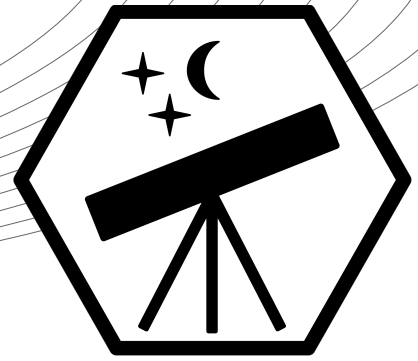


International Astronomy and Astrophysics Competition

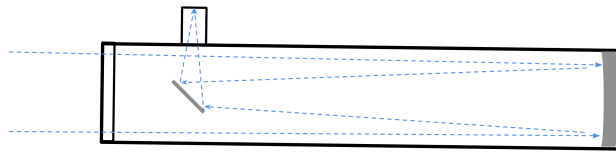
Final Round



Final Round Exam 2025

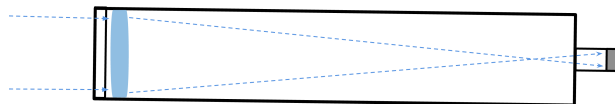
The final round exam was given in the form of an online exam.
Each participant was given a subset of 20 questions in random order.
This paper version is only available for training purposes.

Question 1 : What type of optical telescope is shown in the image?



- (A) Newtonian Refractor (B) Cassegrain Refractor
(C) Newtonian Reflector (D) Cassegrain Reflector
-

Question 2 : What type of optical telescope is shown in the image?



- (A) Refractor (B) Reflector (C) Newtonian (D) Cassegrain
-

Question 3 : Approximately how large is the diameter of the Sun?

- (A) 1,400 km (B) 1,400,000 km
(C) 1,400,000,000 km (D) 1,400,000,000,000 km
-

Question 4 : What is the distance between the Sun and the closest star?

- (A) 4.25 light-years (B) 14.25 light-years
(C) 140.25 light-years (D) 1400.25 light-years
-

Question 5 : If the Sun had a diameter of a football (22 cm), what would be Earth's diameter on this scale?

- (A) 0.002 cm (B) 0.02 cm (C) 0.2 cm (D) 2.0 cm
-

Question 6 : One astronomical unit (AU) is equivalent to approximately ...

- (A) $1.5 \cdot 10^8$ km (B) $1.5 \cdot 10^9$ km
(C) $1.5 \cdot 10^{10}$ km (D) $1.5 \cdot 10^{11}$ km
-

Question 7 : What is the average density of the planet Earth?

- (A) 5500 g/cm³ (B) 5500 g/m³
(C) 5500 kg/cm³ (D) 5500 kg/m³
-

Question 8 : The gravitational acceleration experienced by an object of mass m at the surface of a planet with mass M and radius R equals ...

- (A) $G \cdot mM/R$ (B) $G \cdot mM/R^2$
(C) $G \cdot M/R$ (D) $G \cdot M/R^2$
-

Question 9 : The Hubble parameter $H(t)$ is connected to the cosmological scale factor $a(t)$ by ...

- (A) $H(t) = \dot{a}(t)/a(t)$ (B) $H(t) = a(t)/\dot{a}(t)$
(C) $H(t) = \dot{a}(t)/a^2(t)$ (D) $H(t) = a(t)/\dot{a}^2(t)$
-

Question 10 : The unit of the Hubble constant H_0 is usually given as ...

- (A) (km/Mpc)/s (B) km/(Mpc/s) (C) km/(s/Mpc) (D) (km/s)/Mpc
-

Question 11 : The current age of the universe is ...

- (A) 12.7 billion years (B) 13.7 billion years
(C) 14.7 billion years (D) 15.7 billion years
-

Question 12 : What are the two main components of comets?

- (A) Nickel and iron (B) Hydrogen and helium gas
(C) Rock and dust (D) Ice and dust
-

Question 13 : What are the two tails of a comet mainly made of?

- (A) Rock fragments and liquid water (B) Helium gas and metal vapour
(C) Ice blocks and magnetic fields (D) Dust particles and ionised gas
-

Question 14 : If the distance to a star doubles, the gravitational force it exerts becomes ...

- (A) twice as strong (B) four times as strong
(C) half as strong (D) one quarter as strong
-

Question 15 : **Cepheid variables** are primarily important because they allow astronomers to measure ...

- (A) chemical composition (B) mass
(C) distances (D) luminosity
-

Question 16 : If a Cepheid has a period of 30 days, compared to a 6-day Cepheid, it will be ...

- (A) brighter (B) fainter
(C) same brightness (D) redder
-

Question 17 : The **distance modulus** relates which two quantities?

- (A) Luminosity and temperature (B) Period and brightness
(C) Mass and radius (D) Apparent and absolute magnitude
-

Question 18 : A star has an absolute magnitude of -2.0 and is located 1000 pc away. What is its apparent magnitude?

- (A) 3.0 (B) 5.0 (C) 8.0 (D) 10.0
-

Question 19 : A star has an apparent magnitude of 10.0 and is located 100 pc away. What is its absolute magnitude?

- (A) 0.0 (B) 3.0 (C) 5.0 (D) 8.0
-

Question 20 : The question of why the night sky is dark despite the vast number of stars is known as ...

- (A) Fermi's paradox
 - (B) Olbers' paradox
 - (C) Twin paradox
 - (D) Zeno's paradox
-

Question 21 : Why is the night sky dark, even though the universe contains billions of stars?

- (A) Stars are too small to see
 - (B) Light from distant stars is redshifted
 - (C) Galaxies block each other's light
 - (D) The Sun absorbs distant starlight
-

Question 22 : In cosmology, the critical density determines ...

- (A) the brightness of stars
 - (B) the speed of light
 - (C) the amount of dark energy
 - (D) the geometry of the universe
-

Question 23 : If the density of the universe is smaller than the **critical density**, the universe is ...

- (A) closed
 - (B) flat
 - (C) open
 - (D) static
-

Question 24 : The Milky Way-Andromeda collision probability is mainly influenced by which smaller galaxies?

- (A) M33 and the LMC
 - (B) SMC and Sagittarius Dwarf
 - (C) Fornax and Sculptor
 - (D) M87 and M81
-

Question 25 : Which galaxy tends to increase the probability of a Milky Way-Andromeda collision?

- (A) LMC
 - (B) M33
 - (C) SMC
 - (D) M31
-

Question 26 : Gravitational softening in simulations is introduced to ...

- (A) speed up computation
 - (B) avoid unphysical close encounters
 - (C) increase gravity between particles
 - (D) mimic dark energy
-

Question 27 : The galaxy M31 is also called ...

- (A) Andromeda Galaxy (B) Triangulum Galaxy
(C) Large Magellanic Cloud (D) Small Magellanic Cloud
-

Question 28 : Which two galaxies are the dominant members of the Local Group?

- (A) Milky Way and M31 (B) Milky Way and M33
(C) Andromeda and LMC (D) Milky Way and SMC
-

Question 29 : What is the currently expected timescale for a possible Milky Way-Andromeda merger?

- (A) 0.5-0.7 Gyr (B) 1-2 Gyr (C) 4-8 Gyr (D) 10-15 Gyr
-

Question 30 : The **perihelion distance** is defined as ...

- (A) Closest point of orbit to the Sun (B) Average distance of orbit
(C) Point where orbit crosses ecliptic (D) Farthest point from Sun
-

Question 31 : The discovery of the object **Ammonite** (2023 KQ 14) was significant because it fills the ...

- (A) Kuiper belt resonance gap (B) Perihelion gap
(C) Asteroid belt gap near Jupiter (D) Oort cloud gap
-

Question 32 : The newly discovered Sedna-like object 'Ammonite' has a perihelion of ...

- (A) 40 au (B) 55 au (C) 66 au (D) 100 au
-

Question 33 : Which hypothetical body is often proposed to explain Sedna-like orbits?

- (A) Jupiter's core remnant (B) A nearby pulsar
(C) A captured rogue comet (D) A new planet
-

