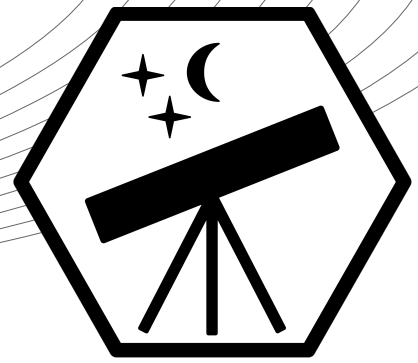


International Astronomy and Astrophysics Competition Qualification Round 2020



Problem A : The Solar System (5 Points)

- | | | | |
|-------------------|------------|-----------------------|-------------------------|
| (1) hydrogen | (2) helium | (3) astronomical unit | (4) carbon dioxide |
| (5) asteroid belt | (6) 79 | (7) Io | (8) ≈ 165 years |

Problem B : Cosmic Scales (5 Points)

- (a) ≈ 110 cm
(b) $\approx 31,580$ km

Problem C : Distance to the Moon (5 Points)

$$\frac{s_M}{d_M} = \frac{s_R}{d_R} \implies s_M = d_M \cdot \frac{s_M}{d_M} \approx 382,000 \text{ km}$$

Problem D : Energy of Satellites (5 Points)

- (a) $E_{kin}(h) = \frac{1}{2}m_S v^2 = \frac{1}{2} \frac{Gm_S m_E}{R_E + h}$
(b) $V = E_{kin}(h) / \rho \approx 29.4$ Litre

Problem E : Nuclear Fusion (5 Points)

two protons fuse \rightarrow transformation of one proton into a neutron: deuterium \rightarrow deuterium collides with another proton \rightarrow release of gamma rays \rightarrow the gamma rays travels to the surface of the Sun \rightarrow sunlight