

## METHOD FOR EVENING ASTRONOMIC OBSERVATIONS

Sheroz Eraliyevich Nurmamatov

Teacher of Chirchik State Pedagogical University

sh.nurmamatov@cspi.uz

### ABSTRACT

This article describes the method of organizing astronomy laboratories and observations in general secondary schools. At the same time, we discussed how practical observations can be made in astronomy, and their types.

**Keywords:** astronomy, laboratory, observation, star, galaxy, Sun, planet, moon, satellite, telescope.

### INTRODUCTION

The organization of evening group observations, when the group is a class, is a laborious task. For a clear organization of classes in this case, the teacher should have several assistants (circle members or the most prepared high school students). If there is an astronomical circle or an elective class in a general educational institution, it is advisable to involve their members in active participation in evening group observations as teacher assistants. It is advisable to involve students of the main general educational institution in independent study of the summer starry sky, having introduced them in advance to the method of using a moving map of the starry sky and the school astronomical calendar. Task topics for them depend on the specifics of the observed objects (determining the positions of the observed planets relative to the stars, counting meteors, observing variable stars and changing their brightness, etc.).

### RESEARCH METHODOLOGY

Mandatory observations under the guidance of a teacher are carried out on a specially equipped site with accurate geographical coordinates. In the absence of a site, it is necessary to choose a place for observations far from the buildings so that the horizon line is clearly visible and the illumination from the windows of the buildings does not affect the adaptation of the observers' vision.

For school astronomical observations, high accuracy of the coordinates of the observation point is not required; it is enough to determine the coordinates of the settlement in which the educational institution is located using the geographical map of the region.

When determining the coordinates, refer to the school geography course, since the method for determining the coordinates is known to students.

The start time of observations is determined using the tables of the school astronomical calendar according to the formula:

$$T_d = T_m - \lambda + n^h + D^h \pm t\varphi + t_c,$$

where  $T_d$  – is the daylight saving time of the start of observations.

$T_m$  – is the mean solar sunset time.

$\lambda$  – observation point longitude,

$n^h$  – timezone number,

D – decree amendment (for summer time - 2 hours, and for winter - 1 hour),  
 $t\phi$  – correction depending on the geographical latitude of the observation point,  
 $t_c$  – duration of civil twilight.

Observations must end no later than 22:00 local standard time.

The study of celestial objects is recommended to be carried out at a height of at least  $20^\circ$  above the horizon, especially in urban conditions, due to the dustiness of the atmosphere. They should have a declination greater than  $-15^\circ$ . Objects with a declination of  $-15^\circ$  can be observed with confidence near the meridian, i.e., at moments close to the upper climax.

In the tasks given below, several objects of the same type of observation located in different parts of the sky are indicated. This allows the teacher to choose the object of observation, taking into account the weather conditions and the position of the Moon in the sky, since the light from the Moon affects the visibility of celestial objects even when observing through a telescope. Teacher-recommended assignments are subject to change if there is bright moonlight. Tasks also involve observations, the theoretical material on which has not yet been considered in astronomy lessons. Therefore, before starting the evening class, it is necessary to conduct a thorough consultation. The materials of these observations should be used in subsequent lessons in the study of theoretical issues.

For evening observations, students should have star charts, flashlights, hardcover notebooks, and pens. They are required to conscientiously fulfill tasks on observations of celestial objects with obligatory notes, sketches in observation notebooks and photographing. Evening observations are more convenient to carry out by dividing the class into groups.

When offering thematic observations, clearly formulate the task for students, discuss with them the procedure for performing the observation and the form of a report on the work done, indicate the literature for independent reading.

The objects of astronomical observations are accessible and exciting, the observations themselves create positive motives in learning. Meanwhile, with a reduction in the time allotted for the study of astronomy in high school, and the transfer of part of the astronomical material to the main school, the practical part inevitably suffers. The natural interest of students in astronomical objects and the explanation of astronomical phenomena, that is, in fact, in the science of astronomy, is missed. Observations can be considered as the first step towards scientific knowledge of the surrounding world.

Watching the autumn sky. Taking into account the weather conditions of the area where evening observation is carried out, it will be organized in the second half of October or early November. The duration of the course is one academic hour.

Having entered the observation site, it is necessary to orient the students in space: indicating the position of the main points, lines and planes of the celestial sphere with reference to the terrain. Prior to the observation, students are given tasks to repeat the concepts used, as well as tasks with a map of the starry sky.

## ANALYSIS AND RESULTS

Having determined the position of the zenith, the four main points of the horizon determine the spatial position of the celestial meridian and the noon line, the first vertical. It is important to recall that the celestial sphere is conditional, which contributes to orientation in space and

allows the observer to determine the position of celestial bodies located in different directions and at different distances from him.

The task for all students in the class is the same:

1. Observation of bright stars and constellations.
2. The study of differences in the apparent brightness and color of stars.
3. Study of the daily rotation of the starry sky.
4. Observation of planets (visual and instrumental).
5. Observation of the Moon through a telescope.
6. Telescope observation of double stars, nebulae, star clusters and galaxies.

Students are divided into groups according to the number of tasks that can be performed simultaneously.

### CONCLUSION/RECOMMENDATIONS

If extracurricular work in physics is well organized in a general educational institution and the teacher pays due attention to astronomical education, then he will always find the most capable students who act as assistants to the teacher and in organizing astronomical observations. Such assistants perform tasks of observing the starry sky using a moving map.

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