Sets (s): All students

YEAR 12

SUBJECT Physics LP1

Knowledge Focus: Motion, energy and matter, using radiation to investigate stars

Ysgol Uwchradd Prestatyn High School

This half term : Skills, Knowledge and Understanding to be developed:

We will investigate how radiation can be used to give information about stars. We will also study moving objects (both rectilinear and projectile motion) and we will define and use the important concepts of momentum and energy.

Key Terms to be learned this half term:

emission and absorption spectra, inverse square law, luminosity, free body diagram, terminal speed, momentum conservation, Newton's laws, work done, work-energy theorem, power, dissipative forces, conservation of energy, elastic and inelastic collisions

Dr Clayton: Using radiation to investigate stars (One bullet point per lesson)
Learning Objectives etc:

- the idea that the stellar spectrum consists of a continuous emission spectrum from the dense gas of the surface of the star, and a line absorption spectrum arising from the passage of the emitted electromagnetic radiation through the tenuous atmosphere of the star
- the idea that bodies which absorb all incident radiation are known as black bodies and that stars are very good approximations to black bodies
- the shape of the black body spectrum and that the peak wavelength is inversely proportional to the absolute temperature (defined by: T (K) =θ (°C) + 273.15)
- Wien's displacement law, Stefan's law and the inverse square law to investigate the properties of stars – luminosity, size, temperature and distance
- the fact that the visible spectrum runs approximately from 700 nm (red end) to 400 nm (violet end) and the orders of magnitude of the wavelengths of the other named regions of the electromagnetic spectrum

Objective assessments:

Completion of past paper questions.

Homework:

Past exam questions from the booklet

Dr Athanasopoulos: Dynamics
Learning Objectives etc:

Week 1-2

- The concept of force and Newton's 3rd law of motion.
- How free body diagrams can be used to represent forces on a particle or body.
- The use of the relationship F = ma in situations where mass is constant.
- The idea that linear momentum is the product of mass and velocity.

APP on dynamics

Objective assessments:

Completion of past paper questions.

Homework:

Past exam questions on dynamics.

Extension: IsaacPhysics problems.

Sets (s): All students

YEAR 12

SUBJECT Physics LP1

Knowledge Focus: Motion, energy and matter, using radiation to investigate stars

Ysgol Uwchradd Prestatyn High School

Week 3-4 • The concept that force is the rate of change of momentum, applying this in situations where mass is constant. • The principle of conservation of momentum and use it to solve problems in one dimension involving elastic collisions (where there is no loss of kinetic energy) and inelastic collisions (where there is a loss of kinetic energy) direction. **Specified practical work** Investigation of Newton's 2nd law.			
Dr Athanasopoulos: Energy concepts Learning Objectives etc: **Week 5-6** • The idea that work is the product of a force and distance moved in the direction of the force when the force is constant. • The calculation of the work done for constant forces. • When the force is not along the line of motion (work done = Fxcosθ) • The principle of conservation of energy including knowledge of gravitational • potential energy (mgh) , elastic potential energy ($\frac{1}{2}kx^2$) and kinetic energy ($\frac{1}{2}mv^2$). • The work-energy relationship: $Fx = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$ **Week 7** • Power being the rate of energy transfer. • Dissipative forces, for example friction and drag, cause energy to be transferred from a system and reduce the overall efficiency of the system. • The equation $efficiency = \frac{\text{useful energy transfer}}{total\ energy\ input} \times 100\%$	**SA** **On all topics covered this term**	**Objective assessments:** Completion of past paper questions.	**Homework:** Past exam questions on energy. Extension: IsaacPhysics problems.

Terms for sections 1.6: Intensity, Absolute or kelvin temperature, Stefan's law [The Stefan-Boltzmann law], Black body, Wien's displacement law, Luminosity of a star.

1.6 (b)		An object (or a surface) which absorbs all the electromagnetic radiation that falls upon it. No body is a better *emitter* of radiation at any wavelength than a black body at the same temperature.
1.6 (d)		The wavelength of peak emission from a black body is inversely proportional to the absolute (kelvin) temperature of the body. $\lambda_m = \frac{W}{T}$ [W = the Wien constant = 2.90×10^{-3} m K]
		The temperature, T in kelvin (K) is related to the temperature, θ, in celsius (°C) by: T / K= θ / °C + 273.15 At 0 K (-273.15°C) the energy of particles in a body is the lowest it can possibly be.
		The total electromagnetic radiation energy emitted per unit time by a black body is given by *power* = $A\,\sigma T^4$ in which A is the body's surface area and σ is a constant called *the Stefan constant*. [$\sigma = 5.67 \times 10^{-8}$ W m^{-2}K^{-4}]
		The total energy a star emits per unit time in the form of electromagnetic radiation. **UNIT: W** [Thus we could have written *luminosity* instead of *power* in Stefan's law (above).]
		The intensity of radiation at a distance R from a source is given by $I = \frac{P}{4\pi R^2}$ **UNIT: W m^{-2}**

Terms for sections 1.3-1.4: Inelastic collision, Elastic potential energy, Force, Power, Momentum, Kinetic energy, The principle of conservation of momentum, Principle of conservation of energy, Work, Newton's 2nd law, Newton's 3rd law, $\Sigma F = m\,a$, Energy, Elastic collision, Potential energy

Sets (s): All students

YEAR 12

SUBJECT Physics LP1

Knowledge Focus: Motion, energy and matter, using radiation to investigate stars

Ysgol Uwchradd Prestatyn High School

1.3 (a)		A push or a pull acting on the body from some external body. **Unit: N**
		If a body **A** exerts a force on a body **B**, then **B** exerts an equal and opposite force on **A**.
1.3 (c)		The mass of a body × its acceleration is equal to the vector sum of the forces acting on the body. This vector sum is called the *resultant force*.
1.3 (d)		Mass multiplied by velocity. ($p = mv$). It is a vector. **UNIT: kg m s^{-1}** or **Ns**
1.3 (e)		The rate of change of momentum of an object is proportional to the resultant force acting on it, and takes place in the direction of that force.
1.3 (f)		The vector sum of the momenta of bodies in a system stays constant even if forces act between the bodies, provided there is no external resultant force.
		A collision in which there is no change in total kinetic energy.
		A collision in which kinetic energy is lost.
1.4 (a)		The product of the magnitude of the force and the distance moved in the direction of the force.(W.D. = $Fx\cos\theta$) **Unit: J**
1.4 (c)		Energy cannot be created or destroyed, only transferred from one form to another. Energy is a scalar.
		This is energy possessed by an object by virtue of its position. $E_p = mgh$ **Unit: J**
		This is energy possessed by an object by virtue of its motion. $E_k = ½mv^2$ **Unit: J**
		This is the energy possessed by an object when it has been deformed due to forces acting on it. $E_{elastic} = ½ Fx$ or $½ kx^2$ **Unit: J**
1.4 (d)		The amount of work a body can do. **Unit: J**
1.4 (e)		This is the work done per second, or energy transferred per second. **Unit: W [= J s^{-1}]**