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SPECA

GCSE Combined Science (AQA Trilogy) · Physics

Energy · Tiered Worksheet

Section A: Foundation

Energy stores and calculations

1) State what is meant by a "system" in physics. [1]

2) A ball is thrown vertically upward. Describe the changes in how the ball's energy is stored as it rises from the moment it leaves the thrower's hand to the moment it reaches its highest point. [2]

3) Calculate the kinetic energy of a 2 kg trolley moving at 6 m/s. [2]

4) A spring with spring constant 250 N/m is stretched by 0.04 m, within its limit of proportionality. Calculate the elastic potential energy stored in the spring. [3]

5) Calculate the gravitational potential energy gained by a 5 kg object raised 3 m vertically. Gravitational field strength = 9.8 N/kg. [2]

6) Calculate the energy needed to raise the temperature of 0.5 kg of water by 20°C. Specific heat capacity of water = 4200 J/kg°C. [3]

7) Define specific heat capacity. [1]

8) A kettle transfers 180,000 J of energy to the water inside it in 90 seconds. Calculate the power of the kettle. [2]

9) Explain what it means to say that an electric heater has a power of 1000 W. [1]

10) A motor has a total energy input of 800 J, of which 320 J is transferred usefully. Calculate the efficiency of the motor as a percentage. [2]

11) Explain, in terms of energy stores, why energy can never truly be "used up," even though the amount of useful energy available tends to decrease over time. [2]

Efficiency and energy resources

12) Give two ways engineers could reduce unwanted energy transfers in a machine with moving parts. [2]

13) State whether natural gas is a renewable or non-renewable energy resource, and explain your answer. [2]

14) Give one advantage and one disadvantage of using wind power to generate electricity, compared with using a fossil fuel. [2]

15) A student claims that because solar power is a renewable resource, it has no negative environmental impact at all. Explain why this claim is a misconception. [2]

16) A student investigates the specific heat capacity of a metal block using an electrical heater. Give two measurements they would need to take during the experiment in order to calculate the energy transferred and the resulting temperature change. [2]

Section B: Higher (in addition to Section A)

Increasing the efficiency of an intended transfer

17) A washing machine motor transfers electrical energy to the kinetic energy store of the drum, but some energy is wasted as thermal energy by friction in the moving parts and by electrical resistance in the wiring. Describe two ways engineers could increase the efficiency of this intended energy transfer, and explain how each named method achieves this. [4]

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18) Explain why increasing the efficiency of an energy transfer does not mean that more energy is created overall. **[2]**

19) An engineer is designing a kettle, intending to transfer electrical energy to the thermal energy store of the water inside it as efficiently as possible. Suggest and explain one design feature that would increase the efficiency of this intended transfer. **[3]**

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