VicPhys
Vicphysics Teachers' Network Inc.

PHYSCON 2023

Small Group Discussion Resources

Unit 3, Outcome 1: Investigate motion and related energy transformations experimentally, and analyse motion using Newton's laws of motion in one and two dimensions.

Assessment Choices	Possible Contexts	Examples of a Task
A: application of physics concepts to explain a model, theory, device, design or innovation	Trampoline, Amusement park rides, velodrome, crumple zones, throwing sticks, centrifuge	Explain the changes in GPE and KE of and the reaction force on a passenger during a ride on the Twin Dragon. Compare a 'Woomera' with a 'modern ball thrower'.
B: analysis and evaluation of primary and/or secondary data, including data plotting, identified assumptions or data limitations, and conclusions	circular motion, magnetic collisions oscillating spring	Investigate the dependence of centripetal acceleration on radius and period. Investigate the elastic collision between two gliders carrying repelling magnets.
C: problem-solving, applying physics concepts and skills to real-world contexts	Amusement park rides, automotive collisions, ball games Traffic, intersections	Evaluate the risks of an amusement park ride. Analyse the motion of a club head and golf ball at impact. To go or not to go: project on stopping distances, related to traffic light sequence Investigate the traffic light cycle of an intersection nearby.
D: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.	Motion on a spring from force and energy points of view Different methods to determine 'g' Different methods to produce circular motion	Solve a set of problems using equations of motion and then solve the same problems using energy concepts. Determine a value for 'g' using a pendulum, and by dropping the same 'bob from a range of heights. Compare and contrast the banking of an aeroplane to change direction with the banking of roads or turning when skiing.

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Unit 3, Outcome 2: Analyse gravitational, electric and magnetic fields, and apply these to explain the operation of motors and particle accelerators, and the orbits of satellites.		
Assessment Choices	**Possible Contexts**	**Examples of a Task**
A: application of physics concepts to explain a model, theory, device, design or innovation	Maglev trains, electrical meters, Loudspeakers, Mass spectrometers, Dielectric elastomers, Trip to Mars	Mass spectrometer investigation. Use a kit to build a motor and explain the components and their function. Describe ways to improve the performance of the motor.
B: analysis and evaluation of primary and/or secondary data, including data plotting, identified assumptions or data limitations, and conclusions	Magnetic field of a solenoid Force on a current carrying wire in a magnetic field	Investigate the strength of a magnetic field of a solenoid, through the force acting on a current in a wire.
C: problem-solving, applying physics concepts and skills to real-world contexts	Satellite motion Charges in E and M fields	Orbital calculations Setting up a cross field velocity selector Explain how contactless payment cards work.
D: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.	Concept of a Field. Properties of electric, magnetic and gravitational fields, Models of 'action at a distance' Storage of energy – gravitational potential versus electrical potential	Outline the similarities and differences between the effects of electric fields, magnetic fields and gravitational fields on matter. In your answer, refer to the definitions of these fields, the shapes of the fields etc.

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Unit 3, Outcome 3: Analyse and evaluate an electricity generation and distribution system		
Assessment Choices	**Possible Contexts**	**Examples of a Task**
A: application of physics concepts to explain a model, theory, device, design or innovation	Three phase power, AC generator, synchronous motors, transformers, inverters, solar cells, flux meters, field meters, Transmission lines, DC vs AC transmission, Transmission below and above ground, wireless transmission	Describe mechanism, benefits and limitations of wireless transmission of energy. Compare and contrast the different types of generators and motors
B: analysis and evaluation of primary and/or secondary data, including data plotting, identified assumptions or data limitations, and conclusions	Magnetic damping Induction	Investigate the falling time of a weighted magnet falling through a metal tube Investigate the magnitude of the emf produced in a solenoid when dropping a permanent magnet through it. Vary the speed of the falling magnet.
C: problem-solving, applying physics concepts and skills to real-world contexts	Energy generation and distribution Power losses in Transmission lines	Explain how wireless charging of mobile works. Investigate the energy conversions in a wind turbine
D: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.	Models for electric circuits inc Field model Transmission systems	Compare the field model for electric circuits to other models Construct a simple transmission model, with and without transformers. Compare the energy losses in transmission in both situations. Use costings of components to identify any advantages/disadvantages.

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Unit 4, Outcome 1: Analyse and apply models that explain the nature of light and matter, and use special relativity to explain observations made when objects are moving at speeds approaching the speed of light		
Assessment Choices	**Possible Contexts**	**Examples of a Task**
A: application of physics concepts to explain a model, theory, device, design or innovation	The Bohr model wave nature of matter Existence of the ether CRT tubes and SR GPS Doppler radar, Lasers	Describe the significance of the Michaelson-Morley experiment
B: analysis and evaluation of primary and/or secondary data, including data plotting, identified assumptions or data limitations, and conclusions	PE Effect Diffraction around a hair	Use measurements from the PE Effect experiment to determine values for Planck's Constant, threshold frequency and Work Function including uncertainties in these values.
C: problem-solving, applying physics concepts and skills to real-world contexts	Cosmic ray showers Diffraction effects in optical microscopy Atomic absorption spectrometer Interferometric measurements Acceleration of particles to speeds close to c	Investigate the observational evidence for the special theory of relativity
D: comparison and evaluation of two solutions to a problem, two explanations of a physics phenomenon or concept, or two methods and/or findings from practical activities.	Particle and wave models of light Structure of the atom Magnetic field and relativity	Compare and evaluate the wave model and the particle model for light. Bohr, de Broglie and Schrödinger EACH proposed a model for the structure of the atom. How does the nature of the electron proposed in each of the three models differ? Consider the motion of charged particles in a magnetic field from the point of view of relativity