|  |  |
| --- | --- |
|  | Australian Curriculum Year 8 Science sample assessment ׀ Student booklet  Energy test |

© The State of Queensland (Queensland Curriculum and Assessment Authority) and its licensors 2014. All web links correct at time of publication.

|  |
| --- |
| *C:\Users\dmur\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\MYQK62BU\13560967873_d7716a7214_b.jpg* |
| Image: *Potential and Kinetic energy*, Slyavula Education, Creative Commons Attribution 2.0, <https://flic.kr/p/mEmSYE> |

|  |
| --- |
| Solve problems about changes within systems caused by energy transfers and transformations. |
| You will:   * identify types of energy and describe transformations * analyse and calculate the efficiency of energy-transformation devices * solve problems by calculating gravitational potential energy and kinetic energy * link knowledge of thermal energy to change of state * analyse data to draw conclusions and evaluate claims. |

# List of equations

The following equations are required to solve some of the questions in this test

# Part A: Short-response questions

1. Complete the table below to identify the energy transformation caused by each energy converter.

|  |  |  |
| --- | --- | --- |
| Main energy form used | Energy converter | Main energy form produced |
|  | toaster | heat |
| chemical potential | torch |  |
|  | car |  |
|  | iPod |  |

1. This toy car moves when you wind it up and let it go.

**Diagram 1: Wind-up toy car**

WindUpCar

Complete the energy chain below to identify three energy transformations starting with a person, winding the toy, to the toy moving.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 🢡 |  | 🢡 |  | 🢡 |  |

**Shade the bubble of your chosen response for Questions 3 to 5.**

**In the space provided under each question show all working or provide full explanations to justify your choice of answer.**

1. What is the kinetic energy of a 0.158 kg cricket ball travelling at 28 m/s?

* 61 936 J
* 4.42 J
* 247.74 J
* 61.94 J

1. Janie is at the top of a ski run which is elevated 40 vertical metres above the ground. Her mass (including her equipment) is 60 kg. Calculate her gravitational potential energy at the top of the slope.

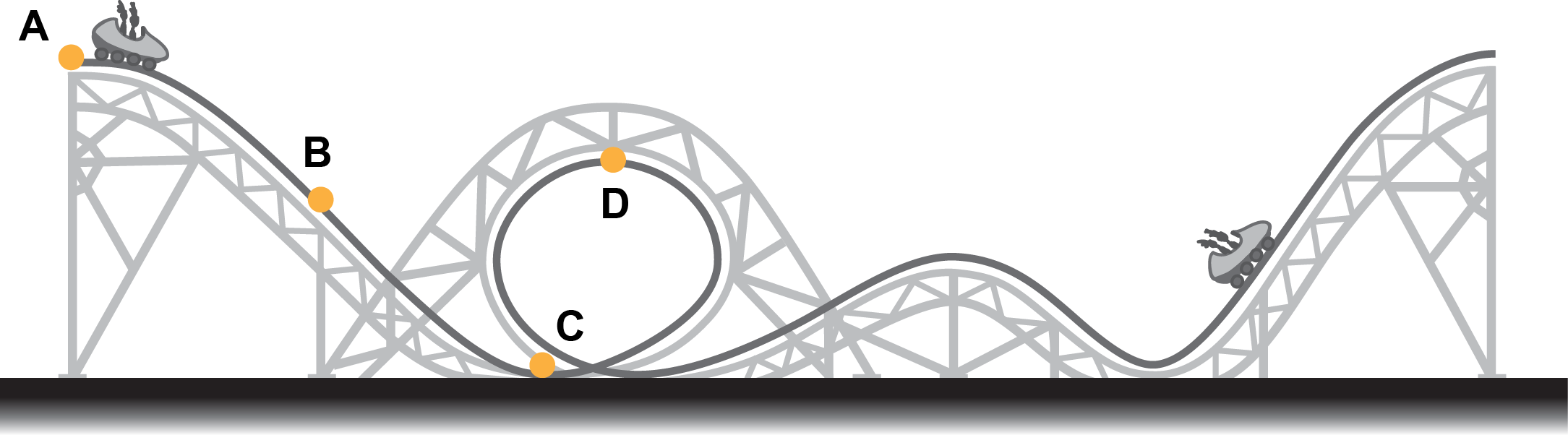
**Diagram 2: Ski run**



* 23 520 J
* 109.8 J
* 940 800 J
* 8 160 J

1. Consider points A, B, C and D on the roller coaster in the diagram below.

**Diagram 3: Roller coaster**

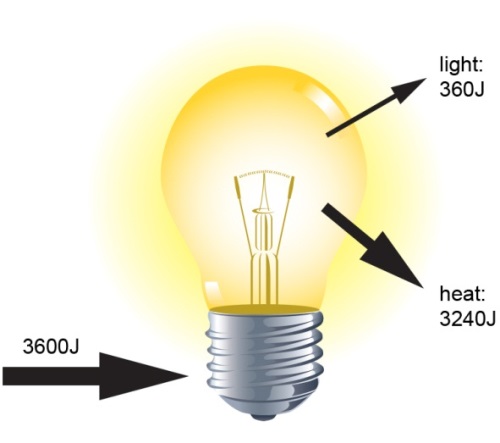


At which point does the roller coaster have the greatest gravitational potential energy?

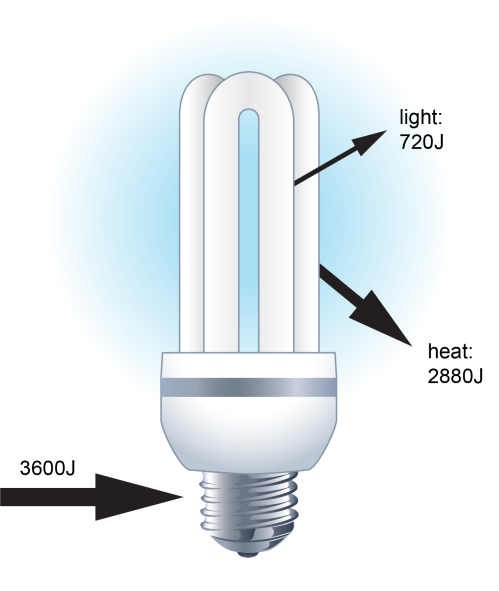
* A
* B
* C
* D

1. Quantitatively analyse the information in the diagrams below and:
   1. compare the efficiency of the energy transformation in a filament electric light bulb with that of an energy efficient electric light bulb
   2. describe the safety advantages of using energy efficient electric light bulbs in preference to filament light bulbs.

**Diagram 4: Energy transformations of a filament electric light bulb**



**Diagram 5: Energy transformations of an energy efficient electric light bulb**



1. Diagram 6 shows a skateboard rider performing a trick on a ramp.

**Diagram 6: Path of skateboard rider**

|  |  |
| --- | --- |
| C:\Users\dmur\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\XRDRPMZV\Skateboarder air-123path.png | **----------** Path of the rider |

* 1. Choose the graph in the table below that best represents the potential and kinetic energy of the rider at each of the positions 1, 2 and 3. NOTE: There are two graphs that will not be used when answering this question.
  2. Justify your choices.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Graph 1** | **Graph 2** | **Graph 3** | **Graph 4** | **Graph 5** |
| C:\Users\dmur\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\XRDRPMZV\A.jpg | C:\Users\dmur\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\XRDRPMZV\B.jpg | C:\Users\dmur\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\XRDRPMZV\14245_C_v2_nv (2).jpg | C:\Users\dmur\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\XRDRPMZV\D.jpg | C:\Users\dmur\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\XRDRPMZV\E.jpg |

1. Cooling milk quickly for storage is an important part of the food safety plan of every dairy farm. Farmers in Australia must cool their milk to 5 °C within 3½ hours from the commencement of milking.

***FOOD SAFETY CERTIFICATE***

🗹 …

🗹 Milk is cooled to 5 °C within 3 ½ hours from the commencement of milking.

🗹 …



A farm is investigating different methods of cooling its milk.

The temperature of the milk is measured regularly after milking a herd of cows.

The graph below shows the drop in temperature of the milk over time using different methods of cooling.

**Diagram 7: The cooling rates of milk using different methods.**

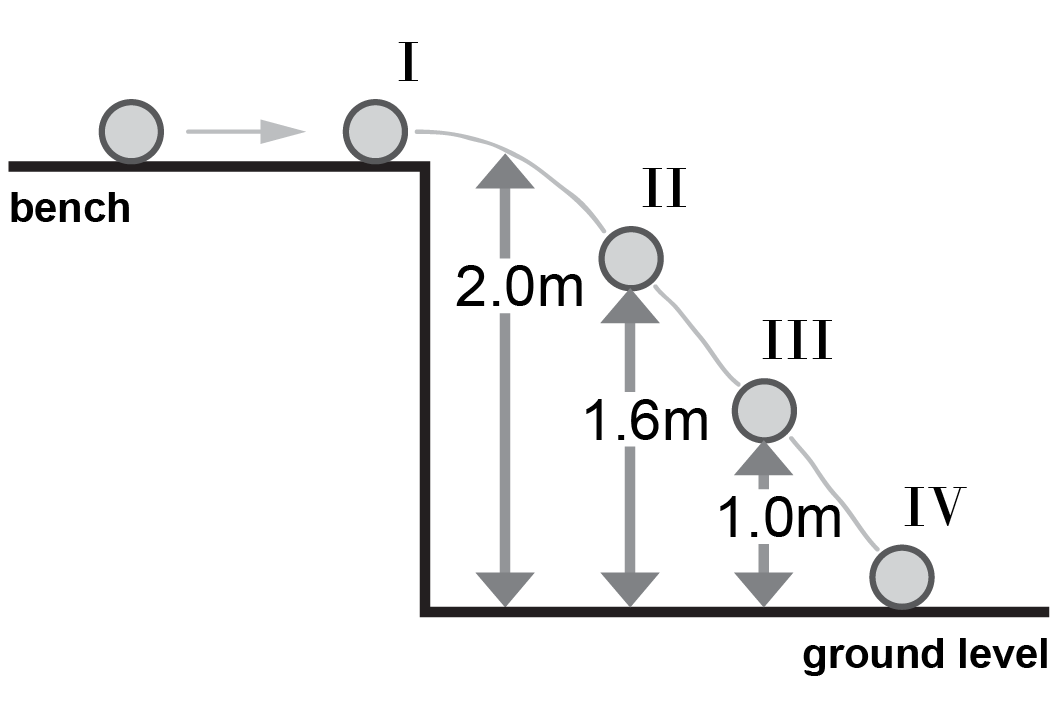
|  |  |
| --- | --- |
| C:\Users\dmur\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\XRDRPMZV\14245_Year8_Science_milk-temp_v2_nv.png | Source: <http://www.dairytechrefrig.com.au/pre-chilling> |

* 1. Would each of these methods allow the farmer to gain a Food Safety Certificate?   
     Justify your answer.

* 1. Evaluate the accuracy of the claim, ‘The Ice bank cools milk to 10 °C, 50% faster than other methods’.

1. A steel ball-bearing of mass 0.2 kg is rolled across a frictionless bench top at 2.0 m/s.   
   It rolls off the edge and falls 2.0 m to the ground as shown in Diagram 8.

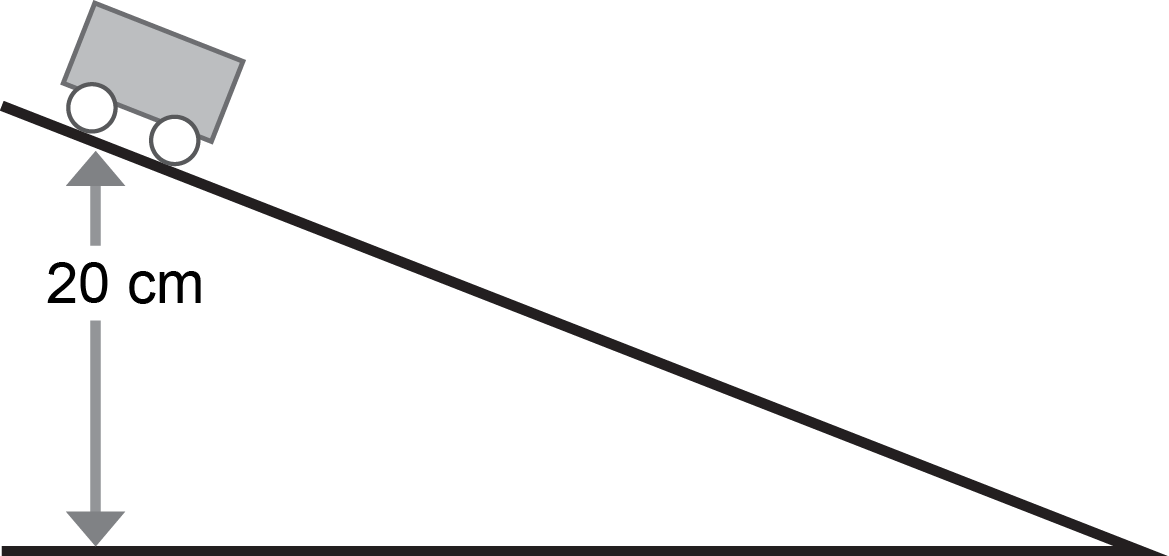
**Diagram 8: A falling ball-bearing.**



Compare the kinetic energy and the gravitational potential energy of the ball-bearing at position I.

1. During an experiment, a Year 8 student releases a 500 g cart from rest and accelerates down an inclined plane 1.2 m in length, as shown in Diagram 9.

**Diagram 9: A cart rolling down a ramp**



* 1. Given the initial height of the trolley on the inclined plane, calculate the initial gravitational potential energy of the trolley.

* 1. Calculate the kinetic energy of the trolley at the base of the incline if the velocity at the base is 1.7m/s.

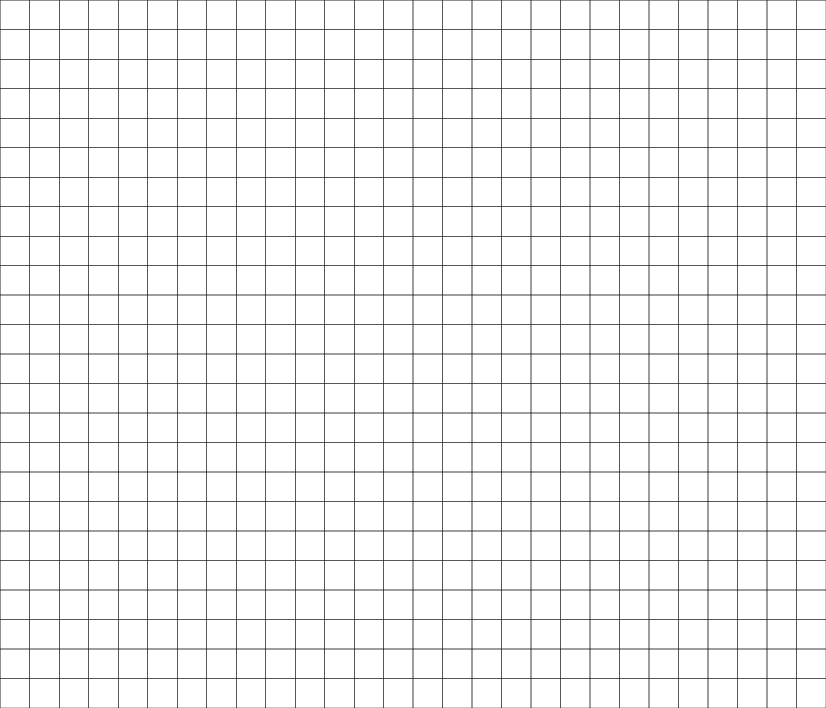
* 1. Calculate the percentage efficiency of the energy transformation.

# Part B: Stimulus-response questions

Use the information and data in the stimulus to answer the questions below.

1. Explain what the data indicates about Australia’s total predicted greenhouse gas emissions from transport between 1990–2020.

1. On the axes below, sketch graphs that compare the greenhouse gas emissions of cars with trains (rail) from 1990–2020.



1. Suggest why the UltraBatteryTM was initially targeted at cars rather than trains.