# End of topic quiz

# Topic P5: Energy

## Instructions and answers for teachers

These instructions cover the learner activity section which can be found on [page 8](#_Chapter:_P4_of). This end of topic quiz supports OCR GCSE (9–1) Combined Science A (J250), Topic P5.

**When distributing the activity section to the learners either as a printed copy or as a Word file you will need to remove the teacher instructions section.**

### The Activity

This end of topic quiz is a teaching and learning resource comprised of 40 marks covering a range of question types. The quiz starts with some multiple choice questions (MCQs) and then moves on to some short answer questions and then finally on to some longer answer questions.

This resource can be used to test and consolidate understanding at the end of teaching the topic or to revisit and refresh knowledge at a later point in the course.

### Learning Outcomes

This end of topic quiz relates to the specification learning outcomes in Topic P5: Energy. The questions in this quiz cover a range of the following topics:

P5.1 Work done

P5.2 Power and efficiency

### Topic: P5 of J250 – Answers

**Total marks: 40**

1. A light bulb outputs 20 J of energy for every 1 kJ inputted. What is the efficiency of the light bulb? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | 0.2 % |  |
| **B** | 2 % |  |
| **C** | 20 % |  |
| **D** | 50 % |  |

Your answer

**B**

1. A toy car is at the top of a ramp, it has 20 J of gravitational potential energy. When it runs down the ramp and reaches the bottom it has zero gravitational potential energy.

Assuming friction and air resistance have no effect, how much kinetic energy does it have at the bottom of the ramp? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | 0 J |  |
| **B** | 10 J |  |
| **C** | 20 J |  |
| **D** | 30 J |  |

Your answer

**C**

1. Which of the following statements is true? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Energy can be created, but not destroyed. |  |
| **B** | Energy can be destroyed, but not created. |  |
| **C** | Energy can be both created and destroyed. |  |
| **D** | Energy can be neither created nor destroyed. |  |

Your answer

**D**

1. Which of the following devices would you use to measure energy in an electrical circuit?   
   **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Ammeter |  |
| **B** | Joulemeter |  |
| **C** | Ohmeter |  |
| **D** | Voltmeter |  |

Your answer

**B**

1. During energy transfer processes, friction can occur. When this happens some of the energy being transferred can be changed into a ‘wasted’ store of energy. Which store is this? **[1 mark]**

|  |  |  |
| --- | --- | --- |
| **A** | Elastic potential |  |
| **B** | Kinetic |  |
| **C** | Gravitational potential |  |
| **D** | Thermal |  |

Your answer

**D**

1. Beth has a mass of 35 kg, her father pulls her back until she is 1.4 m off the ground.



|  |  |  |  |
| --- | --- | --- | --- |
| **(a)** | **(i)** | As Beth is pulled back she gains stored energy. What store of energy is this?  **[1 mark]** | |
|  |  | gravitational potential energy ✓ | |
|  |  |  |  |
|  | **(ii)** | Write down the amount of this energy she has? **[2 marks]** | |
|  |  | 35 kg × 1.4 m × 10 N/kg✓  = 490 J✓ | |
|  |  |  |  |
| **(b)** | **(i)** | When her father lets go of her Beth swings forward.  There **is** air resistance and friction.  How much would the amount of kinetic energy she has compare to the amount of energy she had to start with? **[1 mark]** | |
|  |  | It would be less ✓ | |
|  |  |  |  |
|  | **(ii)** | Write down the energy transfers which take place as Beth swings from the top position to the middle position. **[4 marks]** | |
|  |  | At top position she has gravitational potential energy ✓  as she swings forward this is transferred to kinetic energy ✓  thermal energy is transferred to the surroundings ✓  due to friction ✓ | |
|  |  |  |  |
|  | **(iii)** | How could the energy loss through friction be reduced? **[1 mark]** | |
|  |  | Lubricate the pivot ✓ | |

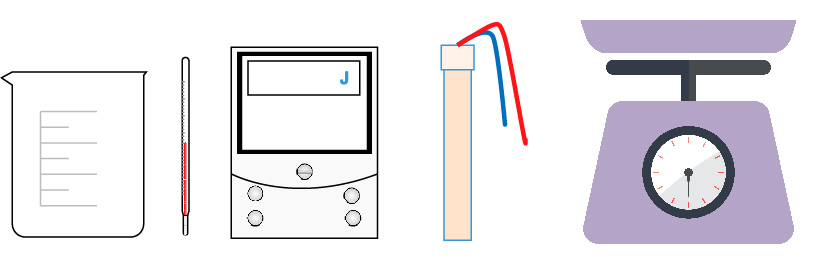
1. A games console with a power rating of 130 W is played with for 4 hours a day.

|  |  |  |  |
| --- | --- | --- | --- |
| **(a)** |  | Over a week, how much energy does it use? **[4 marks]** | |
|  |  | Time switched on is 4 × 7 = 28 hours ✓  28 × 60 × 60 = 100800 seconds ✓  Energy = power × time = 130 × 100800 ✓  = 13.1MJ ✓ | |
|  |  |  |  |
| **(b)** | **(i)** | The games console uses mains voltage. How much current is going through it? **[2 marks]** | |
|  |  | I = P / V = 130/230 ✓  = 0.57A ✓ | |
|  |  |  |  |
|  | **(ii)** | The cables connecting the games console to the plug heat up when it is on.  Why is this? **[3 marks]** | |
|  |  | Electrons collide with atoms in wire ✓  this transfers energy to atoms ✓  which vibrate more ✓ | |

1. Marcy takes a spring of spring constant 20 N/m. The spring extends by 30 cm. A toy car is placed in front of the spring so that when the spring is released it will hit the car and transfer all the stored energy into the car. The car has a mass of 10 g.

|  |  |  |  |
| --- | --- | --- | --- |
| **(a)** |  | How much energy is stored in the spring? **[3 marks]** | |
|  |  | E= ½ × k × e ✓  0.5 × 20 × 0.3 ✓  = 3 J ✓ | |
|  |  |  |  |
| **(b)** | **(i)** | How much kinetic energy does the car have once the spring is fully compressed again? **[1 mark]** | |
|  |  | 3 J ✓ | |
|  |  |  |  |
|  | **(ii)** | How fast is the car travelling at this point? Give a unit. **[3 marks]** | |
|  |  | velocity = √ (3 ÷ (0.5 × 0.010)) ✓  = 24.5 ✓  m/s ✓ | |





beaker thermometer joulemeter immersion heater scales

|  |  |  |  |
| --- | --- | --- | --- |
| **(a)** | **(i)** | How could you investigate to find the specific heat capacity of water using the above equipment? **[6 marks]** | |
|  |  | Find the mass of the beaker ✓  Add water and calculate just the mass of the water ✓  Plug in the immersion heater, and place it in the water ✓  Use the thermometer to measure a specific rise in temperature ✓  Use the joulemeter to measure the energy supplied to the water during this temperature rise ✓  Use the formula specific heat capacity = energy × mass × temp rise to calculate the specific heat capacity ✓ | |
|  |  |  |  |
|  | **(ii)** | During this experiment the water is also transferring energy to the air and surroundings.  Write down two ways to prevent this. **[2 marks]** | |
|  |  | Insulate the beaker ✓  Place a top on the beaker ✓ | |
|  |  |  |  |
| **(b)** |  | Copper has a specific heat capacity of 390 J/kg°C.  How much energy is needed to raise the temperature of 100 g of it by 50°C?  **[2 marks]** | |
|  |  | 0.1 × 390 × 50 ✓  = 1950 J ✓ | |

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If you are looking for examination practice materials, you can find the Sample Assessment Materials (SAMs) on the qualification webpage: [Combined Science A (9–1).](http://www.ocr.org.uk/qualifications/gcse-gateway-science-suite-combined-science-a-j250-from-2016/)

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# End of topic quiz

# Topic P5: Energy

## Learner Activity

### Topic: P5 of J250

**Total marks: 40**

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Your answer

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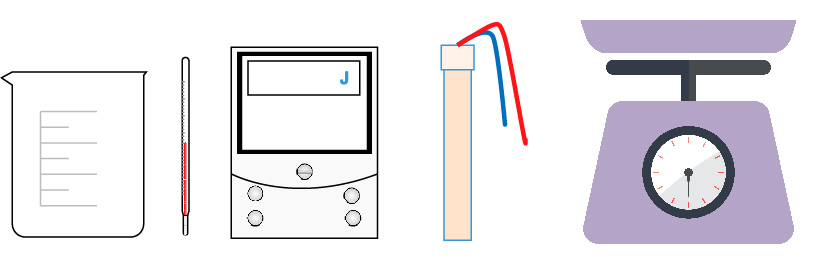
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