

Pecyn parti penblwydd Einstein

Mae detholiad o Becynnau Gweithgareddau Wythnos Gwyddoniaeth a Pheirianeg gan Gymdeithas Wyddoniaeth Prydain nawr ar gael yn y Gymraeg.
www.nsew.org.uk

BIS | Department for
Business Innovation & Skills



About this pack

Background

Albert Einstein's birthday was on March 14th. His work changed the way we view the world for ever. Below you'll find a selection of physics experiments that could be performed at a birthday party for Albert Einstein.

Audience

The ideas in this activity pack have been designed to be flexible and adaptable to the needs of a range of audiences. You may wish to pilot test these activities on a sample audience prior to holding your National Science & Engineering Week event.

Accessibility

This activity pack has been translated into Welsh for accessibility by Welsh learners. For an English version please visit www.nsew.org.uk.

Gweithgareddau

Gweithgaredd 1:

Plygu dŵr

Byddwch angen: Balŵn (rhai siap selsig sy'n gweithio orau), pren mesur blastig, tap neu beipen ddŵr, papur a marciwr.

Agorwch y tap neu'r beipen nes eich bod yn cael llif tenau o ddŵr. Rhwbiwch y balŵn ar eich gwallt, neu ar siwmpwr wlân. Symudwch y balŵn yn agos at, ond heb gyffwrdd, y dŵr. Beth sy'n digwydd i'r llif dŵr? Fedrwch chi egluro hyn? Marciwch ar ddarn o bapur ar y wal tu ôl i'r tap pa mor bell mae'r llif dŵr wedi symud a nodwch balŵn pwy sydd â'r wefr mwyaf ac sy'n gallu symud y dŵr bellaf. Gallech drio defnyddio pren mesur blastig yn lle balŵn i weld os yw'n gweithio'n well neu'n waeth.

Gweithgaredd 2

Hwyl blawd a dŵr

Byddwch angen: Blawd corn, dŵr, lliw bwyd (dewisol).

Hylif neu solid? Mae hwn yn gymysgedd sydd wedi drysu! Rhowch ddau lond cwpan o blawd corn mewn bowlen gyda dau ddiferyn o liw bwyd (mae hyn yn ddewisol) ac un cwpan o ddŵr. Cymysgwch bopeth gyda'i gilydd gan ddefnyddio'ch dwylo nes bod y powdwr i gyd yn wlyb, yna daliwch i ychwanegu dŵr, ychydig ddiferion ar y tro, nes bod ganddoch chi gymysgedd trwchus, llyfn. Nawr chwaraewch gyda'r deunydd newydd - hitiwch, gwasgwch, gwthiwch yn araf a tharwch yn galed! Ydych chi'n sylwi ar unrhyw beth rhyfedd am y deunydd yma?

Gweithgaredd 3:

Arbrawf Ffizzeg

Byddwch angen: Balŵn, diod swigod

Balŵn sy'n chwythu ei hun? Bron iawn! Chwythwch falŵn i fyny yna gollyngwch yr aer ohonno yn syth (mae hyn er mwyn ei ymestyn a'i gwneud hi'n haws i'w chwythu o hyn allan). Nawr rhowch ychydig o ddiod swigod yn y balŵn, clymu'r agoriad, a'i ysgwyd. Dylai'r balŵn ddechrau chwyddo. Beth sy'n digwydd? Pwy fedr gael y balŵn i chwyddo fwyaf?

Gweithgaredd 4:

Swigodtastic

Byddwch angen: Bowlen fawr, 2 gwpan o ddŵr cynnes, ½ cwpan o hylif golchi llestri, 5 llwy de o glyserin (os ar gael), hangeri dillad

Llenwch y fowlen gyda dŵr cynnes (dylai'r fowlen fod yn ddigon mawr i hangyr ffitio y tu mewn iddi). Ychwanegwch yr hylif golchi llestri a'r glyserin. Os oes angen mwy o'r cymysgedd, daliwch i ychwanegu'r cynhwysion yn yr un cyfraneddau.

Gwnewch hangyr yn siâp cylch (mae diametr o ~12cm yn gweithio'n dda). Dyma eich ffon swigod. Dipiwch y ffon i mewn i'r cymysgedd a'i dynnu allan yn araf fel bod film o'r cymysgedd yn llenwi'r cylch. Nawr tynnwch y ffon yn araf trwy'r awyr i ffurfio swigen. Pwy sy'n gallu creu'r swigen fwyaf?

Beth ynglŷn â dŵr llawn sebon sydd yn ei alluogi i greu swigod? Pam ydych chi'n meddwl bod angen glycerin? Pam bod swigod yn lliwiau'r enfys? Pam bod swigod yn popio?

Gweithgaredd 5: Tennis Swigod

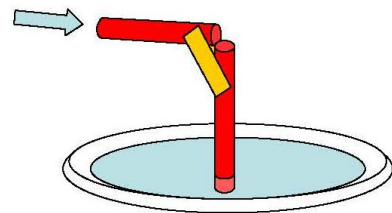
Byddwch angen: Cymysgedd swigod a bowlen fawr, fel uchod, dau hangyr dillad, tiwb o un beiro (heb yr inc).

Gwnewch yr hangyrs yn siâp cylch (~12cm diametr) gyda dolen. Dipiwch y ddau i mewn i'r cymysgedd swigod a'u tynnu allan fel bod ffilm o sebon yn llenwi'r cylch. Dyma eich racedi swigod. Dipiwch un pen o'r tiwb beiro i mewn i'r cymysgedd am ychydig o eiliadau. Tynnwch y tiwb allan a chwythwch i mewn i'r pen arall gan ffurfio swigen. Dyma eich pêl. Nawr mi fedrwch chi ymarfer eich tennis. Efallai y bydd hyn angen ychydig o ymarfer ac mae'n gweithio'n well os oes glyserin yn y cymysgedd. Gwnewch yn siwr nad ydych chi'n trio hitio'n rhy galed neu mi fydd eich raced yn byrstio!

Gweithgaredd 6: Profwch eich gryfder eich sugno

Byddwch angen: Llawer o wellt yfed (tua 50), tâp gludo, dŵr

Faint o wellt fedrwch chi eu gludo at ei gilydd, ben wrth ben, nes i chi beidio gallu sugno dŵr i fyny trwyddynt? Dechreuwch gydag un gwelltyn a daliwch i ychwanegu un ar y tro nes i chi ddod o hyd i'r sugnwr cryfaf – y person sy'n gallu dal i sugno dŵr gyda'r nifer mwyaf o wellt wedi gludo at ei gilydd i wneud un gwelltyn hir, hir. Pam ei bod hi'n mynd yn anoddach i sugno gyda mwy o wellt? Fedrwch chi egluro beth sy'n digwydd?



Gweithgaredd 7: Y gwelltyn hud

Byddwch angen: 2 welltyn yfed, siswrn, tâp gludo, 2 soser yn llawn o ddŵr, 2 darged papur

Torrwch y gwelltyn yn ddau gydag un darn yn hirach na'r llall. Gan ddefnyddio tâp gludo, gludwch y ddau ddarn yn ôl at ei gilydd, ben wrth ben, ar ongl o 90 gradd. Mi fydd agoriad lle mae'r ddau ddarn yn ffurfio'r ongl sgwâr (fel bod y 4 pen ar agor). Sefwch darn lleiaf y gwelltyn yn y soser, chwythwch trwy'r darn hiraf gan anelu at y targed ddylai fod ar bellter penodol i ffwrdd. Y tîm i daro eu targed drosodd gyntaf fydd yn ennill.

Gweithgaredd 8:

Chwythu'n boeth ac yn oer

Byddwch angen: Balŵn (wedi ei chwythu i fyny yn barod sydd orau), potel blastig, bicer gwydr mawr neu unrhyw gynhwysydd mawr arall, dŵr poeth o'r tap (peidiwch â defnyddio dŵr berw), rhew mewn dŵr oer o'r tap.

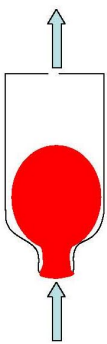
Rhowch agoriad y balŵn dros geg y botel yna rhowch y botel yn y dŵr poeth. Arhoswch ychydig. Beth welwch chi?

Nawr rhowch y botel yn y dŵr oer a rhew. Beth sy'n digwydd nawr? Fedrwch chi egluro beth sy'n digwydd?

Gweithgaredd 9:

Y balŵn hud

Byddwch angen: Balŵn (wedi ei chwythu i fyny yn barod sydd orau), potel blastig tryloyw



Gyda pen neu bensil, gwnewch dwll bach (tua 2mm diametr) yng ngwaelod y botel. Gwthiwch y balŵn i mewn i'r botel ac ymestynnwch agoriad y balŵn dros geg y botel. Nawr chwythwch i mewn i'r botel i chwythu'r balŵn i fyny. Wrth i chi chwythu bydd aer yn dod allan o'r twll y gwnaethoch chi yn y botel (teimlwch gyda'ch bys). Eiliad cyn i chi stopio chwythu, gorchuddiwch y twll gyda'ch bys. Beth sy'n digwydd i'r balŵn pen agored pan fyddwch yn stopio chwythu? Tynnwch eich bys oddi ar y twll a gwelwch beth sy'n digwydd nawr!

Gwnewch y tric eto. Gyda'r balŵn yn llawn, rhowch eich llaw dros geg y botel a thynnwch eich bys oddi ar y twll bach. Beth sy'n digwydd i'r balŵn?

Gweithgaredd 10:

Balŵn sydd ddim yn byrstio

Byddwch angen: Balŵn wedi ei chwythu i fyny, pin, tâp gludo

Y bwriad yw i roi pin mewn balŵn heb iddo fynd "pop"! Gall timau drio gwahanol ffyrdd o roi twll yn y balŵn; y tim buddugol yw'r un gyda balŵn sydd â twll ynddo ond sydd heb ddadchwythu. Fedrwch chi roi twll yn y balŵn heb ddefnyddio tâp gludo ac heb ei fyrstio? Pam bod balŵn sydd wedi byrstio yn edrych fel pe bai wedi cael ei rwygo? Pam bod balŵn sydd yn byrstio yn mynd "bang"?

Background Notes

Activity 1: Wobbly Water

Rubbing the balloon on your hair or woolly jumper causes movement of charged particles from one surface to the other and you end up with a negatively charged balloon. Water molecules are polar, which means they are positive at one end, and negative at the other. When you bring the charged balloon close to the stream of water, the positively charged hydrogen end of the water molecules are attracted to the balloon, and bend towards it as a result.

Activity 2: Slime Time

You'll notice when you start mixing the water with the corn flour that the powder immediately turns to a thick, almost solid, paste. As you add more water and stir, it will clump together like a solid. But when you leave it alone it will look runny and you'll be able to pour it like very thick paint.

When you slowly push your finger into the mixture it should resemble a thick paint. When you try to pick up a piece of the material you find it's one big solid lump. When you push your finger onto the surface of the 'liquid' quickly, and with a lot of force it appears solid. The harder you hit; the more solid it appears.

The mixture is an example of a *dilatant colloid suspension*. These substances get more viscous (even solid) when you hit them hard. When a small sideways force is applied, by shaking the bowl, or pushing into it slowly with a finger, the weak bonds between the particles break, and the substance flows just like a liquid.

Activity 3: A Fizzics Experiment

Fizzy drink has carbon dioxide dissolved in it. This is what gives it its bubbles. Gases take up a larger volume than liquids, therefore, when you shake the drink, causing large amounts of carbon dioxide to be released, the volume of the balloon increases. Can you explain why it's a bad idea to shake a bottle of fizzy drink and then open it?

Activity 4: Bubbletastic

A bubble is formed because of a fine balance between the surface tension of the water and the pressure of the air inside the bubble. Normally the surface tension, caused by forces between water molecules, is too high, so the bubbles skin contracts and breaks. When detergent is added to water, it reduces the forces between water molecules, so there is less surface tension and you are able to make bubbles.

Light waves, like water waves, can interfere with each other. A bubble film is a sort of sandwich: a layer of soap molecules, a filling of water molecules, and then another layer of soap molecules. When light waves reflecting from one layer of soap molecules meet up with light waves reflecting from the second layer of soap molecules, the two sets of waves interfere. Some waves add together, making certain frequencies or colours of light brighter. Other waves cancel each other, removing a frequency or colour from the mixture. The colours that you see are what are left after the light waves interfere. They're called interference colours.

If you look at the bottom of a bubble you should see water dripping out of the bottom. The layer of water will eventually get too thin to support the air inside, and the bubble pops.

The addition of glycerin makes the bubbles last longer as it slows down the rate of evaporation and dripping of the water.

Activity 5: Bubble Tennis

Detergent contains molecules called hydrocarbons. Each molecule has a 'head' and a 'tail'. If the head of the molecule loves water, the tail hates it. This means that all the tails arrange themselves so they are on the outside of the film, as far away from the water as possible. When two soap films come into contact they repel each other because the tails on the surface of one want to avoid the water in the other film. This is why the soap ball and racquet don't stick to each other.

Activity 6: Test your sucking power

When you suck through a normal length straw, you're creating a vacuum at the top of the straw with your lungs. The pressure of the air (the weight of the atmosphere) around the drink in the glass then causes the drink to be pushed up through the straw. There is a limit on the height, and weight, of liquid that atmospheric pressure can support. This means that, even if you created a perfect vacuum with your lungs, you couldn't get the drink to rise above a certain height in the straw. Can you work out what the maximum height is? – How would you do this?

Activity 7: The Magic Straw

When air moves, its pressure falls. So when you blow through the horizontal straw, the pressure at the top of the vertical straw drops. Because the air pressure over the saucer remains the same, the water is pushed up the straw from the normal pressure to the low pressure and squirts your target!

Activity 8: Blowing Hot and Cold

The hot water heats up the air inside the bottle. This causes the volume of the gas to increase and the balloon to expand. The opposite happens when the bottle is placed in the cold water; the gas reduces in volume and the balloon deflates.

Activity 9: The Magic Balloon

As the balloon is blown up, it pushes air out of the hole you've made. The pressure inside the balloon is much higher than the pressure on the outside. If you didn't cover the hole with your finger after you've finished blowing, air would rush back into the bottle to equalise the pressure, pushing the air out of the open end of the balloon. When your finger is over the hole, it stops this from happening so the balloon stays in place.

In the second part of the experiment, you kept your hand over the mouth of the bottle, and let go of the hole. Now air is allowed back into the bottle, so it flows into the bottle, raising the pressure on the outside of the balloon. The balloon shrinks until the pressure inside the balloon is equal to the pressure on the outside.

The Unbreakable Balloon

When a balloon is blown up, the rubber stretches and becomes thinner. When the thin rubber is pierced it tears and cracks spread out easily across the stretched layer - the result is that the balloon bursts. The balloon is full of air at high pressure. With the balloon gone, the high-pressure air is released as a wave. Sound is a wave of highpressure air. When this air hits your ears it makes a bang!

The spread of the cracks makes it appear like the balloon has been shredded. However, if the rubber is reinforced with, say, a piece of sticky tape, then the rubber is not only thicker but the tears and cracks are held together so they are not able to spread across the surface of the balloon. To pierce the balloon without the use of sticky tape, it is easiest to insert the pin through the thickest bits of rubber at the base of the balloon, where the rubber hasn't been stretched by

inflation. The thick, slack rubber area is only broken very close to the point of the pin and the cracks do not spread so the rest of the balloon is left undamaged.

Gweithgareddau Datrys problemau

Gweithgaredd 10: Gwyddoniaeth Roced

Byddwch angen: Balŵn, cardfwrdd o'r tu mewn i bapur tŷ-bach, darn o llinyn, tâp gludiog, dwy wal, addurniadau e.e. peniau, gliter, papur lliw ayyb.

Rydych am adeiladu rocedi a'u rasio i weld pwy fydd yn gallu cael eu roced nhw i fynd gyflymaf.

Balŵn yw'r system gwthio, felly dechreuwch trwy dapio un ochr o'r balŵn i'r cardfwrdd tŷ-bach – unai tapiwch yn eithaf llac dros geg y balŵn (fel eich bod yn dal i allu chwythu i mewn iddo) neu defnyddiwch dâp dwyochrog. Gwnewch yn siwr bod digon o geg a gwddf y balŵn dros ymyl y cardfwrdd tŷ-bach i chi allu chwythu i mewn iddo. Yna addurnwch y cardfwrdd gyda'r peniau, gliter, cerdyn ac unrhyw beth arall sydd ar gael. Dyma eich roced! Nawr defnyddiwch y tâp gludiog i roi dau ddarn o llinyn ar waliau fel eu bod yn rhedeg yn baralel ac yn syth o un wal i'r llall. Cyn i chi eu rhoi nhw ar yr ail wal, clymwch roced ar bob llinyn. Bydd yn rhaid i bob tîm chwythu'r balŵn yna eu gollwng ar yr un pryd. Dylai pum eiliad i chwythu'r balŵn a'u gollwng nhw fod yn ddigon o amser fel man cychwyn. Pwy sy'n ennill y ras? Sut fedrwch chi gael eich roced i fynd yn gyflymach? Beth sy'n gwneud i'r roced symud yn y lle cyntaf?

Gweithgaredd 11: Peiriant Byrstio Balwnau

Bydd angen detholiad o'r deunyddiau canlynol: :

Balwnau
Pinnau amrywiol
Bandiau elastig
Ffon glud
Edau/llinyn
Chwistrelli
Dominôs
Clai
Siswrn
Papur/cerdyn
Tiwb plastig
Poteli plastig amrywiol
Marblis
Tâp gludiog / tâp masgio
Pensil
Hefyd...amrywiaeth o eitemau o ddewis y beirniad.

Eich nòd yw i adeiladu Peiriant Byrstio Balwnau gyda cymaint o ddarnau symudol ag sy'n bosib.

Rheolau: 1/Ni cheir defnyddio eitemau ar wahân i'r rhai sydd wedi eu darparu heb ganiatad y beirniad.
2/ Gellir cychwyn y peiriant gyda llaw ond wedyn dylai redeg ei hun.
3/ Mae penderfyniad y beirniad yn derfynol!

Beirniadu: Os yw'r peiriant yn gweithio mae'r tim yn ennill 50 marc.
Mae pob tim yn ennill 10 marc bonws am bob darn symudol (mae set o dominôs yn cyfri fel un darn symudol).

Gweithgaredd 12:

Amser Parti

Byddwch angen: Un darn o bapur A4 (ar gyfer y cwpan terfynol), ychydig o ddarnau o bapur A4 i ymarfer, diod parti o'ch dewis chi!

Eich nôd yw i wneud cwpan parti allan o ddarn o bapur A4 (i roi eich diod parti ynddo!).

Neu, os am gael cystadleuaeth...

Byddwch angen ar gyfer tim o dri o bobl: 5 darn o bapur A4 i bob tim, bwced o ddŵr, bwced gwag i drosglwyddo dŵr iddo.

Eich nôd yw i symud cymaint o ddŵr â phosib ar draws ystafell gan ddefnyddio dim byd ond cynhwysydd (neu gynhwyswyr) wedi eu gwneud o'r papur sydd wedi ei ddarparu.

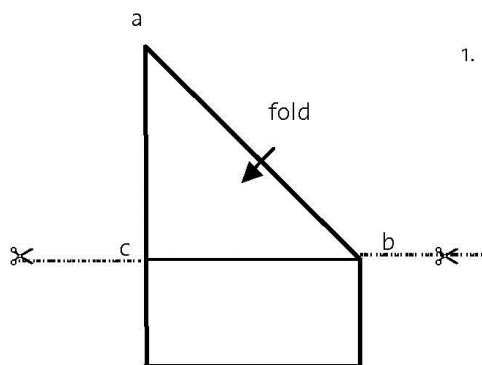
Amser i gyflawni'r dasg: 15 munud

Rheolau:

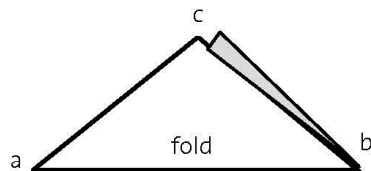
- 1/ Dim ond un cwpan o ddŵr y gellir ei symud ar unwaith.
- 2/ Ni ellir cychwyn ail daith dŵr nes i'r aelod cyntaf o'r tim ddod yn ôl at y bwced dŵr.
- 3/ Dim ond y deunyddiau â ddarparwyd sydd i'w defnyddio.
- 4/ Mae penderfyniad y beirniad yn derfynol!

Beirniadu: Y tim buddugol fydd yr un sydd yn symud y cyfaint mwyaf o ddŵr ar draws yr ystafell yn yr amser penodol.

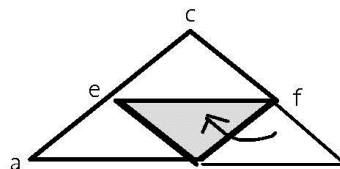
Instructions on how to make a paper cup



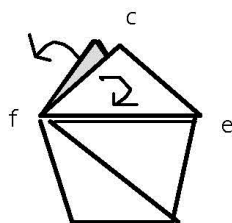
1. Fold a piece of A4 paper and cut to make it square



2. Fold corner **b** to point **e** on **ac** (so that **ce** equals **cf**)



3. Turn paper over and fold corner **a** to point **f**



4. Open out - fold back pointed corners(**c**)and tuck in

Background Notes

Activity 10: Rocket Science

Your rocket is a demonstration of Newton's third law: every force has an equal and opposite force. As the air is being forced out of the balloon by the air pressure inside, it exerts an equal and opposite force on the balloon, which is what makes your rocket move.

The rockets also demonstrate the principle of conservation of momentum. Momentum is the velocity of an object multiplied by its mass. In this case, the momentum of the rocket is zero before it is released, and remains zero once it has stopped moving. The momentum of the balloon is equal and opposite to that of the air coming out, so they cancel each other out.

Activity 11: Balloon Bursting Machine

Bursting the balloon in this activity isn't quite as easy as it sounds. The balloon needs to be held firmly in place so that the pin can pierce it.

Ideas for moving parts might include the following

- Clothes peg releases a string weighted with Plasticine that swings and hits...
- Elastic band stretched taught is released and...
- Two syringes joined together with a piece of tubing, start the machine by pushing in the plunger of one syringe and the plunger on the other moves out and causes...
- A row of dominoes, knock one and they knock each other in sequence, then finish by knocking...
- A marble runs down a ramp and knocks...
- A plastic bottle filled with water, rolls down a ramp and causes...
- A simple seesaw, weight lands on one side, causes the seesaw to tip and...

A junk box can be used at your discretion. It contains extra things that the teams can use. There could even be a bonus score for including one particular nominated item in the machine.

Activity 12: Party Time

This activity is effectively a relay race with water – but the water carrying devices have to be designed and made out of paper. You can either use the diagram below to make a cup or you can use your imagination and invent one of your own. Do you want to make 5 cups from your paper or do you want to make fewer, stronger cups? It is generally best to set up your course outside with a full bucket of water at one end and an empty bucket at the other. Be careful not to slip over on any of the spilt water!

Thank you for using Einstein's Birthday Pack!

We hope you enjoyed the activities within this pack. To help us to continue to provide new activity packs, we'd like to ask you to tell us a little about what you did for National Science & Engineering Week.

Please take a few minutes to fill in this form. If you used this activity pack for NSEW, send in this completed form and we will send you a National Science & Engineering Week Certificate.

Organisation: _____

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Email: _____

Which dates did you do National Science & Engineering Week activities on? _____
What did you do?

Please make any comments about this activity pack, National Science & Engineering Week and/or other possible topics for future packs (feel free to continue on a separate sheet of paper).

☐ Tick this box to be added to our mailing list. This will keep you up to date with NSEW, including grants, resources and activities. Your contact details will not be passed onto third parties.

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