Questions

Q1.

An astronomer observing from Rome sees the star Aldebaran setting. The local sidereal time (LST) is 10:42 and the star's hour angle (HA) is 06h 06min.

Rome has a latitude of 42°N and a longitude of 12°30'E.

(i) Calculate the local sidereal time (LST) in Oxford when Aldebaran transits the observer's meridian.

(2)

local sidereal = ... : ....

(ii) Calculate the hour angle (HA) of the First Point of Aries at this time.

(2)

hour angle = ... h .... min

(Total for question = 4 marks)

Q2.

Two astronomers, Alice and Bob, decide to observe some objects in the sky. Alice observes from London (latitude = 52°N) and Bob observes from a city in Brazil (latitude = 16°S). They decide to observe the following objects:

- the Pole Star
- the Sun at midday on June 21st
- the star Sirius, with a declination of −16°
- the stars in Orion's Belt, with a declination of 0°.

The table below summarises the results of their observations.

Complete the table by writing **one** of the following letters in each box:

C – Circumpolar

N – Not visible

R – Rises and sets without passing through the zenith

Z – Rises and sets and passes through the zenith.

(Two boxes have been filled in for you.)

(3)

	Viewed from **London** (Latitude: 52°N)	Viewed from **Brazil** (Latitude: 16°S)
Pole Star	C	....
Sun at midday on June 21st	....	....
Sirius (Declination:–16°)	....	....
Orion's Belt (Declination: 0°)	R	....

(Total for question = 3 marks)

Q3.

An astronomer on board a ship took measurements of the Sun to measure the ship's latitude.

These measurements are shown in Figure 6 below.

Time (h : min)	Altitude of Sun (°)
11:00	32
11:15	35
11:30	38
11:45	40
12:00	42
12:15	41
12:30	39
12:45	36

Figure 6

The astronomer also looked up the declination of the Sun, which was 8°.

The astronomer used these measurements to make the following conclusion.

The Sun is at 42° when it is at its highest point.

This means that latitude = 42° - 8°

So, the **ship's latitude = 34°**

Evaluate the accuracy of the astronomer's value for his ship's latitude, based on the observational procedures he has used.

(6)

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Q4.

An astronomer made observations of the night sky from Edinburgh at midnight GMT in July.

Edinburgh has a latitude of 55°57′ N and a longitude of 3°15′ W.

Figure 9 shows data for three stars the astronomer observed.

At the time of the observation, Vega was due south on the observer's meridian.

Star	Right ascension	Declination
Arcturus	14 h 10 min	+19° 10′
Polaris	2 h 32 min	+89° 16′
Vega	18 h 30 min	+38° 45′

Figure 9

(i) Determine the altitude and azimuth of the star Polaris at the time of this observation.

Give your answers to the nearest degree.

(2)

Altitude

....

Azimuth

....

(ii) Determine the altitude of Vega at the time of this observation.

(2)

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....

(iii) Determine the sidereal time at Greenwich at the time of this observation.

(3)

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(Total for question = 7 marks)

Q5.

(i) When observing from a latitude of 50°N on the Earth, the Pole Star will appear to have an altitude of:

(1)

☒ **A**   0°

☒ **B**   40°

☒ **C**   50°

☒ **D**   90°

(ii) When observing from a latitude of 50°N on the Earth, the Celestial Equator will have a maximum altitude of:

(1)

☒ **A**   0°

☒ **B**   40°

☒ **C**   50°

☒ **D**   90°

(Total for question = 2 marks)

Q6.

An astronomer made observations of the night sky from Edinburgh at midnight GMT in July.

Edinburgh has a latitude of 55°57′ N and a longitude of 3°15′ W.

Figure 9 shows data for three stars the astronomer observed.

At the time of the observation, Vega was due south on the observer's meridian.

Star	Right ascension	Declination
Arcturus	14 h 10 min	+19° 10′
Polaris	2 h 32 min	+89° 16′
Vega	18 h 30 min	+38° 45′

Figure 9

Vega is a star in the constellation Lyra.

Figure 10 shows an astronomer's observations of Lyra from Edinburgh at midnight GMT in July.

Draw on Figure 10 the position of Lyra if observed at midnight from Edinburgh, six months later.
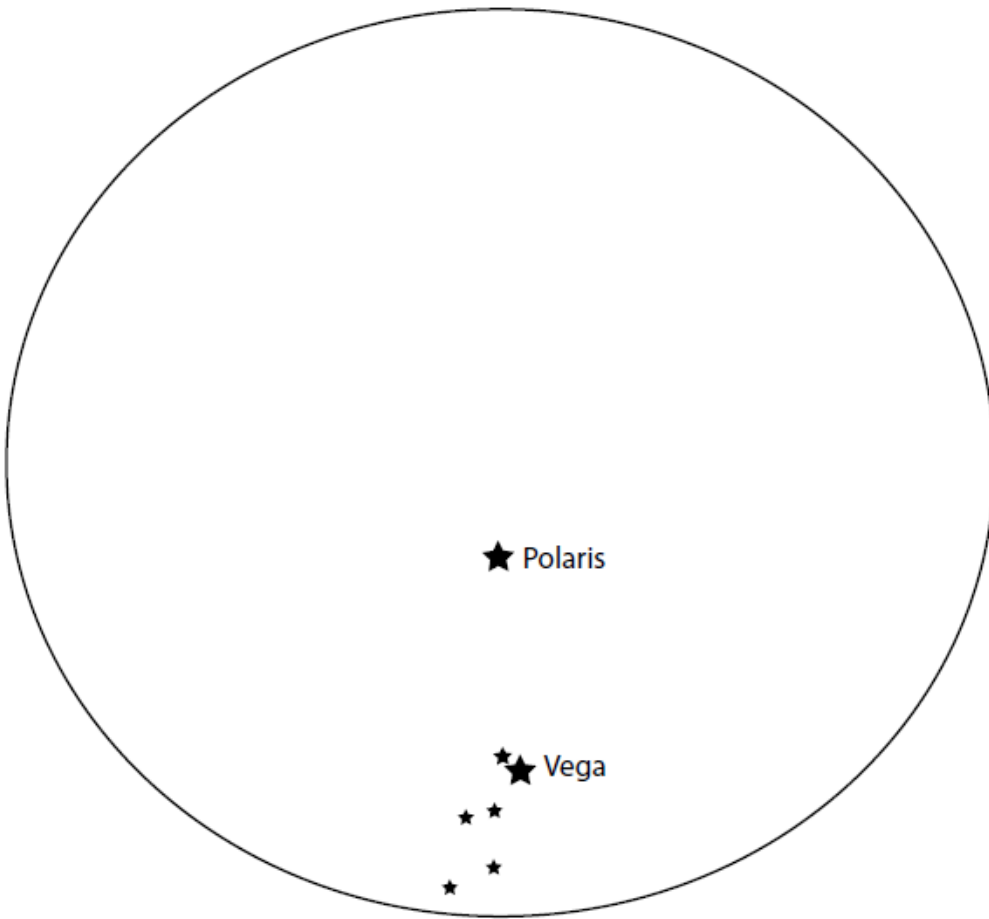
(2)

Figure 10

(Total for question = 2 marks)

Q7.

An astronomer observing from Rome sees the star Aldebaran setting. The local sidereal time (LST) is 10:42 and the star's hour angle (HA) is 06h 06min.

Rome has a latitude of 42°N and a longitude of 12°30'E.

The astronomer waits until Aldebaran is due south and measures its angle above the horizon as 64° 30'.

Show that Aldebaran has a declination (Dec) of 16° 30'.

Use the observational data given above.

Include a carefully labelled diagram in your answer.

(2)

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....

(Total for question = 2 marks)

Q8.

An astronomer observing from Rome sees the star Aldebaran setting. The local sidereal time (LST) is 10:42 and the star's hour angle (HA) is 06h 06min.

Rome has a latitude of 42°N and a longitude of 12°30'E.

Show that Aldebaran has a right ascension (RA) of 04h 36min.

Use the observational data given above.

Include a carefully labelled diagram in your answer.

(3)

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(Total for question = 3 marks)