



AstroChallenge 2015

To: Teachers-in-charge and Participants

On behalf of the organizing committee, I would like to thank you for your keen interest in **AstroChallenge 2015**. The following contents of this letter include important issues and rules to be noted:

1.) Extension of Registration Deadline

In order to facilitate registration, the registration deadline has been extended to May 23rd. For more information and as well as the sign-up sheet, please visit our website at www.astrochallenge.org.

2.) Payment

The registration fee for **each Junior or Senior team** is **\$60.00**. Payment is by cash only. Collection of payment will be done on the first day of the competition during registration. This registration fee serves to defray the costs of the competition and **does not** include the participants' meals on 11th June and 13th June. Participants will be ushered to the canteen for their meals. **Please also note that an additional administrative fee of \$10.00 will be charged** if there is any change in team composition after the registration deadline.

3.) Attire

Participants are encouraged to wear school uniforms (secondary schools and junior colleges) or society T-shirts (polytechnics).

4.) Location and time to report

Day 1 (11th June) 09:00 – NTU Tan Chin Tuan Lecture Theatre

Day 2 (13th June) 09:00 – NUS LT27

The respective maps for NTU and NUS (see Appendix IV) are included in this letter.

5.) Itinerary

Please refer to Appendix I. Please note that the schedule may be subject to changes.

6.) Rules and Regulations

Please note that the Observation Round has been modified this year. For more information, please refer to Appendix II, as well as our website. Further information about the Rules and Regulations will be posted on our [website](#) and [Facebook Page](#).



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7.) *Project Round*

Project Round materials and presentation are to be COMPLETED beforehand and submitted on **Day 2** (13th June) during registration. Please refer to the general Rules and Regulations in Appendix II & III for more information. Further updates and information will be posted on our [website](#) and [Facebook Page](#).

8.) *Consent and Indemnity Forms*

We require all students to submit a Consent and Indemnity Form. A copy of the Consent and Indemnity Form is included in Appendix V. You may also download the form online at our website, http://www.astrochallenge.org/?page_id=19. All students should sign and submit the Consent and Indemnity Forms on **11th June** during registration at NTU.

9.) *Things to bring for the competition*

1. Writing materials and **scientific** calculator
2. Consent and Indemnity Forms for participants on **11th June**
3. Telescope for participants in the Senior category on **11th June**
4. Completed Project on **13th June**
5. Money for meals (You will be guided to the canteen during mealtimes.)

More details and updates on the aforementioned events will be provided on AstroChallenge website at <http://www.astrochallenge.org>.

Please contact us at astrochallenge@gmail.com if you have further enquiries. We look forward to seeing you at **AstroChallenge 2015**. Thank You.

Best regards,

Christopher Cheng

President

AstroChallenge 2015 Committee



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Appendix I – Schedule

Day 1 of AstroChallenge 2015: 11th June 2015 – NTU Tan Chin Tuan Lecture Theatre

Time	Event
08:00 – 09:10	Registration
09:10 – 10:00	Opening Address and Briefing
10:00 – 12:15	Multiple Choice Questions Round
12:15 – 13:45	Break
13:45 – 16:00	Data Analysis Questions Round
16:00 – 16:15	Briefing for Observation Round (Senior Category)
16:15 – 19:00	Dinner Time and Telescope Setup (Senior Category)
19:00 – 22:00	Observation Round (Senior Category)

** All participants are strongly encouraged to attend these events, except for the **Observation Rounds (Senior Category only)**.

Day 2 of AstroChallenge 2015: 13th June 2015 – NUS LT27*

Time	Event
09:00 – 09:15	Registration and short brief
09:15 – 12:00	Project Round
12:00 – 13:30	Lunch Time
12:00 – 12:45	DRQ Debrief (Optional)
13:30 – 13:45	Address by Dr Abel Yang, NUS Physics
13:45 – 16:00	Finals 1 (Junior Category)
16:00 – 16:30	Refreshment and Arrival of Guest of Honour
16:30 – 18:45	Finals 2 (Senior Category)
18:45 – 19:15	Prize Presentation
19:15 – 20:00	Interaction Time (Optional)

* Subjected to changes.



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Appendix II – Rules and Regulations

Note: The following list comprises the rules for all the rounds in AstroChallenge. The organizing committee reserves the right to amend any of the rules contained herein this list. Participants will be notified of the relevant changes.

General rules

- Handheld communication devices or devices with storage and display capabilities (other than calculators) are not to be used during all the quiz rounds.
- Graphic calculators are not allowed.
- Any team caught cheating will be subjected to disciplinary/remedial action, including immediate disqualification. The teacher-in-charge and their respective schools will be notified in the event of cheating.
- The tabulation of total points is final. No further correspondence will be entertained.
- Top 50% of MCQ individual scores, DRQ, Observation, and Project team scores will be released. Full release of results will only be made upon the teacher-in-charge's request, and each school may only view its own students' scores.

Rules and Regulations for Specific Rounds:

Multiple Choice Questions (MCQ) Round

Duration: 2 hours

- This is an individual round.
- Most of the questions in this round will be qualitative.
- A maximum of 5 team members can take part. Participants may leave before the time limit, but may not leave within the last 15 minutes of the exam.
- The overall points for the MCQ round will be the total marks from the best 4 individuals in the team.
- There will be a total of 50 questions. Participants start off with 50 points.
- Two (2) marks will be given for a correct answer, -1 mark for a wrong answer and 0 marks for blanks. A maximum of 7 blank answers are allowed from each individual.
- A Best Astronomer from each category will be selected based on the individual scores for this round. In the event of a tie, several tiebreakers (e.g. most correct answers) will be used to break the tie.
- The questions for the Junior Category will be different from those for the Senior Category.



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Data Response Questions Round

Duration: 2 hours

- This is a group round.
- Most of the questions in this round will be quantitative, with respect to applications in astronomy.
- The team reserve cannot take part, unless one member of the team is absent and/or unwell. Only 4 participants of the team can take part in Data Response.
- The points awarded to the team for this round consist of the total marks tabulated from all the questions.
- There will be a total of 5 Data Response Questions. Each question is not related to one another.

Observation Round (Senior Category only)

Duration: 2-3 hours (depending on the weather)

Venue: NTU Tan Chin Tuan Lecture Theatre

- This is an inter-school round.
- Each school can only have **ONE team (5 people)** in the observation round. If the school has more than 1 participating team, all teams will get the same points as the participating team. The school can choose 5 people out of all its participating teams to participate in this round.
- Participants may bring along any reference materials, subjected to approval. These materials must be submitted to the quizmasters beforehand for review.
- Participants are expected to complete their observation log sheets (provided). They will also be tested on their telescope handling and alignment skills. Judges will verify each object found by the team.
- Goto-enabled mounts/scopes and any form of computerized mounts/scopes are **NOT allowed** to be used during this round, unless the motor and computer are switched off and the scope operated manually.
- Participants are expected to pack their equipment in shock-absorbing material to ensure it will not be damaged during transportation.
- The organizers, judges, NTU and NUS will **not** be liable for any loss or damage of equipment at any point of time during the competition.
- This round is dependent on the weather and in case of bad weather, the organizing committee reserves the right to call off or replace the round.
- The organizing committee of AstroChallenge 2015 cannot be held liable for the weather.



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- In case of bad weather, this round will be substituted with a theoretical observation round, which may comprise a written test and/or the use of stargazing software and/or indoor practical tests.
- Stellarium and other stargazing software are NOT permitted during the theoretical observation round. However, printed/written material such as observation plans and finder charts **may** be permitted for specific components.
- The stargazing software that may be used in the theoretical observation round is Stellarium (<http://www.stellarium.org/>) and the associated Oculars plugin. The question may involve finding deep sky objects, or pointing out particular stars and constellations (analogous to practical observation round). Participants are highly recommended to familiarize themselves with the program prior to the competition, and take note of the following additional settings:
 - Unless otherwise stated, time zone and location are set to those of Singapore. Time will not be paused.
 - What will be shown: stars, planets and deep sky objects (subject to sky condition settings), cardinal points, the ground.
 - What will NOT be shown: labels for celestial objects, constellation lines, celestial coordinates grid.
 - Only keyboard navigation - directional arrow keys, PgUp & PgDown to zoom – is allowed.
 - Sky and viewing options settings: Atmosphere: on, Light pollution: 6, Labels and Markers: all off, Projection: Stereographic.
 - If tested, the telescope and miscellaneous settings in the Oculars plugin will be revealed on the day itself
 - If the Oculars plugin is not used, participants may switch between Equatorial and Azimuthal Mount mode as they see fit.
 - For further information, please see our website for a briefing about the Observation Round.

Project Round

Please refer to Appendix III for AstroChallenge 2015 Project Round Entry Rules and Regulations.

Final Round

Duration: 2.25 hours (projected)

The **top five teams** (based on all the rounds from the Senior and Junior Categories) will take part in this round.



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- Only 4 participants are allowed for each team. The fifth member is not allowed to sit together with the team.
- Only 1 team from each school per category can qualify for the Final Round.
- In the event that 2 or more teams from a school qualify for the Final Round, only the top team will participate in the Final Round.

Round 1: Individual Round

- Each member of the team is to answer questions without help from the other members.

Round 2: Mystery Round

- The rules regarding this round will be revealed on the day itself.

Round 3: Buzzer Round

- The Quizmaster will indicate who has first hit the buzzer before the team is allowed to answer the question. There will be a visual or other sensory cue to determine which team hits the buzzer first.
- Teams are expected to answer immediately after buzzing in. Judges reserve the right to penalize teams that do not answer within a reasonable amount of time.
- The team will be given a time limit to answer the question. If the answer is incomplete or not given after the time limit, the team is deemed to have given an incorrect answer. The question may then be opened to the rest of the teams.
- In the event of a dispute, the judges and organizers reserve the right to have the final say in the accuracy of the answer, and the award of points. The judges' decision is final.

Score Weighting (AstroChallenge 2015)

	Junior	Senior
Round 1 – MCQ	35%	25%
Round 2 – Data Response	35%	25%
Round 3 – Observation	-	30%
Round 4 – Project	30%	20%
Total	100%	100%

Grand total = $0.2 \times \text{Total from Final Round 1 in \%} + 0.3 \times \text{Total from Final Round 2 in \%} + 0.3 \times \text{Total from Final Round 3} + 0.2 \times \text{Total for Preliminary Rounds in \%}$

The weighting for AstroChallenge 2015 is provided to serve as a strategic guide for participants. The organizers reserve the right to amend the weighting pursuant to its discretion.



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Appendix III – Establishing a research station in the AC-2015 System

In the year 2060, mankind has experienced several decades of unprecedented peace and progress as a Type I civilization. With the human population exceeding 15 billion and rapidly growing, demand for many resources (like water and metals, among others) is starting to outstrip supply. In the face of this challenge, existing colonies within the Solar System are struggling to provide for all.

In view of this, mankind is now making a concerted push into the final frontier: interstellar space.

To aid in this effort, the UN is sending 10 pioneers to establish a research station in the nearest main-sequence star known to harbor multiple exoplanets: AC-2015. Not only is AC-2015 relatively close (4 light years away), it also hosts 5 confirmed exoplanets, of which two lie in the Habitable Zone. All these factors have made the AC-2015 star system one of the most promising candidates for scientific exploration and human colonization.

As distinguished astronomers and scientists, your team has been one of the few chosen to design this research station. Your team should ensure that your proposed station fulfils the primary objectives of this mission, which are:

- To sustain/shelter the initial pioneers indefinitely **on a planet of your choice**. In other words, it should not rely on resupply missions from Earth.
- To prepare the groundwork for a future town-sized colony in the AC-2015 system

Hence, while your team is strongly encouraged to establish secondary scientific and/or economic goals, these efforts ultimately should further the primary objectives of the mission.

On 13th June, your team will be allocated a booth to expound on their proposals. Participants should come prepared with a short 5 minute pitch to fellow teams and judges. This pitch should contain, but is not restricted to, the following details:

- Secondary goals (if any), and how they relate to the primary objectives
- Choice of planet and why
- Specialists required for the crew (if any)
- Features of the proposed research station
- Materials that need to be brought from Earth, and their estimated mass
- How will the station come together/ be deployed

All teams are expected to bring a **miniature model** (recommended scale of 1:100) of their structure, but are otherwise free to use any presentation format. Teams are allowed to bring posters/ laptops/ materials/ any other props if they deem it necessary. All presentation materials are to be brought only on 13th June (Day 2).



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At the end of the round, all team members will vote on the best project from each category, subject to restrictions. Further details on the voting process will be given before the Project Round begins.

Should teams have any other enquiries, please email our Head Quiz Master at more.options.exist@gmail.com (Kia Yee).

Worlds

Star/Planet	Mass and semi-major axis	Atmosphere	Estimated Surface Temperature	Comments/Analyses
AC-2015	0.8 M _☉	NA	5000K	As a K3V star, this main-sequence star is believed to be 3 billion years old. Large starspots have been seen to transit this star on occasion
AC-2015b	0.5 M _E 0.2 AU	None	600K (peak) 120K (night)	Due to its close proximity, AC-2015b is believed to be an airless rocky world. This planet is observed to be tidally locked to its host star
AC-2015c	0.7 M _E 0.7 AU	N ₂ /H ₂ O detected	290K	Strong water absorption lines, combined with its lower density than Earth, suggest that this planet is extremely water rich. It is likely that this planet is completely surrounded by immense oceans that are miles deep.
AC-2015d	2 M _E 0.9 AU	CO ₂ /SO ₂ / NO _x /H ₂ O detected	275K	Despite its greater distance, observations suggest that d is only slightly cooler than c. The significant local variation in sulfur/nitrogen oxides suggests that c exhibits extreme volcanic activity. Due to this, large quantities of metal ores and rich soils are likely to be found on this planet.
AC-2015e	0.8 M _J 3.1 AU	H/He	180K	The only known gas giant in the AC-2015 system. Vast quantities of H/He suggest that this planet might serve as a good refueling station.
AC-2015f	0.9 M _E 5 AU	None	100K	Ices probably abound on this planet. With its low surface gravity and distance from the star's gravitational well, this planet will probably be a good staging ground for spacecraft

Power and Transport

While most fields have stagnated since the 2020s, the advent of helium-3 fusion reactors in 2037 ushered in a new age of prosperity. Due to their safety and high efficiency, these reactors are now commonly seen in spacecraft. Most interplanetary spacecraft also utilise thin-film solar panels as a primary power source. Though this voyage has never been attempted before, the UN expects the payload-bearing spacecraft to reach there within 8 years (from Earth's reference frame)



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Appendix IV – Maps of Competition Venues

Map of NTU – Tan Chin Tuan Lecture Theater (TCT-LT)



Direction to go to TCT-LT from Pioneer MRT by Campus Shuttle Bus (Campus Rider)

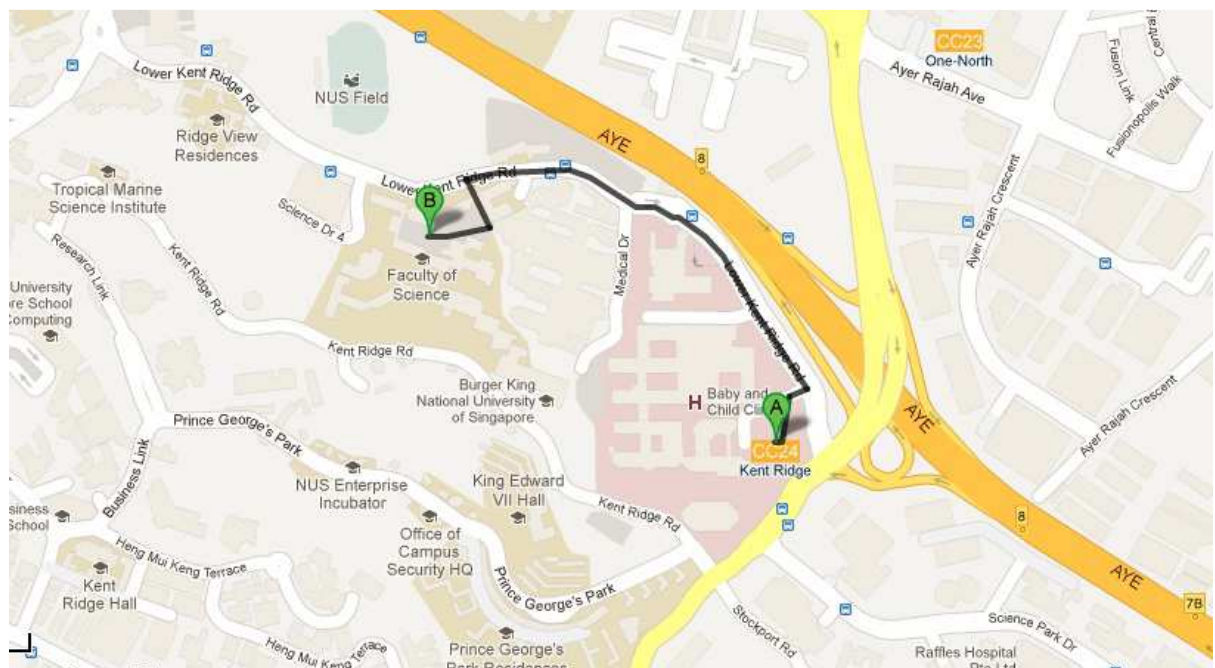


Note: Get on to the NTU Campus Shuttle Bus: Campus Rider (Green Signage) at Pioneer MRT station and get down at Administration Building bus stop. TCT-LT is located at the opposite side of Administration Building.

Map of NUS – LT27



Direction from Kent Ridge MRT to LT27 by bus 95 or NUS Internal Shuttle Bus A2





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Appendix V – Consent & Indemnity Forms

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CONSENT AND INDEMNITY FORM

I, (Dr/Mr/Mrs/Mdm)* _____, the parent/guardian* of _____ hereby grant permission to allow my son/daughter/ward* to participate in AstroChallenge 2015 held at:

NTU – 11th June 2015

NUS – 13th June 2015

or such extended period as may be deemed necessary for the completion of the event. AND I, _____ (student's name), from _____ (student's school) hereby confirm that I am participating in the above stated event voluntarily and by my own free will. I/We* further agree that:

- I/We* **will abide by** the applicable **rules and regulations** as may be prescribed from time to time by the AstroChallenge 2015 Committee; and
- I/We* **will not hold** the AstroChallenge 2015 Committee or any full time or part time staff **responsible or liable** in any way for, and that no right of action shall arise from, any loss or damage (including, without limitation, personal injury and property damage) caused by or sustained as a result of my child's/ward's (as applicable) participation in the activities, whether through: (i) neglect on the part of the AstroChallenge Committee or any of its full time or part time staff; or (ii) otherwise; and
- I/We* **will indemnify** the AstroChallenge 2015 Committee and keep the Committee indemnified against all losses, claims, demands, actions, proceedings, damages, cost expenses, and any other liability arising in any way from my child's/ward's (as applicable) participation in the activities or any breach of my child's/ward's (as applicable) undertakings hereof



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- I/We* am/are aware of the possible risks involved in the event and accept the same, notwithstanding the fact that the event is intended only for those without medical problems and who are in a state of sufficient physical fitness to participate in the same. Participation in this event is at the participant's sole risk.

To be completed by parents/legal guardians of students:

Signature of Parent/Legal Guardian* : _____
 Name of Parent/Legal Guardian* : _____
 Date : _____

To be completed by all students:

Signature of Participant : _____
 Name of Participant : _____
 Date : _____

CONTACT PERSON(S) (PARENT OR GUARDIANS) IN SINGAPORE

Name	1.	Relationship with Participant	1.
	2.		2.
Address	1.		
	2.		
Contact No	1.	Language Spoken	1.
	2.		2.

* Delete where applicable

*** End of Form ***