- **Supporting colleagues to review and implement learning and teaching program, including numeracy strategies**

[redacted] 4/10 6:31 am 1 3

colleague

Term 4 - Physics

Term 4 - Physics

Good morning 08 Science, I have been looking at the content & therefore the plan for year 8 Science this term. There is really only enough content to fill about 4-5 weeks. Therefore, I am requesting an early exam in week 6 for this topic. We could then use the last 2 weeks of term as enrichment activities - 1 week on Heat Investigation (thanks [redacted] for the resources) and 1 week on Rube Goldberg. applicant
You will see planning and lessons in the onenote. I am currently working on reviewing past lessons and putting together for this year but the internet whilst on holiday has been dodgy and I won't get back to this until tonight, so I apologise for the last minute.

See less

applicant [redacted] 4/10 10:58 am 1

colleague [redacted] - I've put a few more worksheets into the planning tab [redacted] just some things I found on the internet, consolidation type things. colleague

colleague [redacted] 4/10 9:22 pm

Thanks [redacted] - I can't see anything my end. Hopefully it'll sync tomorrow. Appreciate your help 😊
applicant

applicant [redacted] 5/10 8:18 am 2

There are some PPT in the Files Teaching and Learning area for energy also

applicant [redacted] 7/10 7:33 am 1 2

There's a lesson on heat transfer now if you want/need it.

applicant [redacted] 12/10 2:57 pm 1

colleague Hi [redacted] - Can I please ask what we doing with sound energy? How much detail is expected on particle vibration and sound waves? Waves overlaps into Year 9 content, but we could describe sound simply as vibrations in air particles and use the "Mexican wave" analogy that is in the textbook. I have this PPT from 2017, do we want to include the bit on light energy as well? What are your thoughts?

Sound and Light Energy.pptx ...

3.6 – review using knowledge of curriculum

colleague [redacted] 12/10 3:02 pm

applicant Thanks [redacted] - I will be looking at this soon, so will get back to you 🙂

applicant [redacted] Taran Edited

I've added a lesson that rolls energy flow diagrams and useful and wasted energy into one related topic, also touching on the idea of efficiency. FYI I have included Sankey diagrams in the lesson because they are used in Biology to show energy flow, and they're a good way to analyse data in a diagram.

2.5 – support colleagues to implement teaching strategies to improve numeracy achievement

colleague [redacted] 13/10 9:41 am

applicant Hi [redacted] - thank you very much for this!

I've just been speaking with [redacted] re your inquiry about Sound. We thought that your ppt was great & sufficient. Therefore, talking about the vibration of particles, but not much on waves (other than mentioning that both light & sound travel via waves) would be what would be required for the exam. Hope that helps.

08 Science - this is FYI too 🙂

colleagues [redacted] 14/10 12:13 pm

Hi [redacted] and [redacted]. How are you going with the production of the exam for the end of term? I am trying to get my head around where we are going with 8 Science this term. Do we have a list objectives for the exam, and an idea around the types if SIS skills we will be assessing?

Previously in 8 Physics we have talked about including some simple equations on GPE -> KE, or calculating GPE with different masses at different heights. Would something along these lines be suitable for the SIS section?

See less

colleagues [redacted] 14/10 1:04 pm

Hi [redacted] & 08 Science - the plan is to look at exam this weekend, so I will be feeding back re my progress. After a chat with [redacted] we discussed that it would be appropriate to calculate KE & GPE & efficiency but I am not sure how this will pan out yet.

Any other suggestions for exam ideas is welcome!

applicant [redacted] 14/10 1:20 pm

So should we be penciling in a lesson to teach calculating energy? This is traditionally done in Year 10...

3.6 – review using knowledge of curriculum/workplace practice

colleague [redacted] 14/10 5:19 pm

I think that challenging the students with the transformation between KE and GPE (mathematical manipulation) would be unreasonable. However, asking them to substitute into a formula (consistent with Year 8 math skills) is within their capability.

applicant [redacted] 14/10 5:49 pm

OK but wouldn't the concepts of what "g" is - the acceleration due to gravity - and "v" for velocity to calculate KE and GPE be beyond the scope of Year 8?

3.6 – review using knowledge of curriculum

colleague [redacted] 14/10 6:15 pm

In their most precise definitions, yes, but they have used 9.8 as g in some mathematical exercises (I think using the GPE formula). We can define v as speed which is what they are comfortable with. It is possible to present that GPE = 9.8 x m x h without reference to "g" as a pronumeral to avoid this.

[redacted] 4/10 8:37 pm applicant

Thanks [redacted] - I will pencil a lesson in for Week 4 on this if its deemed necessary for the exam.

colleague

- **Chat message – creation of calculating GPE lesson**

2.5 – support colleagues to implement teaching strategies to improve numeracy achievement

Thursday, 28 October 2021

colleagues

[redacted] 28/10/2021 5:38 am

Hi [redacted] thank you for the lesson in year 8 science on Calculating GPE. Out of curiosity, where did you find the questions from QCAA? I can click on the link that you included & see the whole resource, but can't seem to find this on my own if I try to navigate the QCAA website.

28/10/2021 7:01 am 1

I found it through a google search. I think I searched "calculating energy Year 8" or something similar.

- **Email of registration to PD – QCAA webinar on Yrs 7-10 Data Literacy**

From: noreply-events@[redacted]
Sent: Tuesday, 12 October 2021 2:37 PM
To: [redacted] [redacted] applicant
Subject: QCAA PD & events registration information

6.2 – engage in targeted opportunity to improve practice

Dear [redacted] applicant

The following is your QCAA Event registration status information:
You are registered to attend:

Event
Online Webinar - Identifying opportunities to build students' data literacy in science Years 7–10

RO Code	Date	Time	Status	Venue
[redacted]	14/10/2021	15:30 - 16:30	Confirmed	ONLINE WEBINAR QCAA ONLINE WEBINAR

Please arrive 15 mins before the start of the event.

Your registration number is [redacted]. Please use this number if you have any enquiries about your registration.

Regards

QCAA PD and events
[redacted]
Email events@qcaa.qld.edu.au

- **Notes taken during data literacy PD**

Data Literacy for 7-10 QCAA 14/10/21

Data Literacy – read, work with, communicate, analyse, argue with
A data rich society

critical consumers – finding meaning and taking action
data literacy of primary and secondary data in curriculum
overview for Science.

Questioning and prediction – pay attention to data to create
questions to drive scientific enquiry

Strategies –
select data as evidence to defend a position.
identify and explain the selection of graph type.
raw uncollated data to represent for particular audience
ask students to summarise given pictorial data. (short length)

ask students to collect data during pendulum experiment
where the length of pendulum is changed.
- how well do they understand how to collect and display data.

[free mobile data sensors science classroom] Google.

Comparing graphs produced from simple experiment to communicate
findings and showing trends, good discussion

Collect data with accuracy
- show data with obvious outlier and discuss effect of its removal.

Describe relationships

ART – directed activity relating to text
critical analysis of representations
reconstruction – reconstruct missing data/axes labels, draw conclusions
questioning – Sankey diagrams, ecological pyramids, pedigree construction
audience + purpose.

2.5 – effective teaching strategy for numeracy achievement

- **Overview of Teacher OneNote showing lessons 7 (Energy flow diagrams) and 12 (Calculating GPE) as part of the shared teaching resources**

L7: Energy flow diagrams - OneNote

Search (Alt+Q)

applicant [redacted]

File Home Insert Draw History Review View Help Class Notebook Share

Undo Paste Cut Copy Format Painter Clipboard Calibri Light 20 Basic Text Heading 1 Heading 2 Styles To Do (Ctrl+1) Important (Ctrl+2) To Do Tag Find Tags Outlook Tasks Tags Email Page Email Meeting Details Meetings Dictate Voice

Teacher 08 Science 2021 | Administration | Lesson Content | Revision | After the exam

Search (Ctrl+E)

L7: Energy flow diagrams

Sunday, 10 October 2021 3:38 PM

Lesson Objectives:

- Use flow diagrams to illustrate transformations between different forms of energy
- Distinguish between useful and wasted energy
- Use a diagram to identify and calculate useful and wasted energy

Evidence of Learning:

- ☐ I can identify energy transformations in a system
- ☐ I can represent energy transformations on a flow diagram
- ☐ I can identify and calculate useful and wasted energy when considering energy transformations in different scenarios

Home study - before next lesson...
☐ Ensure you have complete all the activities on this lesson page, and the review questions for the "Energy Transformations" practical task.

Add Page

L1: Intro to energy
L2: Energy transfers & transf
L3: Heat energy transfer
L4: Prac 5.1.2 - Investigating
L5: Clickview - 'Heat transfer'
Heat Transfer videos
L6: Prac 5.1.1 - Making a spi
L7: Energy flow diagrams
Indigenous Fire Starting T
L8: Prac 5.1.3 - Energy transf
Answers - PRAC 5.1.3 Ene
L9: Energy efficiency
L10: Prac 5.2.3 - Investigatin
L12: Calculating GPE
L13: Investigating the relatio
L14: Sound and light energy
Useful and Wasted Energy

- **Lessons 7 and 12 produced by me and shared with colleagues in the teacher OneNote**

L7: Energy flow diagrams

Sunday, 10 October 2021
3:38 PM

Lesson Objectives:

- Use flow diagrams to illustrate transformations between different forms of energy
- Distinguish between useful and wasted energy
- Use a diagram to identify and calculate useful and wasted energy

3.1 – high expectations through modelling and setting challenging learning goals

Evidence of Learning:

- I can identify energy transformations in a system
- I can represent energy transformations on a flow diagram
- I can identify and calculate useful and wasted energy when considering energy transformations in different scenarios

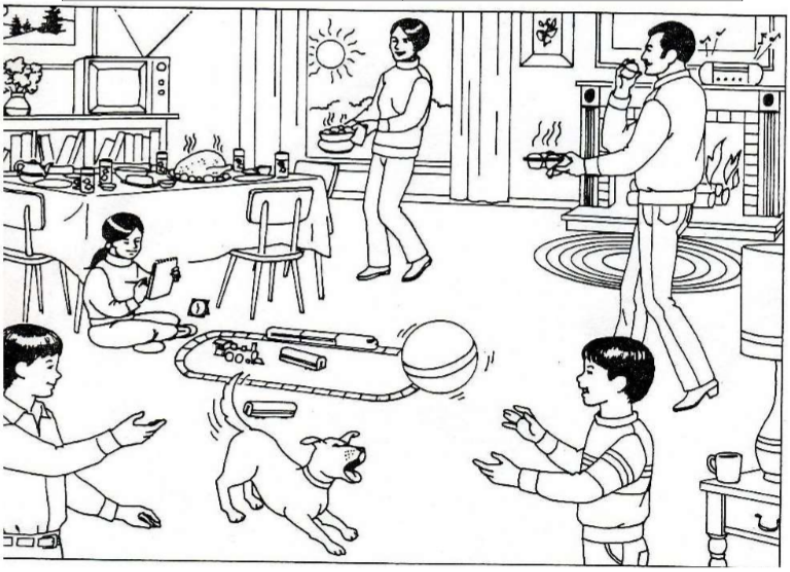
Home study - before next lesson…
Ensure you have completed all the activities on this lesson page, and the review questions for the "Energy Transformations" practical task.

Recall activity: Identifying forms of energy

Illustrations of Energy and Energy Transformations

Using the picture, find as many forms of energy as you can. Following the chart below, color the parts of the illustration where you might find each of the four forms of energy. You may find more than one example of each – stop at 3 of each.

Form of energy	Color
Electrical energy	yellow
Thermal (heat) energy	red
Chemical energy	blue
Mechanical energy	green



BONUS CHALLENGE: On the diagram write in a number beside any energy transformations you can identify. Record the type of transformation and the steps in the table at the bottom of the page. You may use the back of this sheet if you need more room.

Number on Diagram	Type of Transformation	Steps (Types of Energy) ex. chemical —> mechanical

Recall: Energy transformations

Energy transformations occur when one form of energy changes into another form of energy.

Examples of energy transformations include:

- gravitational potential energy being transformed into kinetic energy as an object falls
- chemical potential energy in a battery being transformed into electrical energy

☐ Return to the worksheet above and describe some energy transformations in the table below the picture.

Energy Flow Diagrams

Energy transformations can be represented with **energy flow diagrams** that track changes in energy.

An example of an energy flow diagram for the energy transformations in a torch is illustrated below:

Chemical potential energy → Electrical energy → Light energy

In this energy flow diagram, energy starts out as chemical potential energy (from the battery). The diagram indicates that the chemical potential energy is then transformed into electrical energy (electricity flows in the torch when it is switched on). The electrical (kinetic) energy is then transformed partly into light energy (and partly into heat energy - not shown).

From <https://sites.google.com/site/concordiay8science/energy/1-3-energy-changes/2-energy-transformations>

In an energy flow diagram:

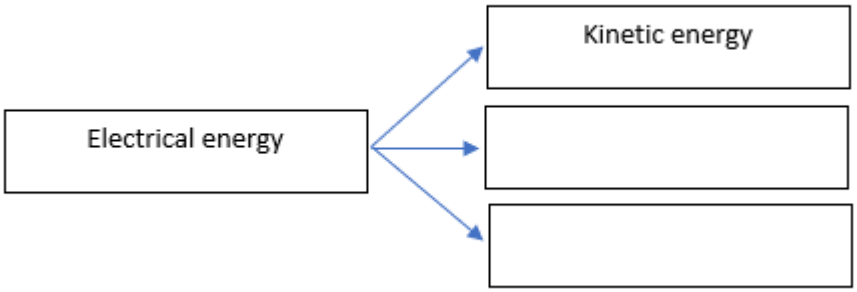
- Arrows show the direction that energy is passed on or changed into other forms in a particular situation.
- You do not have to draw pictures of the devices, boxes can be used to represent the devices.

☐ Complete the energy flow diagrams for the following three examples:

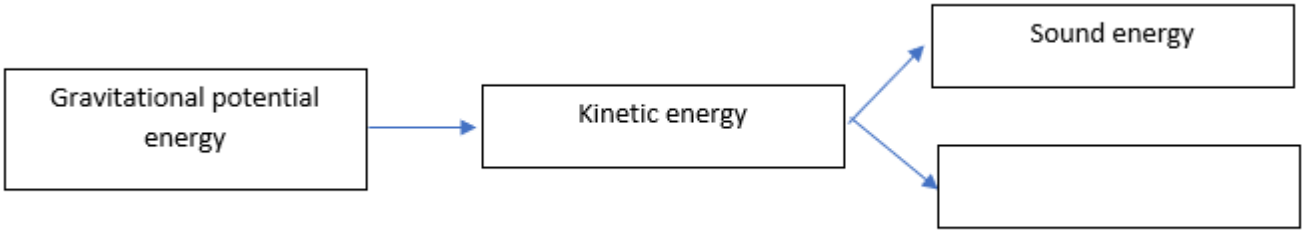
- Playing the piano:

Chemical potential energy → Kinetic energy →

- Running the clothes dryer:



- A rock falling off a cliff and hitting the ground below:



☐ Sketch your own energy flow diagrams for the following energy transformations:

- matchstick that has just been struck
- turning on a laptop computer
- person running up a staircase

Useful and wasted energy

If you push a toy car, you are giving the toy **kinetic energy**. When you stop pushing, the car keeps moving along the ground; however, **friction** between the wheels and the ground **produces heat energy** and eventually the toy car will stop moving because of all of its kinetic energy being converted into heat energy.

This heat energy is **wasted energy**. The energy has been transformed into a form that is **not useful**.

☐ Complete the table below to show useful and wasted energies during energy transformations:

Example	Initial Energy	Useful Energy Produced	Wasted Energy
Using an electric toothbrush	Electrical Energy	Kinetic Energy	Heat and sound energy
Using a torch			
Running a race			

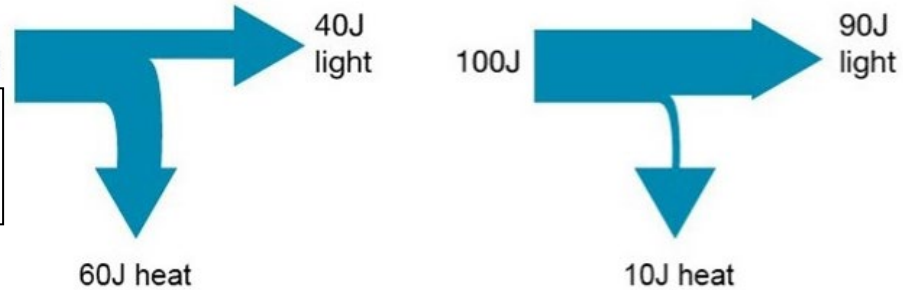
Another form of energy diagram can be used to represent useful and wasted energy is a **Sankey diagram**.
Sankey diagrams show the amount of energy that is inputted into a situation, and then the destination of different amounts of that energy as it is transferred and transformed. It also shows the conservation of energy.

- The width of the arrows represents the proportions of different types of energy in the system.
- Useful energy flows forwards
- Wasted energy is depicted by arrows that go up or down away from the useful energy
- Energy can be quantified in Joules on the diagram

For example, in the diagrams below two light bulbs are compared, both bulbs are supplied with 100 J of energy from the battery; however:

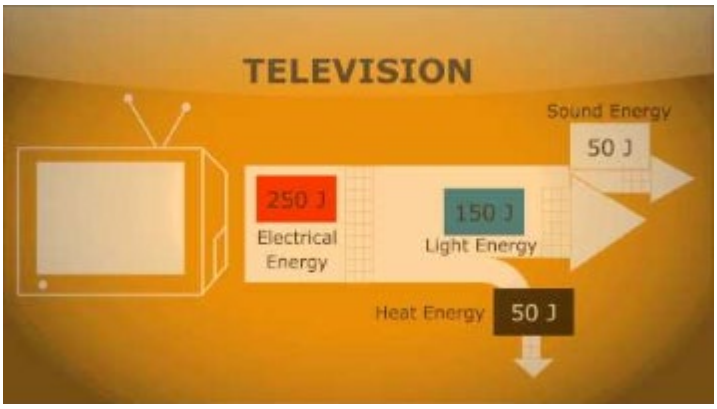
- For the bulb in the first diagram only 40 J of the 100 J of energy from the battery is transformed into useful light energy, 60 J of energy is wasted heat energy.
- For the bulb in the second diagram, 90 J of energy is being transformed into useful energy, and only 10 J is lost as wasted heat energy.

2.5 – strategy for numeracy achievement



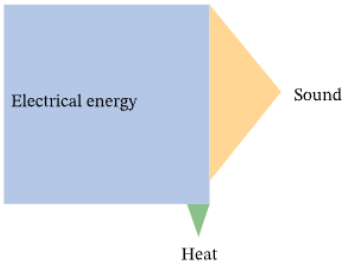
- Which bulb is more energy efficient? Explain why.

Physics - Energy - Sankey Diagrams



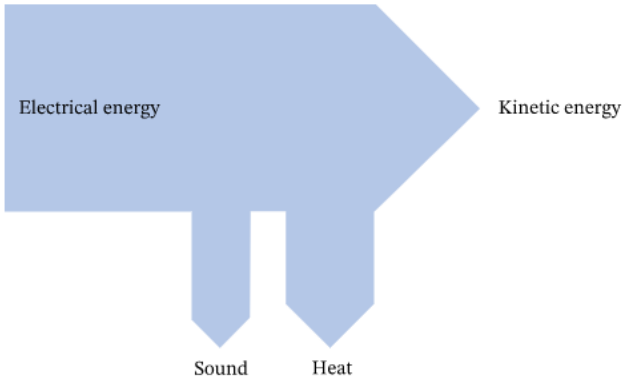
Questions:

1. A cell phone rings when it receives a call. Which of the following is the useful energy transformation for the phone?



A. Electrical energy to heat
B. Electrical energy to sound

2. An electric motor transforms electrical energy to 150 J of kinetic energy, 25 J of heat energy, and 15 J of sound energy.



2.5 – strategy for numeracy achievement

a. How much electrical energy (in Joules) does the motor produce?

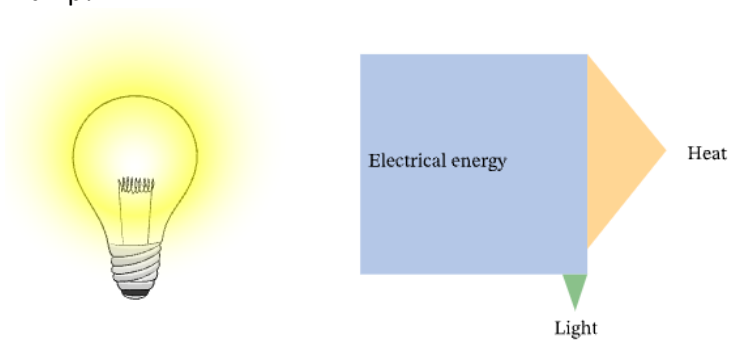
b. Which is greater, the useful energy transfer or the wasteful energy transfer?

3. An electric drill transforms electrical energy to kinetic energy, and some of this kinetic energy is transformed to sound energy.

a. Which is a useful category of energy for the drill?
   A. Kinetic energy
   B. Sound energy

b. Which is a wasteful category of energy for the drill?
   A. Sound energy
   B. Kinetic energy

4. An electric lamp is used to light a room. Which of the following is the useful energy transformation for the lamp?



From <https://www.nagwa.com/en/worksheets/964172354843/>

L12: Calculating GPE

Saturday, 23 October 2021
1:16 PM

Lesson objectives:

- Recall that gravitational potential energy is energy an object has due to its position above the surface of the Earth
- Understand the GPE is lost when an object falls, and GPE is gained when an object is lifted up
- Understand the relationship between GPE and KE
- Use the formula GPE = mgh to calculate the amount of GPE in joules in given scenarios

3.1 – high expectations through modelling and setting challenging learning goals

Evidence of learning

- I am a pro at calculating gravitational potential energy from given scenarios using the formula GPE = mgh.
- I can explain the relationship between GPE and KE using vocabulary that includes the word "transformation/transformed".

Home study - before next lesson…
Ensure you have completed all the activities on this lesson page and that you can tick off the evidence of learning statements.

Why GPE must exist

How do we know that things have energy just because of their height? Well, let's think about the following process:

Step 1: You lift a ball off the ground until it is above your head.

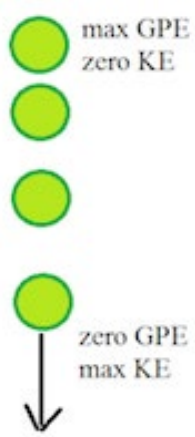
Step 2: You drop it.

Step 3: It moves fast right up until it hits the ground.

Energy is said to be **conserved**, which means that it cannot be created or destroyed, only moved from one form into another. So whatever energy we put in has to go somewhere.

In Step 1: you use energy in your muscles to lift the ball; you have to do work. This energy came from the food you eat, which originally came from the Sun through the food chain. When you lift the ball, you've used up that energy, so it has to go somewhere. We, therefore, conclude that it is stored inside the ball as GPE.

In Step 2: You release the ball and it falls. This proves that energy really was stored inside the ball because after releasing it, it suddenly started moving. The ball is gaining kinetic energy (KE) as it falls, getting faster all the time. Gravitational potential energy is being transformed into kinetic energy.



In Step 3: The ball has reached the ground, but not quite hit it yet. In the instant before it hits the ground, the ball is pretty much at the height it started before you lifted it up. It has its maximum speed and, therefore, its maximum KE. This means that the KE it has now is equal to the GPE it had before you dropped it.

Once the ball hits the ground, some of this kinetic energy is transformed into sound and heat energy.

From <https://study.com/academy/lesson/gravitational-potential-energy-definition-formula-examples.html>

Equation for GPE

The gravitational potential energy (GPE) of an object on Earth depends on:

- its **mass**
- its **height** above the Earth's surface
- the strength of gravity

2.5 – strategies for numeracy achievement

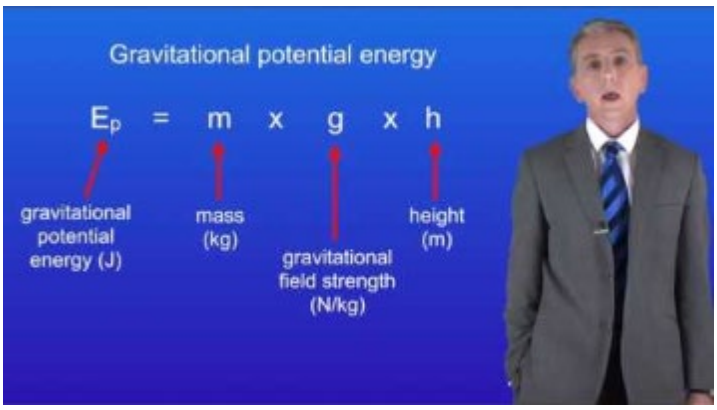
In the equation shown below:

- **m** is the **mass** of the object in **kilograms**
- **h** is the **height** of the object above the ground, measured in **meters**
- **g** is the acceleration due to **gravity** (which is **always 9.8** on Earth)

GPE = mass x gravitational field strength x height

Gravitational potential energy is measured in **Joules**, or units of energy:

GCSE Science Revision Physics "Gravitational Potential Energy"



2.5 – strategy for numeracy achievement

Strategy for calculating

1. Thinking: identify the formula for gravitational potential energy
2. Working: substitute values for m, g and h into the formula, complete the calculation
3. Units: ensure you use J for units after your answer

2.5 – strategies for numeracy achievement

Gravitational potential energy calculations: GPE = mgh

Work these questions with your teacher to practice:

When an object is lifted upwards, it gains GPE.
How much gravitational potential energy have the following objects gained?

1. A brick that has a mass of 1 kg lifted to the top of a house (10 m).

2. A 1,000 kg car lifted by a ramp up to a height of 2 m.

3. A 70 kg person lifted up 50 m by a ski lift.

When an object falls towards Earth, it loses GPE.
How much GPE have the following objects lost?

1. A 0.2 kg football dropping out of the air after being kicked up 30 m.

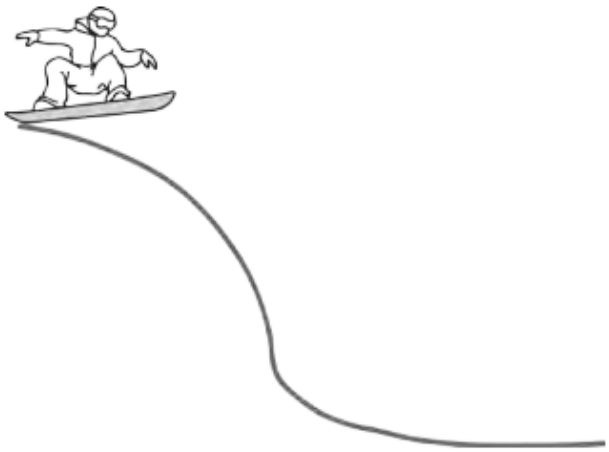
2. A 0.05 kg egg falling 10 m out of a bird nest.

3. Nathan falling 1.5 m to the ground after falling off a ladder (Nathan's mass is around 80 kg).

Understanding and calculation questions to do on your own. ← 2.5 – strategy for numeracy achievement

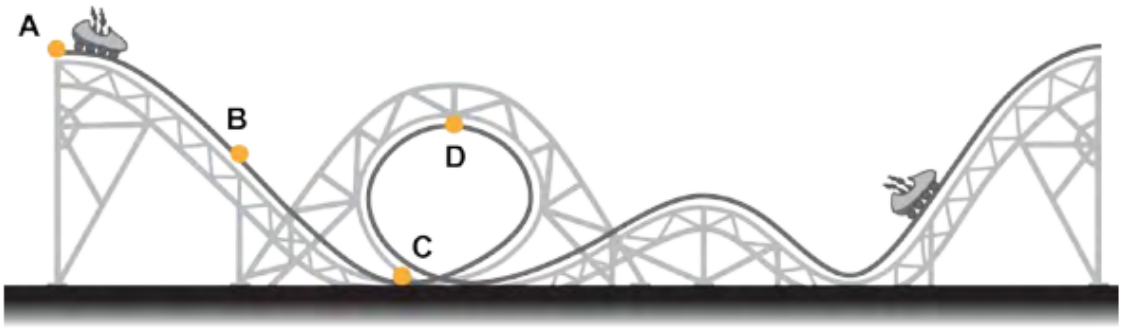
Janie is at the top of a ski run which is elevated 40 metres above the ground. Her mass (including her equipment) is 60 kg. Calculate her gravitational potential energy at the top of the slope.

applicant



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

Diagram 3: Roller coaster

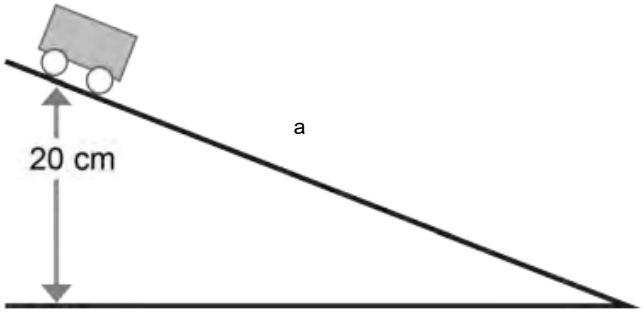


At which point does the roller coaster have the greatest gravitational potential energy?

(link inserted by N. Martin)
Explore the interactive at https://d3tt741pwxqwm0.cloudfront.net/WGBH/conv16/conv16-int-rollercoaster/index.html to help you explain why.

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



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

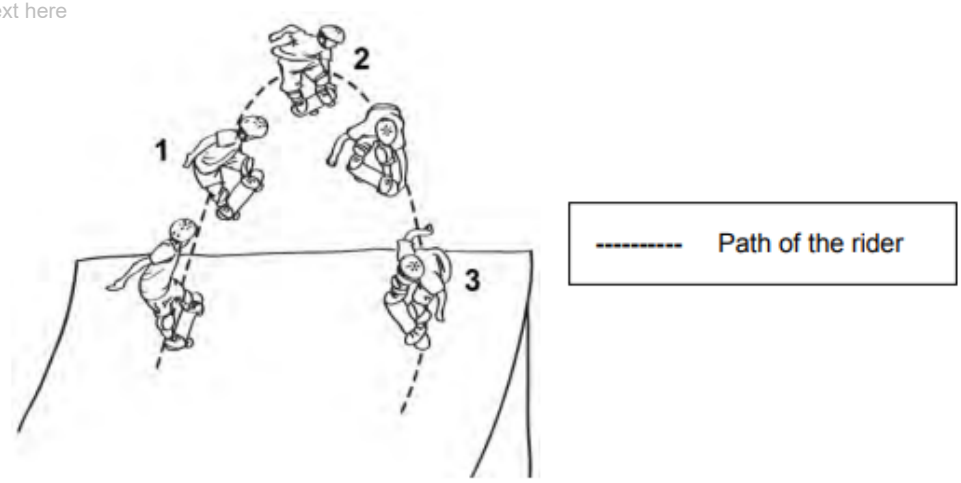
- If you can do this question you can tick of the second "evidence of learning" statement at the start of the lesson:

3.1 – culture of high expectations by setting challenging learning goals

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

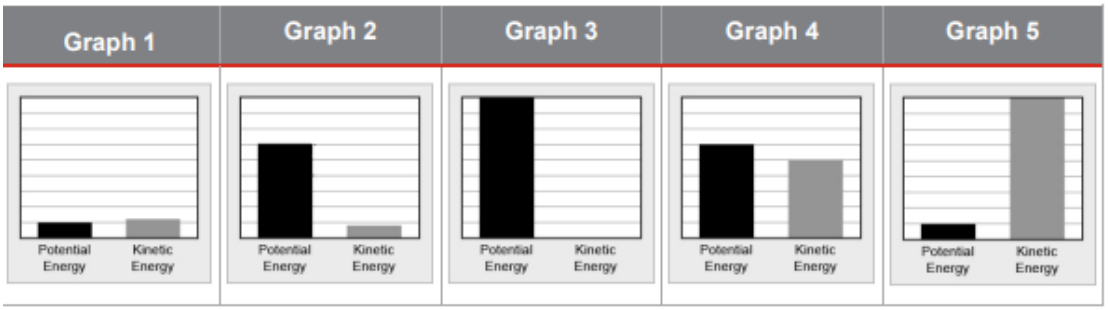
Diagram 6: Path of skateboard rider

Type text here



a. 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.

b. Justify your choices.



https://www.qcaa.qld.edu.au/downloads/p_10/ac_sa_sci_yr8_energy_test.pdf

- **Student work samples of energy efficiency calculations and use of Sankey diagrams**

Efficiency

Questions of efficiency

The efficiency of a machine can be worked out using the equation:

$$\text{Efficiency} = \frac{\text{useful energy output}}{\text{total energy input}} \times 100$$

Use this equation to answer the following questions:

1 An engine has an energy input of 100 J and gives out 27 J of useful kinetic energy. What is the efficiency of the engine?

$\frac{27}{100} \times 100 = 27\%$

2 A hair dryer has an energy input of 1500 J and gives out 1300 J of useful energy. What is the efficiency of the hair dryer?

$\frac{1300}{1500} = 86.67\%$

3 Compare these two machines to decide which is more efficient.

i Machine A uses 1000 J of energy to do 300 J of useful work.

ii Machine B uses 500 J of energy to do 200 J of useful work.

i) $\frac{300}{1000} \times 100 = 30\%$ ii) $\frac{200}{500} \times 100 = 40\%$

Machine B is more efficient.

4 Compare these two cranes to decide which is the more efficient.

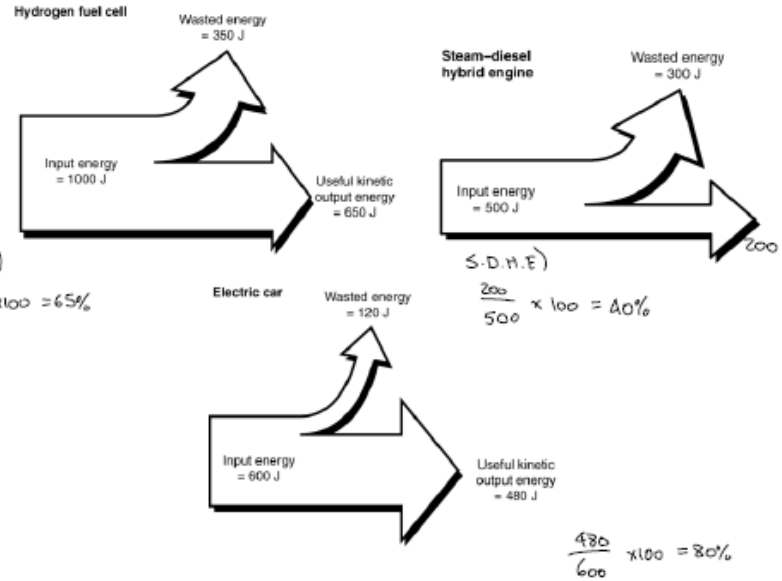
i Crane A uses 800 J of energy to do 350 J of useful work.

ii Crane B uses 750 J of energy to do 300 J of useful work.

i) $\frac{350}{800} \times 100 = 43\%$ ii) $\frac{300}{750} \times 100 = 40\%$

Crane A is more efficient.

5 Look at these energy diagrams. Work out the efficiency of each device.



H.F.C) $\frac{650}{1000} \times 100 = 65\%$

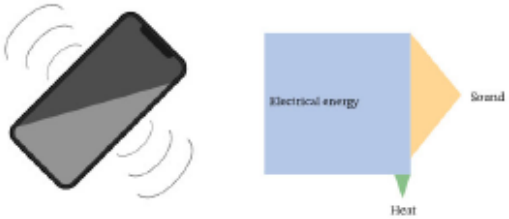
S.D.H.E) $\frac{200}{500} \times 100 = 40\%$

$\frac{480}{600} \times 100 = 80\%$

2.5 – strategy for numeracy achievement (opportunities for independent practice)

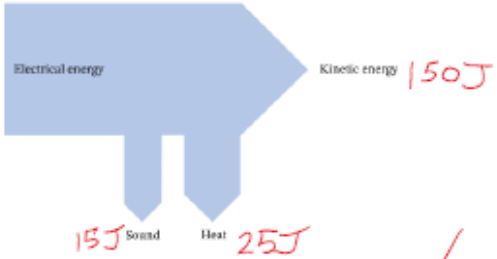
Questions:

1. A cell phone rings when it receives a call. Which of the following is the useful energy transformation for the phone?



A. Electrical energy to heat
B. Electrical energy to sound

2. An electric motor transforms electrical energy to 150 J of kinetic energy, 25 J of heat energy, and 15 J of sound energy.



a) How much electrical energy (in Joules) does the motor produce?
The motor produced 190 J of electrical energy.

190J = 150+25+15

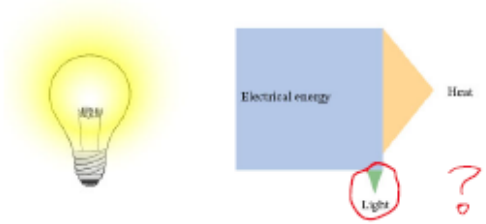
b) Which is greater, the useful energy transfer or the wasteful energy transfer?
The useful energy transfer is greater than the wasteful energy transfer.

3. An electric drill transforms electrical energy to kinetic energy, and some of this kinetic energy is transformed to sound energy.

a) Which is a useful category of energy for the drill?
A. Kinetic energy
B. Sound energy

b) Which is a wasteful category of energy for the drill?
A. Sound energy
B. Kinetic energy

4. An electric lamp is used to light a room. Which of the following is the useful energy transformation for the lamp?



From <https://www.cuemath.com/en/worksheets/964172/964840/>

Gravitational potential energy calculations: GPE = mgh

☐ Work these questions with your teacher to practice:

When an object is lifted upwards, it gains GPE.
How much gravitational potential energy have the following objects gained?

1. A brick that has a mass of 1 kg lifted to the top of a house (10 m).
1x9.8x10=98 J

2. A 1,000 kg car lifted by a ramp up to a height of 2 m.
1000x9.8x2=19600 J

3. A 70 kg person lifted up 50 m by a ski lift.
70x9.8x50=34,300 J

When an object falls towards Earth, it loses GPE.
How much GPE have the following objects lost?

1. A 0.2 kg football dropping out of the air after being kicked up 30 m.
0.2x9.8x30=58.8 J

2. A 0.05 kg egg falling 10 m out of a bird nest.
0.05x9.8x10=4.9 J

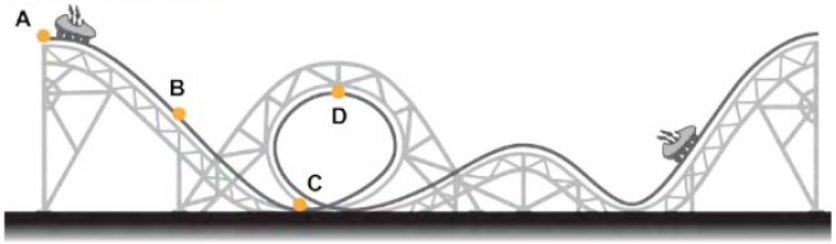
3. Nathan falling 1.5 m to the ground after falling off a ladder (Nathan's mass is around 80 kg).
1.5x9.8x80=1,176 J

Understanding and calculation questions to do on your own.

Janie is at the top of a ski run which is elevated 40 metres above the ground. Her mass (including her equipment) is 60 kg. Calculate her gravitational potential energy at the top of the slope.
60x9.8x40=23,520 J

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

Diagram 3: Roller coaster



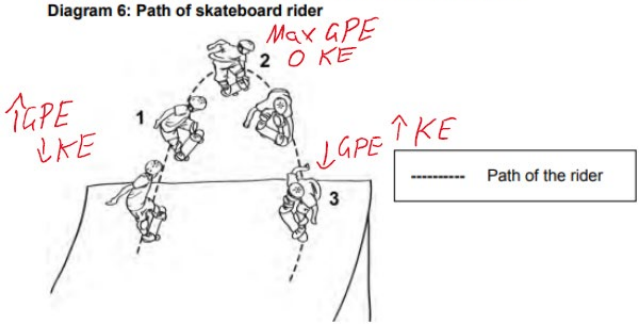
At which point does the roller coaster have the greatest gravitational potential energy?

Explain why.
The roller coaster has the greatest gravitational potential energy at point A because the height of the coaster is the highest.

☐ If you can do this question you can tick of the second "evidence of learning" statement at the start of the lesson:

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

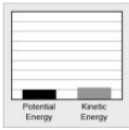
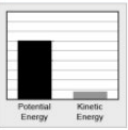
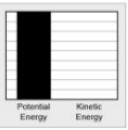
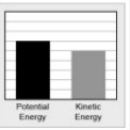
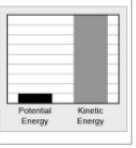
Diagram 6: Path of skateboard rider



a. 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.

b. Justify your choices.

Position 2 Position 1 Position 3

Graph 1	Graph 2	Graph 3	Graph 4	Graph 5
				

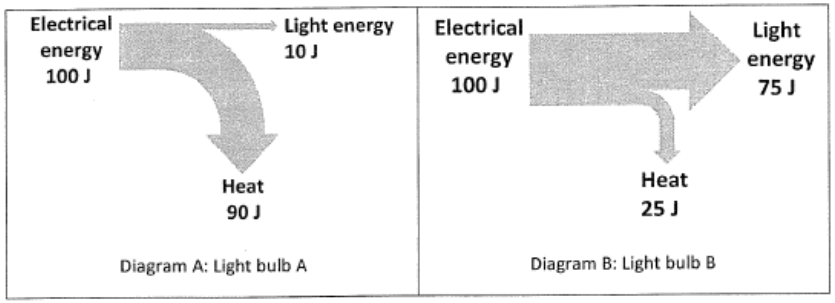
At point 1, the kinetic energy from the skateboards wheels is being transformed into GPE. This is because the skateboarder is being lifted higher, and thus their potential to be acted upon by gravity is increasing. According to the Law of Conservation of Energy, energy cannot be created nor destroyed only transferred or transformed, meaning the rider and board's kinetic energy must be transformed into GPE.

At point 2 on the diagram, all of the kinetic energy from the turning of the skateboard's wheels has been transformed into GPE, and the skater and board have stopped moving. At this point the skater and board possess 100% GPE and zero KE, because the skater's distance from the Earth's surface has increased the potential for gravity to act on them. Since energy cannot be created nor destroyed, the skater's KE was transformed into GPE.

At point 3 on the diagram, the skater's GPE is being transformed into KE as Earth's gravitational field pulls the skater towards the ground. Since the skater's distance from the Earth's surface is decreasing this GPE energy is transformed into KE, making the skater fall faster.

- **Student samples from Year level end of term assessment item, showing successful implementation for numeracy achievement**

9. Diagrams A and B show the energy transformations for two light bulbs that are both provided with 100 J of electrical energy. Some energy is transformed to light, and some to heat.



a) * **Calculate** the energy efficiency of light bulbs A and B using the equation provided. Show your working in the box below.

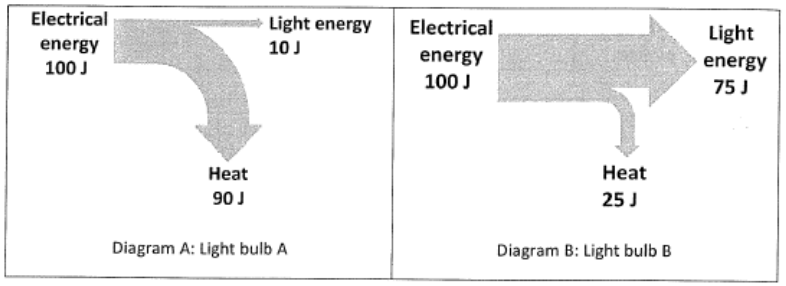
$$Energy\ efficiency\ \% = \frac{useful\ energy\ output}{energy\ input} \times 100$$

Energy Efficiency of Light Bulb A	Energy Efficiency of Light Bulb B
efficiency $= \frac{10}{100} \times 100$ $= 10\%$ ✓	efficiency $= \frac{75}{100} \times 100$ $\approx 75\%$ ✓

b) ** **Describe** which light bulb is the most energy efficient by **referring** to your calculation and the diagram.

Light bulb B is more ~~effe~~ energy efficient as the useful energy is more than the wasted energy, where as in Light bulb A the wasted energy output is more than the useful energy output making it Less energy efficient. 10% vs. 75% efficiency

9. Diagrams A and B show the energy transformations for two light bulbs that are both provided with 100 J of electrical energy. Some energy is transformed to light, and some to heat.



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Energy Efficiency of Light Bulb A	Energy Efficiency of Light Bulb B
$\frac{10}{100} \times 100 = 10\%$ energy efficent ✓	$\frac{75}{100} \times 100 = 75\%$ energy efficent ✓

B –

b) ** **Describe** which light bulb is the most energy efficient by **referring** to your calculation and the diagram.

By looking at my calculations from both light bulb A & B, it is clear light bulb B ✓ is the ~~more~~ most energy efficent. This is because in bulb B, 75% ✓ of the useful ~~energy~~ energy was being used ~~from~~ & only 25 was being wasted. On the other hand light bulb A only used 10% of its useful energy & 90% of the energy input was being wasted.

Really it's 75% of the input energy is useful

app

12. A roller coaster carriage with a mass of 250 kg is perched at the top of a 40 metre high hill and is about to make its descent down the other side of the hill.
The following table displays both the 'Gravitational Potential Energy (GPE)' and 'Kinetic Energy (KE)' of the roller coaster at different points during its descent.

Height (m)	Gravitational Potential Energy (J)	Kinetic Energy (J)
40	a)	0
30	73 500	24 500
20	49 000	49 000
10	24 500	73 500
0	0	98 000

a) * **Calculate** the gravitational potential energy of the roller coaster at the top of the hill. Show working.
GPE = m x 9.8 x h

GPE = 250 x 9.8 x 40
= 98000 J

b) *** Use the data in the table above to **explain the relationship** between GPE and KE as the roller coaster carriage descends the hill.
Your answer should relate to GPE, KE and the Law of Conservation of Energy.

When the carriage is at the top of the hill, (40) GPE is at its maximum as it has the greatest potential to roll down, KE is 0 however, as the carriage decends, (30) it speeds up, meaning that there is more kinetic energy - as it is moving (20) - and less GPE. When the carriage reaches the bottom (10-0) KE is at its Maximum and GPE is at 0. (0) This obeys the law of conservation of energy as no energy is lost, instead it is transformed.

12. A roller coaster carriage with a mass of 250 kg is perched at the top of a 40 metre high hill and is about to make its descent down the other side of the hill.
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10	24 500	73 500
0	0	98 000

a) * **Calculate** the gravitational potential energy of the roller coaster at the top of the hill. Show working.
GPE = m x 9.8 x h

GPE = 40 x 9.8 x 250
= 98 000 J

b) *** Use the data in the table above to **explain the relationship** between GPE and KE as the roller coaster carriage descends the hill.
Your answer should relate to GPE, KE and the Law of Conservation of Energy.

The relationship between GPE and KE as the rollercoaster carriage descends down the hill is that the GPE gets transformed into the KE the closer it gets to the ground.

c) *** **Determine** the point where the roller coaster will be going the fastest. **Explain** your answer using data from the table above.

The roller coaster is at its fastest pace at the height of around 20-10. This is because the GPE is low, and the KE is high so the carriage is travelling faster with more kinetic energy. (73500 J of KE)