

Student Worksheet: Fairphone Case study

Thought starter

ELEMENTS OF A SMARTPHONE

ELEMENTS COLOUR KEY: ● ALKALI METAL ● ALKALINE EARTH METAL ● TRANSITION METAL ● GROUP 13 ● GROUP 14 ● GROUP 15 ● GROUP 16 ● HALOGEN ● LANTHANIDE

SCREEN

Indium tin oxide is a mixture of indium oxide and tin oxide, used in a transparent film in the screen that conducts electricity. This allows the screen to function as a touch screen.

The glass used on the majority of smartphones is an aluminosilicate glass, composed of a mix of alumina (Al_2O_3) and silica (SiO_2). This glass also contains potassium ions, which help to strengthen it.

A variety of Rare Earth Element compounds are used in small quantities to produce the colours in the smartphone's screen. Some compounds are also used to reduce UV light penetration into the phone.

49 In Indium	8 O Oxygen
50 Sn Tin	
13 Al Aluminium	14 Si Silicon
8 O Oxygen	19 K Potassium
39 Y Yttrium	57 La Lanthanum
59 Pr Praseodymium	63 Eu Europium
64 Gd Gadolinium	65 Tb Terbium
	66 Dy Dysprosium

ELECTRONICS

Copper is used for wiring in the phone, whilst copper, gold and silver are the major metals from which microelectrical components are fashioned. Tantalum is the major component of micro-capacitors.

Nickel is used in the microphone as well as for other electrical connections. Alloys including the elements praseodymium, gadolinium and neodymium are used in the magnets in the speaker and microphone. Neodymium, terbium and dysprosium are used in the vibration unit.

Pure silicon is used to manufacture the chip in the phone. It is oxidised to produce non-conducting regions, then other elements are added in order to allow the chip to conduct electricity.

Tin & lead are used to solder electronics in the phone. Newer lead-free solders use a mix of tin, copper and silver.

29 Cu Copper	47 Ag Silver
79 Au Gold	73 Ta Tantalum
28 Ni Nickel	66 Dy Dysprosium
65 Tb Terbium	59 Pr Praseodymium
60 Nd Neodymium	64 Gd Gadolinium
14 Si Silicon	8 O Oxygen
33 As Arsenic	51 Sb Antimony
15 P Phosphorus	31 Ga Gallium
50 Sn Tin	82 Pb Lead

BATTERY

The majority of phones use lithium ion batteries, which are composed of lithium cobalt oxide as a positive electrode and graphite (carbon) as the negative electrode. Some batteries use other metals, such as manganese, in place of cobalt. The battery's casing is made of aluminium.

3 Li Lithium	27 Co Cobalt
6 C Carbon	8 O Oxygen
	13 Al Aluminium

CASING

Magnesium compounds are alloyed to make some phone cases, whilst many are made of plastics. Plastics will also include flame retardant compounds, some of which contain bromine, whilst nickel can be included to reduce electromagnetic interference.

6 C Carbon	12 Mg Magnesium
35 Br Bromine	28 Ni Nickel



Step 1: Read about the Fairphone roadmaps and complete the table below.

[Mining Roadmap](#)

[Manufacturing Roadmap](#)

[Design Roadmap](#)

[Reuse and Recycling Roadmap](#)

List how Fairphone are improving each stage of the mobile phone life-cycle.

Mining	Design
Manufacturing	Reuse and Recycling

Step 2. Begin brainstorming with your group about how you would promote the Fairphone and the principles it represents. Use either [bubbl.us](#) or [mindmeister](#) to record your brainstorming and other research resources listed below:

[OECD Due Diligence Guidance: For Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas](#)

[Mobile Phone Industry Initiatives to Reduce the use of Coltan](#)

[Precious Materials 101](#)

[Conflict-Free Tin Initiative](#)

[Mobile Phone Life Cycles: Use, Take-back, Reuse and Recycle](#)

Step 3. Once you've completed your brainstorming, it's time to design your own sustainable smart phone. You can create a presentation, blog or infographic to support your design. Your presentation should include:

- A name that reflects the values of the Smartphone
- An outline of what it does
- The strengths of the sustainable phone
- How the product relates to improving the mobile phone life cycle
- Supporting images and diagrams to highlight the product

You will also need to be prepared to present your ideas to the class, with each group member talking about their role in creating their Smartphone of the future and how their product contributes to a more sustainable world.