

## TSOKOS READING ACTIVITY

### Lesson 2-4

1. Essential Idea: Conservation of momentum is an example of a law that is never violated.
2. Nature Of Science: The concept of momentum and the principle of momentum conservation can be used to analyse and predict the outcome of a wide range of physical interactions, from macroscopic motion to microscopic collisions.
3. International-Mindedness: Automobile passive safety standards have been adopted across the globe based on research conducted in many countries.
4. Theory Of Knowledge: Do conservation laws restrict or enable further development in physics?
5. Understandings:
  - a. Newton's second law expressed in terms of rate of change of momentum
  - b. Impulse and force–time graphs
  - c. Conservation of linear momentum
  - d. Elastic collisions, inelastic collisions and explosions
6. Applications And Skills:
  - a. Applying conservation of momentum in simple isolated systems including (but not limited to) collisions, explosions, or water jets
  - b. Using Newton's second law quantitatively and qualitatively in cases where mass is not constant
  - c. Sketching and interpreting force–time graphs
  - d. Determining impulse in various contexts including (but not limited to) car safety and sports
  - e. Qualitatively and quantitatively comparing situations involving elastic collisions, inelastic collisions and explosions
7. Guidance:
  - a. Students should be aware that  $F = ma$  is the equivalent of  $F = \frac{\Delta p}{\Delta t}$  only when mass is constant
  - b. Solving simultaneous equations involving conservation of momentum and energy in collisions will not be required
  - c. Calculations relating to collisions and explosions will be restricted to one-dimensional situations
  - d. A comparison between energy involved in inelastic collisions (in which kinetic energy is not conserved) and the conservation of (total) energy should be made

8. Data Booklet Reference:

a.  $p = mv$

b.  $F = \frac{\Delta p}{\Delta t}$

c.  $E_K = \frac{p^2}{2m}$

d. Impulse =  $F\Delta t = \Delta p$

9. Utilization: Jet engines and rockets

10. Aims:

- a. Aim 3: conservation laws in science disciplines have played a major role in outlining the limits within which scientific theories are developed
- b. Aim 6: experiments could include (but are not limited to): analysis of collisions with respect to energy transfer; impulse investigations to determine velocity, force, time, or mass; determination of amount of transformed energy in inelastic collisions
- c. Aim 7: technology has allowed for more accurate and precise measurements of force and momentum, including video analysis of real-life collisions and modelling/simulations of molecular collisions

11. Read section 2-4 in your textbook.

12. Go back and re-read each section listed below and summarize the content of the section in a paragraph:

a. Newton's Second Law in Terms of Momentum: \_\_\_\_\_

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b. Impulse and Force-Time Graphs: \_\_\_\_\_

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c. Conservation of Momentum: \_\_\_\_\_

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d. Kinetic Energy and Momentum: \_\_\_\_\_  
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e. It All Depends On The System: \_\_\_\_\_  
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f. The Rocket Equation: \_\_\_\_\_  
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g. Nature of Science: \_\_\_\_\_  
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13. *You are highly encouraged to practice using the MS Equations function. Proficiency will pay off in the long run.*
14. Answers may be typed or neatly printed. Drawings may be freehand, but try to make use of the 'Shapes' or 'Insert Clipart' functions of MS Word. If you submit this assignment electronically, the filename must be in the following format, "LastnameFirstinitialPerXReadActX-X".