

TSOKOS READING ACTIVITY
Lesson 2-2B

1. Essential Idea: Classical physics requires a force to change a state of motion, as suggested by Newton in his laws of motion.
2. Nature Of Science:
 - a. Using mathematics: Isaac Newton provided the basis for much of our understanding of forces and motion by formalizing the previous work of scientists through the application of mathematics by inventing calculus to assist with this. (2.4)
 - b. Intuition: The tale of the falling apple describes simply one of the many flashes of intuition that went into the publication of *Philosophiæ Naturalis Principia Mathematica* in 1687. (1.5)
3. Theory Of Knowledge:
 - a. Classical physics believed that the whole of the future of the universe could be predicted from knowledge of the present state.
 - b. To what extent can knowledge of the present give us knowledge of the future?
4. Understandings:
 - a. Objects as point particles
 - b. Free-body diagrams
 - c. Translational equilibrium
 - d. Newton's laws of motion
 - e. Solid friction
5. Applications And Skills:
 - a. Representing forces as vectors
 - b. Sketching and interpreting free-body diagrams
 - c. Describing the consequences of Newton's first law for translational equilibrium
 - d. Using Newton's second law quantitatively and qualitatively
 - e. Identifying force pairs in the context of Newton's third law
 - f. Solving problems involving forces and determining resultant force
 - g. Describing solid friction (static and dynamic) by coefficients of friction
6. Guidance:
 - a. Students should label forces using commonly accepted names or symbols (for example: weight or force of gravity or mg)
 - b. Free-body diagrams should show scaled vector lengths acting from the point of application

- c. Examples and questions will be limited to constant mass
 - d. mg should be identified as weight
 - e. Calculations relating to the determination of resultant forces will be restricted to one- and two-dimensional situations
7. Data Booklet Reference:
- a. $F = ma$
 - b. $F_f \leq \mu_s R$
 - c. $F_f = \mu_d R$
8. Utilization:
- a. Motion of charged particles in fields (see Physics sub-topics 5.4, 6.1, 11.1, 12.2)
 - b. Application of friction in circular motion (see Physics sub-topic 6.1)
 - c. Construction (considering ancient and modern approaches to safety, longevity and consideration of local weather and geological influences)
 - d. Biomechanics (see Sports, exercise and health science SL sub-topic 4.3)
9. Aims:
- a. **Aims 2 and 3:** Newton's work is often described by the quote from a letter he wrote to his rival, Robert Hooke, 11 years before the publication of *Philosophiæ Naturalis Principia Mathematica*, which states: "*What Descartes did was a good step. You have added much several ways, and especially in taking the colours of thin plates into philosophical consideration. If I have seen a little further it is by standing on the shoulders of Giants.*" It should be remembered that this quote is also inspired, this time by writers who had been using versions of it for at least 500 years before Newton's time.
 - b. **Aim 6:** experiments could include (but are not limited to): verification of Newton's second law; investigating forces in equilibrium; determination of the effects of friction
10. Read pages 67-75 in your textbook.
11. Complete separate spider diagrams for the major topics listed below.
- a. Newton's Second Law of Motion
 - b. Physics and Mathematics (as it relates to Isaac Newton and the Second Law)
12. This assignment 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". You do not need include a copy of these instructions with the assignment you hand in.



