Practical Test (Astronomy)

Read the following contents (2 pages) in 5 minutes.

In 20XX, you will be an astronaut investigating astronomical object X in the solar system. In the planetarium, the following three situations (A～C) will be reproduced (the time shown in the planetarium is Earth time):

A. The diurnal motion of the Sun and stars on the equator of Object X（2 rotations）.

B. The culmination (highest position) of the Sun 100 km north of that equator（repeat 2 times）.

C. The diurnal motion of stars 30 days (Earth time) after B（repeat 2 times）.

Answer the questions on the next page **after** viewing the projection in the planetarium. If needed, you may use the following physical constant:

・Solar constant on the earth: 1.4×10^{3} Wm^{-2}

Caution 1：Do not talk with each other in the planetarium. The running time is 12 minutes.
Caution 2：You may bring a question sheet, memo pad, and a small light inside the planetarium. If needed, you may take notes inside a planetarium.
Caution 3：A great circle on the celestial sphere passing through zenith represents the celestial meridian and ticks are displayed every 10 degrees.
Caution 4：Do not begin answering the questions until an invigilator signals that you may do so.
Caution 5：The examination time is 20 minutes after the projection.
Caution 6：You can use a calculator, if needed.

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Questions

Q1) Estimate the rotation period of object X in Earth time.

a) 6 hours b) 9 hours c) 12 hours d) 21 hours e) 24 hours f) 30 hours

Q2) Roughly estimate the radius of object X. You can assume that the shape of object X is spherical.

a) 1100 km b) 570 km c) 480 km d) 380 km e) 290 km f) 200 km

Q3) Estimate the revolution period of object X. The eccentricity of the object can be assumed as zero.

a) 3 months b) 1 year c) 3 years d) 5 years e) 30 years f) 150 years

Q4) Estimate the distance of object X from the sun in astronomical units.

a) 0.4 au b) 0.9 au c) 1 au d) 3 au e) 5 au f) 30 au

Q5) Estimate the solar irradiation on the Object X.

a) 1.4×10^{2} Wm^{-2} b) 4.5×10^{2} Wm^{-2} c) 6.9×10^{2} Wm^{-2} d) 1.4×10^{3} Wm^{-2}

e) 2.7×10^{3} Wm^{-2} f) 1.4×10^{4} Wm^{-2}