

TSOKOS READING ACTIVITY

Section 12-2

1. Essential Idea: The idea of discreteness that we met in the atomic world continues to exist in the nuclear world as well.
2. Nature Of Science:
 - a. Theoretical advances and inspiration: Progress in atomic, nuclear and particle physics often came from theoretical advances and strokes of inspiration.
 - b. Advances in instrumentation: New ways of detecting subatomic particles due to advances in electronic technology were also crucial.
 - c. Modern computing power: Finally, the analysis of the data gathered in modern particle detectors in particle accelerator experiments would be impossible without modern computing power.
3. Theory Of Knowledge:
 - a. Much of the knowledge about subatomic particles is based on the models one uses to interpret the data from experiments.
 - b. How can we be sure that we are discovering an “independent truth” not influenced by our models?
 - c. Is there such a thing as a single truth?
4. Understandings:
 - a. Rutherford scattering and nuclear radius
 - b. Nuclear energy levels
 - c. The neutrino
 - d. The law of radioactive decay and the decay constant
5. Applications And Skills:
 - a. Describing a scattering experiment including location of minimum intensity for the diffracted particles based on their de Broglie wavelength
 - b. Explaining deviations from Rutherford scattering in high energy experiments
 - c. Describing experimental evidence for nuclear energy levels
 - d. Solving problems involving the radioactive decay law for arbitrary time intervals
 - e. Explaining the methods for measuring short and long half-lives
6. Guidance:
 - a. Students should be aware that nuclear densities are approximately the same for all nuclei and that the only macroscopic objects with the same density as nuclei are neutron stars
 - b. The small angle approximation is usually not appropriate to use to determine the location of the minimum intensity

7. Data Booklet Reference:
- $R = R_0 A^{1/3}$
 - $N = N_0 e^{-\lambda t}$
 - $A = \lambda N_0 e^{-\lambda t}$
 - $\sin \theta \approx \frac{\lambda}{D}$
8. Utilization: Knowledge of radioactivity, radioactive substances and the radioactive decay law are crucial in modern nuclear medicine
9. Aims: Aim 2: detection of the neutrino demonstrates the continuing growing body of knowledge scientists are gathering in this area of study
10. Read section 12-2 in your textbook.
11. Use the Cornell Notes system to take notes on the lesson material. You have the following options:
- You can print multiple copies of one of the forms on the following pages of this document and handwrite your notes.
 - You can use the MS Word form supplied below and type your notes.
 - You can then print your work and submit a hardcopy, or
 - You can upload the assignment to Focus. If you choose this option, you must use a filename in the format, "LastnameFirstinitialPerXAsgnmtName". For example, "SmithKPerC34ReadActT9-3.doc"
 - You can take notes on notebook paper using the Cornell Notes format and submit the hardcopy.
12. When using this form, remember the **Five R's of Notetaking**:
- Record** – the most important or emphasized information
 - Reduce** – and synthesize information wherever possible, making it as concise as you can
 - Recite** – read your notes out loud
 - Reflect** – and consider how this information is connected to your personal experiences and what you already know
 - Review** – look over your notes more than once
13. As a minimum, you must include notes on the following topics:
- Rutherford scattering experiment
 - Distance of closest approach
 - Nuclear radius
 - Deviations from Rutherford scattering
 - Discrete nuclear energy levels
 - The neutrino
 - Neutrino energy
 - Radioactive decay law
 - The solar neutrino problem

14. Answers may be typed or neatly printed. You do not need to include this page of instructions with your assignment.
15. *Note: The following computer skills should be practiced:*
- a. *Use Microsoft Equation to type any equations.*
 - b. *Drawings may be freehand, but try to make use of the ‘Shapes’, ‘Insert Picture’ or ‘Insert Clipart’ functions of MS Word.*
 - c. *A reading assignment may contain drawings that would be useful in your notes. If you have scanning capability, you should practice scanning pictures and inserting them into documents. As you prepare for college, you should consider investing in a desktop printer-scanner-copier.*
 - d. *Just remember that for formal reports you have to cite any images that you insert into your document. You don’t have to cite scanned images for this exercise unless you use a source other than the textbook.*

CORNELL NOTES and the 5 R's

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Name:
Date:
Topic:

Questions/Key Points	Notes
SUMMARY:	

Name _____

Date _____

CORNELL NOTES

Topic _____

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Questions/key points

Notes

Summary