7th Indian National Astronomy Olympiad
May 1 to 20, 2005

Laboratory Test 1

2453505.72916 JD   Duration 2^h

Seniors

1. A picture of moon was taken on 30th April 2005 . Fig. 1. shows a negative of that picture.
   i.   Find the north-south and the east-west dimensions of the 'Grimaldi' crater.
   ii. The top right of the same figure shows something known as the 'Jewel Handle effect'. Explain what you see and estimate the height of the crater edge. State any assumptions you make.
   iii. The angle of elongation for any body is defined as the sun-earth-body angle. Find the angle of elongation of moon from the given picture. Also find the time of the nearest full moon within an accuracy of a few hours.

   The radius of moon is known to be 1738 km.

2. Fig. 2 shows a graph of the distances of five satellites of a planet 'Caenon' plotted against time (in days).

   i.   Find the mass of Caenon.

   ii. Further investigation of this planet showed that it has a very thin ring. Estimate the maximum radius of such a ring. Comment on this value with respect to the observed satellites of Caenon.

   Independent measurements have shown that the diameter of 'Caenon' is 6780 km (Claude et al ApJ 123/23).

3. Fig. 3 gives you the spectra of six stars. Comment about their temperatures. Find the two Balmer lines (H$_\alpha$ and H$_\beta$) in the spectra. What pattern do you see when you go from the hotter to cooler star. If V = 2.0 for the star BD9547, then calculate V for the other stars.
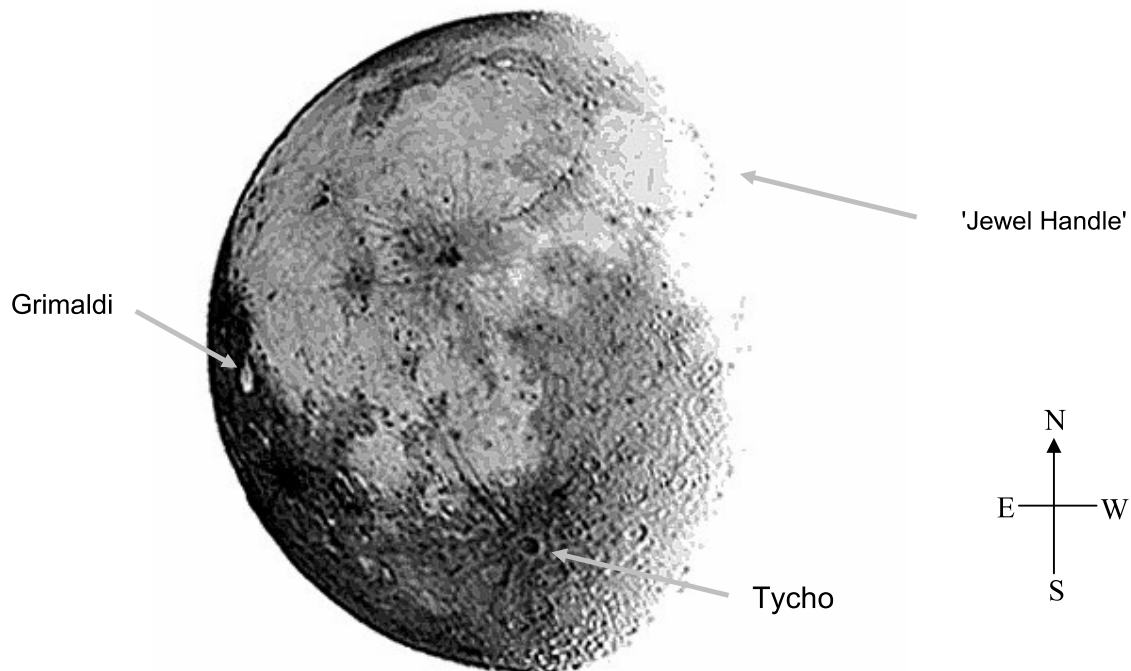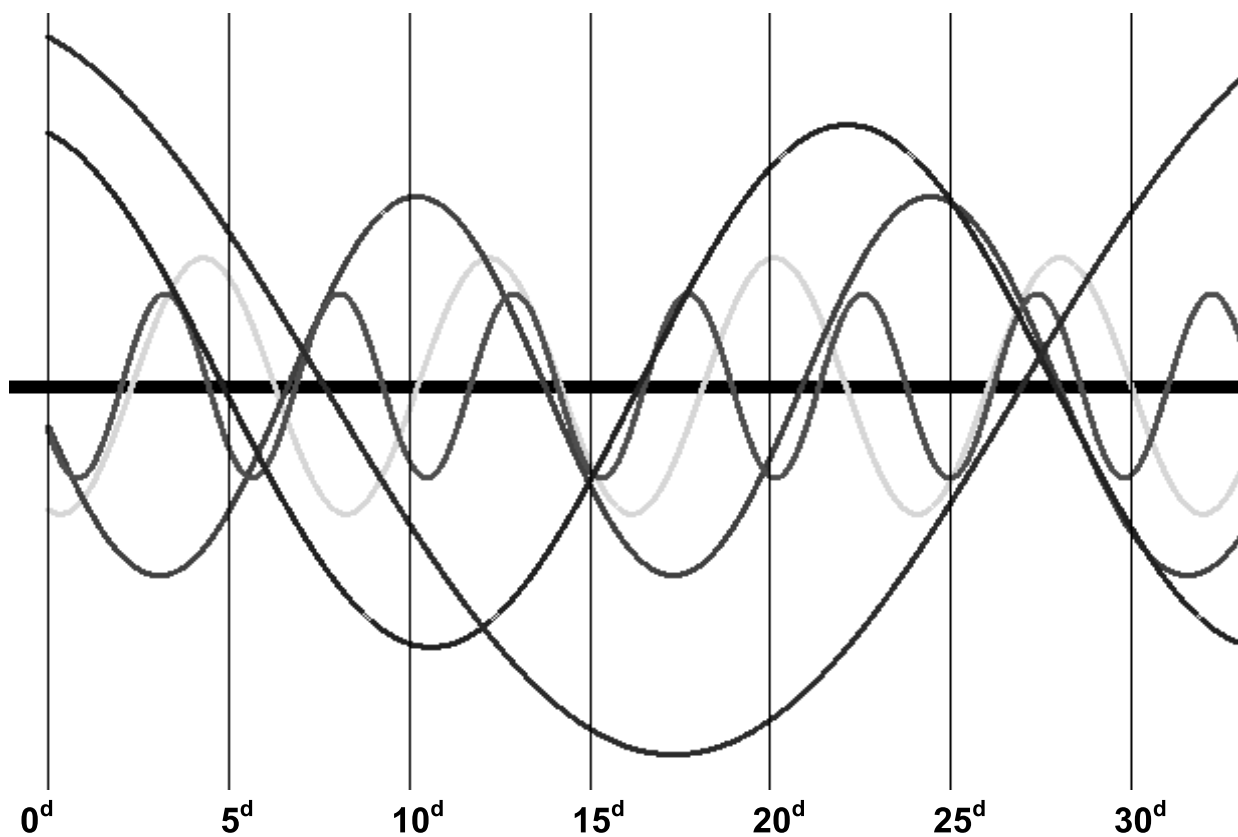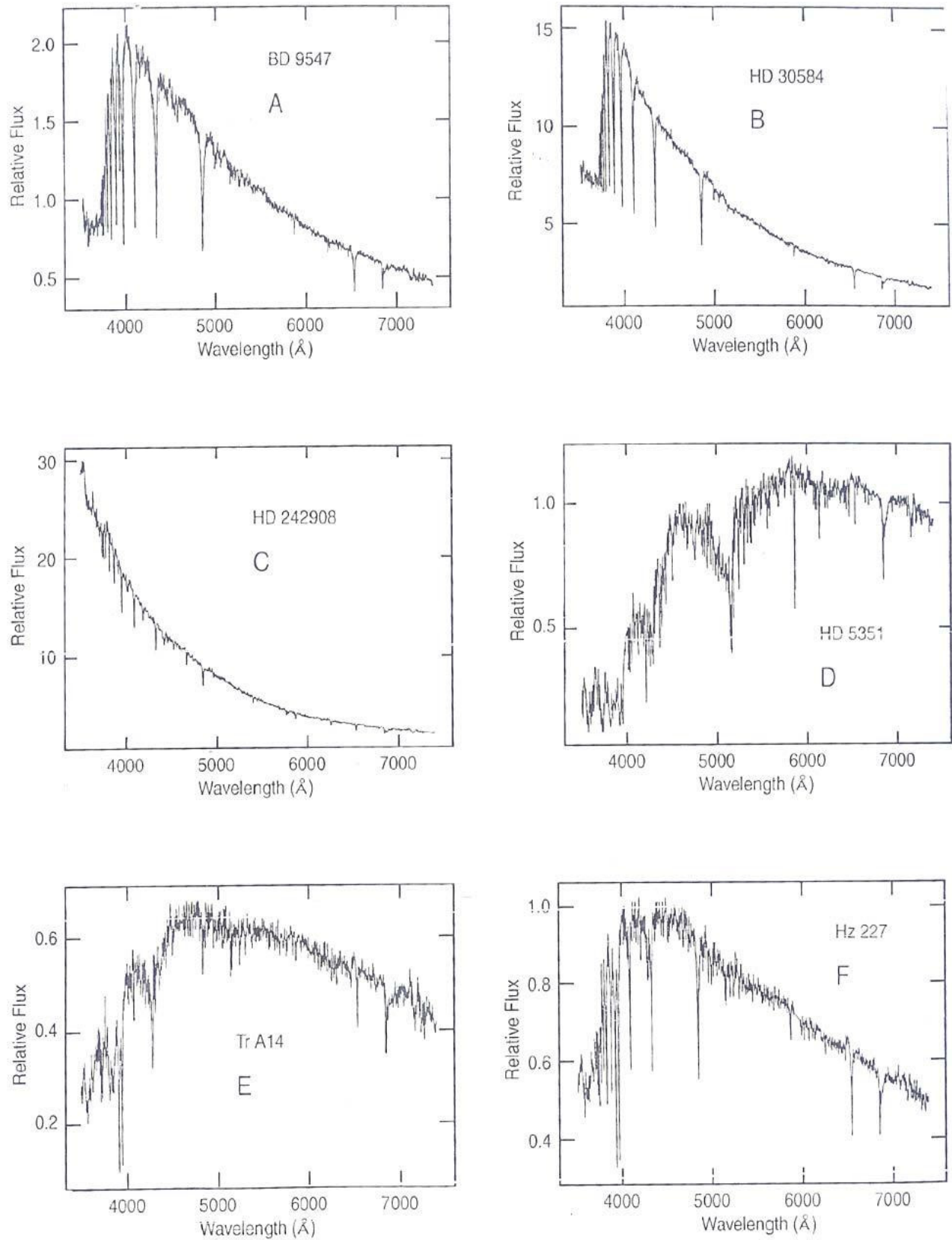
Fig. 1.

Fig. 2.

Fig. 3