THE STRIVING

MUSLIM ACADEMY

Islamic and Academic Education

YEARS 7 TO 9 · SCIENCE

Energy, fuel and cost

Energy as transfer rather than substance, what work means, and the arithmetic of a domestic bill.

WHAT IS INSIDE

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1 sets · a hint on every question

Written for a parent teaching at home. No training assumed, and nothing else to buy.

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Energy is not a substance, and heat is not temperature

Read this, then answer the questions on it.



ENERGY IS NOT A SUBSTANCE, AND HEAT IS NOT TEMPERATURE

Energy is not a thing you can hold. It is an accounting of what a system can do, and the useful questions are always about transfer: from where, to where, and how much was wasted on the way.

Heat has a definition worth learning exactly. OpenStax gives it as the spontaneous transfer of energy due to a temperature difference, and adds that heat is a form of energy whereas temperature is not.

So we cannot say an object has a certain heat content, though a system does have a well-defined internal energy. Heat is what moves when two things at different temperatures meet, and the source notes that heat is often confused with temperature.

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Work, and what counts as doing it

Read this, then answer the questions on it.



WORK, AND WHAT COUNTS AS DOING IT

The scientific definition of work is narrower than the everyday one. The work done on a system by a constant force is the product of the component of the force in the direction of the motion times the distance moved.

Two consequences surprise people. A force at right angles to the motion does no work at all, so carrying a bag along a level corridor does none on the bag. And holding something still does none either, however tiring it is, because the distance is zero.

The signs of force and displacement decide whether the work done is positive, negative or zero, which is how the same equation handles lifting and lowering.

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How each one is answered

Mark it together. Where a question asks for a list, the order does not matter.



ENERGY, WORK AND THE COST OF IT

1. Give the definition of heat used in the source, and say what it adds about temperature.

1. Heat is the spontaneous transfer of energy due to a temperature difference.
2. The source adds that heat is a form of energy whereas temperature is not.

Answer: **the spontaneous transfer of energy due to a temperature difference, and heat is energy while temperature is not**

2. Explain why it is wrong to say an object contains heat.

1. Heat is a transfer of energy, not a quantity stored in something.
2. An object has a temperature, which is not a form of energy.
3. Heat is what moves when that object meets something at a different temperature, so it is a process rather than a content.

Answer: **because heat is a transfer of energy, not something stored; an object has a temperature instead**

3. State the definition of work done by a constant force.

1. The work done on a system by a constant force is the product of the component of the force in the direction of the motion times the distance moved.

Answer: **the component of the force in the direction of the motion, times the distance moved**

4. Explain why holding a heavy bag still does no work in the scientific sense, however tiring it is.

1. Work is force times distance moved in the direction of the force.
2. Holding something still means the distance is zero.
3. So the work done on the bag is zero, even though your muscles are using energy.

Answer: **because the distance moved is zero, so force times distance is zero**

5. A 2 kW heater runs for 3 hours. At 30p a kilowatt hour, what does it cost?

1. 2 × 3 = 6 kilowatt hours.
2. 6 × 30 = 180 pence, which is 1 pound 80.

Answer: **180p, or 1 pound 80**

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SAMPLE PAGES

You have read a few pages. The pack is longer.

What you are holding is a short sample, taken from different parts of the pack so that you can see how a week is planned and what a child is actually asked to do, before you decide.

The complete pack, and the rest of the academic materials, are on our website: schemes of work for a parent teaching at home, and practice packs for the skills children get stuck on.

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Our Islamic Education classes are free. These packs are part of what pays the teachers who teach them.