MID-SEMESTER TEST

PHYS1022 test will be on Monday 4th November at 11 am/noon

It will cover the material from the lectures up to the end of week 5 Monday lecture
(we are currently at the start of week 4!).

There will be no Tuesday lecture, problem classes or Mastering Physics due in week 5.

Please prepare one A4 sheet of revision notes (one sided) which you may bring with you. This will be handed in with your answers but will not be marked.

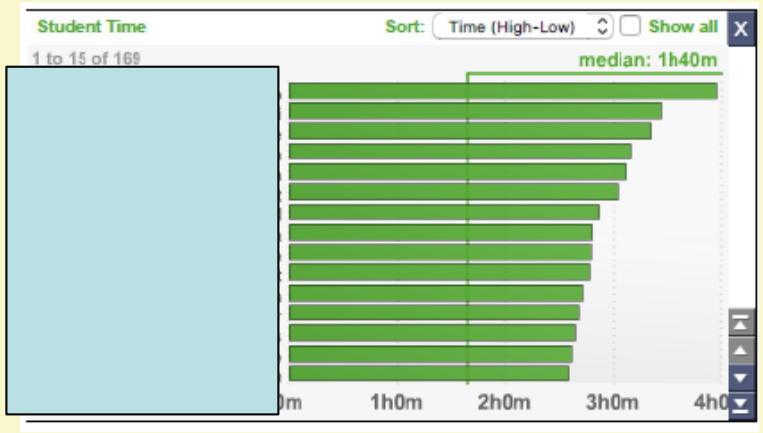
The test is worth 10% of your final mark for this course.
The main purpose of the test is to assess your progress and provide feedback.

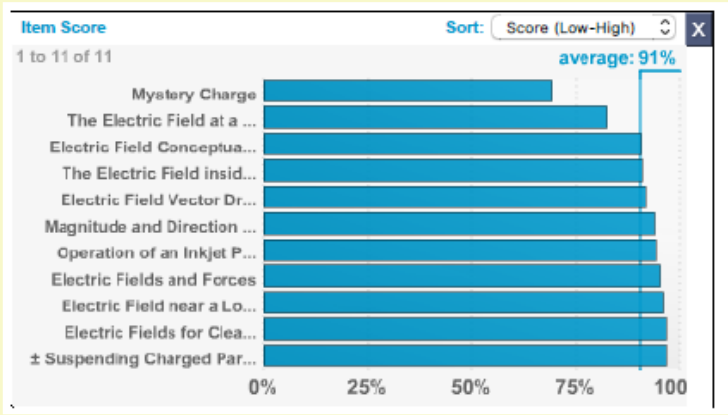
Mastering Physics Down

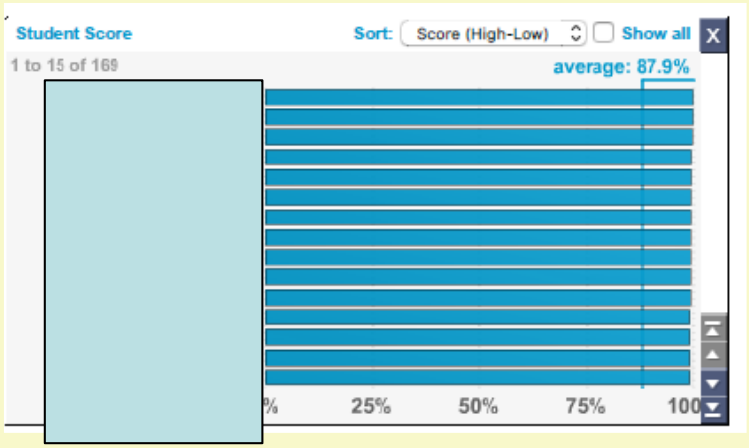
6am-2pm this Saturday

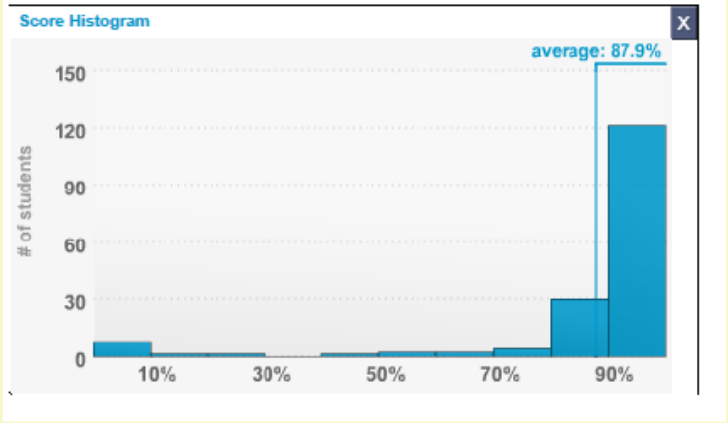
Pearsons upgrading…

MP Week 2 – Electric Fields





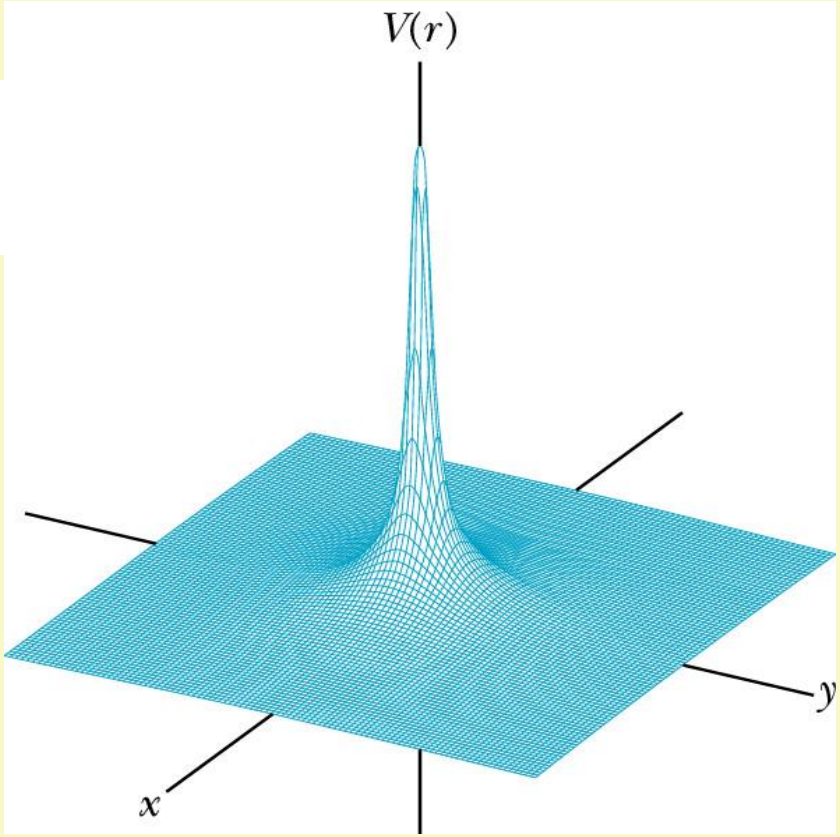




Average 85.8%('18), 86.1% ('17) 87.7% ('16), 84%('15), 85.1% ('14) , 89.5%('13) , 89.7%('12), 85.7% ('11)
Ave Time: 1hr 46min ('18), 1hr 39 min ('17), 1hr 33min ('16), 1 hr 39 min ('15) 1 hr 35 min ('14) 1hr 32min ('13)
1hr 26min ('12), 1 hr 35min ('11)

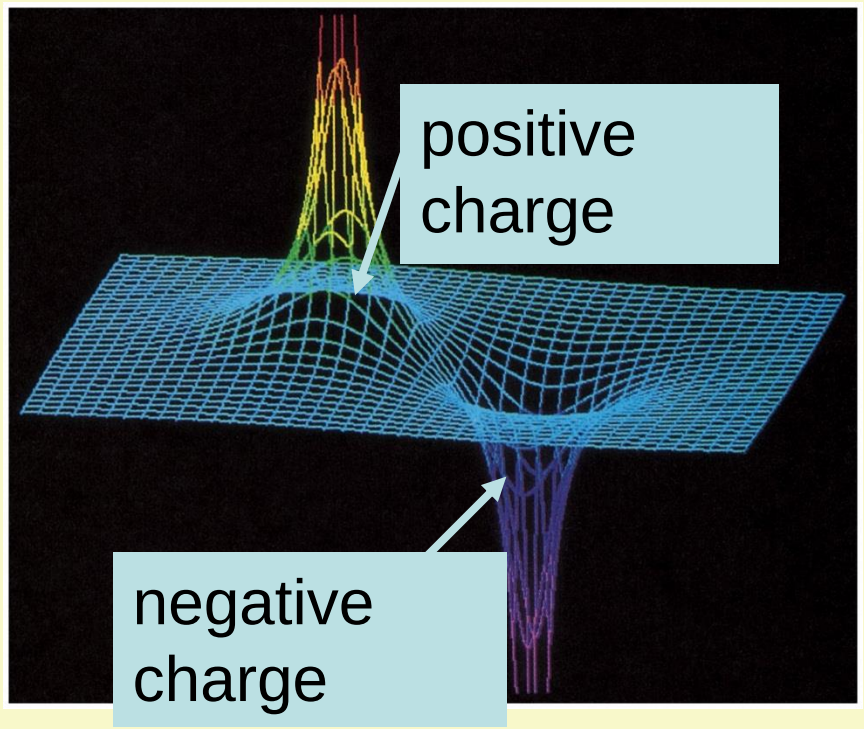
Potential (in the field) of a point charge

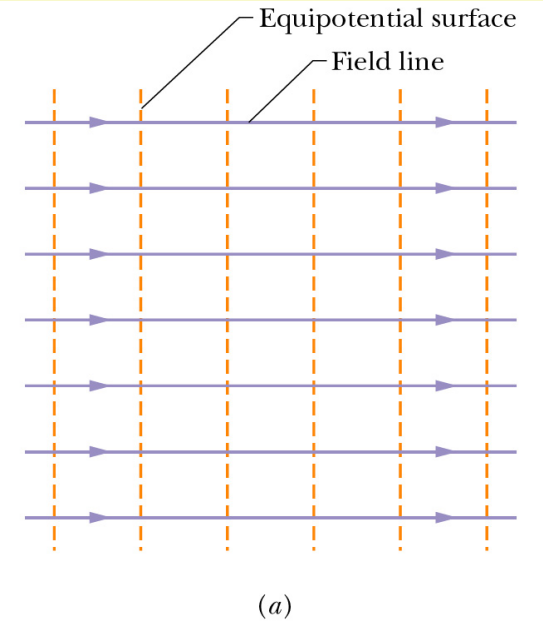
$$V = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$$



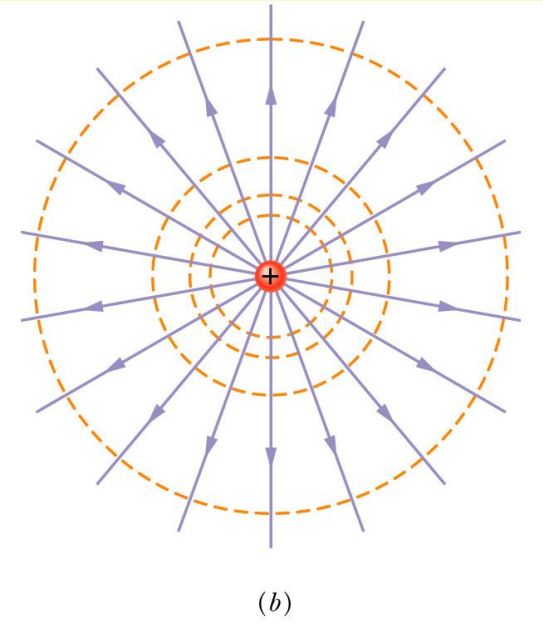
The electrostatic potential in the plane of an electric dipole.

The potential due to each point charge is proportional to the charge and inversely proportional to the distance from the charge.

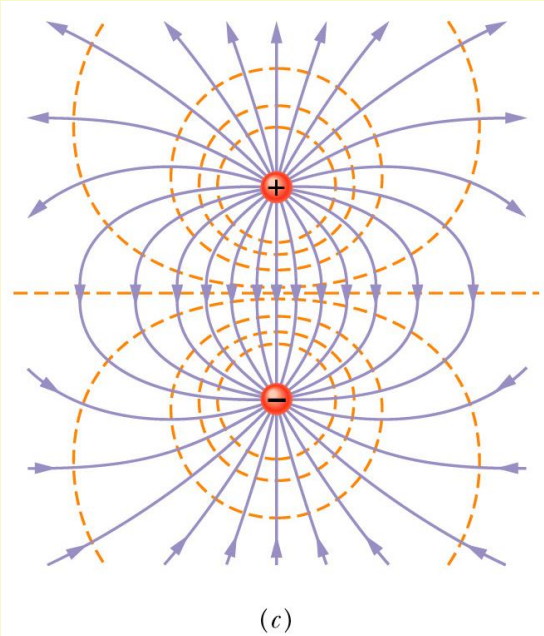




a uniform field



the field of a point charge



the field of an electric dipole

Equipotential surfaces are always perpendicular to electric field lines and thus to E, which is always tangent to these lines.

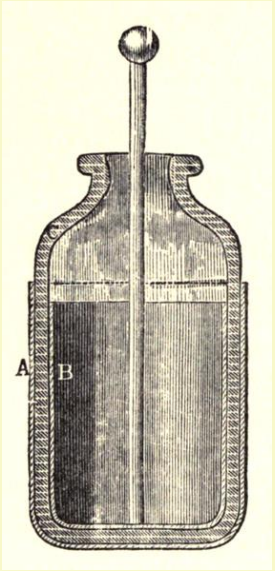
In October 1745, Ewald Georg von Kleist of Pomerania in Germany found that charge could be stored by connecting a high-voltage electrostatic generator by a wire to a volume of water in a hand-held glass jar. Von Kleist's hand and the water acted as conductors, and the jar as a dielectric (although details of the mechanism were incorrectly identified at the time). Von Kleist found, after removing the generator, that touching the wire resulted in a painful spark. In a letter describing the experiment, he said "I would not take a second shock for the kingdom of France." The following year, the Dutch physicist Pieter van Musschenbroek invented a similar capacitor, which was named the Leyden jar, after the University of Leiden where he worked.

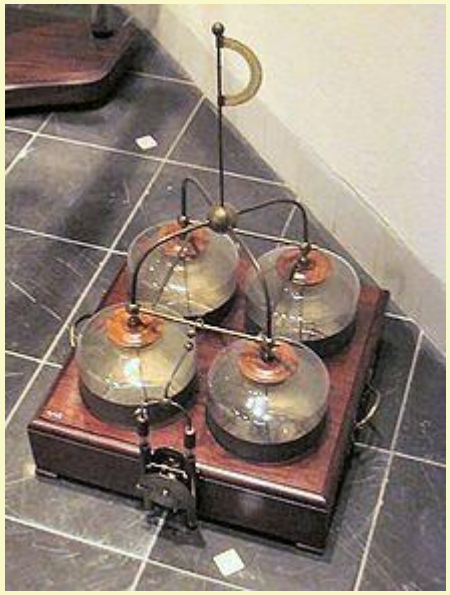
Ewald Georg (or Jürgen) von Kleist (10 June 1700 – December 11, 1748) was a German jurist, Lutheran cleric, and physicist.

Pieter van Musschenbroek (14 March 1692 – 19 September 1761) was a Dutch scientist. He was a professor in Duisburg, Utrecht, and Leiden, where he held positions in mathematics, philosophy, medicine, and astrology. He is credited with the invention of the first capacitor in 1746: the Leyden jar. He performed pioneering work on the buckling of compressed struts. Musschenbroek was also one of the first scientists (1729) to provide detailed descriptions of testing machines for tension, compression, and flexure testing.[1][2] An early example of a problem in dynamic plasticity was described in the 1739 paper (in the form of the penetration of butter by a wooden stick subjected to impact by a wooden sphere).

Leyden Jar

A typical design consists of a glass jar with conducting metal foil coating the inner and outer surfaces. The foil coatings stop short of the mouth of the jar, to prevent the charge from arcing between the foils. A rod electrode projects through the mouth of the jar, electrically connected by some means (usually a chain) to the inner foil, to allow it to be charged. The jar is charged by an electrostatic generator, or other source of electric charge, connected to the inner electrode while the outer foil is grounded. The inner and outer surfaces of the jar store equal but opposite charges.





The original form of the device was just a glass bottle partially filled with water, with a metal wire passing through a cork closing it. The role of the outer plate was provided by the hand of the experimenter. Soon it was found that it was better to coat the exterior of the jar with metal foil (Watson, 1746), leaving the (accidentally) impure water inside acting as a conductor, connected by a chain or wire to an external terminal, a sphere to avoid losses by corona discharge. It was initially believed that the charge was stored in the water. Benjamin Franklin investigated the Leyden jar, and concluded that the charge was stored in the glass, not in the water, as others had assumed. The charge leaks to the surface of the dielectric if contact is imperfect and the electric field is intense enough. Because of this, the fluid inside can be replaced with a metal foil lining. Early experimenters found that the thinner the dielectric, the closer the plates, and the greater the surface, the greater the charge that could be stored at a given voltage.

Lecture/workshop schedule:

Monday/Tuesday 21st / 22nd Oct – lectures as normal

MP3 due in this weekend (end of week 4)

Monday 28th Oct 11am – double lecture

Tuesday 29th Oct – no 11am lecture

No workshops on Wednesday - Friday next week

No MP due in week 5

Monday 4th Nov – mid-semester test

Normal workshop, lecture, MP program then resumes…