**Edited by Joanne Sheppard 27/06/2017**

**Notes:**

* **It appears that many people did not read the tutorial**
  + **Is this because it was too long?**
  + **Should this be a problem for the final tutorial for the website?**
* **I have corrected any spelling mistakes, formatting problems and put data into tables but have otherwise left the answers alone.**
* **Some answers were blank (I am assuming because the volunteers would skip the question) and there was one inappropriate answer that has been deleted.**
* **I’m thinking the best way to progress will be to show only one answer and the corresponding pictures to see whether the right picture can be found from the answer.**

Graphene

#1

* Image shows the representative structure of a chemical system.
* The main body of the structure appears to be a hexagonal Carbon arrangement, much like graphene. However, there are a number of additional functional groups attached at various points.
* At the top left and bottom right, there are Carboxyl groups (COOH), and at the top right, top middle (5 atoms from the top left Carboxyl group), and bottom middle (9 atoms from the bottom right Carboxyl group), there are alcohol groups (OH)
* The caption says: Representative structure only: not true identity.

#2

* The diagram shows the representative structure of a chemical system.
* The main structure is a hexagonal arrangement of Carbon atoms, as in Benzene. However, there are a number of additional functional groups.
* At the top left and bottom right, there are Carboxyl groups (COOH). At the top right, top middle (5 atoms from the top left Carboxyl group) and bottom middle (9 atoms from the bottom left Carboxyl group), there are alcohol groups (OH).
* The caption says: Representative structure only: not true identity.

#3

The image shows an untitled diagram. It shows a lattice structure, a grid of 42, 6 sided regular polygons. Off the corners of three of these polygons extend an arm, with 'OH' at the end. Off the corner of two polygons extend an arm, off the end of which extend 2 more arms; one arm has 'OH' at the end, the other is an arm with two parallel lines, with an 'O' at the end.

#4

* Its an arrangement of hexagons tessellating together to make a roughly rectangle shape overall (8 by 5).
* the top right corner, there is an OH group
* the bottom right is an OH and a double bod to an oxygen molecule (Both coming off a Hydrogen)
* the top left is the same as the bottom right and there is an OH a third of the way along from the top left.

#5

A chemical structure. Looks a bit like a nice honeycomb. But with random OH groups and OOH groups coming off it.

Average Temperature

#1

The image shows a bar chart. The chart title is "Average Temperature in London Per Month". The x-axis label is "Month". The y-axis label is "Temperature (degrees C)". The x-axis ticks and labels correspond to the Months of the year. The y-axis ranges from 0 to 20 in increments of 1 (20 does not have a label, but is the top line on the graph).The bars are positioned as follows:

|  |  |
| --- | --- |
| Month | Temperature (degrees C) |
| Jan | 6 |
| Feb | 6 |
| Mar | 8 |
| Apr | 10 |
| May | 13 |
| Jun | 16 |
| Jul | 18.5 |
| Aug | 18.5 |
| Sep | 16 |
| Oct | 12.5 |
| Nov | 9 |
| Dec | 7 |

#2

* Average temperature in London per month
* x-label: Month, range: January to December.
* y-label: Temperature, degree Celsius.
* Description: A bar plot showing average temperatures for every month of a year, rising from January to July-August, and then declining for the rest of the year. Data (approx.):

|  |  |
| --- | --- |
| Month | Temperature |
| Jan | 6 |
| Feb | 6 |
| Mar | 8 |
| Apr | 10 |
| May | 13 |
| Jun | 16 |
| Jul | 18.5 |
| Aug | 18.5 |
| Sep | 16 |
| Oct | 12.5 |
| Nov | 9 |
| Dec | 7 |

#3

Vertical Bar chart Graph along y axis shows the Average Temperature in London per month. On the y axis it states temperature in units of Celsius, on the x axis it states the month. The y axis scale is such that it goes from 0 to 20 Celsius in increments of 1 unit of Celsius. The x axis goes through in chronological order the months start with January ending at December. The trend of this graph is a wave peaking at July and august at 18.5 Celsius.

#4

Average temperature increases across the months from January to July and august before decreasing in Celsius in the months following august to 7 degrees in December.

#5

A bar graph showing the average Temperature in London for each month of the year. The y-axis shows temperature in °C from 0 °C to 19 °C in increments of 1. The x-axis shows all the months of the year (January to December). The graph shows the average temperature for each month as:

|  |  |
| --- | --- |
| Month | Temperature (°C) |
| January | 6 |
| February | 6 |
| March | 8 |
| April | 10 |
| May | 13 |
| June | 16 |
| July | 18.5 |
| August | 18.5 |
| September | 16 |
| October | 12.5 |
| November | 9 |
| December | 7 |

Stirling Engine

#1

* Title: Stirling Engine
* x-label: Volume, m^3 (cubic meters)
* range 0.8...2.2
* y-label: Pressure, kPa (kilopascals), range 0.5...3.5.
* Description: The plot shows an example cycle of a Stirling engine, a closed loop with 2 curves and 2 straight lines:
* (1.0,3.5) to (2.0,1.75) a curve, the volume increases while the pressure decreases
* (2.0,1.75) to (2.0,0.75) a vertical straight line, the pressure decreases while the volume is constant.
* (2.0,0.75) to (1.0,1.5) a curve, the volume decreases, the pressure rises
* (1.0,1.5) to (1.0,3.5) a vertical straight line, the pressure increases, the volume stays constant

#2

Image shows an untitled plot of velocity in kilometres per second in increments of 10 against time in seconds in increments of 10. It has two different coloured lines, with a legend in the corner showing that the green line described the motion of car 1 and the blue line shows the motion of car 2. The green one is straight between the origin and (20,60), straight between (20,60) and (49,60), then curved between (40,60) and (60,1). The blue line is horizontal at 30 kilometres per second.

#3

It's like a parallelogram! But not necessarily it has curved sides.

#4

This image represents a simple diagram of a heat engine its elements depicted by 3 rectangles positioned one above the other. All of the rectangles have a blue outline around them and are themselves white, except from the middle one which has a blue outline and is turquoise in colour. All of the rectangles are labelled with letters in the middle. The top rectangle is the Hot Reservoir from which an arrow points vertically down to the second rectangle called the Engine. On the right of this arrow a capital letter Q with a subscript capital H is positioned, thus this arrow signifies the heat flowing into the engine from the hot reservoir. There are two arrows, which point away from the Engine rectangle, one of the points to the right and have a capital W written to the right of it, therefore this arrow represents the work done by the engine. The second arrow points vertically down the last rectangle called the Cold Reservoir. Again, to the right of this arrow a capital Q with a subscript capital C is written, thus this arrow represents the heat flowing from the engine to a cold reservoir (excess heat).

#5

The graph title is 'Stirling Engine'. Along the y-axis is Pressure, in units of kPa. It starts at 0.5 and goes to 3.5, in increments of 0.5. Along the x-axis is Volume, in units of metres cubed. It starts at 0.8 and goes up to 2.2, in increments of 0.2. A straight line starting at (1.0, 1.5) goes up to (1.0, 3.5) Then it curves down to (2.0, 1.75), and follows straight to (2.0, 0.74). Then it curves up to (1.0, 1.5).

Carbon Dioxide Emissions

#1

* The image shows a pie chart with title "U.S. Carbon Dioxide Emissions 2015"
* The values are:

|  |  |  |
| --- | --- | --- |
|  |  |  |
| Electricity | 36 |  |
| Transportation | 32 |  |
| Industry | 15 |  |
| Residential & Commercial | 10 |  |
| Other | 7 |  |
|  |  |  |

#2

Image shows a pie chart entitled "US carbon emissions 2015". It has 5 segments of different weightings; electricity (36%), transportation (32%), industry (15%), residential and commercial (10%) and other (7%).

#3

Other factors accounts for 7% of carbon emissions, residential and commercial factors account for 10% of carbon emissions, Industry accounts for 15% of carbon emissions, transportation accounts for 32% of carbon emissions and finally the largest proportion of 36% is accounted for by electricity.

Integrals

#1

Image shows a graph with no title, a plot of f against x. x is plotted in the range of a to b. f is always positive, and is a curve with two maxima and two minima. The curve has been divided into sections.

#2

From f the bars dip and then begin to steadily increase up where they peak

#3

The graph is a histogram, with bars of varying widths and heights. The bars begin at a point 'a' on the x-axis and end at 'b'. A curve is fitted to the top of the bars, with the curve beginning at 'f', on the top left corner of the first bar.

NASA

#1

Image shows a bar chart titled 'cost of NASA mission', with dollars in billions on the y axis, in increments of 1 billion, and the mission name on the x axis. It shows that voyager 1 cost about 3.6 billion, curiosity cost about 2.8 billion, Rosetta cost about 2.5 billion, new horizons cost about 0.9 billion and dawn cost about 0.5 billon.

#2

Velocity – Time Graph

#1

Image shows an untitled plot of velocity in kilometres per second in increments of 10 against time in seconds in increments of 10. It has two different coloured lines, with a legend in the corner showing that the green line described the motion of car 1 and the blue line shows the motion of car 2. The green one is straight between the origin and (20,60), straight between (20,60) and (49,60), then curved between (40,60) and (60,1). The blue line is horizontal at 30 kilometres per second.

#2

* this line graph shows the difference in speeds between two cars
* the x axis shows the velocity in KMS
* the x axis goes from 0 - 70 KMS at a leap of 10 KMS per bar increase.
* the y axis shows the time taken in seconds.
* the y axis goes from 0-60 seconds at a leap of 10 seconds per bar increase.
* car 1 peaked at 60KMS after 20 seconds, flat lined until 40 seconds and decreased back to 0KMS at 60 seconds.
* car 2 travelled at a consistent speed and stayed at 30 KMS for the whole 60 seconds

#3

Velocity increases between 0 and 60 seconds, before staying level between 20 and 40 seconds and then curbing down ward between 40 and 60 seconds.

Proton Decay

#1

The image shows an unlabelled diagram. It shows two black lines on an intercept course from the left, the top on labelled n and the bottom one labelled P+. When they intercept, a curved line emerges right. It is a wavey curve, with one maxima and two minima. This segment is marked W+. At the end of this line two straight lines emerge, both with positive gradients. The steeper one is labelled e+, the shallower is labelled v subscript e.

#2

The line goes from p to a wiggly w and up to e. There is also a n connected to the wiggly w on the left which extends to a ve

#3

* The image does not contain a title, nor does it contain axes. The image depicts a Feynman diagram.
* At the left of the image, two straight lines converge from left to right. The upper line is labelled "n", the lower line is labelled "p+".
* At the point of convergence, a curved waved line begins, going left to right. It begins in a trough, rises to a peak, then dips in a trough again, before terminating.
* This wave is labelled with "W+".
* After the wave, two straight lines diverge, both moving from left to right, and upwards. The left most line is labelled "e+", the right most is labelled "V\_e"

#4

The image is a graph with no units or axis titles. Starting from the left side of the graph moving right there 'n' approaches from the bottom of vertical axis to center of the vertical axis and P+ approaches from the bottom of the vertical axis to the center of the vertical axis. Both n and P+ meet at the center of the vertical axis. At this point a curve begins named W+ which is a wave. The end of this wave breaks off into two straight curves, e+ and v sub e. These lines are both increasing on the vertical and horizontal axis with e+ growing faster than v sub e

Eye

#1

* Hello! This image shows a cross section drawing of the human eye.
* The left of the image shows the front of the eye, which is what the outside world can see, like the iris.
* The right of the image shows the back of the eye, the parts that are inside the eye sockets, like the retina.
* This diagram shows the cornea, Iris and lens at the front of the eye.
* The vitreous body and the sclera are in the middle of the eye.
* The choroid layer, macula, retina and optic nerve to the brain are shown at the back of the eye.

#2

The cross-section diagram of an eye. A main body consists of vitreous body and a lens. Outside of these are other layers that we other functions.

#3

This cross section of the eye demonstrates the structures behind the lens of the eye.

Heat Engine

#1

The hot reservoir is followed by the engine by the process called Qh (which makes a by product called w) which then leads on the cold reservoir by the process QC

#2

This image represents a simple diagram of a heat engine its elements depicted by 3 rectangles positioned one above the other. All of the rectangles have a blue outline around them and are themselves white, except from the middle one which has a blue outline and is turquoise in colour. All of the rectangles are labelled with letters in the middle. The top rectangle is the Hot Reservoir (typo anyone?) from which an arrow points vertically down to the second rectangle called the Engine. On the right of this arrow a capital letter Q with a subscript capital H is positioned, thus this arrow signifies the heat flowing into the engine from the hot reservoir. There are two arrows, which point away from the Engine rectangle, one of the points to the right and has a capital W written to the right of it, therefore this arrow represents the work done by the engine. The second arrow points vertically down the last rectangle called the Cold Reservoir. Again, to the right of this arrow a capital Q with a subscript capital C is written, thus this arrow represents the heat flowing from the engine to a cold reservoir (excess heat).