

Unit 13 - Week 12

Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

Week 9

Week 10

Week 11

Week 12

Gradient Drift and Curvature Drift

Vacuum Drift and Planetary Ring Current

Magnetic Mirroring

Magnetic Mirroring and Loss Cone

Airglow and Aurora

Quiz : Assignment 12

Assignment 12 Solution

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Assignment 12

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-04-22, 23:59 IST.

1) Suppose the earth's magnetic field is 3×10^{-5} T at the equator and falls off as $1/r^3$, as for a perfect dipole. Let there be an isotropic population of 1-eV protons and 30-keV electrons, each with density $n=10^7/m^3$ at $r=5$ earth radii in the equatorial plane. Note: The curvature drift is not negligible and will affect the numerical answer, but neglect it anyway.

Compute the ion ∇B drift velocity.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.3,0.5

1 point

2) How can airglow phenomena be used to find the wind velocity in thermosphere?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) By measuring the Doppler shift in oxygen line at 630 nm.

0 points

3) In case of the data given in question 1, an electron and ion drifts(respectively)

- eastward, westward
 westward , eastward
 both eastward
 both westward

No, the answer is incorrect.
Score: 0

Accepted Answers:
eastward, westward

1 point

4) Using the data given in question 1, find the time taken by an electron to encircle the earth.

- 1.2 hr
 6.2 hr
 4.5 hr
 5.2 hr

No, the answer is incorrect.
Score: 0

Accepted Answers:
4.5 hr

1 point

5) Compute the ring current density in A/m^2 using the information given in question 1.

- 3.34×10^{-8}
 3×10^8
 1.23×10^{-6}
 2×10^{-8}

No, the answer is incorrect.
Score: 0

Accepted Answers:
 2×10^{-8}

1 point

6) A 20-keV deuteron in a large mirror fusion device has a pitch angle θ of 45 degree at the midplane, where $B=0.7$ T. Compute its Larmor radius.

- 12 m
 0.3 m
 11 cm
 8 m

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.3 m

1 point

7) In magnetic mirror which physical quantity of a particle is conserved? How does this physical quantity effects the motion of the particle in magnetic mirror?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) In magnetic mirror, magnetic moment is conserved. As a particle move from weak to strong field in magnetic mirror, due to increase in magnetic field, perpendicular velocity must increase and parallel velocity must decrease to keep the magnetic moment constant.

0 points

8) What are the main atmospheric constituents which helps in formation of aurora and Airglow?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) The emissions from atomic oxygen in different wavelength region help in formation of Aurora and Airglow.

0 points

9) A plasma with an isotropic velocity distribution is placed in a magnetic mirror trap with mirror ratio $R_m = 4$. There are no collisions, so the particles in the loss cone simply escape, and the rest remain trapped. What fraction is trapped?

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Range) 0.80,0.90

1 point

10) Write 3 differences between airglow and aurora.

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: String) Airglow is global whereas aurora is local to polar regions. Airglow intensity is low whereas aurora can be seen from naked eye. Airglow occurs because of interaction of solar radiation whereas aurora occurs because of the interaction between high energy particles.

0 points