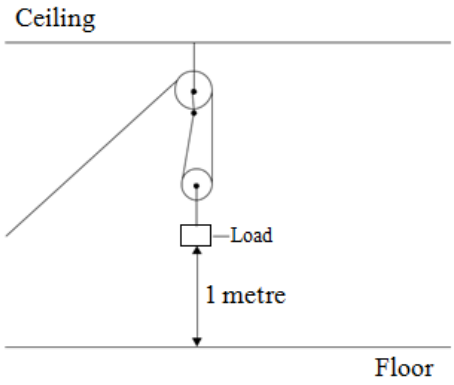
Effeciency 1 MCQS

Q:1 A student investigated a pulley system used to lift different loads. The student calculated the useful energy transferred by the pulley system for each load as it was lifted one metre. She then calculated the efficiency of the pulley system using the following equation.

$$\text{efficiency} = \frac{\text{useful energy transferred by the pulley system}}{\text{total energy supplied to the pulley system}}$$



The table shows the student's results.

Useful energy transferred by the pulley system (in J)	Total energy supplied to the pulley system (in J)	Calculated efficiency
1.00	3.33	0.30
2.00	4.16	0.48
3.00	5.00	
4.00	5.05	0.79
5.00	6.25	0.80

A) What was the efficiency when the useful energy transferred by the pulley system was 3 J?

1)0.15

2)0.167

3)0.60

4)1.6

B) Which value of total energy supplied to the pulley system is probably anomalous?

1)3.33 J

2)4.16 J

3)5.05 J

4)6.25 J

C) Using both your knowledge and the data in the table, suggest what would happen to the efficiency of the pulley system if the energy supplied continued to increase.

The efficiency would eventually . . .

1)exceed 1.00.

2)reach a maximum.

3)begin to decrease.

4)increase, then begin to decrease.

D) The difference between the useful energy transferred by the pulley system and the total energy supplied to the pulley system is called the . . .

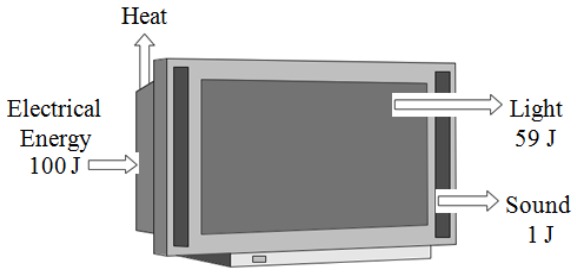
1)effective energy.

2)transferred energy.

3)transformed energy.

4)wasted energy.

Q:2 The diagram shows energy transformations in a television.



A How much energy is usefully transferred by the television?

1)1 J

2)40 J

3)59 J

4)60 J

B How much energy is wasted by the television?

1)0 J

2)1 J

3)40 J

4)59 J

C

$$\text{Efficiency} = \frac{\text{Useful energy transferred by the device}}{\text{Total energy supplied to the device}}$$

What is the efficiency of the television?

1)0.01

2)0.4

3)0.64

4)0.99

D What eventually happens to the energy wasted by the television?

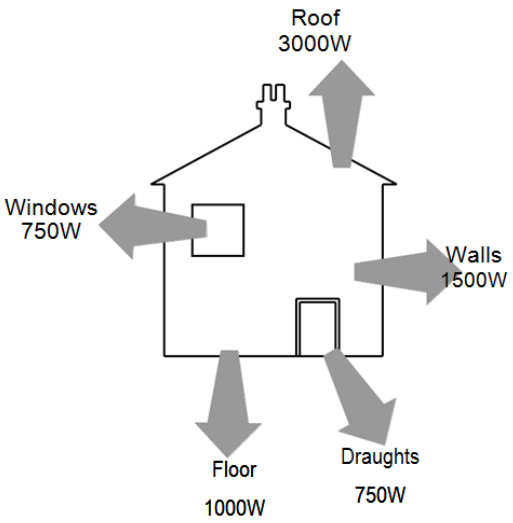
1)It gradually fades away.

2)It is recycled.

3)It increases the greenhouse effect.

4)It becomes increasingly spread out.

Q:3 The diagram shows how energy is lost from a house.



A Heat is lost from the house by . . .

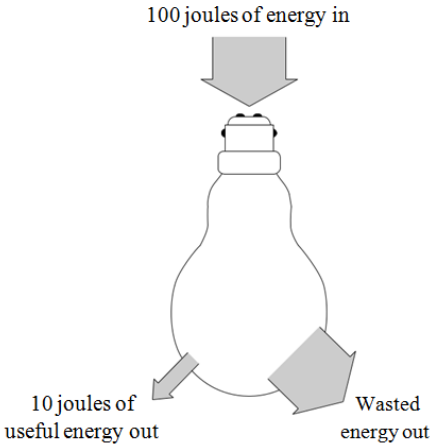
1)conduction only.

2)convection only.

3)convection and radiation only.

4)conduction, convection and radiation.

Q:4 The diagram shows a tungsten filament lamp and the energy used by the lamp in one second.



A How many joules of energy are wasted each second?

1)10

2)80

3)90

4)100

B What type of wasted energy is produced by the lamp?

1)electrical

2)heat

3)light

4)sound

C What happens to the wasted energy?

1)It is transformed into useful energy.

2)It is destroyed.

3)It spreads out and becomes easier to use.

4)It spreads out and becomes more difficult to use.

D What is the efficiency of the lamp?

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

1)0.1

2)0.8

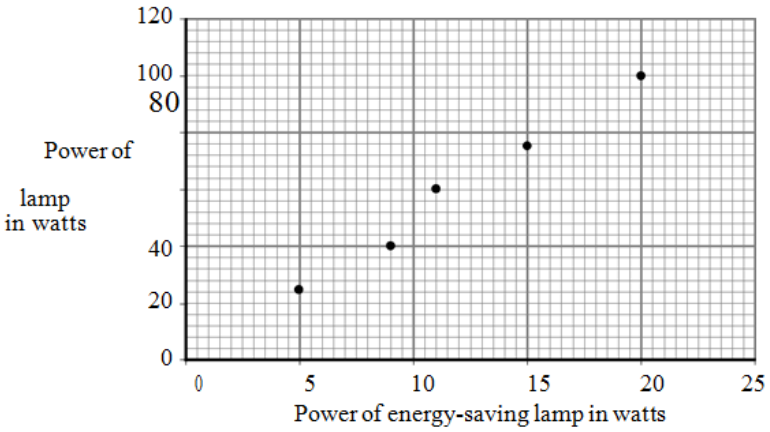
3)0.9

4)1.0

Q:5 A householder bought an energy-saving lamp. She found the following table printed on its packaging.

Power of energy-saving lamp in W	Equivalent power of filament lamp in W
5	25
9	40
11	60
15	75
20	100

The graph shows the data



A To see if the power of the filament lamp is directly proportional to the power of the energy-saving lamp, you should . . .

1)draw a line of best fit.

2)draw a straight line of best fit and see whether it passes through (0,0).

3)plot more points and see whether a straight line is produced.

4)produce a bar chart and see whether there is a positive relationship.

B.

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

A 25 W lamp transforms 25 joules of electrical energy each second.

The efficiency of a 25 W energy-saving lamp is 0.6

How much energy does it waste each second?

1)10.0 J

2)15.0 J

3)41.2 J

4)62.5 J

C The efficiency of a 100 W filament lamp is 0.15

From the data in the table on page 30, what is the approximate efficiency of the 20 W energy-saving lamp?

1)0.03

2)0.15

3)0.30

4)0.75

D The government has recommended that the sale of filament lamps should be stopped. Why is this?

1)to give shops new products to sell

2)to use less fuel for generating electricity

3)to make electricity cheaper to buy

4)to give householders brighter lamps

Q:6 The table is taken from an advert for low-energy lamps.

Save up to 80 % of your electricity bill by switching to low-energy lamps		
Filament lamp	**Equivalent low-energy lamp**	**Power saving**
60 W	12 W	80 %
60 W	15 W	
100 W	20 W	80 %
100 W	24 W	76 %

A A householder changes from using a 60 W filament lamp to using a 15 W low-energy lamp. What is the percentage power saving made?

1)20 %

2)45 %

3)75 %

4)80 %

B A 20 W low-energy lamp provides the same amount of light each second as a 100 W filament lamp.

The efficiency of a 100 W filament lamp is 0.15.

What is the efficiency of the 20 W low-energy lamp?

1)0.03

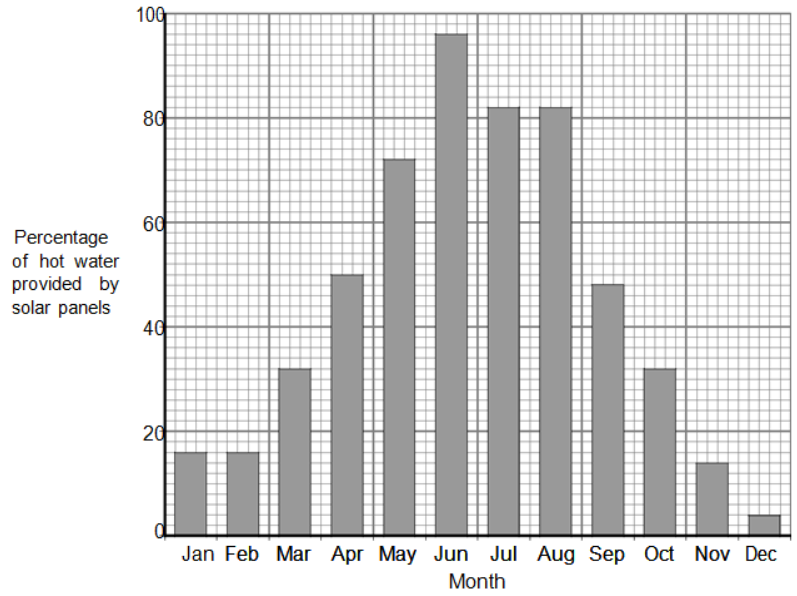
2)0.15

3)0.30

4)0.75

Q:7 Manufacturers claim that 60 % of a household's annual hot water can be provided by solar panels.

The graph shows the typical percentages of hot water provided by solar panels throughout the year



A The data is shown as a bar chart.

This is because one of the variables is . . .

1)a control variable.

2)a categoric variable.

3)a dependent variable.

4)an independent variable.

B In which month do the solar panels provide the lowest percentage of hot water?

1)January

2)February

3)June

4)December

C What is the highest percentage (%) of hot water provided by the solar panels in any month?

1)60

2)72

3)96

4)100

D One type of solar panel transfers 80 J of energy to heat the water from every 200 J of energy that falls on it.

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

What is the efficiency of this solar panel?

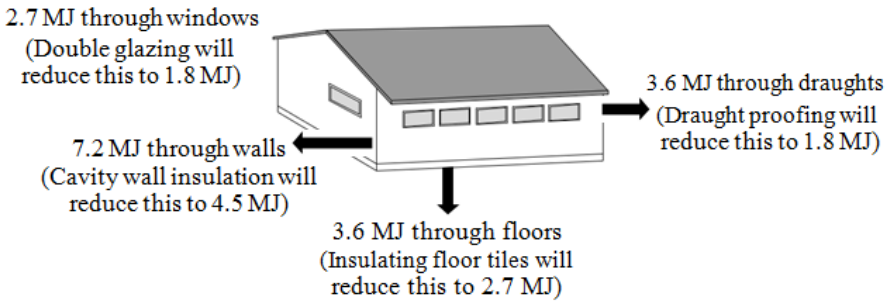
1)0.4

2)0.8

3)2.5

4)120

Q:8 The diagram shows some of the ways in which heat is transferred from the inside of a workshop, and how improvements can reduce the losses. The figures are for the average loss per hour on a cold winter's day.



The table gives the cost of the improvements and how much they will save each year.

Improvement	Cost	Saving each year
Cavity wall insulation	£ 900	£ 345
Double glazing	£ 3000	£ 115
Draught proofing	£ 150	£ 230
Insulating floor tiles	£ 600	£ 115

A Which improvement will result in the largest reduction in heat transfer?

1)cavity wall insulation

2)double glazing

3)draught proofing

4)insulating floor tiles

B The improvements are designed to reduce energy transfer through different parts of the workshop.

Which improvement reduces the transfer through its part of the workshop by the largest proportion?

1)cavity wall insulation

2)double glazing

3)draught proofing

4)insulating floor tiles

C On a cold winter's day, what is the approximate total heat loss from the uninsulated workshop in an eight-hour period?

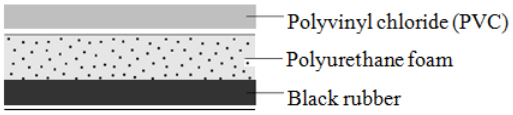
1)140MJ

2)150MJ

3)160MJ

4)170MJ

D The diagram shows a cross-section through the insulating floor tiles.



Which feature makes these tiles good heat insulators?

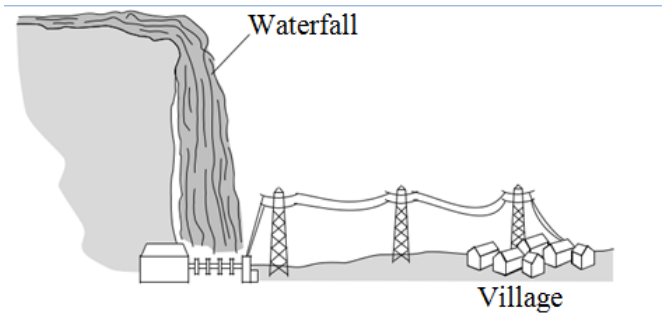
1)Air is trapped in the polyurethane foam.

2)Black rubber is a good emitter of thermal radiation.

3)They are made of three different materials.

4)They are on the floor so the heat movement by convection does not affect them.

Q:9 The diagram shows a hydroelectric scheme.



A small mountain village lies near a waterfall.

The energy of the falling water is used to generate electricity for the village.

The table gives some information about the village and the electrical supply.

Efficiency of generating system	0.12
Energy of water entering turbines per second	10 000 kJ
Population of the village	1200
Average number of people per household	4
Average electrical demand per household	3.0 kW

A The reason why the energy transformation is so inefficient is that . . .

1)the waterfall is not high enough.

2)water is a poor conductor of electricity.

3)heat is produced in the turbines.

4)maintenance costs are high.

$$\text{efficiency} = \frac{\text{useful energy transferred by the device}}{\text{total energy supplied to the device}}$$

B The electrical energy available to the village is . . .

1)833 kJ

2)1 200 kJ

3)83 300 kJ

4)120 000 kJ

C The average power demand for the whole village is . . .

1)900 kW

2)3 600 kW

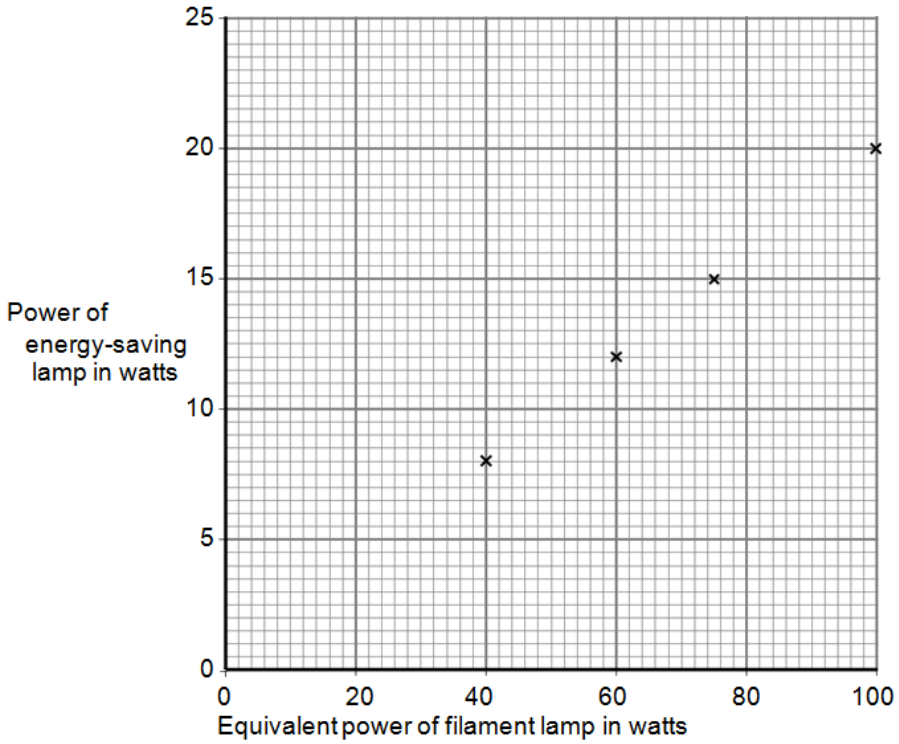
3)4 800 kW

4)14 400 Kw

Q:10 A householder bought an energy-saving lamp. The following table was printed on the box.

Power of energy-saving lamp in W	Equivalent power of filament lamp in W
8	40
12	60
15	75
20	100

The graph shows the data given in the table.



A To see if the power of the filament lamp is directly proportional to the power of the energy-saving lamp, you should . . .

1)draw a line of best fit and see if it passes through (0,0).

2)change the watts to kilowatts.

3)produce a bar chart.

4)use a different scale.

B Assume that the power of the filament lamp is directly proportional to the power of the energy-saving lamp.

What is the power of an energy-saving lamp that is equivalent to a 150 W filament lamp?

1)8 W

2)18 W

3)30 W

4)35 W

C The efficiency of a 100 W filament lamp is 0.15.

What is the efficiency of a 20 W energy-saving lamp?

1)0.03

2)0.15

3)0.30

4)0.75

D The government has decided to stop the sale of filament lamps. This is to save on the amount of fuel needed for making electricity.

Most energy-saving lamps contain toxic chemicals. Safety campaigners say that energy-saving lamps must be disposed of carefully.

Which row in the table correctly describes the types of issue given above that concern the government and safety campaigners?

	The Government	Safety campaigners
1)	environmental	economic
2)	economic	environmental
3)	ethical	social
4)	social	ethical

TOTAL MARKS=34