



Theoretical round. Problems to solve

Reminding. Most of the problems are compiled in such a way that when writing solutions, minimal use of any language is required from the participant. So minimum texts are allowed in solutions of the problems (neither in the native language, nor in one of the official languages of the IAO). Pay more attention to formulas, drawings and graphs. It is permitted to write a few keywords in English (for example, "Yes", "No", "Assume", "Answer", "Average", "Minimum", "Maximum", "Impossible situation", etc.), as well as terms contained in the accompanying tables and names of objects.

3($\alpha\beta\gamma$). Comet Lemmon. Today, exactly during the theoretical round (at the end of the round for participants from the Eastern Hemisphere and at the beginning for the Western Hemisphere), comet C/2025 A6 (Lemmon) passes the perihelion of its orbit at a distance of $p = 0.5299$ au from the Sun. In its previous approach to the Sun, the comet was observed in the second half of the 7th century AD.

- 3.1.** Estimate the speed of the comet at the given moment.
- 3.2.** During the passage of the inner regions of the Solar System, a slight deceleration of the comet occurred, equivalent to the fact that at the perihelion point, the comet instantly lost $\delta = 0,023$ % of its velocity. In what century will the inhabitants of the Earth see the comet during its next visit to the inner regions of the Solar System?

4($\alpha\beta\gamma$). On a remote exoplanet. The table (see on a separate sheet) shows the characteristics of the Earth-like, presumably habitable exoplanet Antechea in the planetary system of the star Erythrelatis in the constellation Ursa Major. For comparison, similar characteristics of the Earth are given. Determine the spectral class (O, B, A, F, G, K, M) of the star Erythrelatis, if possible, also specify the subclass (for example, B8, A4, G2, etc.). The orbits of the planets can be considered circular. Explain which parameter from the table you use at each step of the solution (in square brackets, for example [#4]). At the end of the solution, specify which parameters the answer to the problem does not depend on (for example, "Not depend on [#1, 4, 5, 6]").

5($\alpha\beta\gamma$). Canopus and Sirius.

- 5.1.** Calculate the most favorable time for observations of Canopus in Dhaka over the next 24 hours. Bangladesh time should be used.
- 5.2.** Suppose that due to smog, Canopus will be visible in Dhaka only at the most favorable time for its observation, and at the limit of visibility to the naked eye. What magnitude will Sirius be visible at this time?