Microplastics and degradation

Part 1 – Ways to degrade

Photo degradation – this is the only natural process decompose plastic. Ultraviolet light causes plastic to disintegrate- it's the same process that causes sunburn. UV light provides the energy for a chemical reaction in the plastic's long polymer chains which causes them to react with oxygen from the air, and break into smaller chains. Plastic doesn't disappear though, it just turns into smaller and smaller pieces of plastic.

Erosion – In the ocean, materials like glass get buffeted about by the wind and water, and scuffed against the sea floor. Glass is made out of molten sand. Over time these forces will completely disintegrate the glass into tiny glass grains that blend in with the rest of the sand, but it takes thousands of years to achieve this completely.

Biodegradation – Natural materials such as dead plants, animals and animal waste are biodegradable. These are broken by two types of decaying organism:

a. The **detritivores** (on land these would be things in the soil like earthworms, maggots, millipedes and woodlice. But in the sea they would be things like sea cucumbers and sea worms like the Bone-eating snot-flower worms. These animals help to increase surface area of the dead remains for the second type of organism to get to work.
b. The **decomposers** – these are the bacteria that chemically break down dead material.

Question 1. Which items of marine litter do you think photo degrade, which erode and which items biodegrade when they enter the sea? Fill in the box below with your answers.

Plastic bottle	Glass bottle	Fishing line	Cigarette Butt

Orange peel	Plastic bag	Biodegradable plastic bag	Apple core

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Part 2 – Experiment Observations

Placed around the room are examples of litter in trays of sea water to simulate the ocean. The litter has been in the sea water since the experiment was set up. Record the level of degradation that has occurred in the table below using your own words and the degradation scale. **Note:** You do not need to visit each litter item in the order listed in the table.

Degradation scale:

1. No change has occurred
2. Small spots of degradation are observed
3. Evidence of degradation across all most of litter item but still in one piece
4. Litter item is severely degraded and has broken up into pieces
5. Litter item has completely disappeared

Litter item	Write a description of the change that has occurred in your own words	No. on degradation scale
Plastic bottle		
Glass bottle		
Fishing line		
Cigarette butt		
Orange peel		
Plastic bag		
Biodegradable plastic bag		
Apple core		

1. Were the results what you expected? Use the space below to write down any results in the table that surprised you and why

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2. Which of the three degradation methods (photodegrade, erode or biodegrade) do you think happens most rapidly based on the experiment results? Write your answer in the space below

3. Can you think of any flaws to the design of this experiment?