Observational Competition

Please read these instructions carefully:

1. All participants will receive a question set, a writing board, a pen, a ruler and a headlight by the organizers.
2. This competition consists of two parts:
   a) Two questions on “Naked Eye observation”. You have 12 minutes to answer these two questions.
   b) One question on “Using a telescope”. Each part of this question has a specific time, which is mentioned in your question sheet.
3. All participants will be guided by assistants to the observing site until returning to the waiting hall. Assistants will collect the answer and problem sheets.
4. **Do not forget** to fill out the boxes at the top of each answer sheet with your country name and your student code.
5. You have 2 minutes to familiarize yourself with observing ground and darkness of your environment, just before starting the exam time in observing ground.
6. Examiner’s alarm will indicate the beginning and the end of each part of your exam.
7. Each problem has a specific guideline which helps you during the exam.

Naked Eye Observations

You Have 12 minutes to answer the questions of the Naked Eye Observations (Question 1 and Question 2)

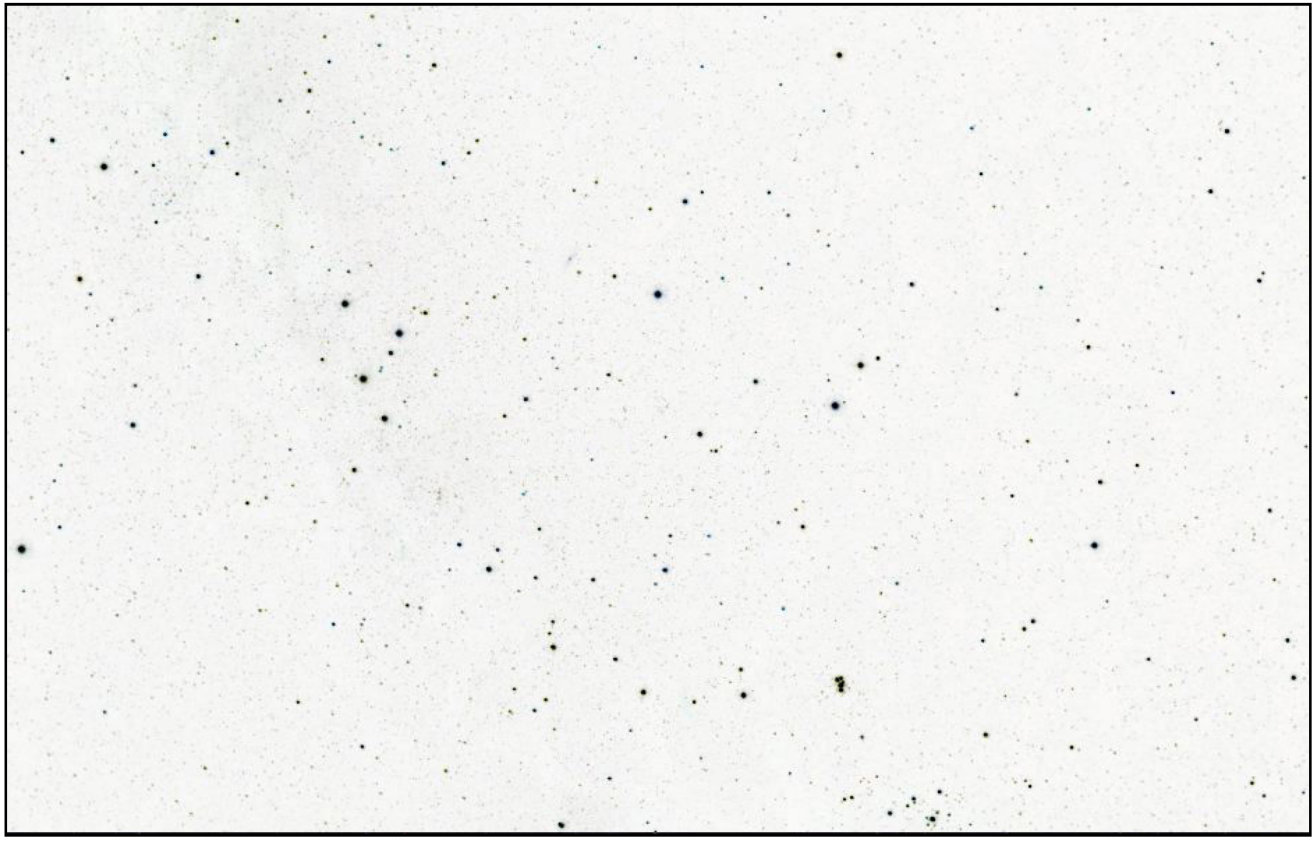
Question 1: (40 Points)

1.1: Figure 1 (frame size $\cong 100^{\circ} \times 70^{\circ}$) shows a part of the sky, for 22 October 2009 at 21:00 local time. Four bright stars in Perseus and Andromeda constellations are missing in this chart. Find these missing stars by looking at the sky. Then, draw a cross on the location of each missing bright star in these two constellations on the chart (i.e. figure 1). Use numbers in table 1 to indicate these crosses**.**

Table 1

Number	Common Name	Bayer Names
1	Mirfak	Alpha Persei
2	Alpheratz	Alpha Andromeda
3	-	Epsilon Persei
4	Menkib	Xi Persei
5	-	Gamma Persei
6	Algol	Beta Persei
7	Almach	Gamma Andromeda
8	-	Delta Andromeda
9	-	51 Andromeda
10	Mirach	Beta Andromeda
11	Atik	Zeta Persei

Question 1 - Figure 1



Question 2:

2.1: Figure 2 shows a part of the sky which contains **Cepheus constellation**, for 22 October 2009 at 22:00 local time. Five bright stars in Cepheus constellation are identified by numbers (1, 2, … , 5) and common names. Estimate the angular distances (in units of degrees) between two pairs of stars shown in table 2 and complete this table with your answers. **(40 Points)**

Table 2

Angular Distance	
Pairs of stars	**Angular Distance (degrees)**
1 (Errai) and 2 (Alfirk)	
1 (Errai) and 3 (Alderamin)	

2.2: Use table 3 and figure 2, then estimate the “apparent visual magnitude” of stars 2 (Alfirak) and 3 (Alderamin) and complete table 4. **(40 Points)**

Table 3

Star Name	**Apparent Visual Magnitude**
Polaris	1.95
Altais	3.05
Segin	3.34
All of these stars, are marked in the figure 2	

Table 4

Magnitude Estimation		
Star Number	**Star Name**	**Apparent Visual Magnitude**
2	Alfirk	
3	Alderamin	

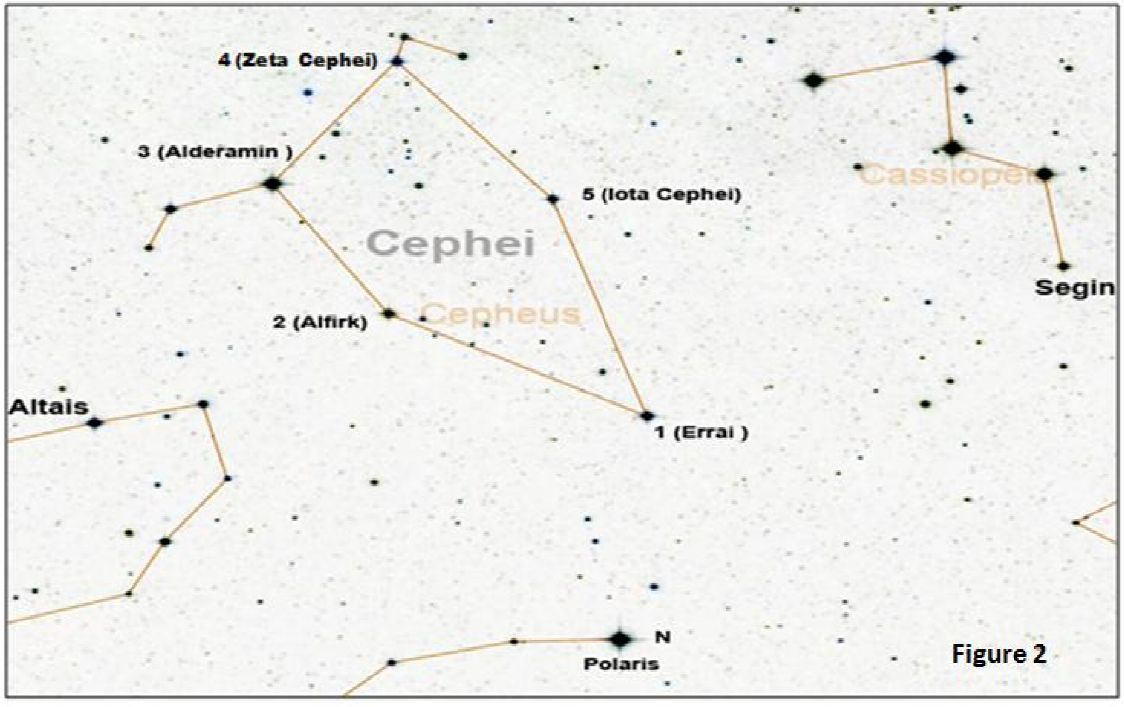


Figure 2

Telescopic Observations

Note: You have only 13 Minutes to answer all parts of this Question

Question 3

Before starting this part, please note:

The telescope is pointed by the examiner towards Caph (α Cas). Please note the readings on the grade circles before moving the telescope (to be used in 3.2).

3.1: Choose one of the 4 recommended stars listed below; write down the name of the selected star in table 5 and point the telescope to that star. Then, notify the examiner to check it. **(6 minutes; 40 Points)**

1- Deneb (Alpha Cygni)
2- Alfirk (Beta Cephei)
3- Algol (Beta Persei)
4- Capella (Alpha Aurigae)

Table 5

Name of selected star

3.2**:** The Telescope is pointed to Caph in Cassiopeia constellation (RA: 0h:9.7m ; Dec: 59°:12'). Using the clock beside the telescope write down the local time (with the format of HH:MM:SS) in the appropriate field in table 6. Then, by using the graded circle on the telescope mount, estimate "declination" and "hour angle" of the target measured from South, which you chose in part one of this question. Then, complete Table 6. **(7 minutes; 40 Points)**

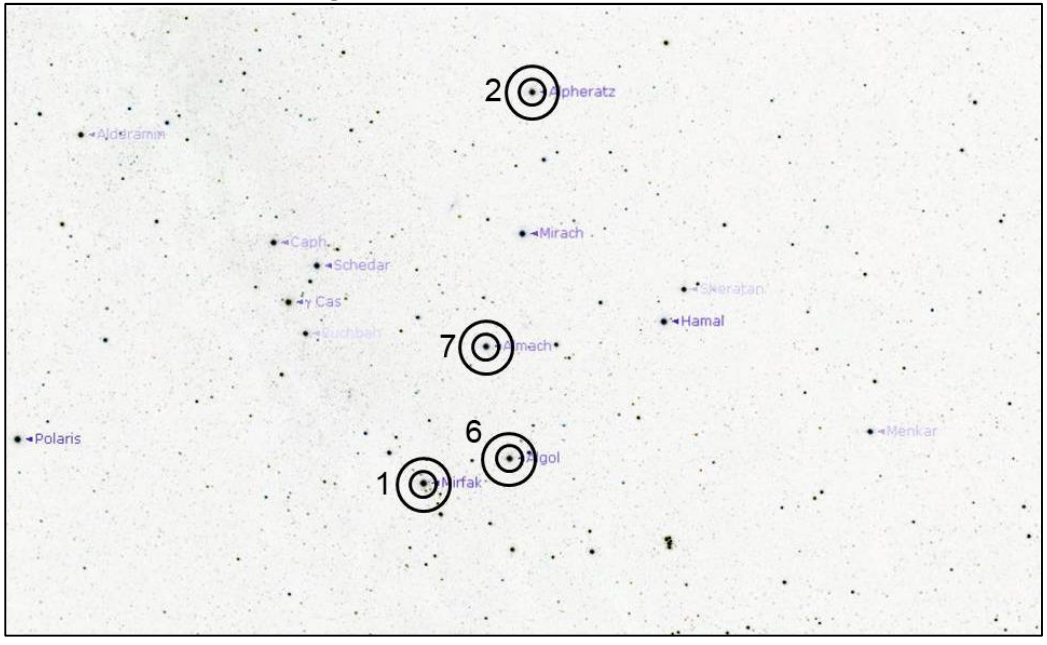
Table 6

Name and Coordinates of the Selected Star			Local Time :
Name of Selected Star	Hour Angle (hh:mm)	Declination (°:')	

Solutions and Marking Scheme

Solution 1:

Figure 2 – Solution of Problem 1



Marking Scheme:

Part 1: Location of each bright star:

A) Small Circle + Correct Number: +10 points.
B) Large Circle+ Correct Number: +5 Points.
C) Small Circle without Identifier Number : +5 Points
D) Large Circle without Identifier Number: 0 Point.
E) Small or Large Circle+ Incorrect Identifier Number: 0 Point.

Solution 2:

Part 1:

Table 2

Angular Distance	
Stars Name	**Angular Distance (Degree)**
1 (Errai) and 2 (Alfirk)	$11^{\circ}:09^{'}:10^{''} \sim 11^{\circ}$
1 (Errai) and 3 (Alderamin)	$18^{\circ}:36^{'}:50^{''} \sim 19^{\circ}$

Marking Scheme:

Part 1: $\Delta =$ Error in estimation of angular distance.

$\Delta \leq 2^{\circ}$: 20 points
$2^{\circ} < \Delta \leq 4^{\circ}$: 10 Points
$\Delta > 4^{\circ}$: 0 Point

Part 2:

Table 4

Magnitude Estimation		
Number	**Star Name**	**Visible Magnitude**
2	Alfirk	3.2
3	Alderamin	2.4

For Each Star:

$\Delta m \leq 0.2$: 20 points
$0.2 < \Delta m \leq 0.5$: 15 Points
$0.5 < \Delta m \leq 0.8$: 10 Points
$0.8 < \Delta m \leq 1.0$: 5 Points
$1.0 < \Delta m \leq 1.2$: 2 Points
$\Delta m > 1.2$: 0 Point

Solution 3:

Coordinate of Selected Star				**Local Time :**
Star	**Hour Angle**	**R.A.**	**Dec.**	
Deneb (Alpha Cygni)	ST-RA	20h 41m	+45°	
Alfirk (Beta Cephei)	ST-RA	21h 28m	+71°	**Sidereal Time :**
Algol (Beta Persei)	RA-ST	03h 08m	+41°	
Capella (Alpha Aurigae)	RA-ST	05h 18m	+46°	

Marking Scheme:

Part 1: Point the Telescope to the coordinates of the selected stars.
If the examiner confirms the star in the 32 mm eyepiece: 40 Points
If the examiner confirms the star in the finder scope: 20 Points
If the examiner doesn't see the star in Finder : No Point

Part2: Estimate Hour Angle and Declination. (Δ= Error)

HA:
- $\Delta \leq 30\ min$: 20 points
- $30\ min < \Delta \leq 45\ min$: 15 Points
- $45\ min < \Delta \leq hour$: 10 Points
- $1\ hour < \Delta \leq 1.5\ hour$: 5 Points
- $\Delta > 1.5\ hour$: 0 Point

If Participant estimates R.A. Instead of H.A.: 20 Point

Dec:
- $\Delta \leq 2^{\circ}$: 20 points
- $2^{\circ} < \Delta \leq 4^{\circ}$: 15 Points
- $4^{\circ} < \Delta \leq 8^{\circ}$: 10 Points
- $8^{\circ} < \Delta \leq 10^{\circ}$: 5 Points
- $\Delta > 10^{\circ}$: 0 Point