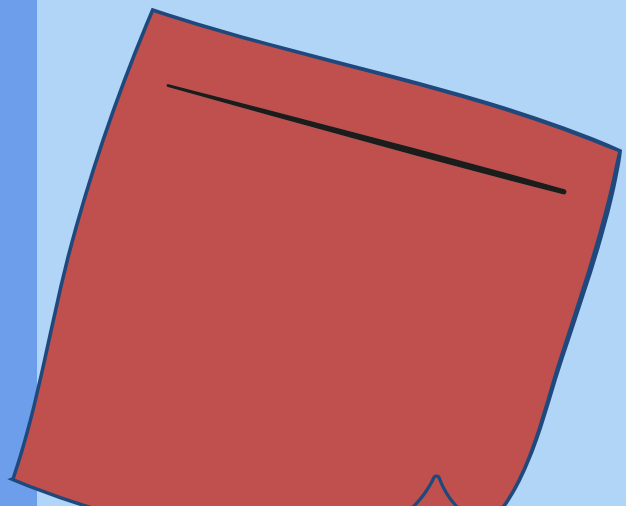
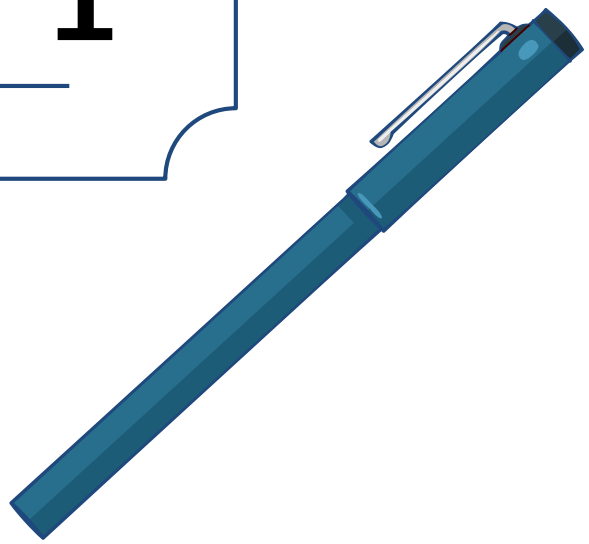
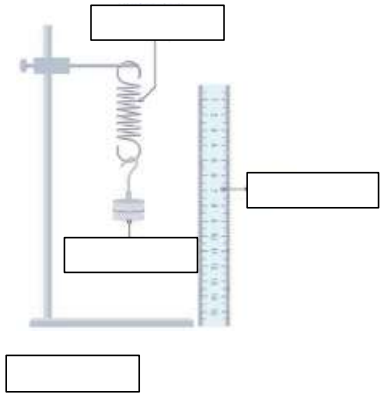
Year 10 Summer catch up, Physics paper 1





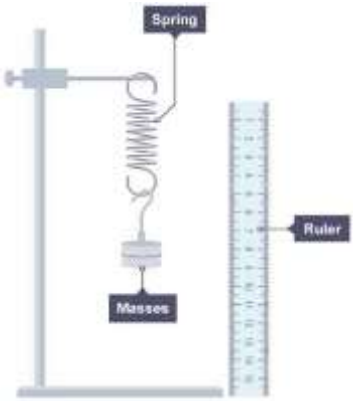
ENERGY

MNSP Science

State the 8 energy stores	What are the four energy transfers?	What equation is used to calculate gravitational potential energy?	What equation is used to calculate kinetic energy?	What equation is used to calculate energy efficiency?
	What equation is used to calculate work done?	What equation is used to calculate power?	What equation defines Hooke's law?	What is defined as the energy required to increase the temperature of 1kg of a substance by 1oC?
Label the equipment 	What are the three methods of heating?	What type of heating only occurs in solids?	What is transferred when particles bump into each other?	What do metals have that make them good conductors?
	Is nuclear power renewable or non-renewable?	What are the three fossil fuels?	Give three examples of renewable energy resources.	What energy resource is produced by controlling the flow of water through a turbine?
What is described as the point beyond which Hooke's law is no longer true when stretching a material?	Describe the relationship between force and extension for objects that obey Hooke's law.	Give two disadvantages of fossil fuels.	Give one advantage of fossil fuels.	Give two disadvantages of wind turbines.

ENERGY

MNSP Science

State the 8 energy stores Magnetic store Internal store Chemical potential Kinetic store Gravitational potential store Electrostatic store Elastic potential store	What are the four energy transfers? Mechanical Radiance Thermal Electrical	What equation is used to calculate gravitational potential energy? GPE = m x g x h	What equation is used to calculate kinetic energy? KE = 1/2mv2	What equation is used to calculate energy efficiency? efficiency =useful output total input
	What equation is used to calculate work done? W.D. = F X D	What equation is used to calculate power? E = P x T	What equation defines Hooke's law? F = K x E	What is defined as the energy required to increase the temperature of 1kg of a substance by 1oC? specific heat capacity
Label the equipment  	What are the three methods of heating? Conduction, convection and radiation	What type of heating only occurs in solids? conduction	What is transferred when particles bump into each other? Energy	What do metals have that make them good conductors? Delocalised electrons
	Is nuclear power renewable or non-renewable? non-renewable	What are the three fossil fuels? Coal, oil and gas	Give three examples of renewable energy resources. Solar, wind, hydroelectric	What energy resource is produced by controlling the flow of water through a turbine? Electrical
What is described as the point beyond which Hooke's law is no longer true when stretching a material? limit of proportionality	Describe the relationship between force and extension for objects that obey Hooke's law. directly proportional	Give two disadvantages of fossil fuels. non-renewable resource – will run out, combustion of fossil fuels increases CO_2 emissions	Give one advantage of fossil fuels. reliable	Give two disadvantages of wind turbines. will only produce electricity when there is wind (unpredictable), spoils the view (visual pollution).

EXAM EXPOSURE

MNSP Science

Give one environmental advantage to turning off electrical appliances when they are not being used.

A 'can-chiller' is used to make a can of drink colder. The can-chiller decreases the temperature of the liquid in the can by 15 °C. The mass of liquid is 0·33 kg. The specific heat capacity of the liquid is 4200 J/kg°C.

Calculate the energy transferred from the liquid as it cools.

Figure 1

current efficiency energy force frequency

Step-up transformers are used to increase the potential difference, which causes a decrease in the _____.

This means that the temperature of the cables is lower, so there is less wasted _____.

This increases the _____ of the power transmission process.

A farmer plans to generate all the electricity needed on her farm, using either a biogas generator or a small wind turbine. The biogas generator would burn methane gas. The methane gas would come from rotting the animal waste produced on the farm.

When burnt, methane produces carbon dioxide. The biogas generator would cost £18 000 to buy and install. The wind turbine would cost £25 000 to buy and install.

The average power output from the wind turbine would be the same as the continuous output from the biogas generator.

Evaluate the advantages and disadvantages of the two methods of generating electricity.

Conclude, with a reason, which system would be better for the farmer to buy and install.

EXAM EXPOSURE

MNSP Science

Give one environmental advantage to turning off electrical appliances when they are not being used.

Less greenhouse gases released Less contribution to global warming

A 'can-chiller' is used to make a can of drink colder. The can-chiller decreases the temperature of the liquid in the can by 15 °C. The mass of liquid is 0·33 kg. The specific heat capacity of the liquid is 4200 J/kg°C.

Calculate the energy transferred from the liquid as it cools.

Figure 1

E = 0.33 x 4200 x 15

E = 20790 J

Step-up transformers are used to increase the potential difference, which causes a decrease in the current.

This means that the temperature of the cables is lower, so there is less wasted energy.

This increases the efficiency of the power transmission process.

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Evaluate the advantages and disadvantages of the two methods of generating electricity.

Conclude, with a reason, which system would be better for the farmer to buy and install.

Advantages of both methods:
both renewable sources of energy
both have no fuel (cost)
both have very small (allow 'no') running costs
no carbon dioxide produced accept carbon neutral, accept no greenhouse gases, accept doesn't contribute to global warming
Advantages of wind:
higher average power output produces more energy is
insufficient Advantages of hydroelectric:
constant / reliable power (output)
lower (installation) cost
Disadvantages of wind:
higher (installation) cost
variable / unreliable
power output (may) kill
birds / bats
Disadvantages of
hydroelectric:
lower power output
(may) kill fish or (may)
damage habitats more difficult
to set up (within river)
Disadvantages of both
methods:
(may be) noisy
visual pollution ignore payback time unless no other relevant points made, ignore time to build for both

ELECTRICITY

MNSP Science

Draw the symbol for an LED.	What is current?	What is potential difference?	What is charge flow?	What is the difference between series and parallel circuits?
Which piece of equipment is used to measure current?	What piece of equipment is used to measure potential difference?	What is electrical resistance?	List all the types of resistors.	What is the purpose of the cell or battery in a circuit?
What is the rule for current in a series circuit?	What is the rule for current in a parallel circuit?	What is the rule for potential difference in a series circuit?	What is the rule for potential difference in a parallel circuit?	What is power?
What colour are each of the wires in a plug?	What does the live wire do?	What does the neutral wire do?	What does the earth wire do?	What does a fuse do?
What equation links time, charge flow and current?	What equation links current, potential difference and resistance?	What equation links power, potential difference and current?	What equation links current, power and resistance?	Why are the plug casings made of plastic?

ELECTRICITY

MNSP Science

Draw the symbol for an LED. 	What is current? Rate of flow of electrical charge	What is potential difference? How much energy is transferred between two points on a circuit	What is charge flow? Property of a particle that experiences a force in a magnetic field.	What is the difference between series and parallel circuits? Series =one path for current to flow Parallel =multiple paths for current to flow
Which piece of equipment is used to measure current? Ammeter	What piece of equipment is used to measure potential difference? Voltmeter	What is electrical resistance? Opposition to the flow of current.	List all the types of resistors. Fixed resistor Variable resistor Light dependent resistor (LDR) Thermistor	What is the purpose of the cell or battery in a circuit? Transfer potential difference to the charges (electrons)
What is the rule for current in a series circuit? Current is the same everywhere in a series circuit	What is the rule for current in a parallel circuit? Current splits along the different paths in a parallel circuit	What is the rule for potential difference in a series circuit? Potential difference splits between the components in a series circuit	What is the rule for potential difference in a parallel circuit? Potential difference is the same on each path in a parallel circuit	What is power? The amount of energy transferred each second
What colour are each of the wires in a plug? Brown=live Blue =neutral Green and Yellow =earth	What does the live wire do? Carries current into the device	What does the neutral wire do? Completes the circuit	What does the earth wire do? Provides a path for current to flow from the case of the device to the ground if there is a fault	What does a fuse do? Glass or ceramic canister containing a thin wire that melts if the current gets too high
What equation links time, charge flow and current? Charge flow =current x time	What equation links current, potential difference and resistance? Potential difference =current x resistance	What equation links power, potential difference and current? Power =current x potential difference	What equation links current, power and resistance? Power =current ^{2} x resistance	Why are the plug casings made of plastic? Plastic is a good insulator

EXAM EXPOSURE

MNSP Science

Use the correct ***word*** to complete the sentence.

atoms protons electrons ions

Metals are good conductors of electricity because electrical charge is transferred by delocalised

When the potential difference across the resistor was 0.80V, the current in the resistor was 0.020 A

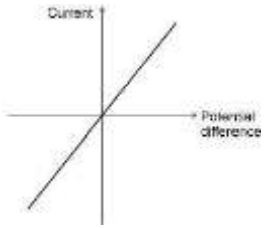
Calculate the power dissipated by the resistor.

Use the equation:

power = potential difference × current

The diagram below shows a sketch graph of the student's results. The LDR was in a constant bright light.

The student concluded that the current in the LDR is inversely proportional to the potential difference across the LDR. Explain why the student's conclusion is incorrect.



In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Information about the two electricity generation systems is given in the table. Compare the advantages and disadvantages of the two methods of generating electricity.

Use your knowledge of energy sources as well as information from the table.

The wind turbine costs £50 000 to buy and install.
The hydroelectric generator costs £20 000 to buy and install.
The average power output from the wind turbine is 10 kW.
The hydroelectric generator will produce a constant power output of 8 kW.

EXAM EXPOSURE

MNSP Science

Use the correct ***word*** to complete the sentence.

atoms protons electrons ions

Metals are good conductors of electricity because electrical charge is transferred by delocalised **electrons**

When the potential difference across the resistor was 0.80V, the current in the resistor was 0.020 A

Calculate the power dissipated by the resistor.

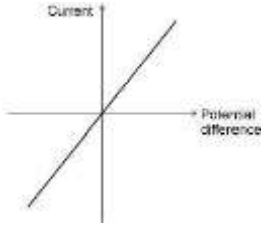
Use the equation:

power = potential difference × current

0.80 x 0.020 = 0.016

The diagram below shows a sketch graph of the student's results. The LDR was in a constant bright light.

The student concluded that the current in the LDR is inversely proportional to the potential difference across the LDR. Explain why the student's conclusion is incorrect.



- graph shows) direct proportion
- (because) it is a straight line through the origin

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

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The hydroelectric generator costs £20 000 to buy and install.
The average power output from the wind turbine is 10 kW.
The hydroelectric generator will produce a constant power output of 8 kW.

Use your knowledge of energy sources as well as information from the table.

- both renewable sources of energy
- both have no fuel (cost)
- both have very small (allow 'no') running costs
- no carbon dioxide produced *accept carbon neutral, accept no greenhouse gases, accept doesn't contribute to global* warming

Advantages of wind:

- higher average power output *produces more energy is insufficient*

Advantages of hydroelectric:

- constant / reliable power (output)
- lower (installation) cost Disadvantages of wind:

- higher (installation) cost
- variable / unreliable power output
- (may) kill birds / bats

Disadvantages of hydroelectric:

- lower power output
- (may) kill fish or (may) damage habitats
- more difficult to set up (within river)

Disadvantages of both methods:

- (may be) noisy
- visual pollution *ignore payback time unless no other relevant points made, ignore time to build for both*

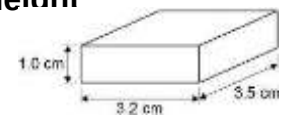
PARTICLE MODEL OF MATTER

MNSP Science

What are the three states of matter?	Describe the arrangement of particles in a solid.	Describe the arrangement of particles in a liquid.	Describe the arrangement of particles in a gas.	What is density?
What is the equation that links mass, density and volume?	What piece of equipment is used to measure the density of an irregularly shaped object?	How can you tell when a symbol equation is balanced?	What two types of energy is internal energy the sum of?	What is described as the amount of energy needed to change the state of one kg of a substance?

EXAM EXPOSURE

Use the following equation to calculate the volume of stone B in cm^3. **volume = length × width × height**



The mass of stone B is 56 grams. Use your answer from above to calculate the density of stone B in g/cm^3

A scientist cooled the air inside a container. The temperature of the air changed from 20 °C to 0 °C. The volume of the container of air stayed the same. Explain how the motion of the air molecules caused the pressure in the container to change as the temperature decreased.

PARTICLE MODEL OF MATTER

MNSP Science

What are the three states of matter? Solid, liquid and gas	Describe the arrangement of particles in a solid. Lattice structure Particles touching Vibrate around fixed point Low energy	Describe the arrangement of particles in a liquid. Randomly arranged Particles touching Particles move around each other moderate energy	Describe the arrangement of particles in a gas. Randomly arranged Particles far apart Particles move quickly in all directions High energy	What is density? How closely packed the particles are in a solid, liquid or gas
What is the equation that links mass, density and volume? density =mass ÷ volume	What piece of equipment is used to measure the density of an irregularly shaped object? eureka can	How can you tell when a symbol equation is balanced? there is equal amounts of atoms on each side of the equation.	What two types of energy is internal energy the sum of? Kinetic energy and potential energy	What is described as the amount of energy needed to change the state of one kg of a substance? Specific latent heat

EXAM EXPOSURE

Use the following equation to calculate the volume of stone B in cm^3.

volume = length × width × height

volume = 3.5 × 3.2× 1.0= 11.2cm3

The mass of stone B is 56 grams. Use your answer from above to calculate the density of stone B in g/cm^3

56 ÷ 11.2 =5
Density =5 g/cm3

A scientist cooled the air inside a container. The temperature of the air changed from 20 °C to 0 °C. The volume of the container of air stayed the same. Explain how the motion of the air molecules caused the pressure in the container to change as the temperature decreased.

pressure decreased

because molecules have less (kinetic) energy *allow less speed/velocity*

so fewer collisions (with the wall/container each second) *allow collide with less force, allow less force on the walls*

ATOMIC STRUCTURE AND RADIATION

Name the 3 types of radiation.	What is an isotope?	What is an alpha particle?	What is an beta particle?	What is gamma radiation?
What is meant by half life?	What is described as exposing objects to beams of radiation?	What is described as if an object has a radioactive material introduced into it?	Why do some isotopes go through nuclear decay?	What protection methods do we put in place to keep us safe from radiation poisoning?

EXAM EXPOSURE

Complete the nuclear equation to show the radioactive decay of polonium-210
Use the periodic table to help you.

$$^{210}_{84}Po \longrightarrow \_\_\_\_ + {}^{4}_{2}He$$

The teacher investigated how the thickness of lead affected the amount of gamma radiation that could pass through it. Explain why the teacher stood as far away from the apparatus as possible.

Ionising radiation can be used to treat patients in hospital. People working in hospitals must limit their exposure to ionising radiation. Explain how the use of ionising radiation in hospitals can be both useful and harmful.

ATOMIC STRUCTURE AND RADIATION

MNSP Science

Name the 3 types of radiation. alpha, beta and gamma	What is an isotope? an atom with the same number of protons but a different number of neutrons	What is an alpha particle? 2 protons and 2 neutrons or helium nucleus	What is an beta particle? high speed electron	What is gamma radiation? electromagnetic wave
What is meant by half life? time taken for activity to half or for half the radioactive nuclei to decay	What is described as exposing objects to beams of radiation? irradiation	What is described as if an object has a radioactive material introduced into it? contamination	Why do some isotopes go through nuclear decay? they have and unstable nucleus / the decay stabilises the nucleus	What protection methods do we put in place to keep us safe from radiation poisoning? keeping your distance from the source,

EXAM EXPOSURE

Complete the nuclear equation to show the radioactive decay of polonium-210
Use the periodic table to help you.

$^{210}_{84}Po \longrightarrow \underset{82}{\overset{206}{Pb}} + {}^{4}_{2}He$

The teacher investigated how the thickness of lead affected the amount of gamma radiation that could pass through it. Explain why the teacher stood as far away from the apparatus as possible.

Ionising radiation can be used to treat patients in hospital. People working in hospitals must limit their exposure to ionising radiation. Explain how the use of ionising radiation in hospitals can be both useful and harmful.

- used to diagnose problems
- X-rays and CT scans
- sterilising instruments/killing bacteria
- Radiotherapy
- to treat cancer
- used to kill cancer cells
- medical tracers
- gamma knives

Harm

- can change / mutate DNA
- causing cells to grow uncontrollably
- causing tumours / cancer
- from regular exposure causing increased dose
- to eggs / sperm / embryos