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Physics Paper 1

for Combined Science

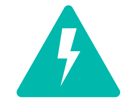
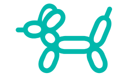
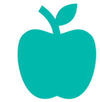
The Basics Booklet

Energy– The Basics

Units:

Name	Value	Symbol
Energy		
Mass		
Speed		
Spring Constant		
Extension		
Height		
Gravitational Field Strength		
Temperature Change		
Specific Heat Capacity		
Power		
Time		

Give the names of the different types of energy stores

What is the first Law of Thermodynamics:

Give the energy transfers in the following examples:

An electric kettle		→	
A battery powered torch		→	
A skydiver diving		→	
A car crashing into a wall		→	

Energy– The Basics

Define the following Key Words

System	
Kinetic Energy	
Elastic Potential Energy	
Gravitational Potential Energy	
Specific Heat Capacity	
Power	
Closed System	
Dissipated	
Renewable	
Non-Renewable	

Give the equation that links the following variables:

Kinetic Energy, Mass, Speed

Elastic Potential Energy, Extension, Spring Constant

Gravitational Field Strength, Gravitational Potential Energy, Height, Mass

Change in Thermal Energy, Mass, Specific Heat Capacity, Temperature Change

Energy Transferred, Power, Time

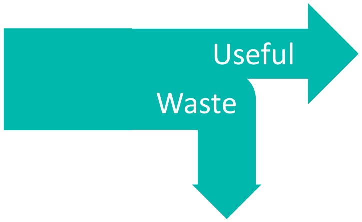
Power, Time, Work Done

Efficiency, Total Power Input, Useful Power Output

Efficiency, Total Input Energy Transfer, Useful Output Energy Transfer

Energy– The Basics

Sankey Diagrams



Circle the diagram above that shows the most efficient device.

Explain how you could make these devices more efficient:

Loss of heat in a coffee cup

Friction between the brakes and wheels of a bicycle

Sound created by a vibrating washing machine

A building that is losing a lot of heat

Complete the table for facts about the different energy resources:

Energy Resource	Renewable ?	Advantage	Disadvantage

Electricity – The Basics

Key Terms

Electric Current	
National Grid	

Units

Measurement	Unit	Symbol
Charge Flow		
Current		
Time		
Potential Difference		
Resistance		
Power		
Energy Transferred		

Circuit Symbols

Switch (open)		LED	
Switch (closed)		Lamp	
Cell		Fuse	
Battery		Voltmeter	
Diode		Ammeter	
Resistor		Thermistor	
Variable Resistor		LDR	

Electricity – The Basics

Equations

Complete the equations that link these terms:

Charge flow, Current & Time:

Current, Potential Difference & Resistance:

Current, Potential Difference & Power:

Current, Potential Difference & Resistance:

Energy Transferred, Power & Time

Charge Flow, Energy Transferred & Potential Difference:

Resistors

	Graph	Description
Ohmic conductor		
Filament Lamp		
Diode		

Thermistor

Use:

LDR

Use:

Electricity – The Basics

Circuit Rules Give the rules for current, potential difference, and resistance in these circuits:

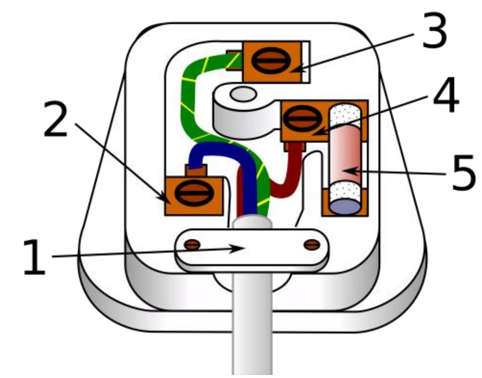
Series Circuit		Parallel Circuit	
Current		Current	
Potential Difference		Potential Difference	
Resistance		Resistance	

What type of supply is the mains electricity in the UK?	
What is the frequency of the UK domestic electricity supply?	
What is the potential difference of the UK domestic electricity supply?	

Alternating potential difference

Direct potential difference

Mains Electricity



	Live	Neutral	Earth
Colour			
Use			
Potential Difference			

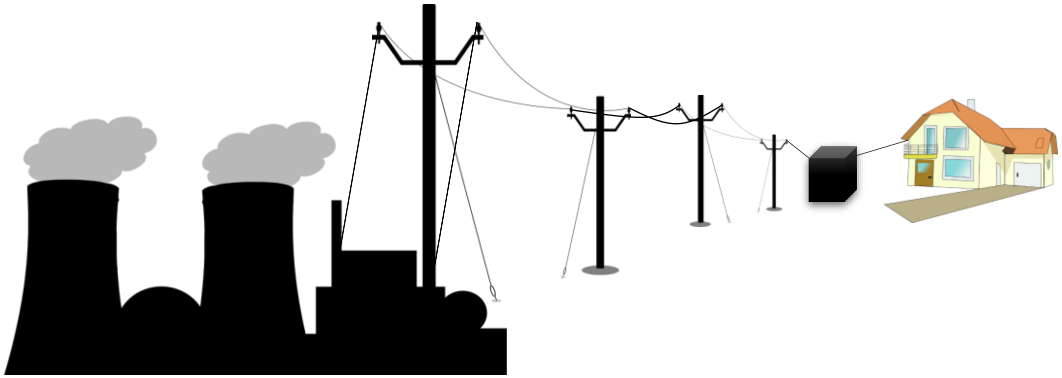
Energy Transfers

Give the energy transfers in the following devices:

Device	Input	Useful output	Waste output
Battery operated torch			
Mains electric fan			
Mains electric heater			

The National Grid

Label the key parts:



Define what each of these transformers do:

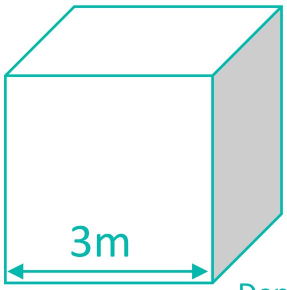
Step Up Transformers		Step Down Transformers	

Particle Model – The Basics

Units:

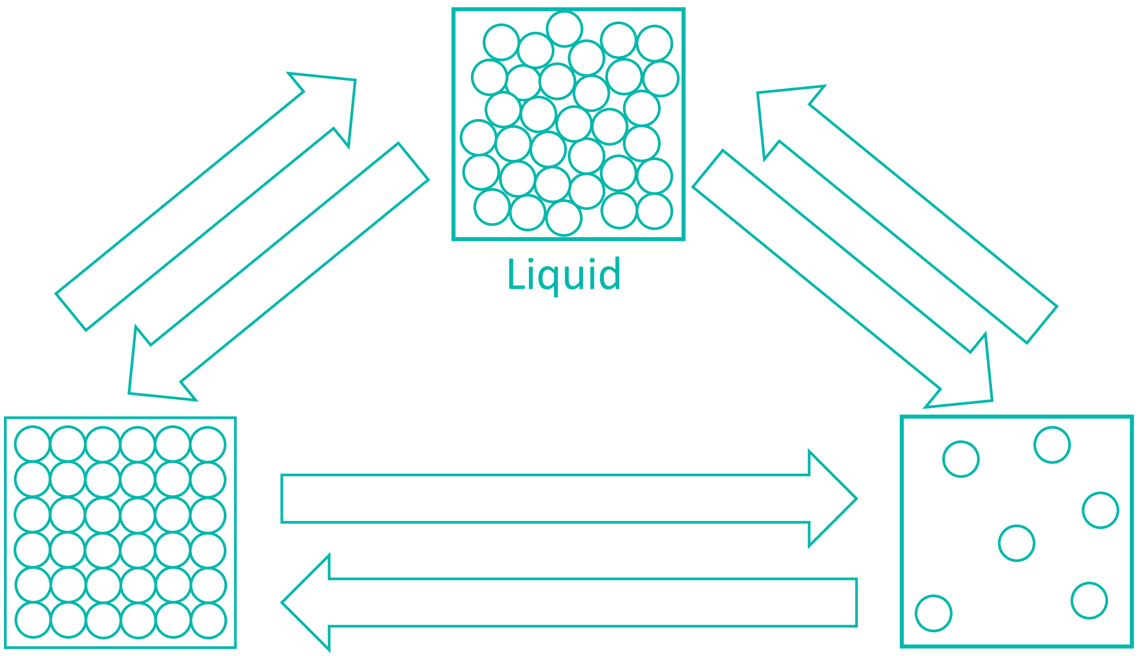
Name	Value	Symbol
Density		
Mass		
Volume		
Thermal Energy		
Specific Heat Capacity		
Temperature Change		
Specific Latent Heat		

Calculate the density of the following cube with a mass of 2.7kg:

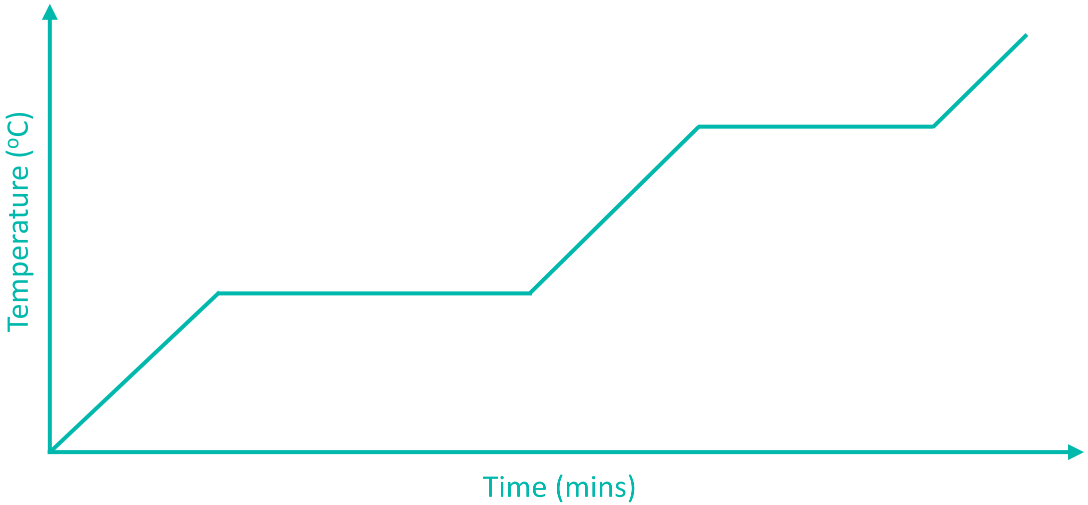


Density: ______________ Unit: ___________

Draw a diagram to model a solid, liquid and gas. Give the name of the state changes:



Label the graph with the key information it shows:



Particle Model – The Basics

Define the following Key Words

Density	
Physical Change	
Internal Energy	
Kinetic Energy	
Potential Energy	
Specific Heat Capacity	
Specific Latent Heat	
Specific Latent Heat of Vaporisation	
Specific Latent Heat of Fusion	

Give the equation that links the following variables:

Density, Mass and Volume

Change in Thermal Energy, Mass, Specific Heat Capacity&Temperature Change

Energy for a Change of State, Mass, Specific Latent Heat

Compare Specific Latent Heat & Specific Heat Capacity

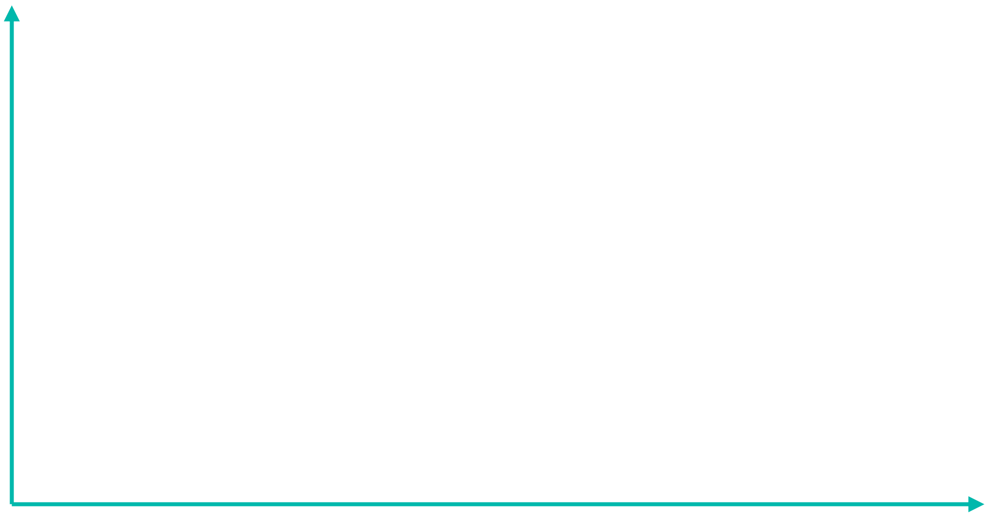
	Specific Latent Heat	Specific Heat Capacity
Temperature Change		
State Change		
Energy Used		

Particle Model – The Basics

Particle Motion in Gases

The molecules of a gas are in constant ____________________ motion.

Draw the relationship between the temperature of a gas and its pressure at a constant volume:



Describe the relationship between the temperature of a gas and its pressure at a constant volume:

Explain the relationship between the temperature of a gas and its pressure at a constant volume:

How much heat energy is required to raise the temperature of 5kg of aluminium by 10°C. The specific heat capacity of aluminium is 900 J/kg°C.

Energy: ____________________

Calculate the Specific Heat Capacity of Brass. It takes 7768J of heat energy to heat 0.9kg of solid brass from 10°C to 33°C. Give your answer to 3 significant figures.

Specific Heat Capacity: ____________________

How much heat energy does it take to tun 350g of boiling water into steam. The specific latent heat of fusion of ice is 335,000J/kg. The specific latent heat of vaporisation is 2,260,000J/kg

Heat Energy: ____________________

How much energy is needed to freeze 500 grams of water at 0°C?

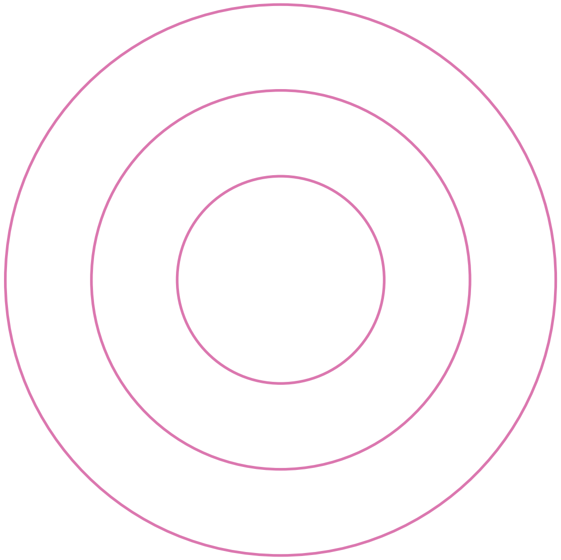
Energy: ____________________

Atomic Structure – The Basics

Key Terms:

Mass Number	
Atomic Number	
Isotope	
Ion	
Activity	
Half Life	
Contamination	
Irradiation	
Peer Review	

Complete and label the diagram showing the structure of an atom.



Labels

Nucleus
Proton
Electron
Neutron

Fill in the missing gaps for the following atoms:

Element	Atomic Mass	Number of protons	Number of neutrons	Number of electrons
Lithium				
Argon				
Calcium				
	20			
		30		
				36

Atomic Structure – The Basics

Complete the end of the sentences below:

All atoms of the same element have the same number of	
An isotopes of an element has a different number of	
An ion is an element that has lost or gained an	

Number the sentences in the correct order:

	The discovery of the proton
	The development of the plum pudding model
	The nucleus becomes an accepted scientific idea
	Niels Bohr suggested that electrons orbit the nucleus at specific distances
	The discovery of the electron
	James Chadwick provides evidence to show the existence of the neutron

Give the number to the following facts

The radius of an atom in metres	The charge on an electron	The atomic number of Sodium	The mass number of Sodium
The number of neutrons in Sodium	The mass of a proton	The number of electrons in an alpha particle	The number of protons in a helium nuclei

Which type of nuclear radiation is this?

Electromagnetic radiation from the nucleus	
This consists of two neutrons and two protons, it is the same as a helium nucleus	
The most penetrating type of radiation	
The least ionising type of radiation	
A high speed electron ejected from the nucleus as a neutron turns into a proton	
The most ionising type of radiation	

Atomic Structure – The Basics

Complete the nuclear equations:

$$^{219}_{86}\text{radon} \rightarrow {}^{\_\_}_{\_\_}\text{polonium} + {}^{\_\_}_{\_\_}\text{He}$$

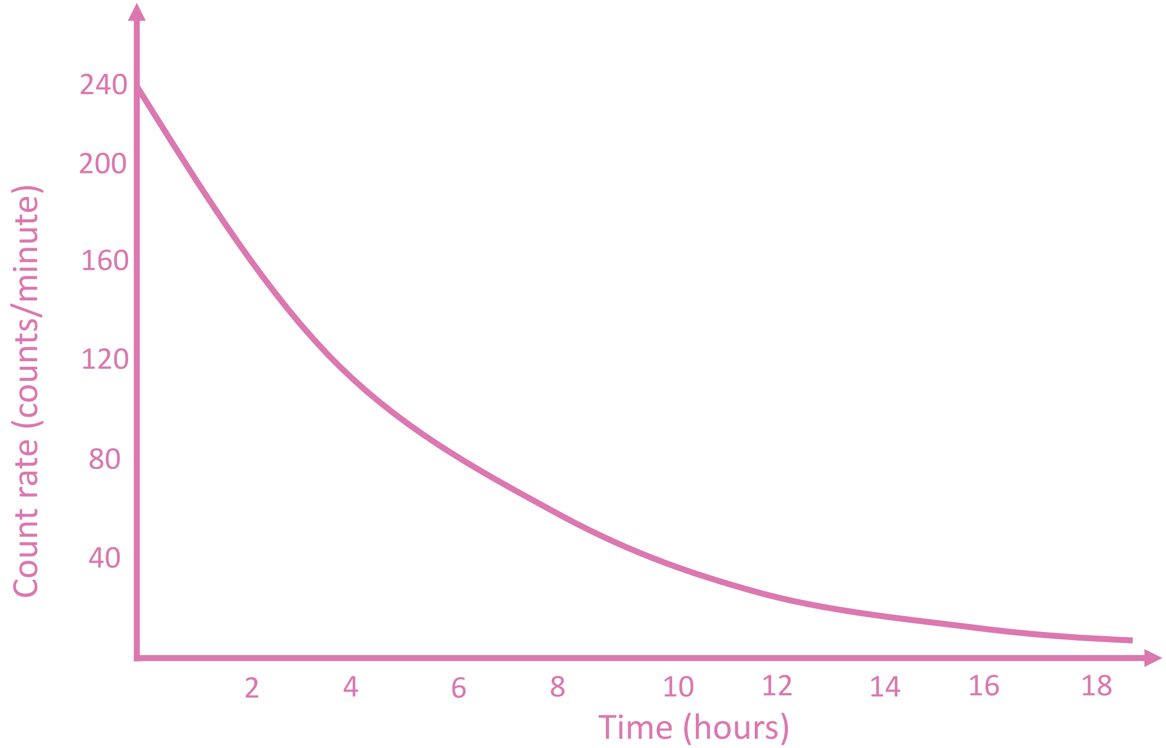
$$^{14}_{6}\text{carbon} \rightarrow {}^{\_\_}_{\_\_}\text{nitrogen} + {}^{\_\_}_{\_\_}\text{e}$$

Which type of nuclear radiation is this?

The emission of this type of radiation causes:

The charge of the nucleus to increase but the mass stays the same	
The mass and the charge of the nucleus do not change	
The charge of the nucleus and the mass decrease	

Calculate the half life of the following radioactive isotope.



The half life of Technetium-99m is 6 hours. 12mg of Techetium-99m is injected into a patient and starts to decay into Technetium-99.

Calculate the amount of Technetium 99m present in the patient after 24 hours.

Calculate the amount of Technetium-99 in the patient after 48 hours.