

HIGH-ENERGY-DENSITY PHYSICS WITH DR VALENTIN KARASIEV AND DR SUXING HU

TALKING POINTS

KNOWLEDGE

1. What is high-energy-density physics?
2. Where do the environments studied in high-energy-density physics occur naturally?

COMPREHENSION

3. What are the key differences between high-energy-density physics and 'standard' physics on Earth?
4. How does high-energy-density physics help us to understand what happens in stars?

APPLICATION

5. Where are plasmas used in our lives?

ANALYSIS

6. What makes it challenging to create computational models for materials in high-energy-density environments?
7. How can discoveries in high-energy-density physics be useful to us?

SYNTHESIS

8. A molecule or material will generally have different states of matter at different temperatures (i.e. solid, liquid, gas, etc.) How would you summarise the different states of matter from very low to very high temperature?

EVALUATION

9. Reflect on your vision of a physicist's job before and after reading about Valentin's research. What aspects of this job did you get to know?

ACTIVITIES YOU CAN DO AT HOME OR IN THE CLASSROOM

- Get crafty and make a model of two hydrogen atoms, including all the protons and electrons. With your model, look at how bringing the hydrogens together (as occurs under higher pressure) affects where the electrons go. Are they still attached to one proton or could they move to the other proton now? What would happen if you added more atoms?
- Design a poster to explain the differences in temperature and pressure between Earth and a star. Question your peers about how these different conditions may change the types of atoms and molecules formed in the two different places.

MORE RESOURCES

- There are some YouTube videos on the history and development of high-energy-density physics at *Lawrence Livermore National Laboratory*, one of the most important places in the development of high-energy-density physics. They are very advanced but, even if you do not understand all the science, you can see all the different areas that high-energy-physics has affected:

www.youtube.com/watch?v=8T7ShKKsM7k&ab_channel=LawrenceLivermoreNationalLaboratory

- If you thought there were only three states of matter before you read this article (there are actually more than 10!) you can learn more about some of the more exotic ones here:

www.ck12.org/book/ck-12-physical-science-for-middle-school/section/4.1/

- Find out more about Valentin and his career here:

www.lle.rochester.edu/index.php/education/research-areas/high-energy-density-physics-hedp-theory-group/valentin-v-karasiev/