EDEXCEL Topic 8 ENERGY – FORCES DOING WORK

Work

Work done	*Energy transferred by a force*	Energy is transferred when things happen

Work done = force X distance moved in the direction of the force

E = F X d

Non-useful energy stores	*Energy stored in a way that is not useful*	Most 'wasted' energy is transferred into the thermal energy stores of the surroundings.

Mechanical process	*An object moving due to a force acting upon it*	EG: push, pull, stretch, squash.

Pushing an object along a rough surface and work is done against frictional forces.

Energy is transferred to the kinetic energy store of the object as it starts to move.

Some energy is also transferred to the thermal energy store of the object, the surface and the surroundings due to friction.

The temperature of the object and surroundings increases.

Dissipation	*Thermal energy is transferred to the surroundings*	The transfer of thermal energy into the thermal energy store of the surroundings causes the temperature to rise.

Energy transfer = Work done

Gravitational force doing work	*Objects dropping from a height*	Energy transfers mechanically from the object's GPE energy store to the object's KE store.

ΔGPE = m X g X Δh

Change in Gravitational Potential Energy = mass X gravitational field strength X change in height.

Kinetic Energy = ½ X mass X velocity^2

KE = ½ X m X v^2

A force doing work	*Objects thrown upwards*	Energy transfers mechanically from the initial force exerted by the person, to the KE store of the object to the object's GPE store.

Energy transfer involves the way energy is stored when systems change

Energy in a system can be changed	By: • Work done by forces • In electrical devices • In heating

System	*A group of objects*
Closed	*Energy cannot enter or leave the system*
Open	*Energy can enter or leave the system*

Total energy remains the same (No net change).

Energy transfer diagrams	An easy way to see the energy transfers between different energy stores.

Energy transfer diagram for apple falling from a tree.

GPE store of apple	*Mechanically – work done by gravity* →	Apple's KE store.
	Mechanically – work done against air resistance →	Thermal energy store of apple and surroundings.

Power

One Watt	*One joule per second*

Power	*The rate at which energy is transferred*

A more powerful crane will lift a box up a certain height, quicker than a less powerful crane.

P = E ÷ t

Power = Work done ÷ time

Efficiency = useful energy transferred by the device ÷ total energy used by the device.

Efficiency	*How well (or uselessly) a device transfers energy*

High efficiency	*An energy transfer process that wastes less energy*
Low efficiency	*An energy transfer process that wastes a lot of energy*

Energy transferred	*Joule (J)*
Force	*Newton (N)*
Distance	*Meter (m)*
Gravitational Potential Energy (GPE)	*Joule (J)*
Mass	*Kilogram (Kg)*
Gravitational field strength (gfs)	*Newton per kilogram (N/Kg)*
Height	*Meter (m)*
Kinetic Energy (KE)	*Joule (J)*
Velocity	*Meter per second (m/s)*
Power	*Watt (W)*
Work done	*Joules (J)*
Time	*Seconds (s)*

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Work

Energy stored in a way that is not useful	Most 'wasted' energy is transferred into the thermal energy stores of the surroundings.
An object moving due to a force acting upon it	EG: push, pull, stretch, squash.
Thermal energy is transferred to the surroundings	The transfer of thermal energy into the thermal energy store of the surroundings causes the temperature to rise.
Objects dropping from a height	Energy transfers mechanically from the object's GPE energy store to the object's KE store.
Energy transferred by a force	Energy is transferred when things happen

Pushing an object along a rough surface and work is done against frictional forces.

Energy is transferred to the kinetic energy store of the object as it starts to move.

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	By: • Work done by forces • In electrical devices • In heating

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	The rate at which energy is transferred

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	An energy transfer process that wastes less energy
How well (or uselessly) a device transfers energy	
	An energy transfer process that wastes a lot of energy

	Joule (J)
	Newton (N)
	Meter (m)
	Joule (J)
	Kilogram (Kg)
	Newton per kilogram (N/Kg)
	Meter (m)
	Joule (J)
	Meter per second (m/s)
	Watt (W)
	Joules (J)
	Seconds (s)

EDEXCEL Topic 8 ENERGY – FORCES DOING WORK

Work

Non-useful energy stores

Mechanical process

Pushing an object

Energy is transferred

Some energy is also transferred

Dissipation

Energy transfer =

The temperature

Gravitational force doing work

ΔGPE = m X g X Δh

Work done

E = F X d

Energy transfer involves the way energy is stored when systems change

Energy in a system can be changed

KE = ½ X m X v^2

A force doing work

System	
Closed	
Open	

Total energy

Energy transfer diagrams

Energy transfer diagram for apple falling from a tree.

Power

One Watt

Power

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Power = Work done ÷ time

Efficiency

Efficiency

High efficiency	
Low efficiency	

Energy transferred	
Force	
Distance	
Gravitational Potential Energy (GPE)	
Mass	
Gravitational field strength (gfs)	
Height	
Kinetic Energy (KE)	
Velocity	
Power	
Work done	
Time	

Pushing

Energy is transferred

Some energy

The temperature

ΔGPE =

E =

KE =

Energy transfer

Total energy

Work

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Power

P =