Report on S7 (2007)

There were 21 Physics candidates, who scored a mean 37.4 and SD 6.42. In addition the questions were answered by 13 Phys & Phil candidates as part of the three-hour BT paper. They scored a mean 42.7 with SD 21.6, but many of them answered three, and two four questions on this part of the paper.

Q1 (Use of constraints) 1 attempt, mean 20 plus 2, 16.5, 2.12 for P&P. Unpopular but godd efforts from those that tackled it. Some problems with index control when handling products of sums.

Q2 (compound pendulum) 20 attempts, mean 22.0, SD 2.96 plus 12, 20.2, 3.86 for P&P. A very standard problem that generated many good solutions. The problem was aguably too easy although not many candidates could explain clearly why one frequency diverged as $m_1/m_2 \to 0$.

Q3 (Poisson brackets and symmetry) 11 attempts, mean 16.6, SD 5.96 plus 10, 17.6, 5.44 for P&P. This problem worked well. Pretty much everyone knew Noether's theorem and could handle Poisson brackets and find the Hamiltonian. Most lost marks through not being clear how a function generates a flow in phase space. A satisfactorily large minority were able to show how the invariant G arises from a symmetry of the potential.

Q4 (Rotating frame to Hill's equations) 10 attempts, mean 14.1, SD 3.59 plus 17, 14.9, 6.57 for P&P. The problem worked well except that only a couple of students grasped that the circular frequency Ω is a function of r and the last part of the problem involved aproximating this function by its tangent. Some weaker candidates missed the contribution to the Coriolis force that comes from the derivative w.r.t. $\mathbf{r}$. The candidates were not good at the physical interpretations of the given solutions; they found it hard to transfer back from the (X, Y) system to rotating polar coordinates, and from these to intertial coordinates.