



OBSERVATIONAL
TEST
PLANETARIUM

PART I

**READ
CAREFULLY**

Inside the dome:

- 1) The observational round in the planetarium consists of two parts, one inside the dome and the other outside the dome.
- 2) The inside part consists of 3 questions and takes 30 minutes.
- 3) When you enter the dome, you will be directed to your seat. Here you will find a clipboard with your answer sheet attached, one data table and a flashlight. During the adaptation time the students may stand and change the position around his place, but they are not allowed to communicate with each other. During the observation you can stand and turn in order to make a comfortable observation.
- 4) Fill your student ID in the box on the answersheet.
- 5) PAY ATTENTION TO THE ASSISTANTS, and follow their instructions.
- 6) The timing for the first part is as follows:
 - a) **8 minutes for your eye adaptation to the darkness;**
 - b) **10 minutes for the first question;**
 - c) **6 minutes for the second question;**
 - d) **6 minutes for the third question;**
- 7) Use the flash light only when you need it and point it only to your paper.
- 8) When you leave the dome, leave everything on your seat.
- 9) PLEASE WRITE ONLY ON THE PRINTED SIDE OF THE ANSWER SHEET. DON'T USE THE REVERSE SIDE. The evaluator will not take into account what is written on the reverse of the answer sheet.

GOOD LUCK!



Please write ONLY on this side of the paper

Question 1

The sky projected in the dome corresponds to Suceava (Long $26^{\circ} 15'$), at 18:00 UT, on a certain day of a certain month.

8 minutes – relax and familiarize your eyes with the darkness. During this time don't use the flash light.

Two arcs of circle will now be projected. The arcs are segmented. Each segment represents an interval of some degrees. This number is not the same for each arc.

10 minutes – Question 1

- a. Identify each arc by circling the correct name and give the angular size of each segment (in degrees).

First arc	Equator	Meridian	Ecliptic	Segment size
Second arc	Equator	Meridian	Ecliptic	Segment size

- b. Estimate the local sidereal time of the sky you see in the dome.

θ_{sidereal}

- c. Determine the month to which the projected sky would correspond at the given time. Fill in the box the number of the month (1 to 12).

Month number



Please write ONLY on this side of the paper

Question 2 and 3

For questions 2 and 3 the assistant will use a small red arrow pointer to point some objects in the sky. Each object will be pointed at for **2 minutes** (30 seconds arrow pointer on and 10 seconds off). Please pay attention to the assistant announcements.

6 minutes – Question 2

Location of three Messier objects will be pointed one by one. For each Messier object pointed, fill in the boxes the Messier catalog number of it and the number which indicates its type, as follows: **1 for galaxy, 2 for nebula, 3 for open cluster, 4 for globular cluster.**

Also, for each object, fill in the appropriate box the IAU abbreviation of the constellation where the star is located. Use **Table 1** for this purpose.

1 st Messier object		Number which indicates the type		IAU abbreviation of the constellation	
2 nd Messier object		Number which indicates the type		IAU abbreviation of the constellation	
3 rd Messier object		Number which indicates the type		IAU abbreviation of the constellation	

6 minutes – Question 3

Three stars will be pointed successively. Each star will be pointed 2 minutes. Fill the appropriate box the name of the star (or Bayer designation) and the number which indicates its type (**1 for single, 2 double**). Also, for each star, fill in the appropriate box the IAU abbreviation of the constellation where the star is located. Use for that **Table 1**.

1 st Star		Number which indicates the type		IAU abbreviation of the constellation	
2 nd Star		Number which indicates the type		IAU abbreviation of the constellation	
3 rd Star		Number which indicates the type		IAU abbreviation of the constellation	

You have finished the first part. Verify if you have written your student ID on every page. Put the clipboard with the answer sheets attached and the flashlight on your seat, and leave the dome.

MARKING SCHEME for Observational_part1 – Planetarium (50 points)

Question1 (20 points)

- a. First arc length – length – **MERIDIAN 10° - 1p+2p**
Second arc segment length – **EQUATOR 15° - 1p+2p**
- b. $\theta_{\text{sidereal}} - 13\text{h}30\text{m}$ **6p**
+/- 15 m – full points; +/- 30 m half points
- c. Month number – **June (6) - 8p**

Question 2 (15 points)

1 st Messier object	M101 2p	Number which indicates the type	1 1p	IAU abbreviation of the constellation	UMa 2p
2 nd Messier object	M57 2p	Number which indicates the type	2 1p	IAU abbreviation of the constellation	Lyr 2p
3 rd Messier object	M92 2p	Number which indicates the type	4 1p	IAU abbreviation of the constellation	Her 2p

Question 3 (15 points)

1 st Star	β UMi / Kochab 2p	Number which indicates the type	1 1p	IAU abbreviation of the constellation	UMi 2p
2 nd Star	γ Leo / Algieba 2p	Number which indicates the type	2 1p	IAU abbreviation of the constellation	Leo 2p
3 rd Star	α CVn / Cor Caroli 2p	Number which indicates the type	2 1p	IAU abbreviation of the constellation	CVn 2p

Star chart:

You have 30 minutes to finish this part.

Please use only a pencil to make the drawings and markings.

After you finish the work fill your student ID on the answer sheet as well as on the sky map.

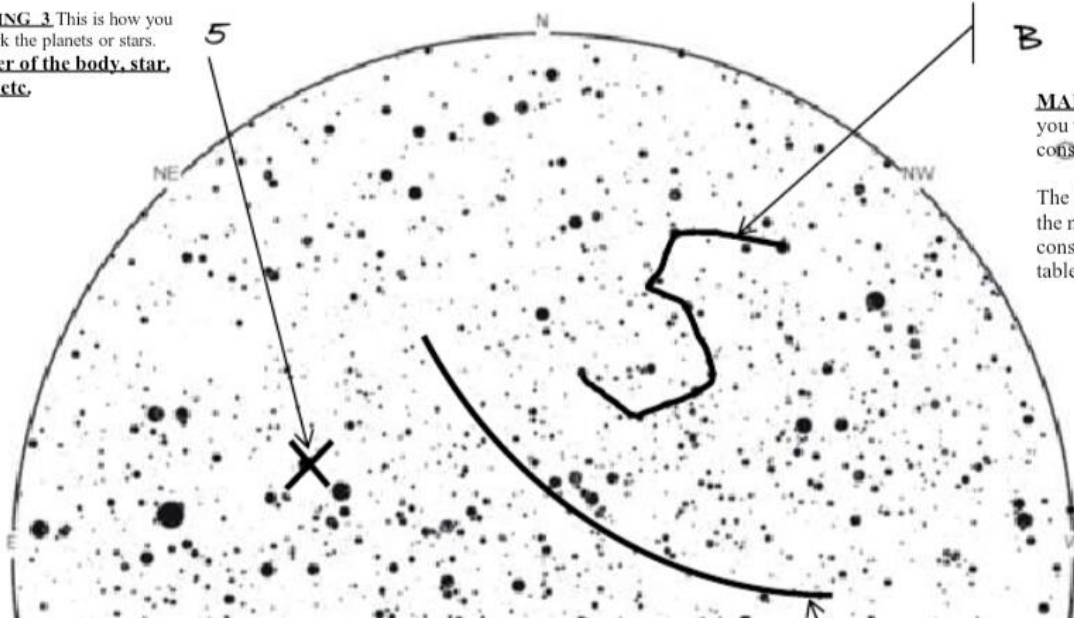
Put the answersheets in the folder; leave the compass, the ruler and the pencil on the table.

Thank you!

In this part you will use the sky-map found in the envelope. The map represents the sky in Suceava (Latitude $47^{\circ} 39'$ North, Longitude $26^{\circ} 15'$ East) on the day of the test at 22:00 local time. The observer who made the sky-map was at a very high altitude above Suceava; the Zenith point is in the center of the chart. Please use a pencil for marking and drawing lines on the sky-map. Use the example 1, 2 and 3 to draw lines and mark objects on the map, as seen in the figure bellow.

HOW TO DRAW AND MARK ON THE SKY-MAP

MARKING 3 This is how you will mark the planets or stars.
Number of the body, star, planet etc.



MARKING 2 This is how you will mark the constellations.

The letter corresponds to the name of the constellation according to table 1.

MARKING 1 This is how you will draw the curves/lines and indicate what it represents.



Please write ONLY on this side of the paper

Questions

The map represents the sky in Suceava (Latitude $47^{\circ} 39'$ North, Longitude $26^{\circ} 15'$ East) at 19:00 UT on the day of test. The observer who made the sky-map was at a very high altitude above Suceava; the Zenith point is in the center of the chart. Solve question 1 to 4 on one copy of the map and questions 5 to 8 on the second copy of map.

- (2p) Draw on the map the horizon for an observer located on the ground in Suceava.
- (8p) Draw the celestial equator, the ecliptic, the galactic equator and the local meridian on the map with continuous lines.
- (9p) Mark the cardinal points (as N for north, E for east, S for south and W for west). Mark all the visible planets (except Uranus and Neptune) of the Solar System on the map and number them as 1, 2, ..., 6 in the order of increasing orbital radius (Skip number 3 for the Earth). Note that planets are not currently shown on the map.
- (4p) Identify and mark the four brightest stars in visual band above the horizon line. Number the star starting from **1** – the brightest, and continue with the fainter ones till number **4** for the faintest. Fill in the following table the Bayer name of the four identified stars.

Marking on the map	1	Name of the star	
	2	Name of the star	
	3	Name of the star	
	4	Name of the star	

- (6p) Draw on the map, approximate figures of any 15 constellations which lie completely above the horizon. Each constellation you mark should be identified on the map with the IAU abbreviation, using **Table 1**.
- (5p) Mark on the map the positions of the following objects:
 - The Messier objects: M31, M27, M13;
 - β Cygni, δ Ursa Minoris.

- (10p)

Estimate the sidereal time of the map; write the value in the box.

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- (6p)

Estimate the equatorial coordinates (right ascension and declination) of the star Altair (α Aquilae). Write your answer in the box.

$\alpha =$
$\delta =$

MARKING SCHEME for Observational part2 – Chart (50 points)

Question 1 – **2p**

Question 2 – **8p** (2p for each line (2p x 4 = 8p))

Question 3 – **9p** (0.5p for each cardinal point (0.5p x 4 = 2p); 1.4p for each planet (1.4p x 5 = 7p))

Question 4 – **4p** (each star name 0.5p + at correct position in the list 0.5p)

Marking on the map	1	Name of the star	α Boo (Arcturus)
	2	Name of the star	α Lyr (Vega)
	3	Name of the star	α Aur (Capella)
	4	Name of the star	α Aql (Altair)

Question 5 – **6p** (0.4 p for each constellation (15 constellations))

Question 6 – **5p** (each object 1p)

Question 7 – **10p** (18h; +/-15m full points; +/- 30m half points)

Question 8 – **6p** (Ascension – 20h+/-1h - 3p; Declination – +10°+/-5° – 3p)