Unit 1: Introduction to Astronomy

Name: _____ Class / No: _____ Date: _____

Learning outcomes

- AST.1.1 — Astronomy and scientific thinking
- AST.1.2 — Why did astronomy begin?
- AST.1.3 — The people who shaped astronomy
- AST.1.4 — Astronomy and the other sciences
- AST.1.5 — Observation and theory
- AST.1.6 — Telescopes

Questions

1. (AST.1.1) What is the most important contribution of Newton’s Principia (1687) to scientific thinking?

   ○ A) Proposing for the first time that the Sun is at the centre
   ○ B) Showing that the same law of gravity holds in the sky and on Earth
   ○ C) Inventing the telescope
   ○ D) Compiling a star catalogue

2. (AST.1.1) If the shadow angle in Eratosthenes’ measurement had been 6° instead of 7.2°, how would the circumference change for the same distance?

3. (AST.1.2) If high water was at 10:00 today, at about what time will it be tomorrow?

   ○ A) 10:00
   ○ B) 10:50
   ○ C) 09:10
   ○ D) 22:00

4. (AST.1.3) Why is the period–luminosity relation that Henrietta Leavitt found for Cepheid variables important?

5. (AST.1.3) Which of the following pairings is wrong?

   ○ A) Ulugh Beg – Samarkand star catalogue
   ○ B) Taqi al-Din – Istanbul Observatory
   ○ C) al-Biruni – measuring the Earth’s radius
   ○ D) Payne – the three laws of planetary motion

6. (AST.1.4) The discovery of helium is an example of the link between which two sciences?

   ○ A) Astronomy and biology
   ○ B) Astronomy and chemistry
   ○ C) Geology and biology
   ○ D) Mathematics and biology

7. (AST.1.5) What do you conclude when you compare the discovery of Neptune with the search for “Vulcan”?

8. (AST.1.6) How many times more light does a 200 mm telescope collect than a 100 mm one, and how does its resolving power change?

9. (AST.1.6) Why are X-ray telescopes sent into space?
   - ○ A) Because it is colder in space
   - ○ B) Because the atmosphere absorbs X-rays
   - ○ C) Because X-rays can only be seen at night
   - ○ D) Because magnification is higher in space

Score: ____ / 9

Practical tasks

1. AST.1.1: Read the following records in the Science Library and, for each, write the chain “observation → model → test” in one sentence. (SpaceTRC records: Eratosthenes, MUL.APIN, Copernicus, Principia)
2. AST.1.2: Write in a table which sky event the early societies in these records followed, and why; draw one generalisation from your table. (SpaceTRC records: Stonehenge, MUL.APIN, Dresden Codex)
3. AST.1.3: Choose at least six scientists from the records below and build a timeline with the columns “question – method – impact”. (SpaceTRC records: Hipparchus, Ibn al-Haytham, al-Biruni, Ulugh Beg, Ali Qushji, Taqi al-Din, Kepler, Leavitt, Payne)
4. AST.1.4: Choose a star in the Star Atlas. For each item in its panel (distance, colour index, magnitude), write which science’s method produced it. (SpaceTRC records: Star Atlas, Payne)
5. AST.1.5: Read the records below. Compare the Neptune and Mercury cases in a “prediction – observation – result” table. (SpaceTRC records: Newton, Principia, Einstein)
6. AST.1.6: In the records below, find the wavelengths at which Hubble and Webb observe. Explain why both are in space. (SpaceTRC records: Hubble launch, Webb’s first images, Galileo, Huygens)

Answer key — Unit 1: Introduction to Astronomy

1. B. Copernicus proposed the Sun-centred model; Newton’s contribution is a single universal law of gravity.
2. Circumference = (360 / 6) × 5,000 = 300,000 stadia, i.e. 20% larger. The smaller the angle, the larger the calculated circumference.
3. B. Tides follow the Moon, which rises about 50 minutes later each day, so high water is also about 50 minutes later.
4. Measuring a Cepheid’s period gives its true brightness, and comparing that with its apparent brightness gives its distance. Hubble used this method to show that Andromeda lies outside the Milky Way.
5. D. The three laws of planetary motion are Kepler’s; Payne determined what stars are made of.
6. B. Helium was first found in the Sun’s spectrum (1868) and obtained chemically on Earth in 1895.
7. The same method (proposing an unseen body) was confirmed for Neptune and refuted for Vulcan. Mercury’s anomaly was explained by a new theory (general relativity). A theory gains value only when it is tested by observation.
8. It collects (200/100)² = 4 times more light; the resolution angle halves (from about 1.38″ to 0.69″), so finer detail can be seen.
9. B. The atmosphere absorbs X-rays, gamma rays and most ultraviolet light before they reach the ground.

Teacher note

Lesson flow (40-minute class hour): 5 min prediction question, 15 min explanation and worked example, 15 min activity on the site, 5 min two questions. For AST.1.3, giving each student one scientist and building a shared class timeline works well.

Common misconceptions: (1) People in the Middle Ages thought the Earth was flat; in fact a spherical Earth had been the common view since antiquity, and Eratosthenes measured its circumference. (2) A telescope’s main job is to magnify; in fact its two most important properties are light-gathering power and resolving power. (3) A theory is an “unproven guess”; in science a theory is a system of explanation that has been tested against observation many times.