

## Paper C1 2005

Total Number of Physics Students taking exam: 55  
Mean grade: 57.3%  
Standard Deviation: 14%

**Problem 1** Topic: Cosmology: thermal history of the Universe, derivation of cosmological Saha equation, freeze out.

Number: 22  
Mean grade: 15.4  
Standard Deviation: 3.7

Derivation of Saha's equation was done by almost all students. Estimate of recombination was completed successfully by only one student- clearly the fact that there wasn't an exact solution phased almost all students.

**Problem 2** Topic: Cosmology: evolution of density perturbations, neutrinos.

Number: 19  
Mean grade: 12.6  
Standard Deviation: 6.4

The last part of the question (to find how peculiar velocities could be used as a probe of hot dark matter) was only answered by a few of the students and of these only a small fraction were successful.

**Problem 3** Topic: High Energy Astrophysics: AGNs, high-energy background radiation.

Number: 20  
Mean grade: 14.3  
Standard Deviation: 4.1

Most students had difficulty with the first, descriptive part of the question and many were unable to get the correct value and units for the energy flux. Most of the question was probably done in class- it was clear from how almost all the students answered it that they were repeating a standard pattern.

**Problem 4** Topic: High Energy Astrophysics: first order Fermi acceleration, synchrotron spectrum. Number: 51

Mean grade: 17.3  
Standard Deviation: 3.0

Very easy question where the students got almost full marks for most of it. The last five points were more difficult and no students answered that part of the question correctly.

**Problem 5** Topic: Cosmology and Galaxies: Tully Fisher relation and Schmidt-Kennicutt law.

Number: 22  
Mean grade: 8.5  
Standard Deviation: 4.2

The first part was familiar to the students and they got mostly full marks. The other parts were based on lecture material but were apparently too difficult and the students did not score well.

**Problem 6** Topic: Advanced Stellar Structure- binary systems with black holes.

Number: 39  
Mean grade: 13.5  
Standard Deviation: 3.8

A well balanced question with the first two parts being very familiar to the students and they scored most of the marks there. The last parts seemed a bit more difficult to the students.

**Problem 7** Topic: Advanced Stellar Structure- molecular clouds and protostars.

Number: 31  
Mean grade: 11.7  
Standard Deviation: 6.7

The first part of the question was solved by most of the students by manipulating the equations long enough to find the right results. The middle part posed to be a bit more sophisticated and students got the general idea but made small errors in the derivation. The last part was easy and most of the students just got confused by not knowing which of the approximations to use.

**Problem 8** Topic: Atomic Physics and Stellar Atmospheres- planetary nebula, emission lines of OIII.

Number: 31

Mean grade: 16.3

Standard Deviation: 3.8

Overall a balanced question. Students were able to answer much of the question correctly, clearly repeating a pattern they had seen in homework problems. Most of them actually got the numerical answers quite accurately.