

**Designer Stuff: Cross-links and Plasticisers**

pgs. 147-148

ENGLISH	JAPANESE
Melting Point	融点・溶解点
Guttering	溝
Cross-links	クロスリンク、架橋
Now that	今や---なので
Rub	こする
Sulfur	硫黄
Separate	分離する
Weaken	弱める
Bond	結合
Added	加えられて
Vulcanisation	加硫、硫化
Plasticisers	可塑剤
Inventor	発明者
Frame	枠
Lock	からみあう
Harden	かたくなる、固まる
Lump	かたまり
Only that it did	単にそうだった
Bend	曲げる
Durable	耐久性のある
Rubber	ゴム
Oily Liquid	油を含んだ液体
PVC	ポリ塩化ビニル
Slide	滑るように進む
Rub away	こすって消す
Wear away	すり減る、擦り切れる
Properties	物性

**Activity 1:** Listen to the presentation and fill in the missing information below.

**Fill in the blanks:**

In 1840, the inventor, Charles Goodyear, mixed \_\_\_**Sulfur**\_\_\_ and rubber which created the process of \_\_\_**vulcanisation**\_\_\_. This process made rubber **harder** and **stronger**.

Rubber that is vulcanized will not **rub/ wear** away easily, not like a pencil's **eraser**.

Sulfur makes **cross-links** between the polymer chains. This makes the long molecules unable to **move**. Therefore, the polymers become less **flexible** and they have a **higher** melting point.

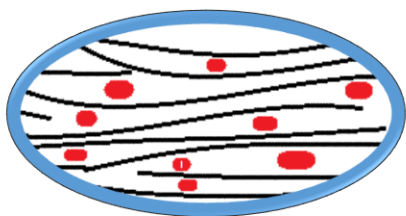
Student name:

Student number:

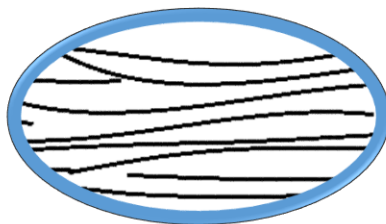
PVC, a polymer, can become softer and more **flexible** by using a **plasticiser**. This is an **oily** liquid that sits **between** the molecules of a material. This makes the **polymer** chains move **farther** apart from each other, so they **slide** more easily. The bonds becomes **weaker** and **less energy** is needed to break the chains.

**Activity 2:** Answer the following questions by using the presentation and the textbook.

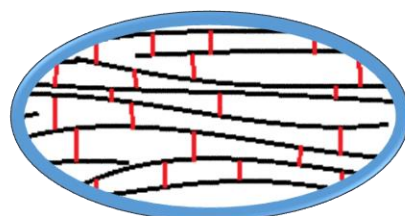
1. a) Label the pictures below as **polymer**, **polymer with cross links**, or **polymer with plasticizers**.



Polymer with plasticisers



Polymer



Polymer with cross-links

- b) Julia is a scientist and wants to make a box with a high melting point. Which polymer from the question above should she use? Why should she use that?

**Julia should use the polymer with cross-links. This is because the cross links make the rubber harder (more difficult to break) so it takes more energy (heat) to break the polymer chains.**

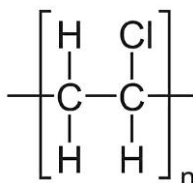
2. a) Julia needs to make a raincoat, but she only has hard PVC. What can she do with the PVC to make a raincoat? What properties will the raincoat have?

**Julia can add a plasticiser to the PVC to make it more flexible and softer.**

- b) What can Julia use the hard PVC for around her home? What other properties make hard PVC useful?

**Julia can make window frames or guttering, hard PVC is durable so it won't break easily, it also has a high melting point.**

3. This is an image of the polymer, Polyvinylchloride (PVC). In this image, what does the 'n' represent? [1 mark]



**The 'n' represents a very large (unlimited) number of monomers in the polymer because the number of monomers in the polymer is unknown.**