Exam Report

Module Code/Title: PHYS1022 Electricity and Magnetism

Module Leader: Prof Nick Evans

Feedback comments:

The exam came in on expected targets and has not been scaled. The vast majority of the class showed a decent understanding of the material that had been taught. I think it was a sensible test of the knowledge taught. The 9% group of students failing were quite away a drift of passing – please, please engage with lectures, problem sheets, and workshops – A level will not get you through this course!

Section A

A1 A lot of the students did not seem to realise that the constant k is equal to 1/4*pi*epsilon. A few of them divided by it instead of multiplying by it so that they obtained the wrong answer.

A2 A few students approached this problem by thinking that the total charge=the charge density/area. Some did not think to integrate over the whole disk and that by simply multiplying the area of a circle by the charge density they would obtain the correct answer. Most of them, however, did well in this question.

A3 Most students did not seem to have a problem with this question. A few tried to obtain an answer by considering a triangle on a wire but most of them chose a suitable Gaussian surface to solve this problem.

A4 This question was generally done well and hardly anyone had a problem with it.

A5 Most students struggled with this question. Only few thought about Kirchhoff's laws and even fewer managed to use it correctly.

Section B

B1 (a) There were a number of very good answers to this question (which we'd done in class) and overall I thought the class' ability to use integration was good. A minority were at sea from line one.
(b) was done well by most – you do need to explain the symmetry principles that let you guess a good Gaussian surface and then compute the area integral to get full marks.
Sorry for the skip in letters – hey, it means I took a section out at some point to make it easier!!
(c) Ex = -d phi/dx, Ey = -d phi/dy etc - lots of people roughly knew but had confused vector notation.
(d) **energy** provided by an **external agent**, to a **unit test** charge, to move **from infinity**

B2 (a) required some synthesis which many people weren't good at – Ampere's law with the Maxwell term shows I and a changing E generate B.. orbital and spin motion of electrons generate B and are aligned in magnets.

(b) to get full marks need to say E, B and v are all perpendicular – many didn't.
(c) taken from the problem sheet – energy conservation is crucial for the periodic nature of the trajectory – a lot of people either got (iii) energy conservation or (iv) mv^2/r= q (E + vxB) but relatively few both.

B3 (a) was mostly well answered – as with Gauss' law explaining assumptions about B leading to choice of Amperian loop was needed. (b) was book work and mostly well done. Some good answers for (d) and (e) which tested derivations from late in the course so tested perseverance!