

Energy and efficiency and the usefulness of electrical appliances

1.	(a)	60	<i>for 1 mark</i>	1	
	(b)	electrical to light	<i>gains 1 mark</i>	2	
		but electricity to light and heat	<i>gains 2 mark</i>		
		anything to heat and light	<i>gains 1 mark</i>		
	(c)	(unwanted) heat produced	<i>for 1 mark</i>	1	[4]
2.	(a)	60% sector correct		3	
		other two sectors closer to 13:7 than 12:8 or 14:6			
		sectors correctly labelled (w.r.t rank order of size)			
		<i>each for 1 mark</i>			
	(b)	(i)	<i>ideas that wasted energy</i>	2	
			is transferred to surrounding air		
			pan		
			stove		
			is converted to another/correctly named energy form		
			<i>any 2 for 1 mark each</i>		
		(ii)	40 for 1 mark	1	[6]
3.	(a)	kinetic	<i>accept movement</i>	1	
	(b)	(i)	3 (kWh)	2	
			<i>allow 1 mark for selecting the correct information</i>		
		(ii)	transfers more energy	1	
			<i>accept transform or use for transfer</i>		
			<i>accept electricity for energy</i>		
			<i>allow higher (average) power and switched on for more time</i>		
					[4]

4.	(a)	£15	2
		<p><i>allow 1 mark for use of 125 (kWh)</i> <i>allow 1 mark for an answer 1500</i> <i>allow both marks for 1500 pence / p</i> <i>allow 1 mark for correct calculation of annual cost for either freezer (£27 and £42)</i></p>	
	(b)	£45	2
		<p>or their (a) × 3</p> <p><i>allow 1 mark for correct use of 3</i> <i>allow 1 mark for $12 - 9 = 3$</i></p>	
	(c)	<u>any two</u> from:	2
		<p><i>the marks are for the explanation</i></p> <p>yes plus explanation</p> <ul style="list-style-type: none"> • less electricity / energy needed / used <i>accept less energy wasted</i> • less (fossil) fuels burned <i>accept a named fossil fuel</i> <i>do not accept conserving (fossil) fuels</i> • less polluting gases emitted <i>accept a named polluting gas / greenhouse gases / carbon emissions / reduce global warming</i> <i>accept an answer in terms of nuclear fuel</i> <i>eg less nuclear fuel required (1)</i> <i>less nuclear waste (1)</i> <p>or</p> <p><u>no plus</u> explanation</p> <ul style="list-style-type: none"> • old freezer must be disposed of • hazardous chemicals inside freezer <i>accept CFC gases</i> • (lot of) energy used in producing new freezer 	
5.	(a)	(i) electric motor	1
		any one from:	1
		<ul style="list-style-type: none"> • least energy wasted • most energy usefully transformed • largest kinetic energy output 	
	(ii)	85%	2
		<i>allow 1 mark for only using the width of input and the kinetic arrow</i>	
	(b)	(i) two output arrows shown, one labelled heat, the other light	1
		width of the arrow significantly wider than light arrow	1

[6]

	(ii) any two from:	2	
	<ul style="list-style-type: none"> • some energy is wasted as heat • all (output) energy is transferred to the surroundings • energy becomes spread out • difficult to use energy for further useful transformations 		[8]
6.	(a) (i) makes it warmer / raises the temperature <i>accept produces convection (current)</i> <i>accept makes it less dense</i>	1	
	(ii) reduced or slows down	1	
	(b) (i) electrical energy (to run the pump) must be paid for <i>accept electricity for electrical energy</i> <i>accept electricity is needed for the pump</i> <i>accept it uses electricity</i> <i>accept because of the pump</i>	1	
	(ii) more useful (heat) energy is transferred into the house than the energy used to operate the pump	2	
	or reduced cost of heating the house is greater than the cost of running the (electrical) pump		
	or costs little to run compared to the savings made <i>accept for 1 mark reduces energy bills</i> <i>or reduced fuel costs / heating costs owtte do not accept it's cheap</i>		[5]
7.	(a) four calculations correctly shown	2	
	$200 \times 10 - 1800 = \text{£}200$ $100 \times 10 - 2400 = -\text{£}1400$ $50 \times 10 - 600 = -\text{£}100$ $20 \times 10 - 75 = 125$ <i>accept four final answers only</i> or obvious rejection of solar water heater and underfloor heating, with other two calculations completed <i>any 1 complete calculation correctly shown</i> or showing each saving $\times 10$ of all four calculations = 1 mark <i>answers in terms of savings as a percentage of installation cost</i> may score savings mark only		
	hot water boiler	1	
	<i>correct answers only</i>		
	(b) less electricity / energy to be generated / needed from power stations	1	
	<i>accept less demand</i>		
	reduction in (fossil) fuels being burnt	1	
	<i>accept correctly named fuel; accept answer in terms of:</i> <i>fewer light bulbs required because they last longer (1 mark)</i> <i>less energy used / fuels burnt in production / transport etc. (1 mark)</i> <i>ignore reference to CO₂ or global warming</i> <i>ignore reference to conservation of energy</i>		[5]