

# HOW MUCH IS YOUR E-WASTE WORTH!?

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## OBJECTIVES

- Learn which metals are considered critical and discover their content in common electrical items
- Appreciate the value of waste electrical equipment as a driver for recycling
- Calculate how much the critical metals in your waste electronic equipment are worth

## MATERIALS NEEDED

- Waste electronic equipment around the house
- Calculator

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## BACKGROUND INFORMATION

*Please see the webpage for more information about e-waste*

- Discarded electronic equipment is one of the world's largest waste streams, up to 50 million tonnes each year
- Most of it ends up in landfills, polluting the environment
- Many of the materials in e-waste could be recycled and used to make new products, which would also decrease our dependence on finite natural resources
- Critical metals are those in high demand which also have low supply rates from natural sources. E-waste contains many critical metals, as seen in this practical
- E-waste also contains other recoverable metals such as aluminium, iron and copper, whose value are not considered here

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## STEP-BY-STEP INSTRUCTIONS

- Go around your house and count the number of smart phones, PCs, flat screens/TVs, laptops/notebooks and lithium-ion batteries (found in laptops, tablets etc.) which are not currently in use
- Then use the data provided on the average critical metal contents of those electrical items, together with the metal prices, to determine the value of the e-waste in your house. You may use the worksheet provided to help you

## ADDITIONAL ACTIVITIES

- Research online to find the contents and values of other metals found in these electrical items, such as aluminium, iron and copper. Then add these to the figures from the critical metals to see the total value of all the metals in your e-waste

How much is your e-waste worth!  
Age range: 13-18 years

DATA<sup>1</sup>

You can use the following data in your calculations. Watch out for the units! (€1.0 = £0.9)

Item	Metal	Average content (%)
<b>Smart phone (0.29 kg)</b>	Cobalt	2.172
	Silver	0.090
	Gold	0.009
	Beryllium	0.001
	Palladium	0.004
<b>PC (7.13 kg)</b>	Cobalt	0.016
	Silver	0.089
	Tungsten	0.009
	Gold	0.001 <sup>2</sup>
	Palladium	0.001
<b>Flat screen or TV (6.92 kg)</b>	Indium	0.001
	Silver	0.007
	Tungsten	0.009
	Gold	0.002
	Palladium	0.001
<b>Laptop/notebook (2.68 kg)</b>	Cobalt	0.002
	Indium	0.002
	Silver	0.013
	Tantalum	0.063
	Gold	0.006
	Gallium	0.060
	Palladium	0.002
<b>Lithium-ion battery (in laptop/tablet etc.) (0.80 kg)</b>	Cobalt	12.23
	Lithium	3.75

Metal	Price (€ / kg)
<b>Cobalt</b>	20.7
<b>Indium</b>	0.49
<b>Lithium</b>	5.8
<b>Silver</b>	465
<b>Tantalum<sup>3</sup></b>	157
<b>Tungsten<sup>3</sup></b>	26
<b>Gold</b>	34013
<b>Beryllium<sup>3</sup></b>	411
<b>Gallium</b>	268
<b>Palladium</b>	20059

<sup>1</sup> Data from 'Critical metals in discarded electronics' (<https://norden.diva-portal.org/smash/get/diva2:936670/FULLTEXT02.pdf>)

<sup>2</sup> Likely mistake in the critical metals book, alternative source for this value: Dell blog (<https://blog.dell.com/en-us/how-much-gold-is-in-smartphones-and-computers/>)

<sup>3</sup> Value is of corresponding oxide or master alloy

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WORKSHEET

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You may find this worksheet helpful for your calculations

Item	Mass of metals in item	Value of metals in item	Number of items	Value of items (£)
Smart phone				
PC				
Flat screen or TV				
Laptop/notebook				
Lithium-ion battery				
			<b>Total value (£)</b>	