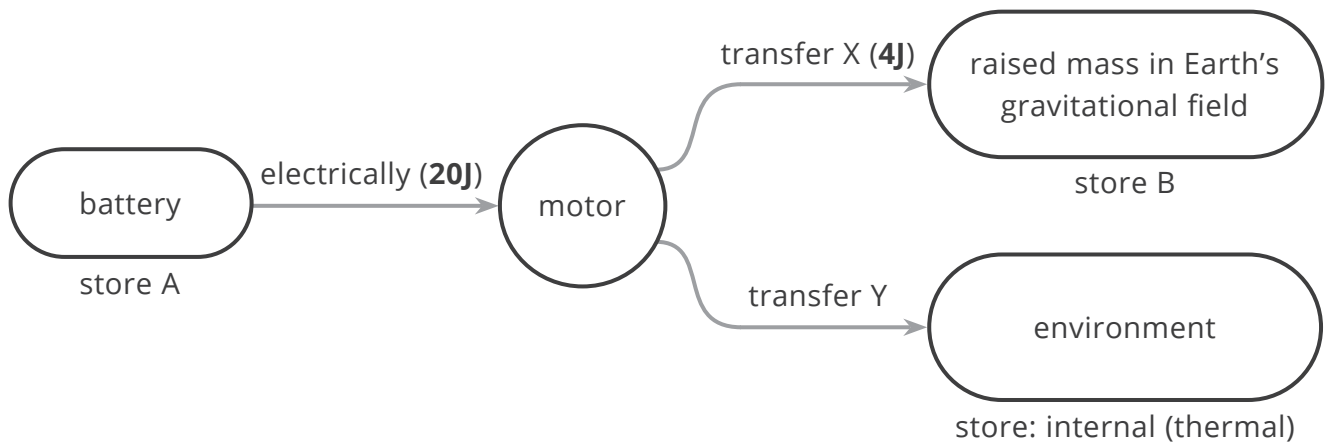# Energy Transfers and Efficiency **Answers**

A battery-powered motor is used to lift a small mass off the ground. The energy transfer diagram shows the ways that energy is stored at the start and end of the process, and the pathways by which energy is transferred between the stores.

1. Give the name of the energy store or transfer represented by each label.

   store A: **chemical energy store**

   store B: **gravitational potential energy store**

   transfer X: **mechanically/work done by forces**

   transfer Y: **heating (by radiation)**

2. Calculate the amount of energy that is transferred to the internal (thermal) energy store of the environment.

   20 – 4 = 16

   energy transferred = **16** J

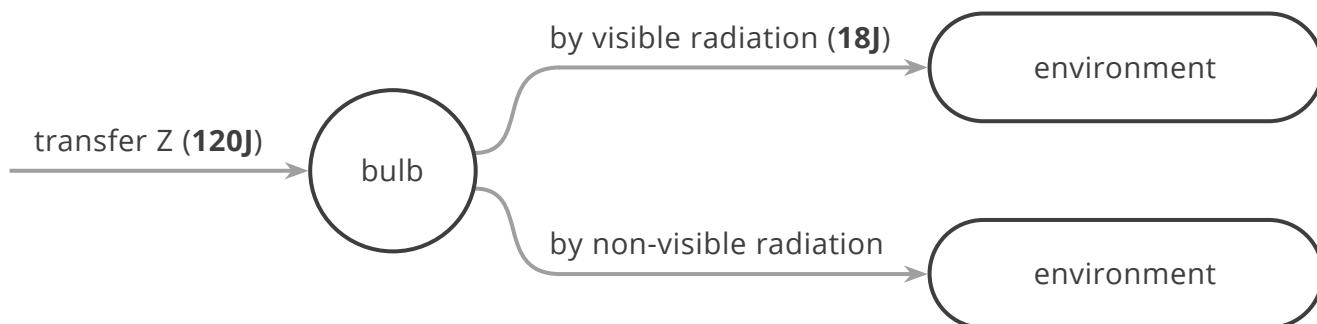3. Calculate the efficiency of the motor.

   $\frac{4}{20}$ **= 0.2**

   efficiency = **0.2**

4. Suggest how the efficiency of the motor could be improved.

   Reduce the friction between the moving parts using lubrication.

A filament bulb is switched on and 120J of energy is transferred to it from the mains electricity supply. Energy is transferred from the bulb to the surroundings by radiation. Only 18J of the energy is transferred by visible radiation. An energy transfer diagram for the system is shown.

by visible radiation (**18J**)

environment

transfer Z (**120J**)

bulb

by non-visible radiation

environment

5. Name the pathway by which energy is transferred to the bulb.

   electrically/work done when a current flows

6. Calculate the amount of energy that is not transferred usefully.

   120 - 18 = 102

   energy = **102**J

7. Calculate the efficiency of the bulb.

   $\frac{18}{120}$ = **0.15**

   efficiency = **0.15**

Chlorophyll in the leaves of plants absorbs energy for photosynthesis. Over a period of time, 3.4kJ of energy is transferred from the Sun to a plant's leaf. During photosynthesis, 306J of energy is stored as glucose molecules in the plant.

8. Name the pathway by which energy is transferred from the Sun to the plant leaf.

   heating (by radiation)

9. Name the useful energy store at the end of the process of photosynthesis.

   chemical energy store

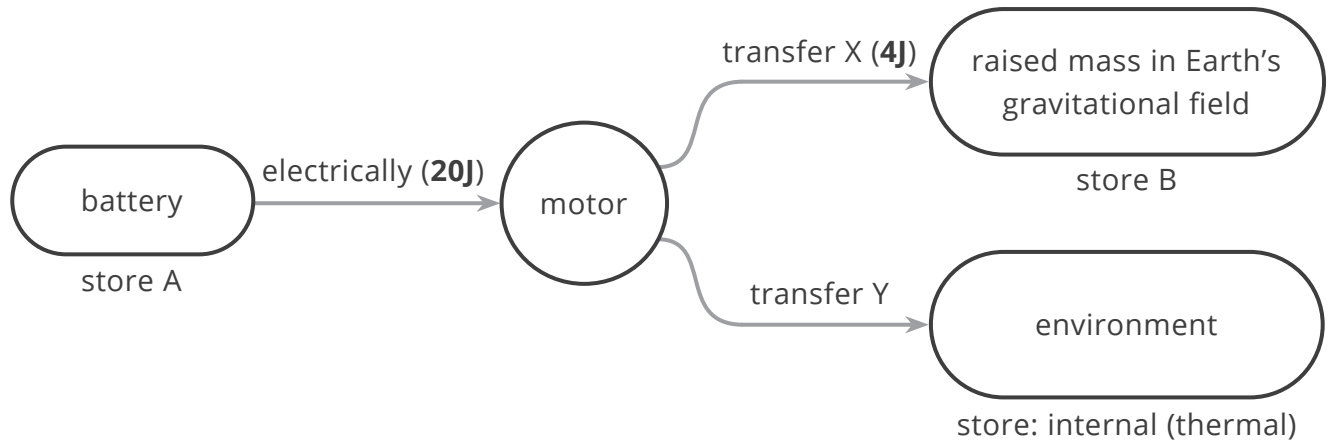10. Calculate the efficiency of photosynthesis.

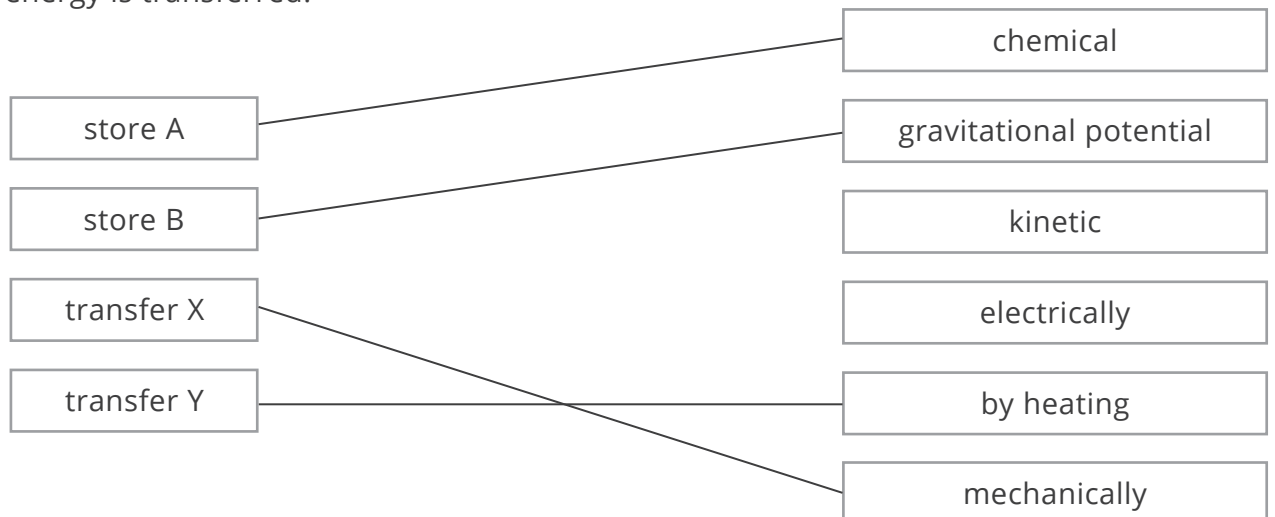   **3.4kJ × 1000 = 3400J**

    $\frac{306}{3400}$ = **0.09**

    efficiency = **0.09**

Energy Transfers and Efficiency **Answers**

A battery-powered motor is used to lift a small mass off the ground. The energy transfer diagram shows the ways that energy is stored at the start and end of the process, and the pathways by which energy is transferred between the stores.

transfer X (**4J**) → raised mass in Earth's gravitational field

store B

battery → electrically (**20J**) → motor

store A

transfer Y → environment

store: internal (thermal)

1. Draw **one** line from each label to the way that energy is stored or the pathway by which energy is transferred.

	chemical
store A	gravitational potential
store B	kinetic
transfer X	electrically
transfer Y	by heating
	mechanically

2. Calculate the amount of energy that is transferred to the internal (thermal) energy store of the environment.

20 – 4 = 16

energy transferred = **16** J

The following equation can be used to calculate the efficiency of the system:

$$\text{efficiency} = \frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$$

3. Calculate the efficiency of the motor.

$$\frac{4}{20} = 0.2$$

efficiency = **0.2**

A filament bulb is switched on and 120J of energy is transferred to it from the mains electricity supply. Energy is transferred from the bulb to the surroundings by radiation. Only 18J of the energy is transferred by visible radiation. An energy transfer diagram for the system is shown.

by visible radiation (**18J**)

environment

transfer Z (**120J**)

bulb

by non-visible radiation

environment
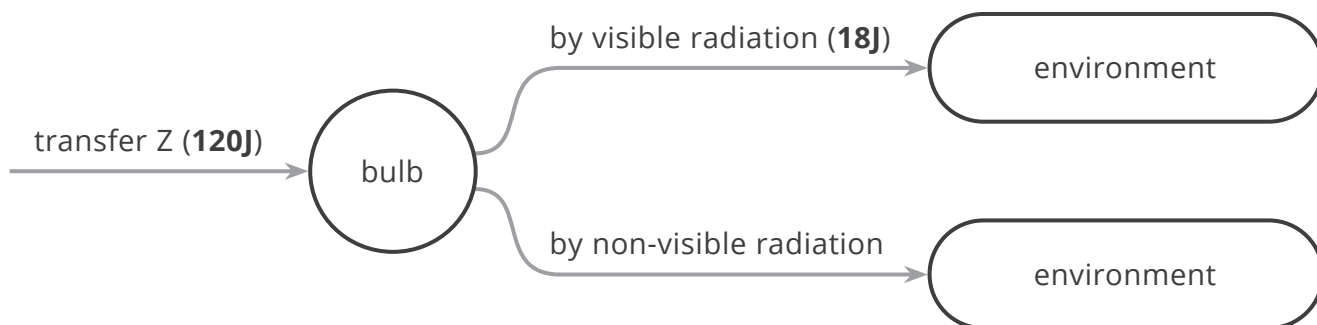
4. Name the pathway by which energy is transferred to the bulb.
   electrically/work done when a current flows

5. Calculate the amount of energy that is not transferred usefully.
   120 - 18 = 102

   energy = **102**J

6. Calculate the efficiency of the bulb.
   $\frac{18}{120}$ **= 0.15**

   efficiency = **0.15**

Chlorophyll in the leaves of plants absorbs energy for photosynthesis. Over a period of time, 3.4kJ of energy is transferred from the Sun to a plant's leaf. During photosynthesis, 306J of energy is stored as glucose molecules in the plant.

7. Name the pathway by which energy is transferred from the Sun to the plant leaf.
   heating (by radiation)

8. Name the useful energy store at the end of the process of photosynthesis.
   chemical energy store

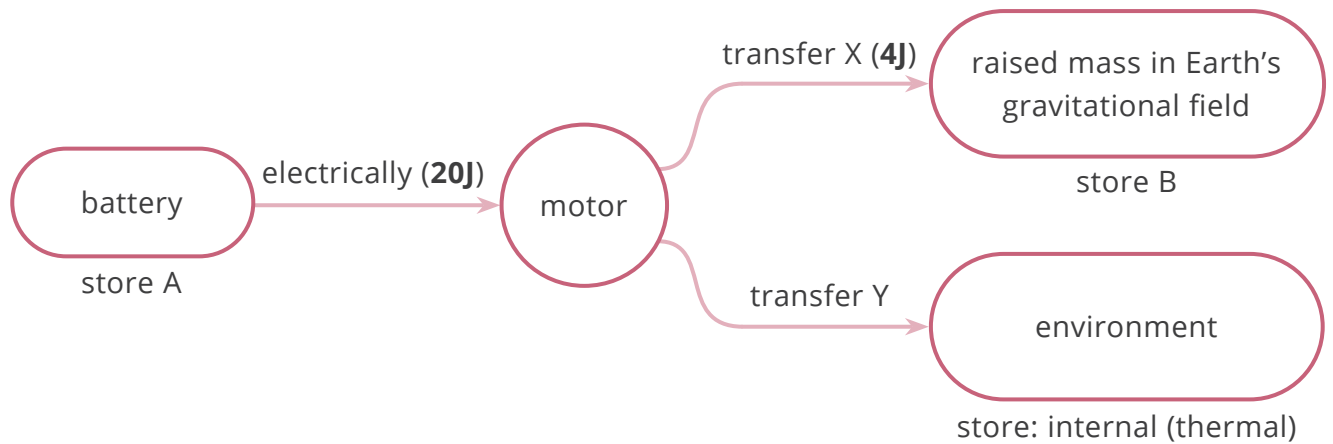9. Calculate the efficiency of photosynthesis.
   3.4kJ × 1000 = 3400J

   $\frac{306}{3400}$ **= 0.09**

   efficiency = **0.09**

Energy Transfers and Efficiency

A battery-powered motor is used to lift a small mass off the ground. The energy transfer diagram shows the ways that energy is stored at the start and end of the process, and the pathways by which energy is transferred between the stores.

transfer X (**4J**) → raised mass in Earth's gravitational field — store B

battery — store A — electrically (**20J**) → motor

transfer Y → environment — store: internal (thermal)

1. Draw **one** line from each label to the way that energy is stored or the pathway by which energy is transferred.

store A	chemical
store B	gravitational potential
transfer X	kinetic
transfer Y	electrically
	by heating
	mechanically

2. Calculate the amount of energy that is transferred to the internal (thermal) energy store of the environment.

_____

_____

energy transferred = _____ J

The following equation can be used to calculate the efficiency of the system:

$$efficiency = \frac{\textbf{useful output energy transfer}}{\textbf{total input energy transfer}}$$

3. Calculate the efficiency of the motor.

_____

_____

efficiency = _____

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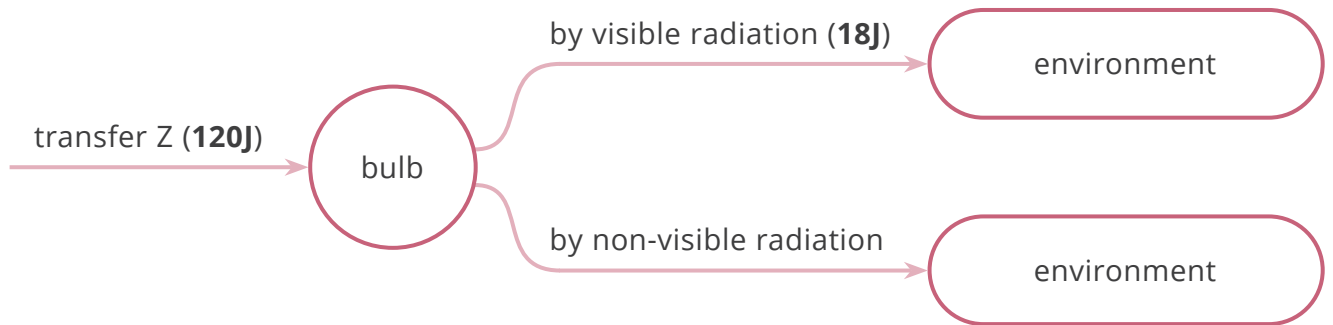
4. Name the pathway by which energy is transferred to the bulb.

   _____

5. Calculate the amount of energy that is not transferred usefully.

   _____

   energy = _____ J

6. Calculate the efficiency of the bulb.

   _____

   _____

   efficiency = _____

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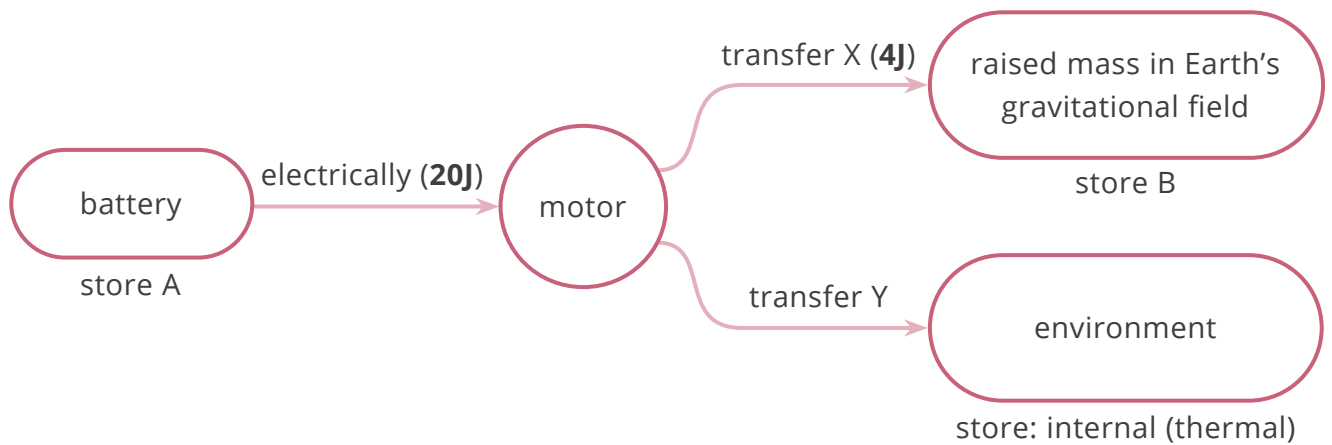
   _____

8. Name the useful energy store at the end of the process of photosynthesis.

   _____

9. Calculate the efficiency of photosynthesis.

   _____

   _____

   _____

   efficiency = _____

Energy Transfers and Efficiency

A battery-powered motor is used to lift a small mass off the ground. The energy transfer diagram shows the ways that energy is stored at the start and end of the process, and the pathways by which energy is transferred between the stores.

transfer X (**4J**) → raised mass in Earth's gravitational field — store B

battery — store A → electrically (**20J**) → motor

motor → transfer Y → environment — store: internal (thermal)

1. Give the name of the energy store or transfer represented by each label.

   store A: _____

   store B: _____

   transfer X: _____

   transfer Y: _____

2. Calculate the amount of energy that is transferred to the internal (thermal) energy store of the environment.

   _____

   _____

   energy transferred = _____ J

3. Calculate the efficiency of the motor.

   _____

   _____

   _____

   efficiency = _____

4. Suggest how the efficiency of the motor could be improved.

   _____

   _____

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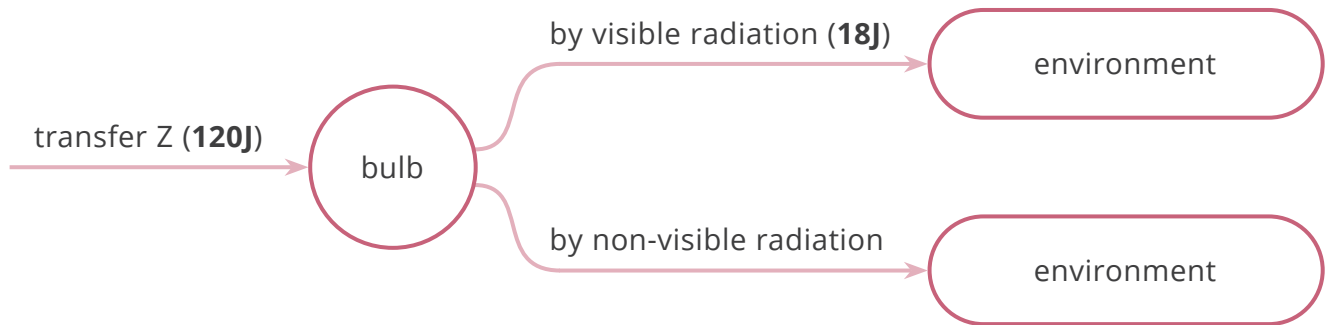
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_____

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_____

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_____

_____

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_____

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_____

10. Calculate the efficiency of photosynthesis.

_____

_____

_____

efficiency = _____