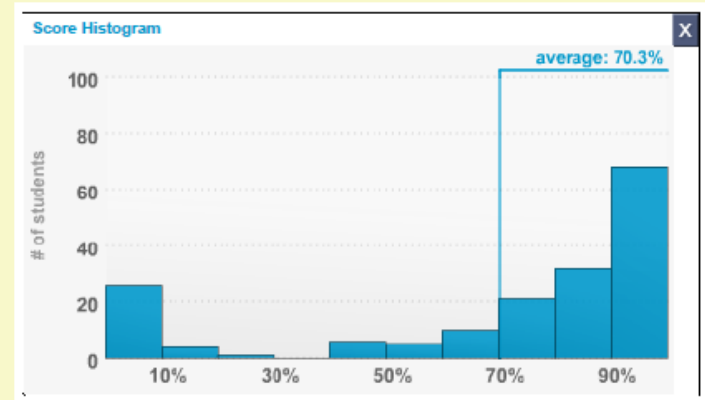
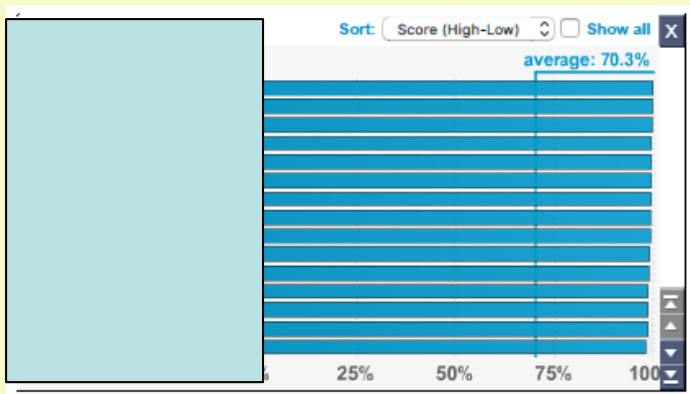
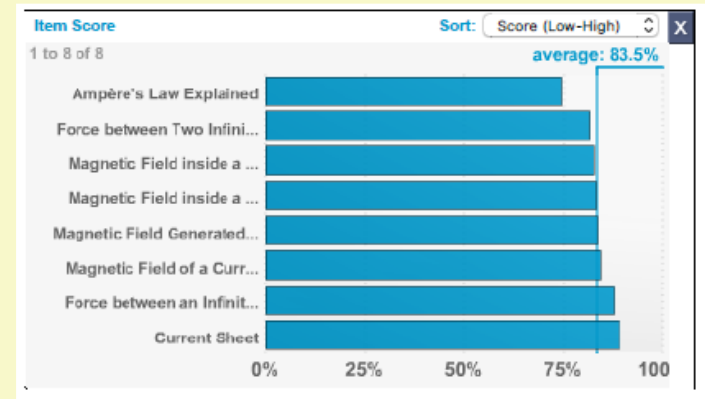
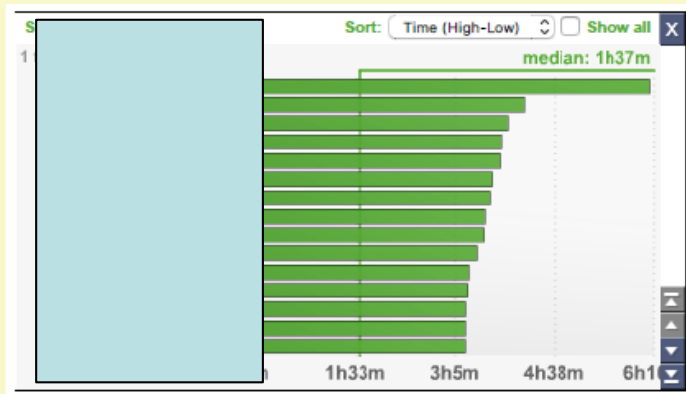


Average 78.3% ('18) 81.6% ('17) 77.4% ('16) 84.9% ('15) 82.3% ('14)
 85.6%('13) 75.5%('12) 85.1% ('11)

Ave Time: 1 hr 34 min ('18) 1 hr 32 min ('17) 1hr 30min ('16)
 1hr 30min ('15) 1 hr 23 min ('14) 1hr 28min ('13)
 1hr 25min ('12) 1 hr 39min ('11)



Note the n-2 rule: your best 7 homeworks only contribute to your course mark.



Michael Faraday, [FRS](#) (1791–1867) was an English [chemist](#) and [physicist](#). His [inventions of electromagnetic rotary devices](#) formed the foundation of electric motor technology, and it was largely due to his efforts that [electricity](#) became viable for use in technology.

As a chemist, Faraday discovered [benzene](#), investigated the [clathrate hydrate](#) of chlorine, invented an early form of the [Bunsen burner](#) and the system of [oxidation numbers](#), and popularised terminology such as [anode](#), [cathode](#), [electrode](#), and [ion](#).

Faraday received little formal education. Historians of science refer to him as the best experimentalist in the history of science.

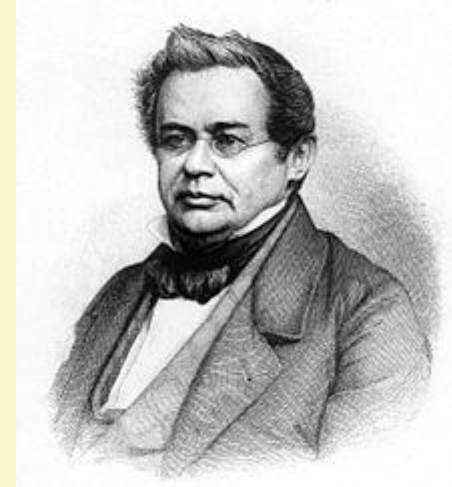
He was a member of the Sandemanian Church, a Christian sect founded in 1730 that demanded total faith and commitment. Biographers have noted that "a strong sense of the unity of God and nature pervaded Faraday's life and work."

Faraday undertook numerous, and often time-consuming, service projects for private enterprise and the British government. This work included investigations of explosions in coal mines, being an expert witness in court, and the preparation of high-quality optical glass. Faraday spent extensive amounts of time on projects such as the construction and operation of light houses.

Faraday gave a successful series of lectures on the chemistry and physics of flames at the Royal Institution, entitled [The Chemical History of a Candle](#). This was one of the earliest [Christmas lectures](#) for young people, which are still given each year. Between 1827 and 1860, Faraday gave the Christmas lectures a record nineteen times.

Heinrich Friedrich Emil Lenz (1804–1865) was a Russian [physicist](#) of [Baltic German ethnicity](#). He is most noted for formulating [Lenz's law](#) in electrodynamics in 1833.

He travelled with the navigator [Otto von Kotzebue](#) on his third expedition around the world from 1823 to 1826. On the voyage Lenz studied climatic conditions and the physical properties of [seawater](#). The results have been published in "Memoirs of the [St. Petersburg Academy of Sciences](#)" (1831).



Dinorwig Power Station

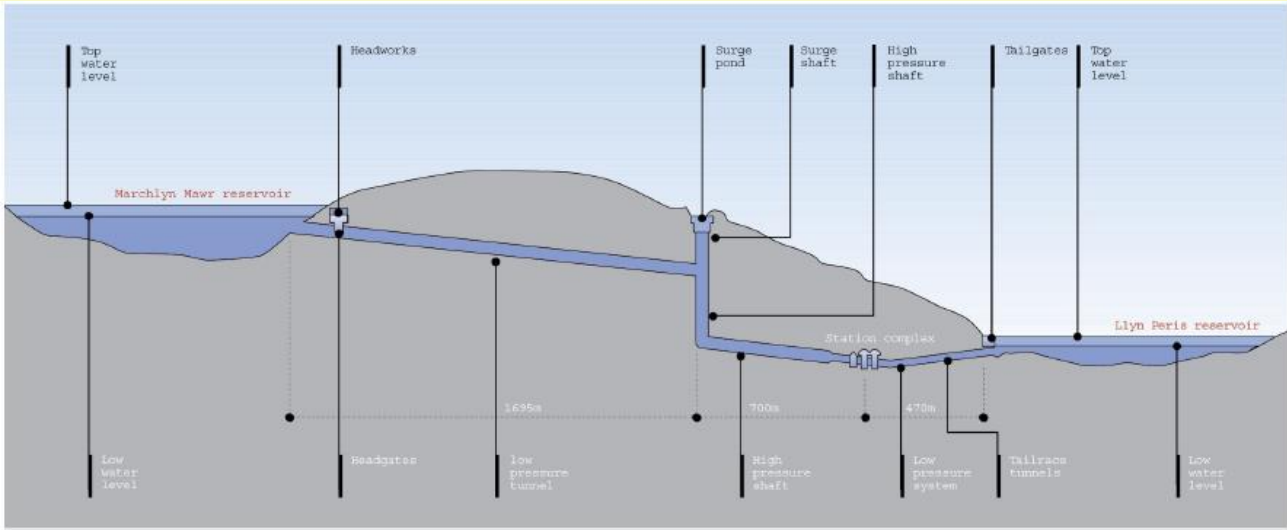
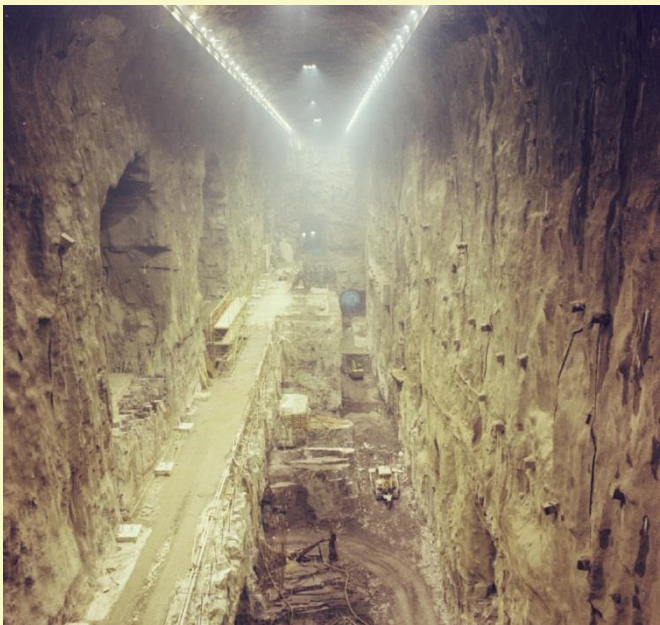


The basic idea is very simple. There is a large reservoir on top of Elidir Mountain. It is called Marchlyn Mawr. When full it holds over 7,000,000 cubic metres of water and it's 34 metres deep.

The lower lake is called Llyn Peris.



So you dig a hole in the mountain...





taps we call main inlet valves. Each valve can open in 5 seconds and allow 75.000 litres of water to pass through it every second.

turbine hall. The water passing through the valves spins the turbine (a modern day water wheel) which in turn spins the shaft which is connected to the generator. The generator then makes electricity. We have 6 of these turbines all ready to go at the drop of a switch.



- Can supply electricity to the grid in ten seconds compared to other power stations which can take up to fourteen hours to start generating.
- If we were generating electricity on all six of the units that we have, we could keep the whole of Wales in electricity for up to five hours.

- We would then run out of water so the water has to be pumped back up to the upper lake ready for the next surge in demand.
- We normally pump at night between 12am and 6am using surplus electricity from the National Grid.

From standstill, a single 450-tonne generator can synchronise and achieve full load in approximately 75 seconds. With all six units synchronised, 0MW to 1800MW load can be achieved in approximately 16 seconds.

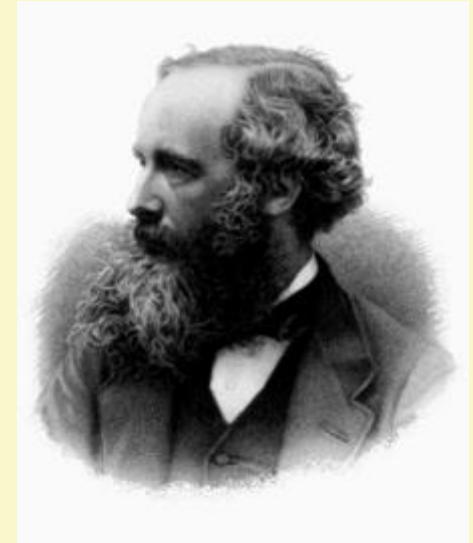
James Clerk Maxwell of [Glenlair^{\[1\]}](#) [FRS](#) [FRSE](#) (1831–1879) was a Scottish^[2] [physicist and mathematician](#). In 1865 Maxwell published *A Dynamical Theory of the Electromagnetic Field*. It was with this that he first proposed that light was in fact undulations in the same medium that is the cause of electric and magnetic phenomena.

Maxwell also helped develop the [Maxwell–Boltzmann distribution](#), which is a statistical means of describing aspects of the [kinetic theory of gases](#).

It was unknown how Saturn's rings could remain stable. Maxwell devoted two years to studying the problem, proving that a regular solid ring could not be stable, and a fluid ring would be forced by wave action to break up into blobs. Since neither was observed, Maxwell concluded that the rings must comprise numerous small particles he called "brick-bats", each independently orbiting Saturn. It was considered the final word on the issue until direct observations by the [Voyager](#) flybys of the 1980s confirmed Maxwell's prediction.

Maxwell is also known for presenting the first durable [colour photograph](#) in 1861 and for his foundational work on the [rigidity](#) of rod-and-joint frameworks like those in many bridges.

A collection of his poems was published by his friend [Lewis Campbell](#) in 1882. Many appreciations of Maxwell remark upon his remarkable intellectual qualities being matched by social awkwardness.





Joseph Henry (1797 – 1878) was an [American](#) scientist who served as the first Secretary of the [Smithsonian Institution](#). While building electromagnets, Henry discovered the [electromagnetic](#) phenomenon of self-[inductance](#). He also discovered mutual inductance independently of [Michael Faraday](#), though Faraday was the first to publish his results.

Prof. Henry was introduced to [Prof. Thaddeus Lowe](#), a balloonist from New Hampshire who had taken interest in the phenomenon of lighter-than-air gases, and exploits into meteorology, in particular, the high winds which we call the [Jet stream](#) today. It was Lowe's intent to make a transatlantic crossing by utilizing an enormous gas-inflated aerostat. Henry took a great interest in Lowe's endeavors, promoting him among some of the more prominent scientists and institutions of the day.

Henry identified the [room acoustics](#) phenomena we now call direct sound, early reflections, and reverberation.

Henry showed an interest in seeing Bell's experimental apparatus. After the demonstration, Bell mentioned his untested theory on how to transmit human speech electrically by means of a "harp apparatus". Henry said Bell had "the germ of a great invention". When Bell objected that he lacked the necessary knowledge, Henry firmly advised: "Get it!"

Teaching After Xmas Henceforth

Xmas

Week 12 – Monday 11-1 – I'll work through an old exam

Week 12 – Tuesday 11-12 - revision Q&A session