

18th Indian National Astronomy Olympiad Orientation cum Selection Camp(Sr)

Theory Test 1

Time : 9:00 - 10:30 ☺

Date : 10th May, 2016

Maximum! Marks : 60

You've probably dreamt of a perfectly wonderful test, but this is not it!

Once upon a time in a far far away galaxy, there were born the civilisation of *Ortsa*. And they lived happily ever after...

...until a few years back, the dark lord *Shrapnel* shredded away their home planet. It was a deadly massacre, yes it was! But it was not the end. Some survived and one amongst them was *Taher, the Shah*. He shall recover in *silence* and return to claim his homeland.

1 MASTERCHEF

15 Marks

Teri maa ka frared, both connected by the secret material *Drake*. He fills it with a litre of water at 25°C . How much time does it take the water to boil if kept in a furnace at 6000 K ?

You have the following information about Drake:

Absorption Band for Outer Layer: $\lambda = 3000 \text{ \AA}$, $\Delta\lambda = 500 \text{ \AA}$

Absorption Band for Inner Layer: $\lambda = 8000 \text{ \AA}$, $\Delta\lambda = 500 \text{ \AA}$

Dimensions of the container: $20 \times 10 \times 10 \text{ cm}$

2 MOTORBIKE MADNESS

20 Marks

Rachit, the bravest of all Ortsa is camping on the ancient planet *Earth*. On June 10, he decides to ride his motorbike along his latitude such that he would always see the sun on horizon. After a few hours, he gets bored and decides to ride along the longitude at the same speed as before. He notices that he can still keep up with the Sun for some time. Find the latitude. He is really intrigued by this and wants to do this with a star instead of the Sun. Find the condition on the co-ordinates of the stars for which this is possible.

3 I LAVA YOU

25 Marks

Nandu is hovering in orbit around the remote desert planet of *Runeterra*. His despair came to an end when he saw his lover *Nandini* in the same orbit in perfect conjunction with Runeterra. Without any ado, he prepares his jets to reach her when he notices one of Shrapnel's shooter bots continuously firing bullets in all directions. The velocity of the bullets is such that they closely miss hitting the lovers (when they are at their initial positions). Help him find a trajectory towards his lover such that the bullets can't reach him. The shooter is fixed at a position in space initially midway between Nandu and the planet.
