P1F Energy: Foundation Tier Practice

AQA 8463 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Give the name for each of these energy stores: chemical store in a battery, energy stored by a stretched rubber band.

(a) Energy store in a battery (chemical store). **(1)**

(Total for Question 1 is 1 mark)

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2 State the unit used for energy in the SI system.

(a) Unit for energy. **(1)**

(Total for Question 2 is 1 mark)

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3 Give two examples of ways energy can be transferred from one object to another.

(a) Two examples of energy transfer methods (one answer gives both). **(1)**

(Total for Question 3 is 1 mark)

4 Complete the sentences. Fill in the missing words.

1. When an object is raised above the ground its energy store increases and we call this the gravitational potential energy store.

2. When a moving object slows down its energy in the kinetic store decreases.

(a) Complete sentence 1: name the store. **(1)**

(b) Complete sentence 2: name the store. **(1)**

(Total for Question 4 is 2 marks)

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5 Calculate the increase in gravitational potential energy when a 2.0 kg box is lifted 3.0 m. Use g = 10 N/kg and show your working.

(a) Calculate using E = m x g x h. **(2)**

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(Total for Question 5 is 2 marks)

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6 A kettle has power rating 3000 W. It is on for 2.0 minutes. Calculate the energy supplied to the water in joules. Show your working.

(a) Use E = P x t. Convert minutes to seconds first. **(2)**

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(Total for Question 6 is 2 marks)

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7 Write the energy from question 6 in kilojoules (kJ).

(a) Convert 360000 J to kJ. **(2)**

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(Total for Question 7 is 2 marks)

8 Extended response 6-mark question.

A person boils 1.0 kg of water in a kettle. Describe and explain all the main energy transfers that happen from the moment the kettle is switched on until the water is boiling. Include where energy is stored, how energy is transferred, and why not all the electrical energy becomes thermal energy in the water.

(Total for Question 8 is 6 marks)

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9 An electric lamp takes in 60 J of electrical energy each second. Each second it gives out 12 J as light energy. Calculate the efficiency of the lamp as a percentage. Show your working.

(a) Use efficiency = (useful energy output / total energy input) x 100. **(3)**

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(Total for Question 9 is 3 marks)

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10 In an experiment a pupil supplies 5000 J of energy to 0.50 kg of water and the temperature of the water rises by 2.0 degrees C. Calculate the specific heat capacity of the water using c = E / (m x deltaT). Show your working and unit.

(a) Calculate c = E / (m x deltaT). **(3)**

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(Total for Question 10 is 3 marks)

11 A person pushes a toy car with a constant horizontal force of 20 N for 5.0 m. Calculate the work done on the car. Show your working.

(a) Use work done = force x distance. **(2)**

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(Total for Question 11 is 2 marks)

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12 State the definition of power in physics and give its SI unit.

(a) Definition of power. **(1)**

(b) SI unit of power. **(1)**

(Total for Question 12 is 2 marks)

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13 A lift raises a load with a force of 200 N through a height of 4.0 m in 10 s. Calculate the power produced while lifting. Show your working.

(a) First calculate work done then power = work / time. **(2)**

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(Total for Question 13 is 2 marks)

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14 Give one example of a renewable energy source and one example of a non-renewable energy source.

(a) Name one renewable source. **(1)**

(b) Name one non-renewable source. **(1)**

(Total for Question 14 is 2 marks)

15 State the principle of conservation of energy in one sentence.

(a) Write the conservation of energy principle. **(2)**

(Total for Question 15 is 2 marks)

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16 A car slows down and comes to rest. Describe where the kinetic energy of the car goes. Give two places the energy goes and one short explanation.

(a) Name two stores or forms where the kinetic energy is transferred. **(2)**

(b) Give a short explanation why temperature of brakes increases. **(1)**

(Total for Question 16 is 3 marks)

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17 A small mass of 1.5 kg is lifted 2.0 m. Calculate the change in gravitational potential energy using g = 10 N/kg. Show working.

(a) Use E = mgh. **(2)**

(Total for Question 17 is 2 marks)

Mark scheme · P1F Energy: Foundation Tier Practice

Question 1

- (a) **B1** chemical store cao
- **(a) Answer: Chemical store**

Question 2

- (a) **B1** joule or J cao
- **(a) Answer: Joule (J)**

Question 3

- (a) **B1** examples such as heating, mechanical work, electrical transfer, radiation, sound, oe (any two in one answer) cao
- **(a) Answer: For example: heating and electrical transfer.**

Question 4

- (a) **B1** gravitational potential energy store or gravitational store cao
- **(a) Answer: Gravitational potential energy store**
- (b) **B1** kinetic store or kinetic energy store cao
- **(b) Answer: Kinetic store**

Question 5

- (a) **M1** substitutes values into E = m x g x h: E = 2.0 x 10 x 3.0
- (a) **A1** 60 J cao
- **(a) Answer: 60 J**

Question 6

- (a) **M1** converts time to seconds and substitutes: t = 2.0 x 60 = 120 s and E = 3000 x 120
- (a) **A1** 360000 J cao
- **(a) Answer: 360000 J**

Question 7

- (a) **M1** divides by 1000 or shows conversion: 360000 / 1000
- (a) **A1** 360 kJ cao
- **(a) Answer: 360 kJ**

Question 8

- **Level 3** (5-6): Detailed description and explanation of the energy transfers, including identification of stores, correct sequence of transfers, and evaluation of energy losses. Uses scientific terms and links causes and effects.
- **Level 2** (3-4): Clear description of the main energy transfers and some explanation of losses. Some scientific terms used but with limited linking of causes and effects.
- **Level 1** (1-2): Simple statements about energy transfers, e.g. electricity to thermal, with little or no explanation of losses or stores.
- **Indicative content:**
  - Electrical energy supplied to the kettle from the mains when switched on.
  - Energy transferred to the heating element then to the water by heating (conduction through the kettle base and convection in the water).
  - Thermal energy store of the water increases as temperature rises.
  - Some energy is transferred to the kettle metal and the air (waste heat) by conduction and convection; some energy is emitted as sound or light (small amount).
  - Not all electrical energy becomes thermal energy in the water because of energy lost to the surroundings and heating the kettle itself; efficiency is less than 100%.
  - Reference to the idea that the hotter water has more energy in its thermal store and that the energy transfer continues until boiling point is reached.

Question 9

- (a) **M1** substitutes values into efficiency formula: efficiency = (12 / 60) x 100
- (a) **A1** 20 % cao
- (a) **B1** correct working or statement showing 12/60 = 0.20 and 0.20 x 100 = 20 %
- **(a) Answer: 20 %**

Question 10

- (a) **M1** substitutes values: c = 5000 / (0.50 x 2.0)
- (a) **M1** evaluates denominator 0.50 x 2.0 = 1.0 and divides 5000 / 1.0
- (a) **A1** 5000 J/kg degrees C cao
- **(a) Answer: 5000 J/kg degrees C**

Question 11

- (a) **M1** substitutes: W = 20 x 5.0
- (a) **A1** 100 J cao
- **(a) Answer: 100 J**

Question 12

- (a) **B1** the rate of doing work or the rate of energy transfer cao
- **(a) Answer: The rate of doing work or rate of energy transfer.**
- (b) **B1** watt or W cao
- **(b) Answer: Watt (W)**

Question 13

- (a) **M1** calculates work done: W = 200 x 4.0 = 800 J and substitutes into P = W / t
- (a) **A1** 80 W cao
- **(a) Answer: 80 W**

Question 14

- (a) **B1** any renewable such as solar, wind, hydro, biomass, geothermal cao
- **(a) Answer: For example: solar**
- (b) **B1** any non-renewable such as coal, oil, natural gas, nuclear cao
- **(b) Answer: For example: coal**

Question 15

- (a) **B1** energy cannot be created or destroyed
- (a) **B1** energy can be transferred from one store to another but the total energy is conserved, oe
- **(a) Answer: Energy cannot be created or destroyed; it is transferred between stores so the total energy remains the same.**

Question 16

- (a) **B1** thermal energy of the brakes/tyres/road (heat) or thermal store of surrounding air
- (a) **B1** sound energy (noise) or energy in deformation if parts bend, oe
- **(a) Answer: Thermal energy in the brakes and sound energy.**
- (b) **B1** friction between brake parts converts kinetic energy into thermal energy, causing temperature to rise, oe
- **(b) Answer: Friction converts the car's kinetic energy into thermal energy in the brakes so their temperature rises.**

Question 17

- (a) **M1** substitutes: E = 1.5 x 10 x 2.0
- (a) **A1** 30 J cao
- **(a) Answer: 30 J**