023

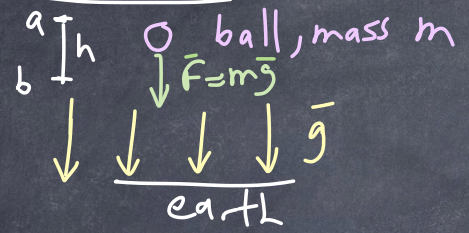
Week 9, Lecture 1
Nov. 15th, 2023
Prof. Ben Kilminster



why?

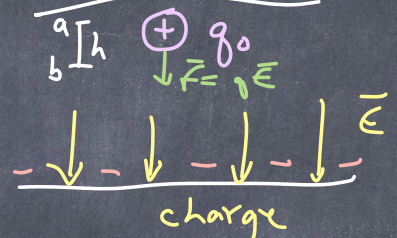
Potential Energy

Gravitational



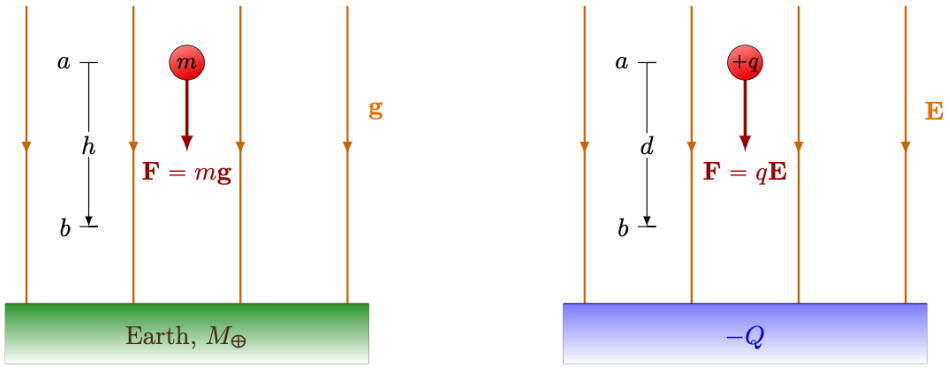
a: initial
b: final

Electrical



$$\bar{F} = q_0 \bar{E}$$

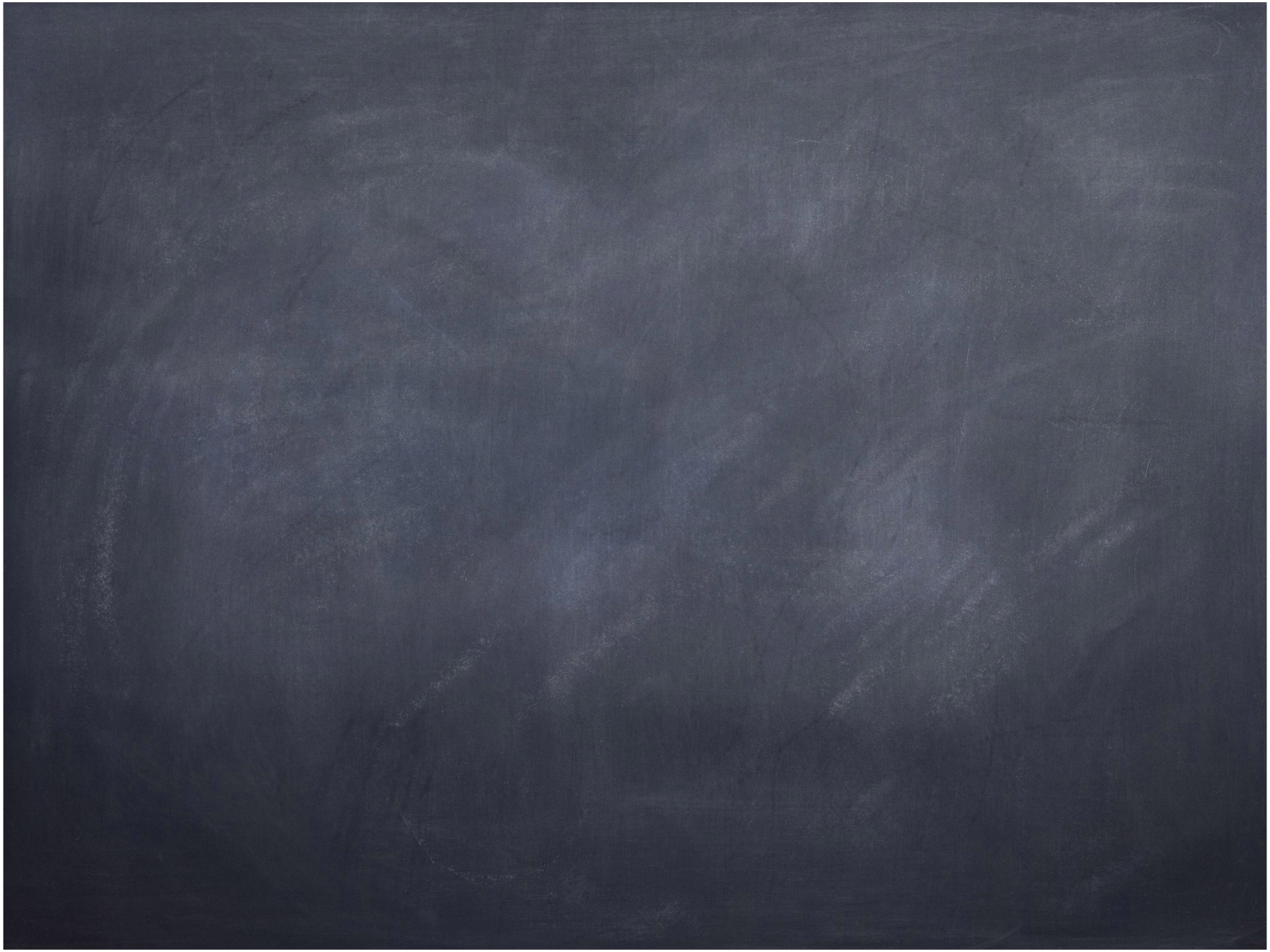
3.1 Electric potential energy

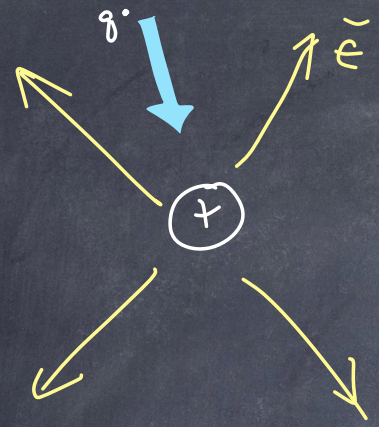


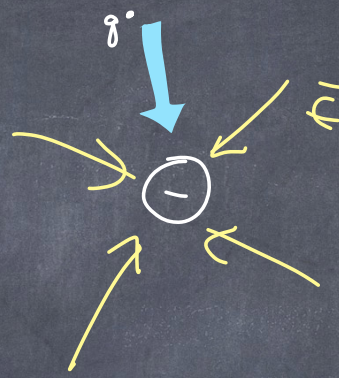
(a) Gravitational: $\Delta U = -mgh$.

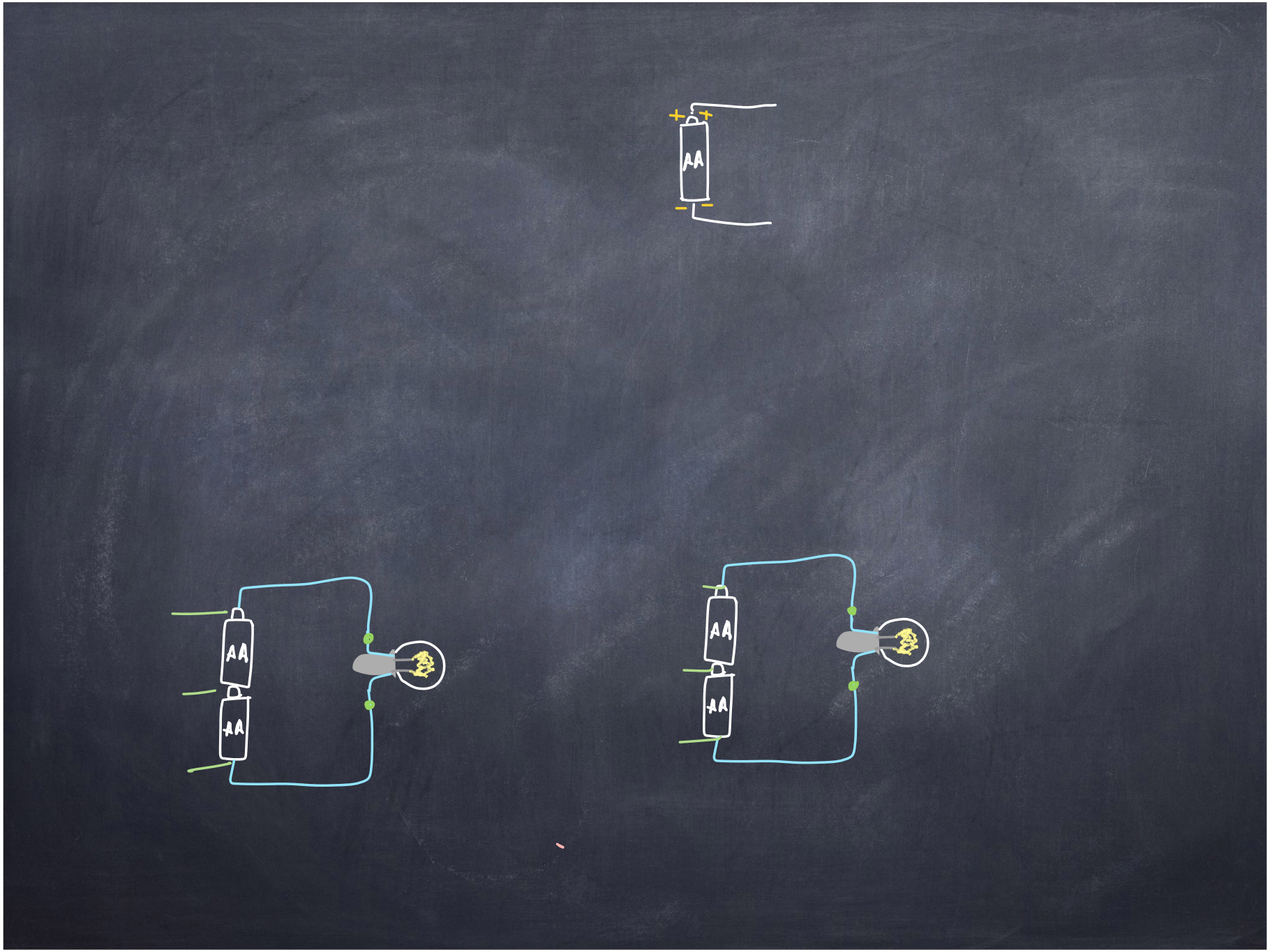
(b) Electric: $\Delta U = -qEd$.

Figure 3.1: Comparison of potential energy difference $\Delta U = U_b - U_a$ in a force field.

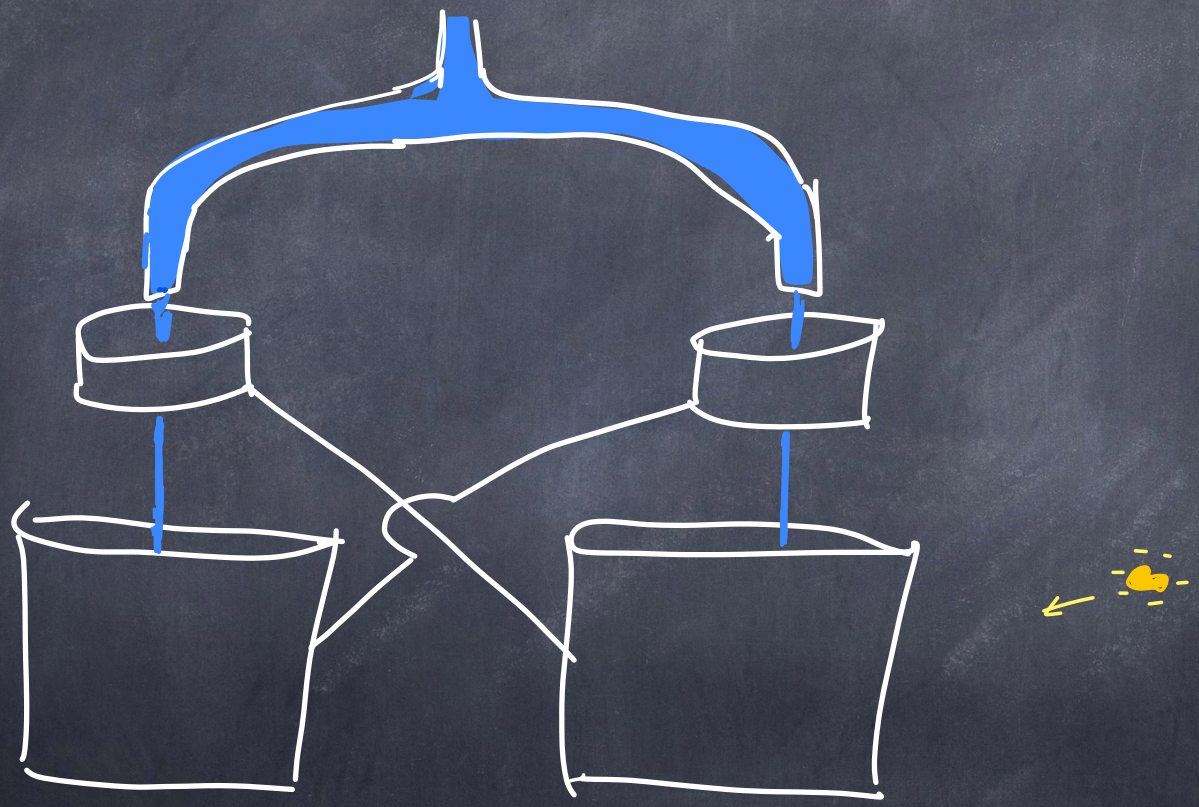



q
+

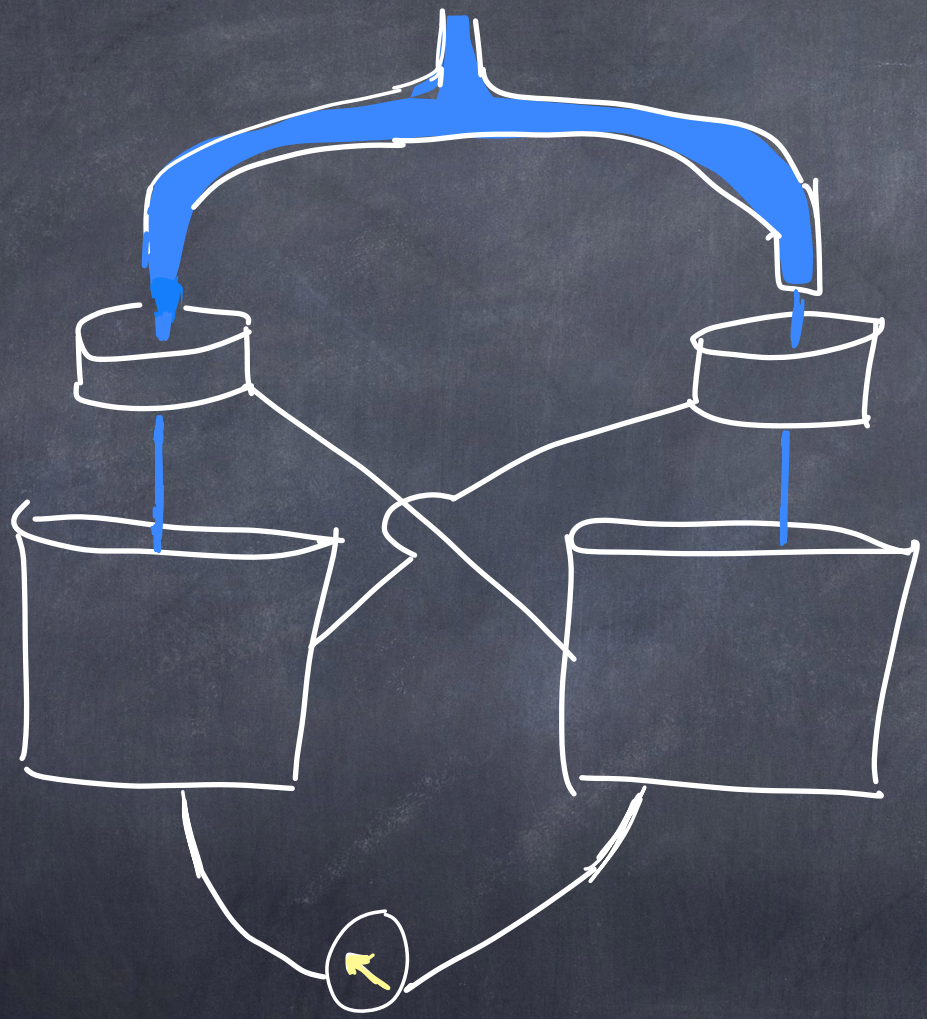

q
−


AA
AA
AA
AA

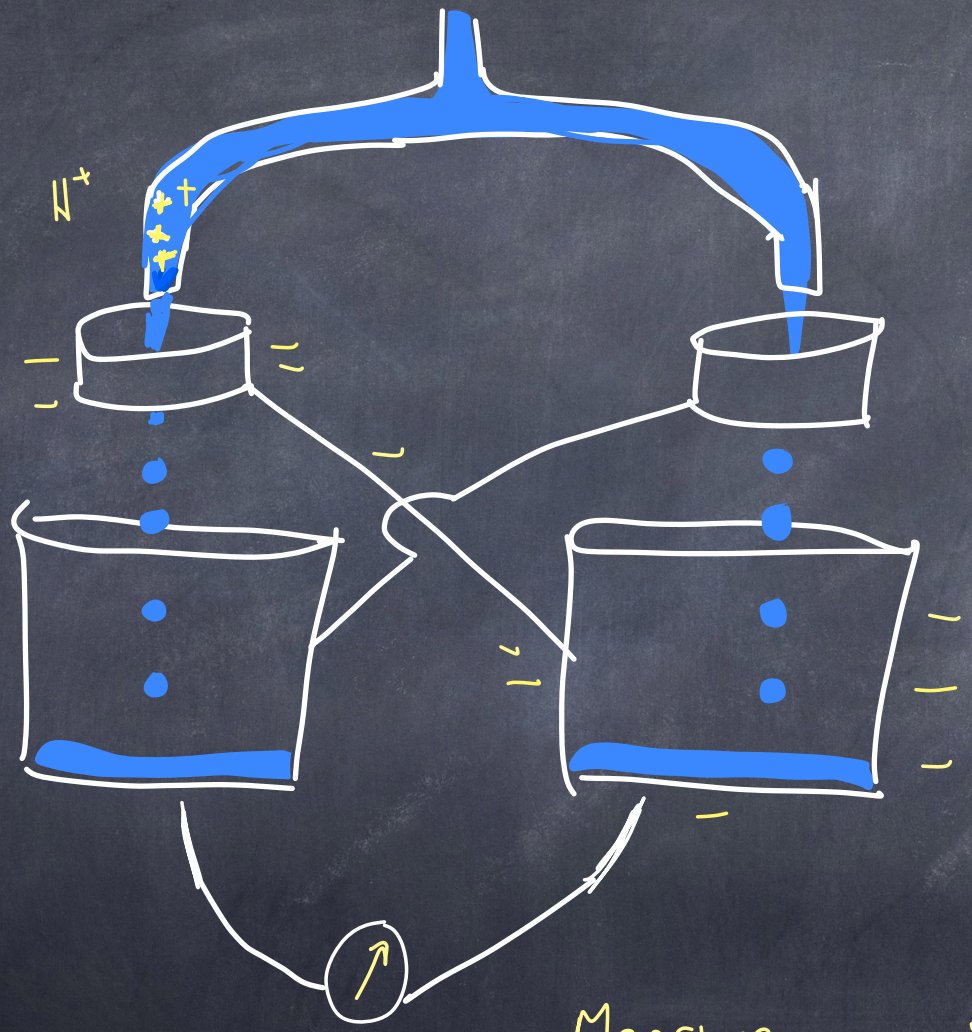
we can charge one conductor with respect to another, to create a potential difference.



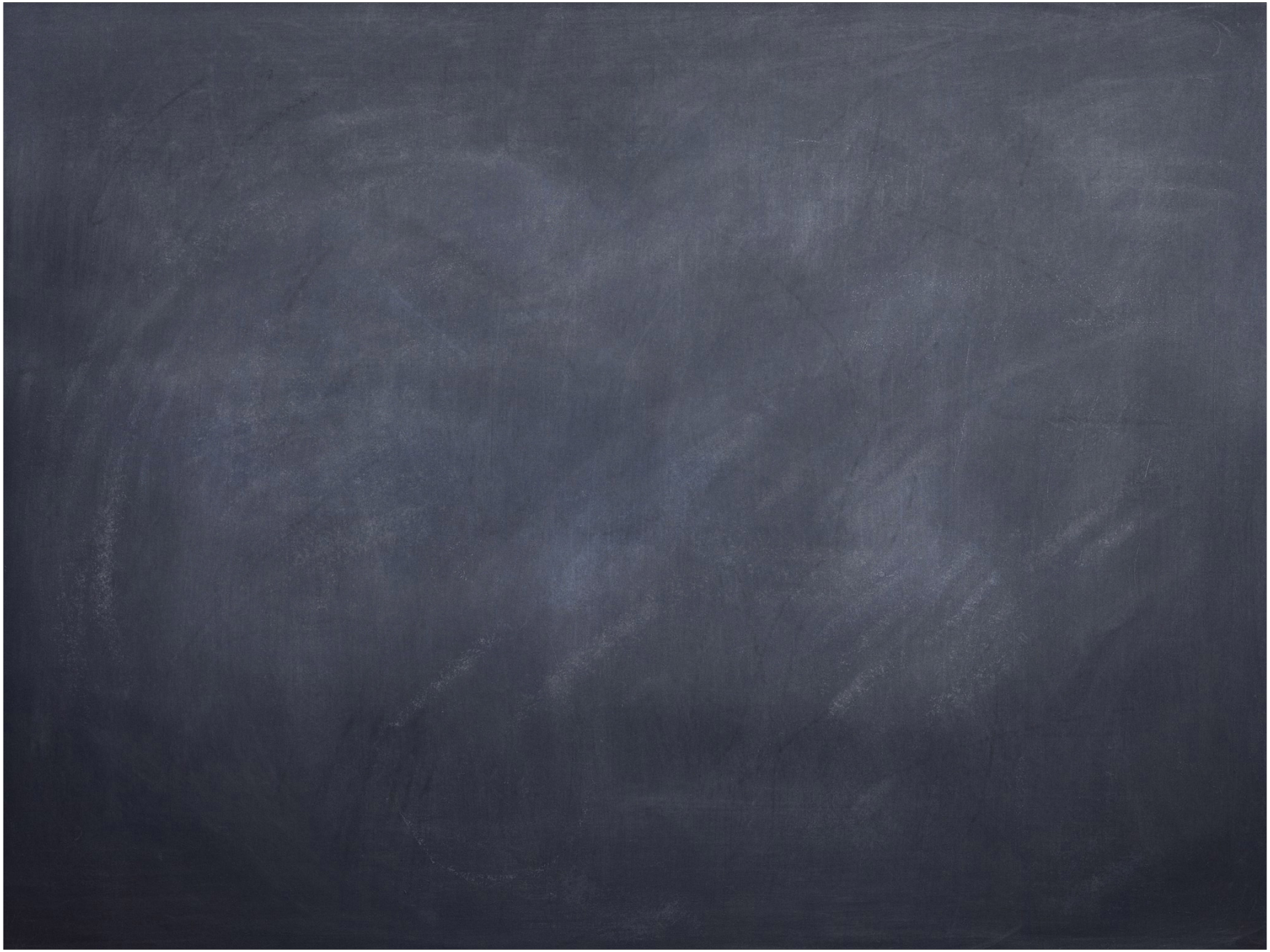
Kelvin generator (Kelvin water dropper)



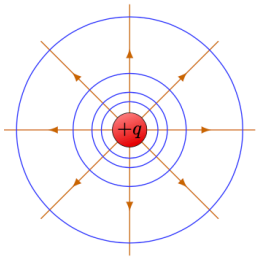
Kelvin generator (Kelvin water dropper)



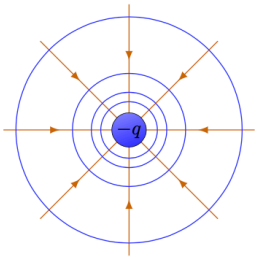
Measure
↖ The voltage difference
(relates to charge)



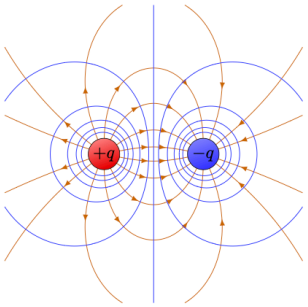
Equipotential lines: lines of equal potential



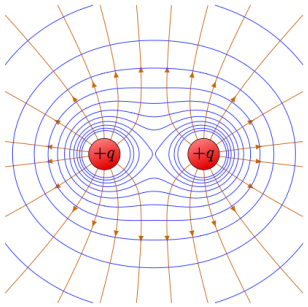
(a) Positive charge.



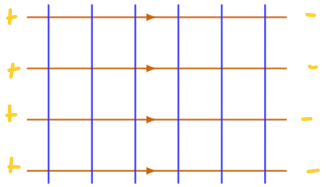
(b) Negative charge.



(c) Opposite point charges.

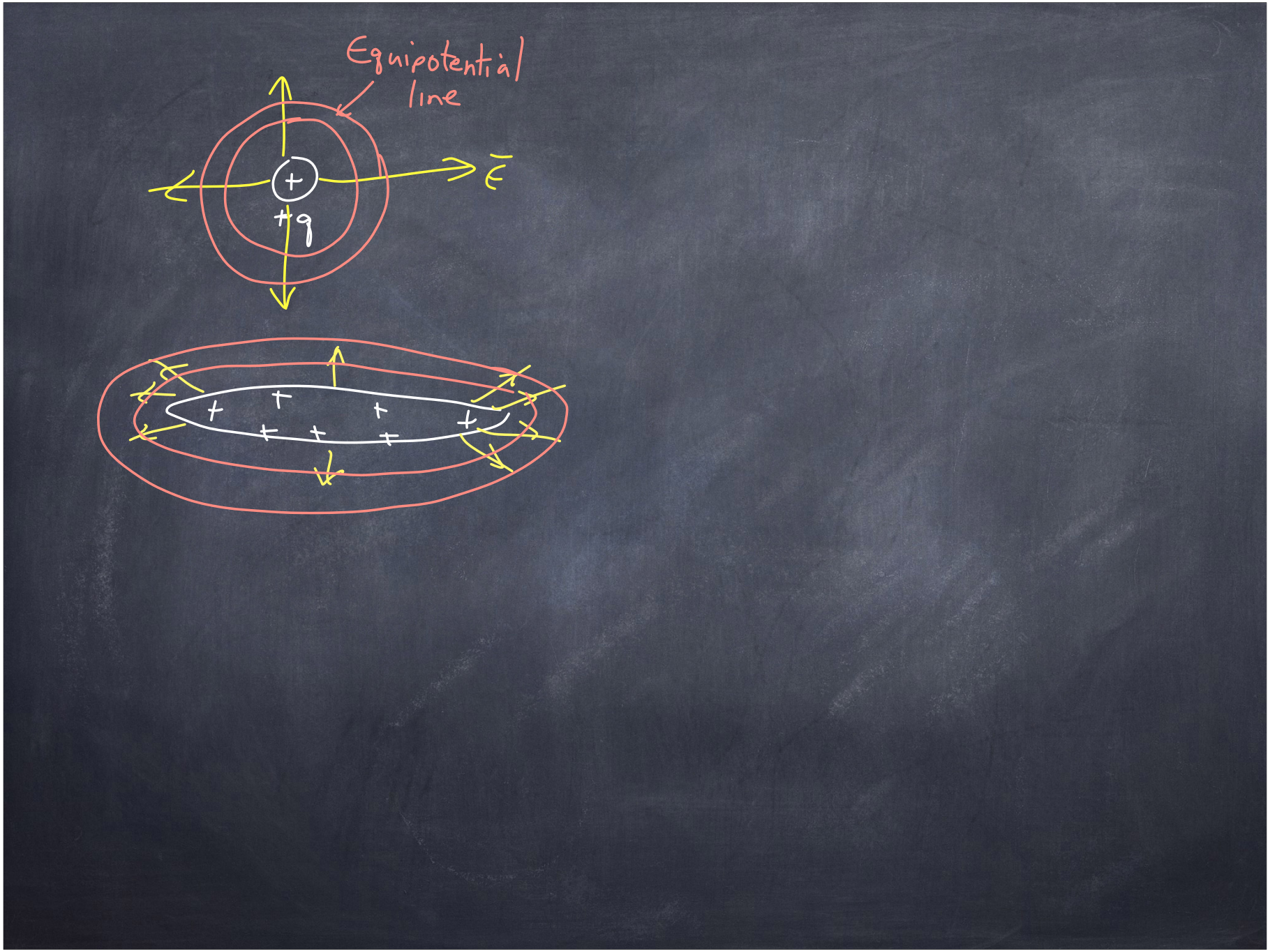


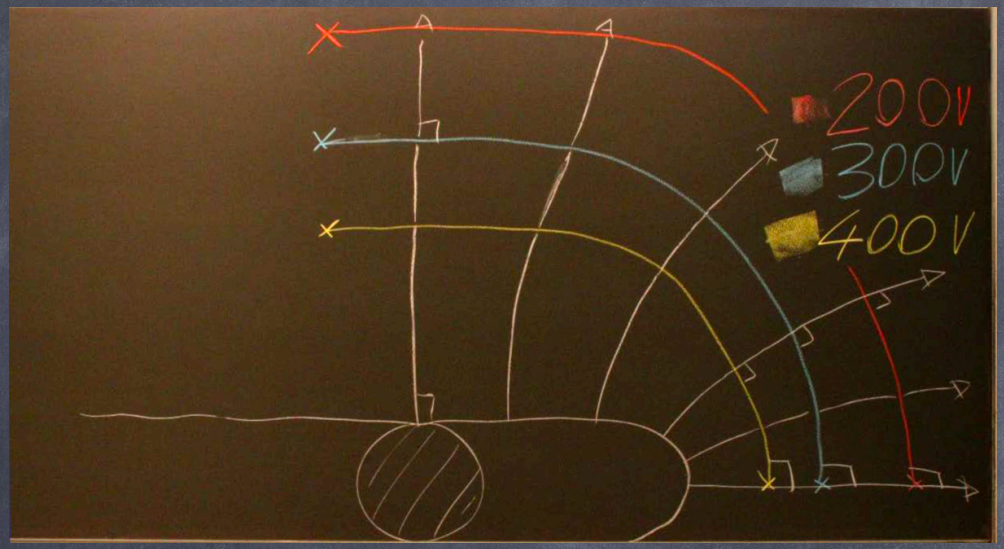
(d) Same-sign point charges.

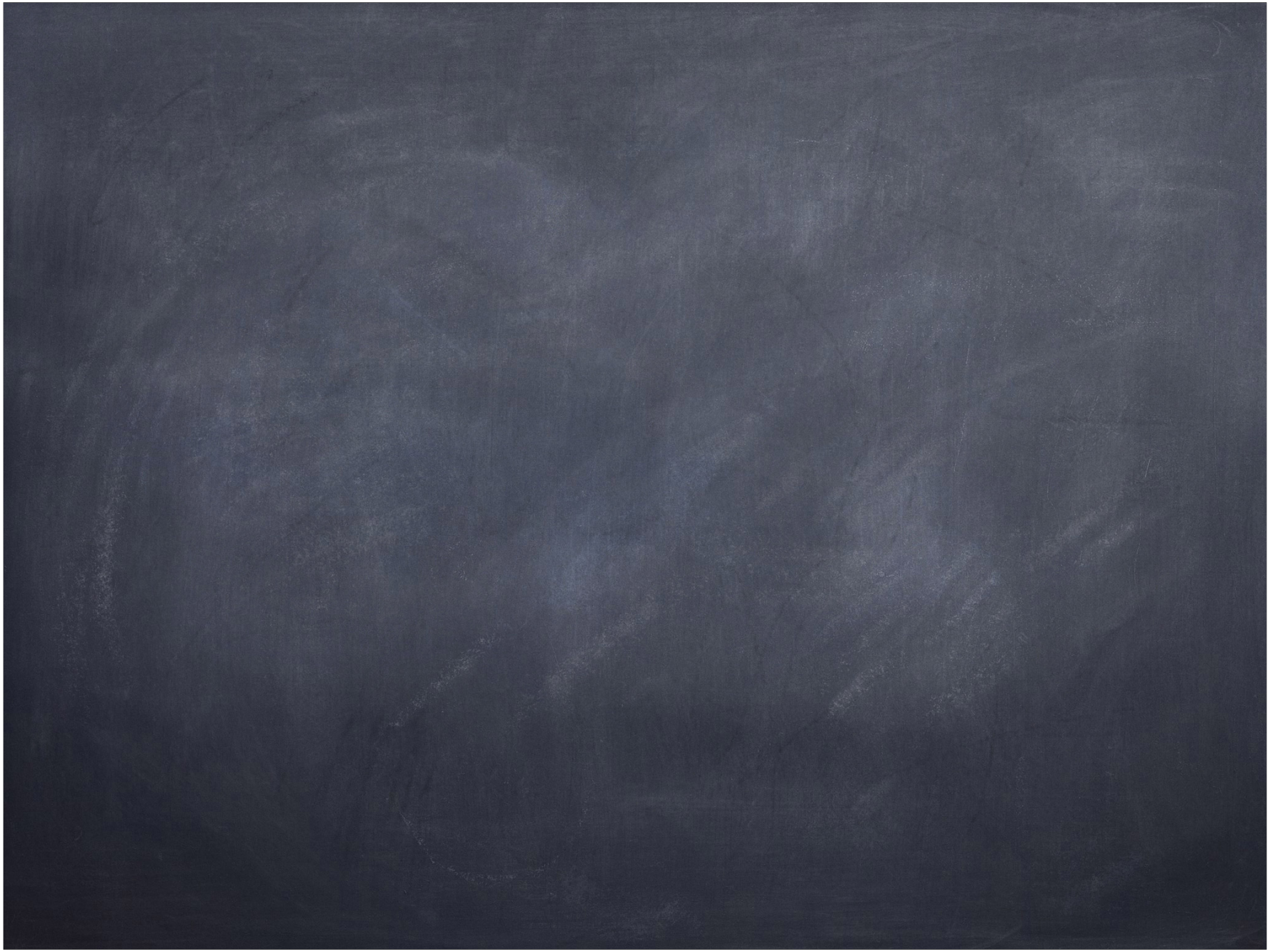


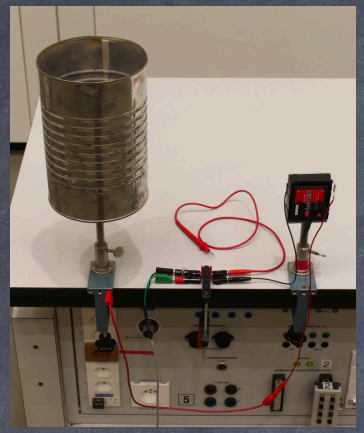
(e) Uniform field (like for a infinite sheet of charge).

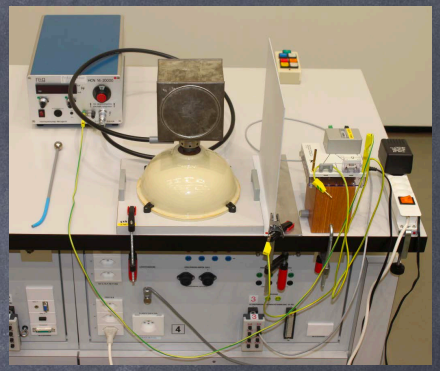
Figure 3.6: Equipotential surfaces (blue) of electric field lines (orange) for different configurations of point charges. All the points on the same equipotential have the same electric potential. The equipotential are equidistant to each other: Two neighbouring equipotentials differ by a fixed voltage ΔV.

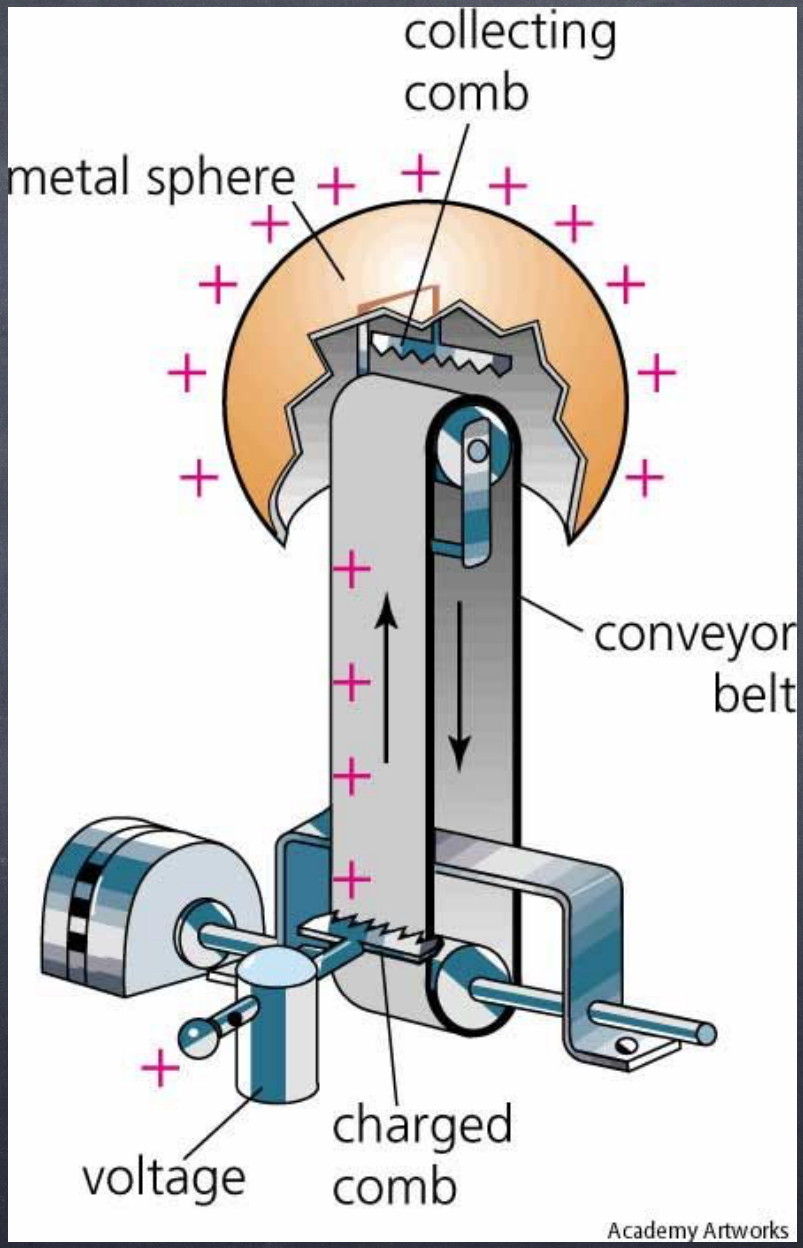

Equipotential line
+q
E

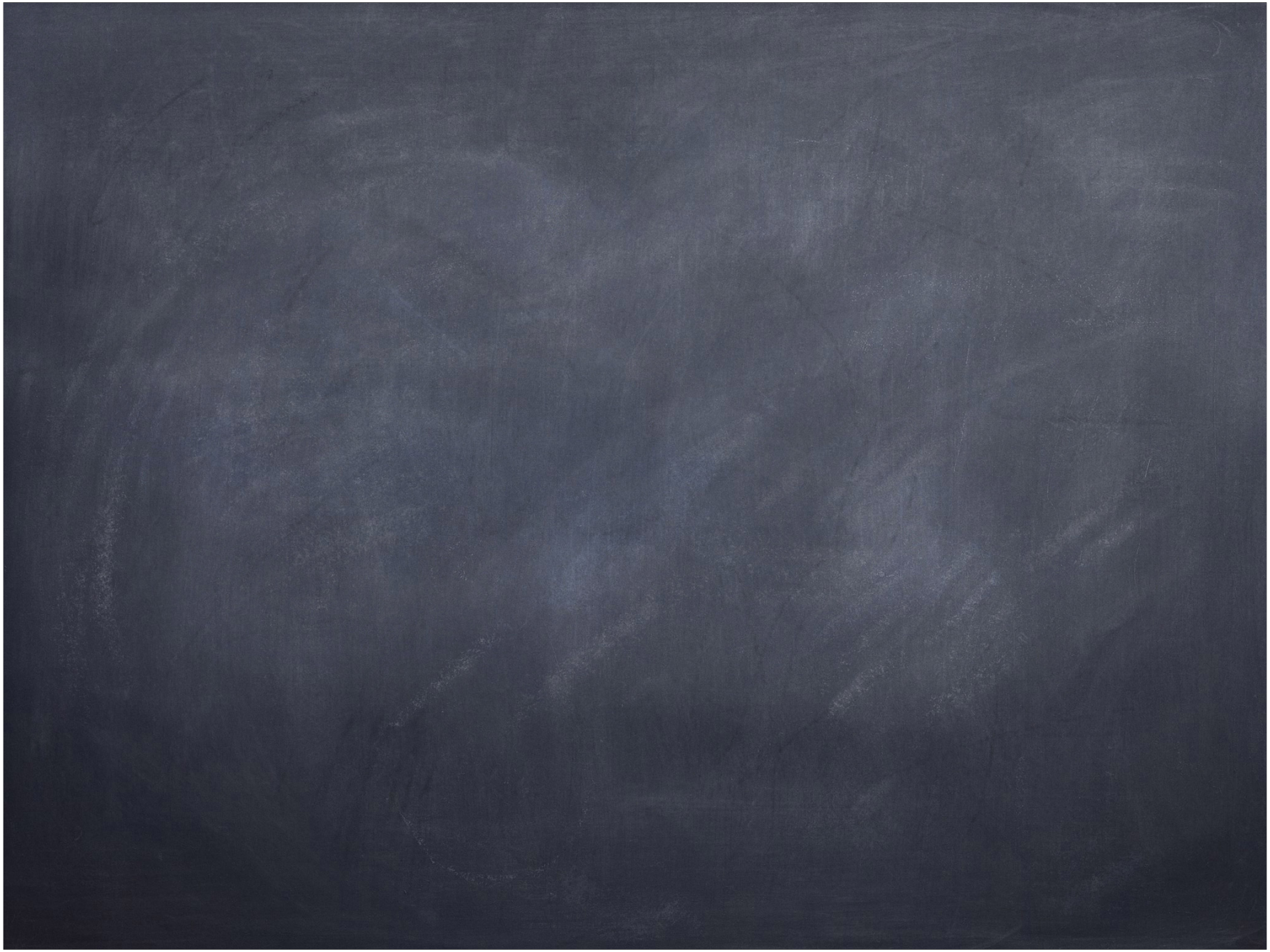

200V
300V
400V

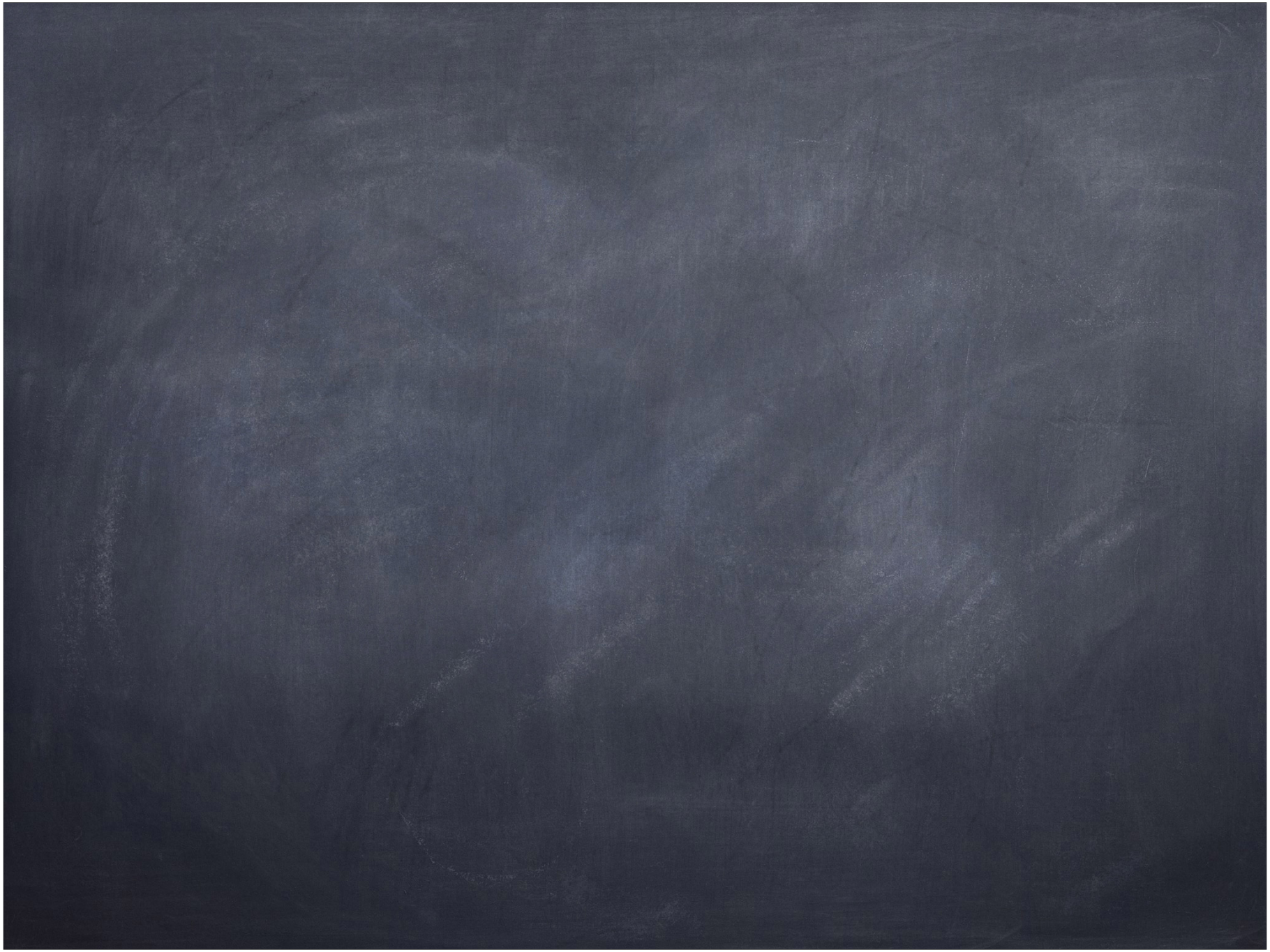


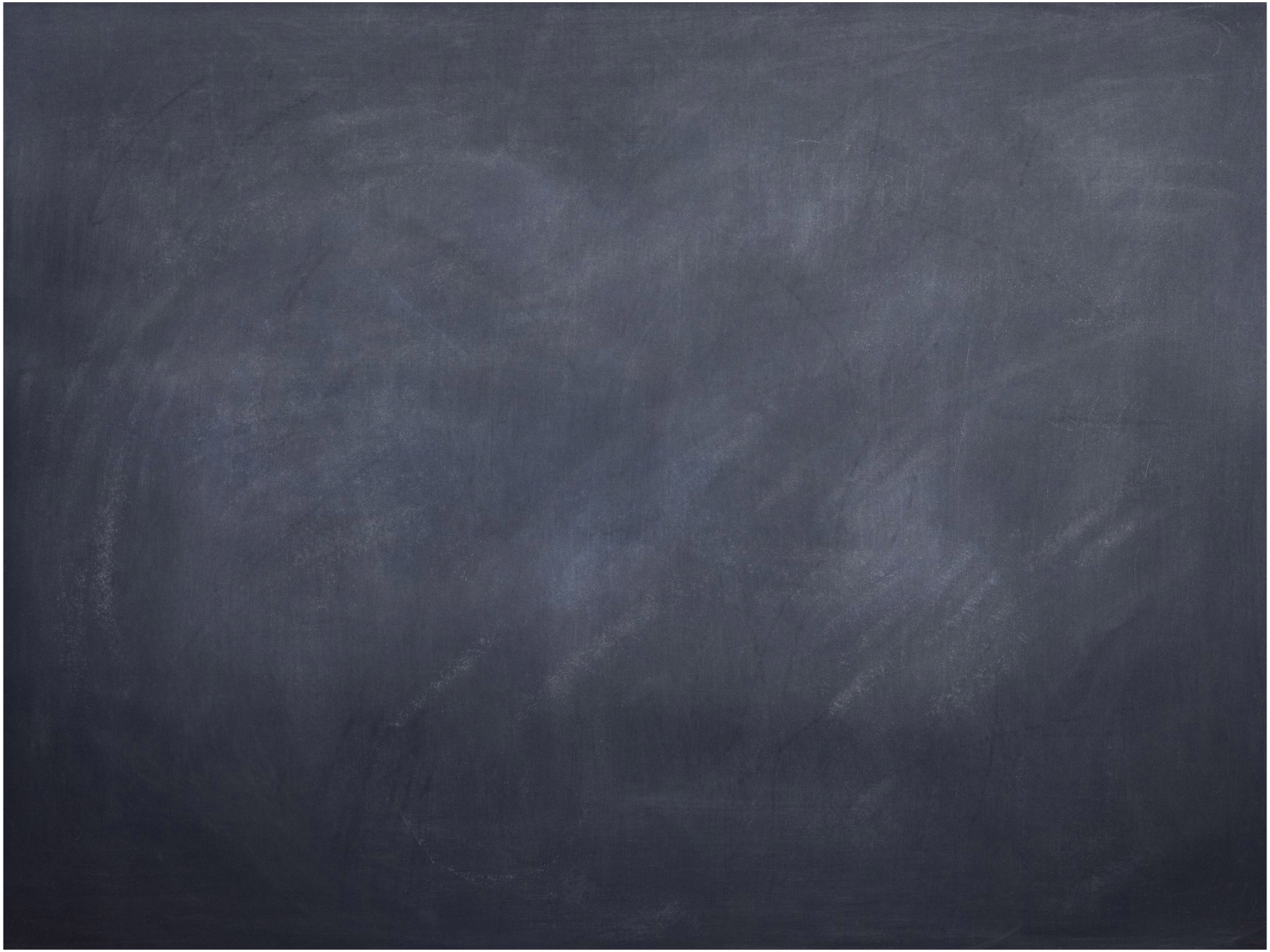


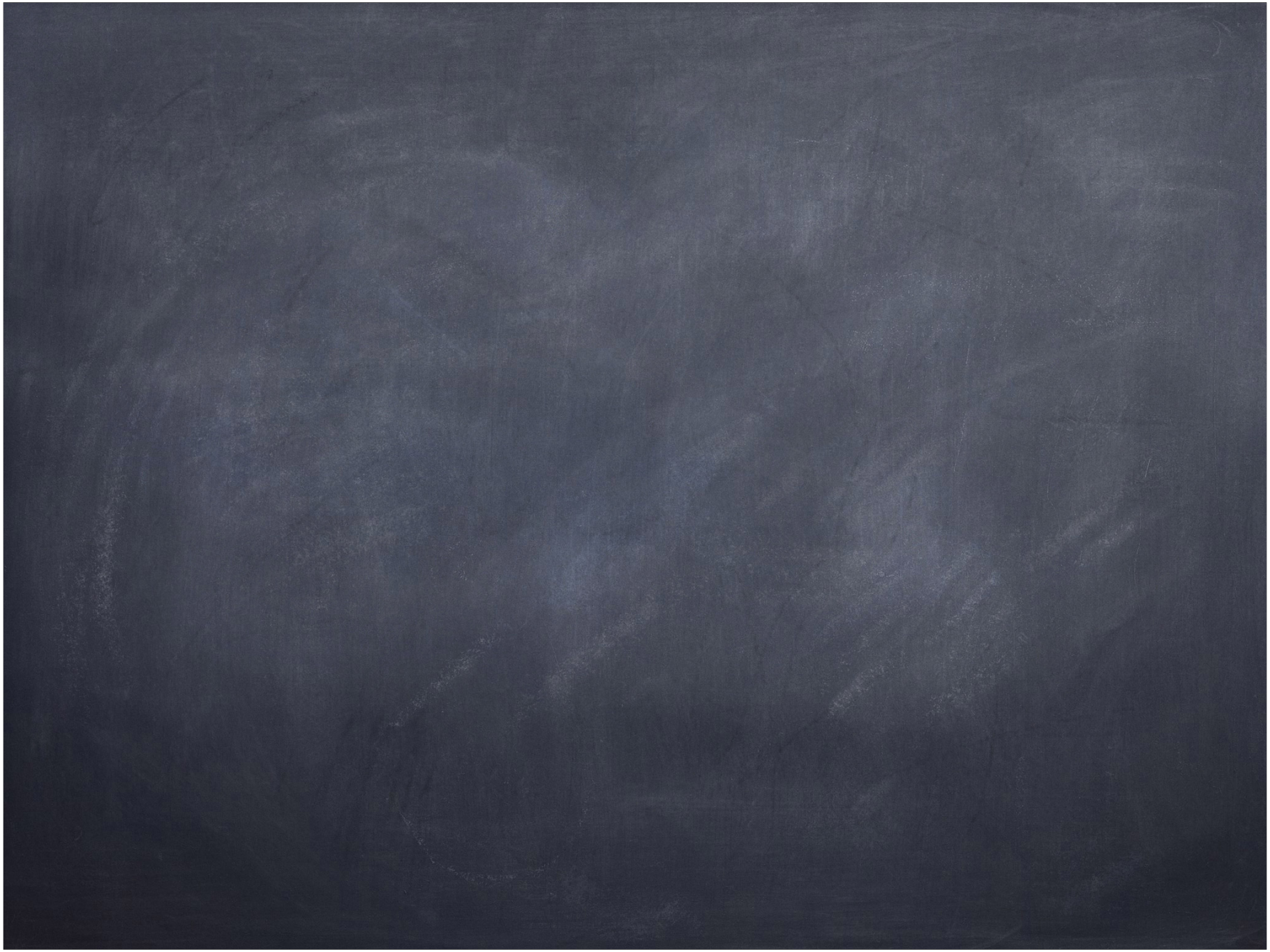


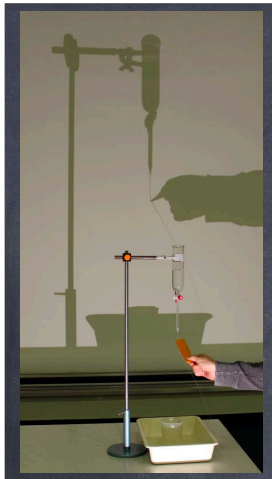

collecting
comb
metal sphere
conveyor
belt
charged
comb
voltage
Academy Artworks



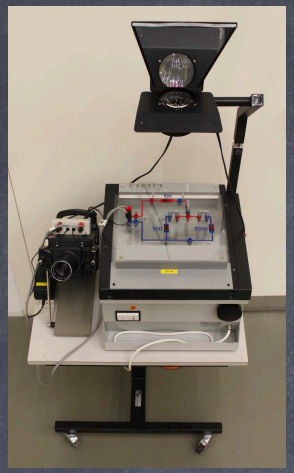




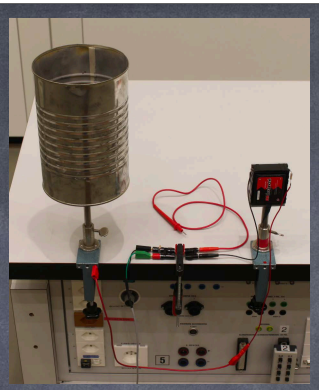




ES43



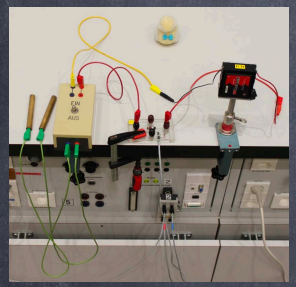
ES62



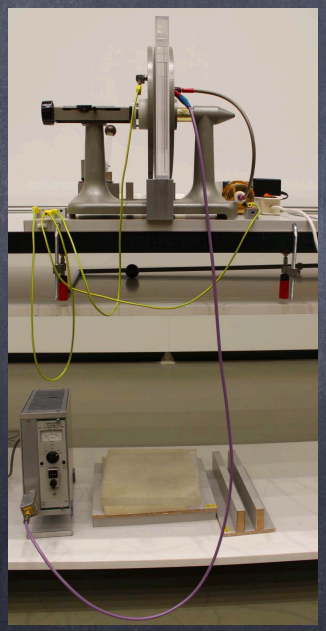
ES12

ES28

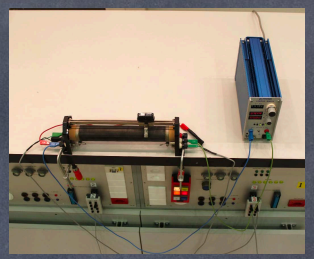
ES20



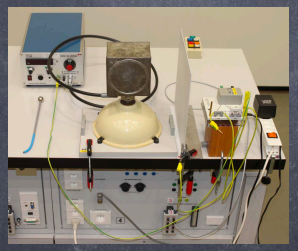
ES70



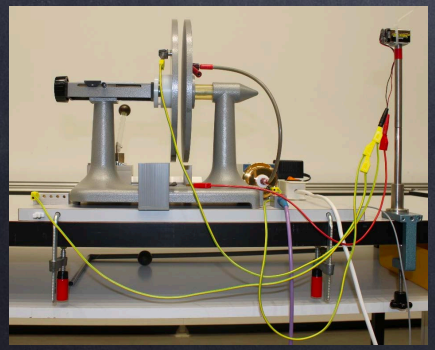
ES44



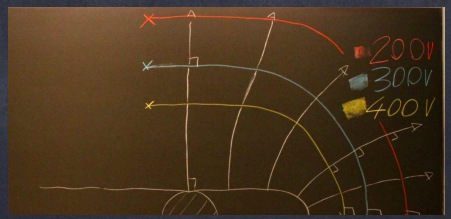
ES61



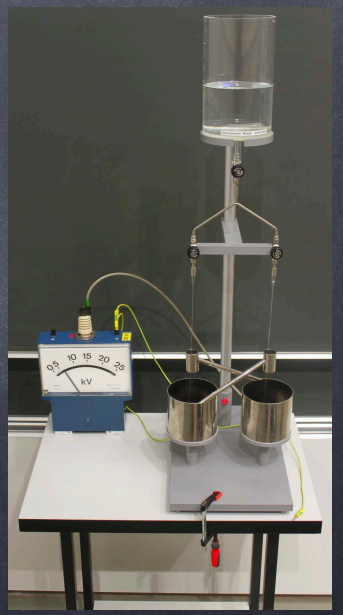
ES14



ES34



ES10



ES25