NUCLEAR PHYSICS WITH DR DANIEL PITONYAK

ACTIVITIES

THE POWER OF PERSUASION

One of nuclear physics' most impactful applications is its potential to produce massive amounts of energy that can be harnessed inside nuclear reactors to generate electrical power. Despite its potential to supply the world's energy demands, nuclear energy production accounts for only around 10% of global energy production. This is largely due to the controversy surrounding nuclear energy and fears that it is unsafe.

A) Research nuclear energy production and create a list of its advantages and disadvantages. Consider its potential for energy production, the viability of alternative sources of energy, the risks involved and how they might be overcome. Once you have completed your list, decide whether you are for or against using nuclear power as an energy source.

B) Imagine that you write for an online science blog. Write a short blog post to convince your audience that nuclear power is a good/bad idea. Use persuasive writing techniques to make your blog more effective. Explain how nuclear power is generated in an easy-to-understand way, explain your viewpoint, make your arguments compelling and include quotes and statistics from reliable sources.

TALKING POINTS

KNOWLEDGE & COMPREHENSION

1. What does the ancient Greek word '*atomos*' mean? Why were atoms named after this word?
2. What particles make up an atom?
3. What are protons and neutrons composed of?
4. What causes a proton's spin?

APPLICATION

5. As a nuclear physicist, you may be involved in research that initially has no obvious real-world application. How would you justify your research to a potential funder?
6. What computational techniques do you think Daniel uses to analyse the data from a high-energy collision?

ANALYSIS

7. How do high-energy collisions allow nuclear physicists to study the internal structure of protons?
8. What are the motivations behind constructing the Electron-Ion Collider?

SYNTHESIS

9. Particle accelerators use electric and magnetic fields to accelerate protons and electrons to incredibly high speeds. What would happen if you tried to accelerate a neutron in a particle accelerator? Why?

EVALUATION

10. Nuclear physics has many applications, including nuclear power, nuclear medical techniques and nuclear weapons. How would you assess the impact that nuclear physics has had on humanity?
11. To what extent do you believe that blue skies research is an effective approach to science?

ANIMATION

HEAD TO DANIEL'S FUTURUM WEBPAGE FOR AN ANIMATION ABOUT HIS WORK:

www.futurumcareers.com/can-we-unlock-the-secrets-hidden-deep-within-the-nucleus-of-an-atom

MORE RESOURCES

- You can explore Daniel's research in more depth on his website: **www.sites.google.com/view/pitonyak-qcd/home**
- Learn more about the Electron-Ion Collider and what nuclear physicists hope to discover from it: **www.bnl.gov/eic**
- The UK Research and Innovation (UKRI) has a collection of useful teaching resources related to nuclear physics: www.ukri.org/what-we-offer/public-engagement/public-engagement-stfc/engage-with-our-areas-of-science-and-technology-stfc/nuclear-physics/nuclear-physics-resources