

Captain's contest for the Science Fight 4

Captains are invited to the stage. Chairpersons give out the sheets with five questions and read them aloud. Five minutes are given to write answers down. The winner is determined by the maximum number of correct answers. In case of a tie, an extra Problem 6 is offered. The sheets with answers and names of Captains are then submitted to the Scoring Commission for archiving, and the results are recorded in SF protocols of each Group.

1. Rank the following materials in order of increasing density: uranium (U), water (H₂O), mercury (Hg), iron (Fe).

Answer: H₂O – Fe – Hg – U

2. What is the principal feature that is present in eukaryotic cells (e.g. plants, animals, or insects) and absent in prokaryotic (e.g. bacteria and archaea)?

Answer: Nucleus / membrane-bound organelles

3. What is the chemical formula or formal scientific name for common cooking salt?

Answer: NaCl or sodium chloride

4. What are three types of regular polygons that each can tile a plane with no spaces? Give either names or pictures.

Answer: Triangles, squares and hexagons

5. It is known that planets in the Solar System do not move in ideal circular orbits, but rather in ellipses. Which planet of the Solar System has the highest eccentricity of orbit, i.e. has the most non-circular orbit?

Answer: Mercury at $e \sim 0.21$. The nearest competitor is Mars at $e \sim 0.093$

To break the tie between two or more captains in case of equal results, an extra Problem 6 is offered and the captain with the closest result in Problem 6 is declared winner.

6. Isaac Newton left his scientific legacy in classical mechanics, calculus, optics and many other areas. What is the exact date Isaac Newton was born on?

Answer: 25 December 1642

Captain's contest for the Semi-Finals

Captains are invited to the stage. Chairpersons give out the sheets with five questions and read them aloud. Five minutes are given to write answers down. The winner is determined by the maximum number of correct answers. In case of a tie, an extra Problem 6 is offered. The sheets with answers and names of Captains are then submitted to the Scoring Commission for archiving, and the results are recorded in SF protocols of each Group.

1. In 1905, Albert Einstein published the first paper on Theory of Special Relativity. In 1915, he published an extension of that theory, named General Relativity. What is the new phenomenon of nature that General Relativity describes, but Special Relativity does not?

Answer: Gravity. Other answers, such as gravitational lensing or Mercury orbit precession also count

2. A molecule is called organic if it has at least one covalent bond between two specific chemical elements that form the basis of chemistry of living things. What are those two elements?

Answer: Carbon and hydrogen. All organic compounds have at least one C-H bond. Either carbon or hydrogen alone is not enough

3. Our galaxy, the Milky Way, appears as a bright strip on the sky when viewed from the surface of the Earth. What shape does our galaxy appear to have for an outside observer?

Answer: Spiral



4. How many cells does an unfertilized chicken egg contain?

Answer: One

5. You have two beakers. One has a mixture of salt water with ice, the other a mixture of pure water with ice. What beaker is colder?

Answer: Salt water beaker is colder because salt reduces the melting point

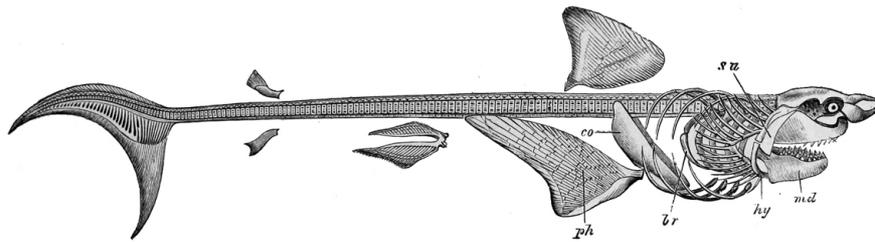
To break the tie between two or more captains in case of equal results, an extra Problem 6 is offered and the captain with the closest result in Problem 6 is declared winner.

6. Captains are asked to determine the duration of a time interval without using any equipment. Using a stopwatch, chairperson claps hands two times to mark beginning and end of a 32 seconds interval.

Captain's contest for the Finals

Captains are invited to the stage. Chairpersons give out the sheets with five questions and read them aloud. Five minutes are given to write answers down. The winner is determined by the maximum number of correct answers. In case of a tie, an extra Problem 6 is offered. The sheets with answers and names of Captains are then submitted to the Scoring Commission for archiving, and the results are recorded in SF protocol.

1. For most of vertebrate animals the skeleton is made of bones. However, there are a few common species of fish whose skeleton is completely made of cartilage (connective tissue). Give an example of such a fish.



Answer: Any of these: shark, skate, ray, sawfish, chimaeras

2. In which direction do bananas grow on a palm tree with respect to the ground?

Answer: upwards



3. What is the largest two-digit prime number?

Answer: 97

4. What percentage of a big (by volume) iceberg is visible above water?

Answer: 10%, density of pure ice is about 920 kg/m^3 , and that of seawater about 1025 kg/m^3

5. Name the first human invention moving faster than sound.

Answer: whip

To break the tie between two or more captains in case of equal results, an extra Problem 6 is offered and the captain with the closest result in Problem 6 is declared winner.

6. The IYNT considers the famous natural philosopher Leonadro da Vinci as one of inspirations. What is the exact date and year of Leonardo's birth?

Answer: 15 April 1452