Y9 Energy Homework Grids

Name: _____

Science Teacher: _____

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Grid 1.1: Use KO 40 – 41 Due: _____

State 3 types of energy store

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State three pathways of energy transfer

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What is a closed system?

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The following are types of what store of energy:

A battery

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A moving car

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Complete the following unit conversions, show your working out, you can use a calculator:

1000 kJ =…..... J
2200 kJ =…..... J
30.3 kJ =…..... J
12J = …..... kJ
282800 J = …..... kJ

151g = …..... kg
243g = …..... kg
8 kg = …..... g
24 kg = …..... g

The speed of a rocket just after being launched is 12 m / s.
The mass of the rocket is 0.05 kg.

(i) Calculate the kinetic energy of the rocket just after being launched.

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Kinetic energy = ...J

(2)

The speed of a car is 30 m / s.
The mass of the car is 1500 kg.

(i) Calculate the kinetic energy of the car.

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Kinetic energy = ...J

(2)

Grid 1.2: Use KO 41 Due: _____

A mass is attached to the bottom of a hanging spring with a spring constant of 250 N/m. It stretches from 10.0 cm to 11.4 cm.

Calculate the elastic energy stored by the stretched spring.
REMEMBER TO CONVERT YOUR UNITS

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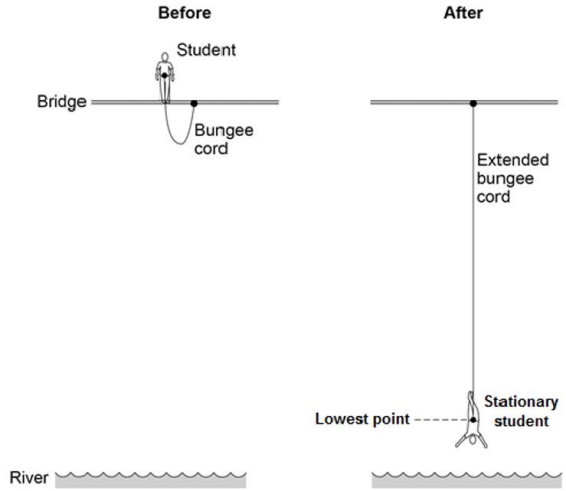
The image below shows a student before and after a bungee jump.



A bow is attached to an with a spring constant of 80 N/m. It stretches from 0 cm to 50cm cm.

Calculate the elastic energy stored by the stretched spring.
REMEMBER TO CONVERT YOUR UNITS

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The bungee cord has an unstretched length of 20 m. The student jumps off the bridge.
Complete the sentences to describe the energy transfers.

Before the student jumps from the bridge he has a store of ……..... energy.
When he is falling, the student's store of ..... energy increases.
When the bungee cord is stretched, the cord stores energy as ……..... ..... energy.

Grid 1.3: Use KO 43 Due: _____

What type of objects have gravitational potential energy?

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What are the units for gravitational potential energy, mass, gravitational field strength and height?

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Write down the equation that links kinetic energy, mass and speed.

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Use the specific heat capactiy equation to answer the following:

How much energy is released into the surroundings when a cup of tea holding 250g of fluid cools from 90°C to 40°C? c = 4200 J/kg°C

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Calculate the **gravitational potential energy** of the following objects on Earth:

m = 10 kg
h = 5 m

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m = 20 kg
h = 15 m

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m = 100 g (you must convert g into kg before you calculate E_K)
h = 100 cm (convert to m)

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Grid 1.4: Use KO 42 Due: _____

What is the equation that links work done, force and distance?

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What is work done equivalent to?

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How much work is done by the brakes if a 5000N braking force is used to stop a car over 20m?

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The diagram below shows a crane being used to lift a shipping container.
The container was lifted a height of 14 m
The crane did 3 430 000 J of work on the container.
Calculate the force exerted by the crane on the container.

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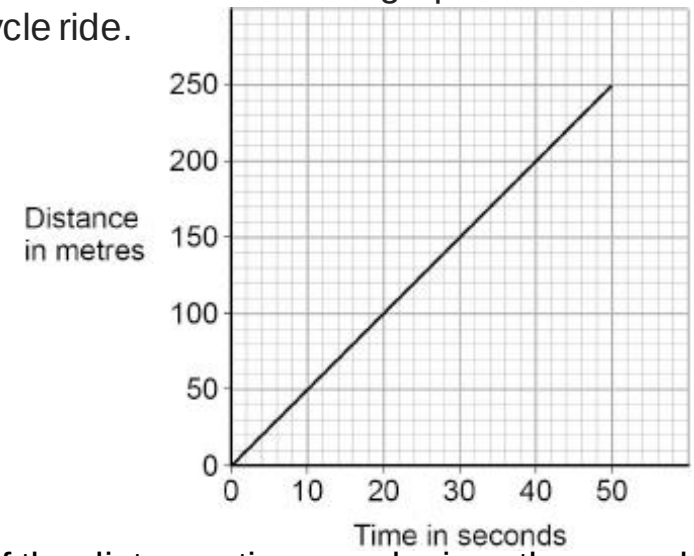
The graph below shows a distance-time graph for 50 seconds of a bicycle ride.



A) The gradient of the distance-time graph gives the speed of the bicycle.
Determine the speed of the bicycle.

…… $\frac{250 - 0}{50 - 0}$ ……

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Speed =..... m/s

The bicycle travels a distance of 250 m
The bicycle exerts a constant horizontal force of 30 N on the ground.
Calculate the work done. Give the unit.

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.....Work done = ... Unit .....

Grid 1.5: Use KO 44 & 61 Due: _____

Calculate the **energy ΔE** (in **J**) for each of the following:

m = 10 kg and Δθ = 4 °C (for **water SHC = 4200**)

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m = 15.5 kg and Δθ = 0.5 °C (for **aluminium SHC = 899**)

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m = 0.5 kg and Δθ = 20 °C (for **copper SHC = 390**)

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HIGHER – Calculate the **energy ΔE** (in **J**) for each of the following: **must convert units**

m = 12.2 g and Δθ = 10.1 °C (for **concrete SHC = 900**)

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m = 300.3 g and Δθ = 0.8 °C (for **copper SHC = 390**)

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In the specific heat capacity required practical state the following.

Independent variable

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Dependent variable

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Control variables

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Two sources of error in the practical

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What variable goes on the x –axis of the graph?

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Calculate the power of a motor that uses 40,000 J of energy to lift an object in 20 seconds.

Give your answer in kW.

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Grid 1.6: Use KO 44 Due: _____

Write down the equation which links energy transferred (E) , power (W) and time (t).

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The power of a fan heater is 2.75 kW.
Calculate how many kilowatt hours (kWh) of energy are transferred when the fan heater is used for 6 hours.

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How much will it cost to use the fan heater for 6 hours if one Unit of electricity costs 7p?

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The power of a microwave is 4.00 kW.
Calculate how many kilowatt hours (kWh) of energy are transferred when the microwave is used for 0.5 hours.

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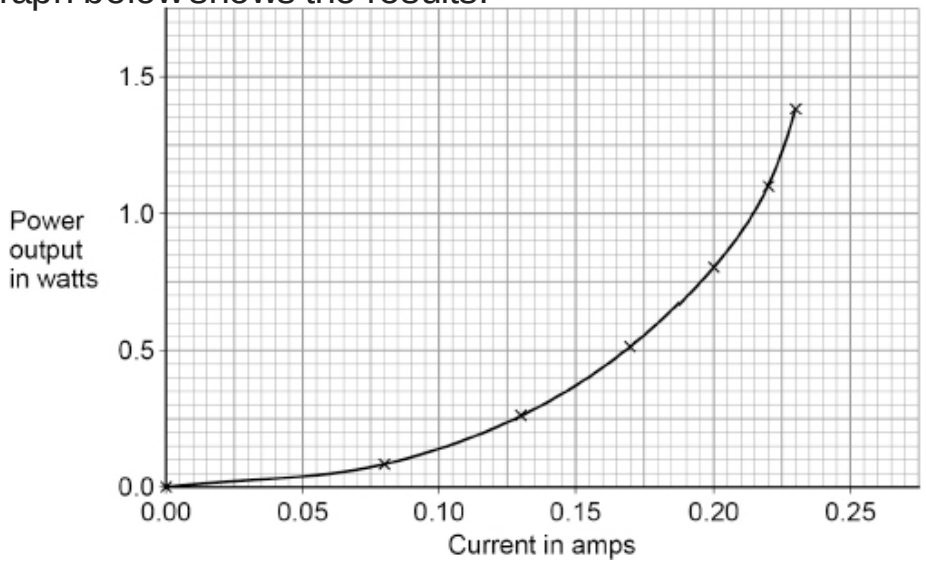
A student investigated how the power output of a filament lamp varied with the current in the lamp. The graph below shows the results.



Describe how varying the current affects the power output of the filament lamp.

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What would the power output be at 0.15 current?

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What current would have a power output of 1.25 W?

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Grid 1.7: Use KO 46, 49,50 Due: _____

An eco-house is designed to be environmentally friendly.

The solar panels and a wind turbine are used to generate electricity for the eco-house.
Solar and wind are both renewable energy resources.
What does renewable energy resource mean?
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Biomass, nuclear and natural gas are three other energy resources.

State whether each energy resource is renewable or non-renewable
Biomass ….....
Nuclear ….....
Natural gas ….....

Moving air makes the wind turbine spin.
The wind turbine generates electricity which is used to charge a battery.
Complete the sentences.

When the wind turbine spins faster there is an increase in its …..... energy.
Charging the battery increases the
…..... store of energy of the battery.

The average power transferred to the solar panels by sunlight is 26 000 W
Calculate the average energy transferred to the solar panels in 30 seconds.
Use the equation:

energy transferred = power × time

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Average energy transferred to solar panels = …..J

Write down the equation that links efficiency, total power input and useful power output.
….....

The solar panels on the roof of the eco-house have an efficiency of 0.15
The average power input to the solar panels is 26 000 W
Calculate the average useful power output from the solar panels.
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Average useful power output = ….. W

Grid 1.8: Use KO 50 and 51 Due: _____

A small group of people live in an area in the mountains. The people plan to buy an electricity generating system that uses either the wind or the flowing water in a nearby river.

- 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

Compare the advantages and disadvantages of the two methods of generating electricity.
Use your knowledge of energy resources and information given.

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State 2 advantages of geothermal power
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Explain why some people may argue wind power would be better in the UK than geothermal and solar power
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Explain why some people may argue wind power would be better in the UK than solar power
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What type of energy is the basis for petrol and diesel?
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Why are bio-fuels reliable?
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Which fuel has the highest energy density per kg?
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What is released when you burn fossil fuels and why is it an issue?
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What is found in coal that causes acid rain?
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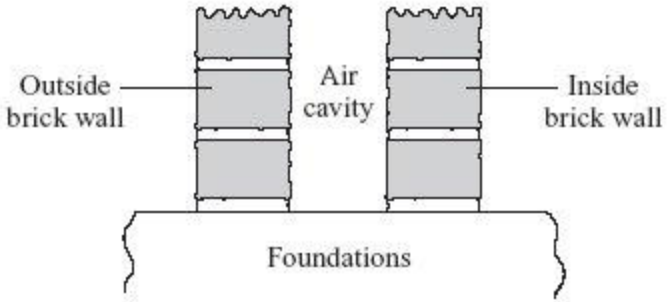
Grid 1.9: Use KO 48 Due: _____

The diagram shows a section through the walls of a house built in 1930.



The diagram shows a section through the walls of a house built in 1930.

Explain how the air cavity between the two walls reduces the heat transfer from the house.

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The table on the other side of the page shows the installation costs and yearly savings on energy bills for different methods of insulating a house.

Give **one** reason why loft insulation is often fitted to an old house before double glazing or cavity wall insulation.

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Method	Insulation cost in £	Yearly saving on energy bills in £
Double glazing	4000	65
Loft insulation	240	60
Cavity wall insulation	600	80

The time it takes for the saving on energy bills to equal the cost of installing the insulation is called the pay-back time.

Calculate the pay-back time for loft insulation.

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What are the 3 methods of heat transfer and what medium do they occur in?

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What happens to the density of objects as they are heated?

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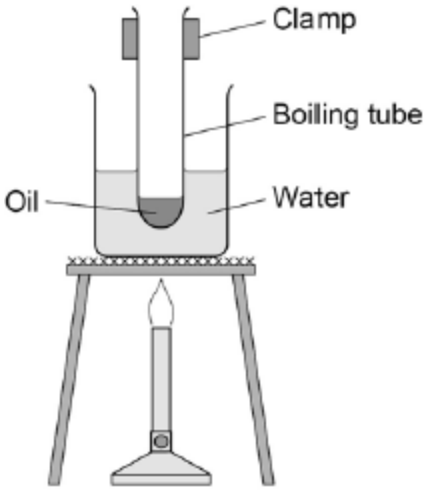
Grid 1.10: Use KO 61 Due: _____

A student investigated the change in temperature when oils of different specific heat capacities were heated.
She set up the apparatus shown in the figure below.



This is the method used.

1. Put 25 g of oil into a boiling tube.
2. Pour 100 ml of water into a beaker and heat it with a Bunsen burner.
3. When the water is boiling, put the boiling tube into the beaker.
4. When the temperature of the oil reaches 30 °C, heat for a further 30 seconds and record the rise in temperature.
5. Repeat with different oils.
6. Repeat the whole investigation.

Name **two** pieces of apparatus the student used that are **not** shown in the figure above.

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What are the independent and dependent variables in the student's investigation?

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Give **two** safety precautions the student should have taken.

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Suggest **one** improvement to the student's method.

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The mean change in temperature of the castor oil is 20 °C
The specific heat capacity of castor oil is 1 800 J / kg °C
The mass of oil used is 0.025 kg
Calculate the change in thermal energy of the castor oil the student used.

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