

Astronomy and Earth Science Competition

It is recommended to choose the most interesting tasks from the 7 proposed ones (1 or 2 tasks for the 8th grade and below, 2 or 3 tasks for 9th grade and above). You may use the list of questions for each task as a plan for your answer, or you may answer only some of the questions.

(*) Asterisks denote questions for 9th grade and above, younger students are allowed to ignore them.

Contribute reasonable amount of examples and explanations to your answer.

1. Books are about to cover So not to get bored
The truth from astronomy lover Milk needs to be poured
Books are especially dry And Milky Way is to be rediscovered!
To hide the secrets of sky (*From the advertising on milk box, tr.*)

The giant stellar system that contains our Sun is called Our Galaxy or Milky Way.

a) Why is it “Way”, and why is it “Milky”? What another names does it have?

b*) When and how was the nature of Milky Way irradiance in different wavelength ranges understood? How was its structure defined at different times? What kinds of currents (or flows) exist in the Milky Way, and what do they consist of?

2. Mishutka (Teddy Bear) from the Russian children’s programme “Good night, kids!” once said (issue Jan 19, 2011) “It would be better if the icebergs sank, because they would not impede the ships”.

a) Why don’t the icebergs sink? If they would sink in water, what would change? If one imagines putting a bit of ice on the bottom of the ocean, would it come back to the surface?

b*) What kinds of “submarine” icebergs exist on Earth? Can there be “icebergs” on other planets?

3. Handbook for soviet tourists issued in 1960s offered the following way of orientation using a wristwatch: point the hour hand to the south; divide in half the angle between the hour hand and one o’clock mark; the half angle mark show you the direction to the south.

It is amazing that a half-century ago this method gave acceptable accuracy; during the last thirty years it worked only five months a year; and during the entire last year it didn’t show the correct direction!

a) How does this method of finding one’s bearings work?

b) What was its initial precision?

c) Why doesn’t this method work now (on 2012) nearly in any place where it worked earlier?

4. In his poem “The Bronze Horseman” A.S. Pushkin described the flood that had taken place in 1824 and had been typical for St. Petersburg as follows:

Neva — more swelling and more brutal,
Like in a kettle boiled and steamed,
And then, as a wild creature seemed,
Jumped on the city...

a) Why did floods in St. Petersburg take place during the storms?

b) How do they differ from the flood that happened on July 07, 2012 in Krymsk, Krasnodar region?

c*) What is the difference between the dike dams in Saint Petersburg, London, Venice, Louisiana, Zeland and Japan? What is the maximum possible height of the floods?

5. The last transit of Venus across the solar disk in the 21st century was observed on June 06, 2012.

a) What Venus transits were observed in the course of history, and what scientific problems did they allow to solve?

b*) Why are Venus transits observed only in certain months of the year with long breaks in between, and how can such a periodicity be explained?

c*) For what kind of other celestial objects are such transits also observed?

6. Is it possible to observe the brightest star of the Northern Hemisphere and the brightest star of the Southern Hemisphere at the same time? If it is possible, where is it possible?

7. What kinds of telescopes do you know? What telescopic systems are used now and to what purpose? What systems do you believe are going to be developed in future? Can you list any inventors and constructors of telescopic systems?