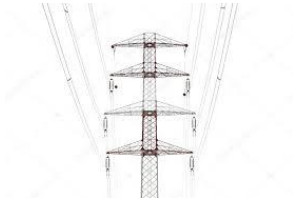
HEAD BREAKING QUESTIONS

Things that make you go… what?

HIGHER LEVEL SYNOPTIC QUESTIONS

WHA PHYSICS
S McKelvie

A power pylon has 33Kv passing through a low resistance wire of 6KΩ. The wire is 149m long and reaches a temperature of 32^0C. Calculate the power lost in the wires during transmission.



Lessons for next time:

_____kW

Pylons are 95% efficient. How much time would it take to transfer 1.5MJ

Lessons for next time:

_____s

A toaster needs 64.12kJ to toast bread. It is plugged into the mains, and the heating element has a resistance of 0.076kΩ. How much time would it take to toast a slice of bread.

Lessons for next time:

_____min

On Planet Steve, an object has 2.6MJ of KE was dropped from 1.3km. Suggest a range of masses for the object.

Lessons for next time:

_____Kg

A Generator has an efficiency of 32% and produces 1.8kJ/s. What is the total amount of energy being transferred to the generator?

_____J

14% of the energy from the water is transferred in turbines. Deduce how much energy is in the flowing stream.

_____kJ

The Dam is 14m high and the water is 14°C. Each particle of water has an internal energy store of 134.5pJ and oscillates at a frequency of 13GHz. Calculate the mass of the water flowing through the dam.

_____kg

Calculate the velocity of the water through the HEP stations.

_____m/s

Lessons for next time:

State whether these are series or parallel circuits. Explain your answer.

A: The power pack is set at 12V. There are two bulbs and 2 ammeters. One bulb has a voltage of 3V and a current of 1.2A.

B: The total voltage of this circuit is 9V and the total current is 3A. One bulb, when measured with an ohmmeter has a resistance of 2Ω. There are no smaller resistors than this one.

C: The voltage over a bulb is 6V and the resistance is 0.51A. the voltage of an immersion heater is 14V and the resistance is 1.19Ω.

An old generator produces 21Kj/min of useful energy with every litre of fuel used. Each litre of diesel contains 15,757J of chemical energy. What is the efficiency when the generator is filled with 3.3L of fuel and runs out in 2.5 mins ?

_____%

After lubrication with 3.5% m/vmmol silica lubricant, it is no 20% efficient. Calculate the useful energy output.

Lessons for next time:

_____J/s

A rocket is launched at 450m/s. The mass of the booster is 8 tonnes and the mass of the probe is 2.7 tonnes. How high did the rocket reach?

Lessons for next time:

_____km

What velocity would the rocket have to reach to achieve low earth orbit at 114km

Lessons for next time:

_____m/s

Mr Hewitt lifts a box of glue to a shelf. The box is 8.6kg and the shelf is 1.6m high. How much energy was transferred in the process?

_____J

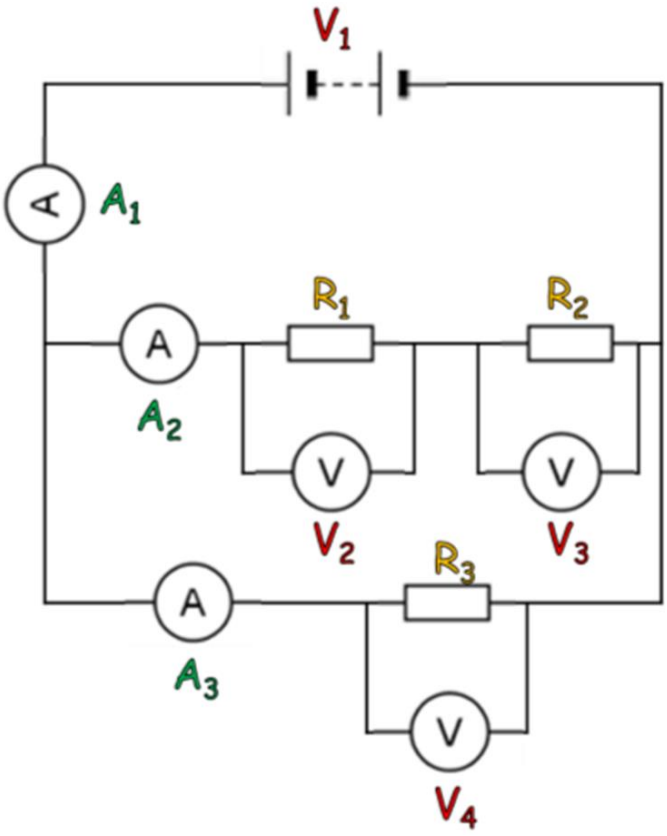
This proved too much, and Mr Hewitt hurt his back. He rigged a motor to the mains electricity and included a 3A fuse for safety. What would be the minimum time that the motor would need to lift the box.

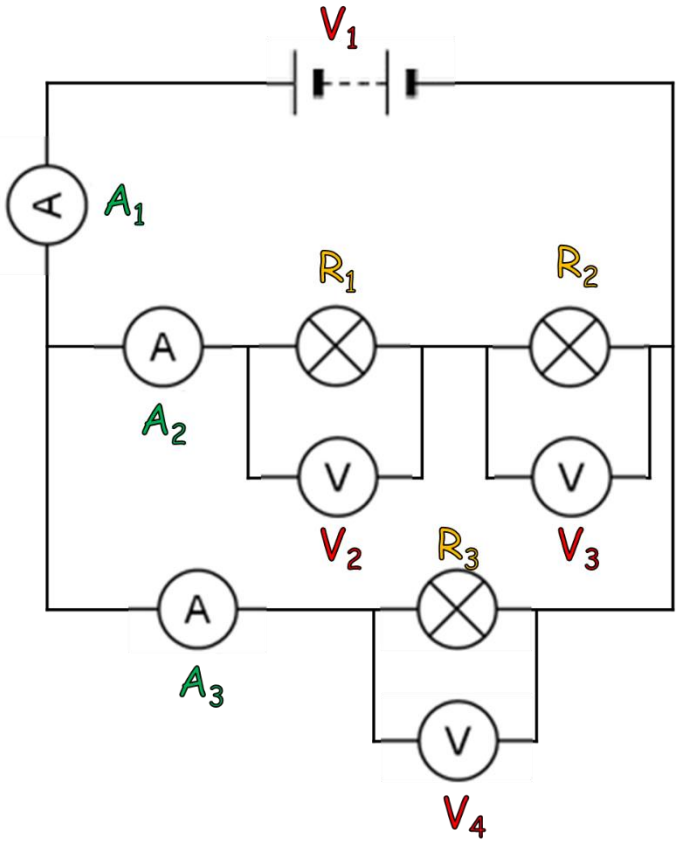
_____s

The efficiency of the motor is only 5%. How long would it actually take to lift the box?

Lessons for next time:

_____s





The power pack gives 12V to the circuit.

The resistor R_3 has a rating of 10Ω. Calculate the current in A_3.

_____A

The current shown in A_1 is 2.5A. Calculate the current in A_2.

_____A

V_2 shows a rating of 5V. Calculate the calculate the value of R_1.

_____Ω

Calculate the value of R_2.

_____Ω

Calculate the resistance in the whole circuit.

_____Ω

Show the potential difference of the complete circuit is 12V.

_____V

Explain why the resistance of the circuit is less than 10Ω.

Calculate the power transferred in the circuit using the voltage and current in the circuit.

_____W

Using the power rating, show the total resistance of the circuit is less than 10Ω.

Lessons for next time:

_____W

The Power of the circuit decreased by 50% when the filament lamps were added. Calculate the new current at A_1.

_____A

Calculate the current at A_2.

Lessons for next time:

_____A

V_2 shows a rating of 4V, calculate the resistance in R_1.

_____Ω

Calculate the resistance of the filament lamp in R_2.

_____Ω

Explain why the resistance of the filament lamps has increased.

Using the equation $P=I^2R$, calculate the resistance of the complete circuit.

_____Ω

Using the rules of resistance in series and parallel circuits, confirm this calculation is correct.

The dancing minion has a power rating of 6W.

Calculate the amount of energy transferred in 2 minutes of dancing.

_____J

The minion is powered by a 2V button battery, calculate the current.

_____A

What is the energy transferred if the minion dances for 6 minutes?

Lessons for next time:

_____J

After 6 minutes the chemical store of the battery has reduced, the current is now 2A, calculate the charge flowing in the circuit.

_____C

The new voltage is 1.5V. Calculate the energy transferred in the 6 minutes.

_____J

Calculate the resistance in the circuit after the battery depleted.

_____Ω

The dancing minion is replaced with a new 2V battery. The power rating is now 8W. Calculate the time taken to transfer 1000J of energy if the charge is 20C.

Lessons for next time:

_____min

Notes