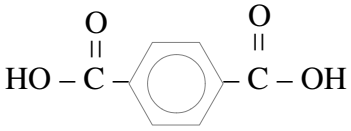
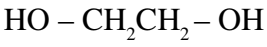
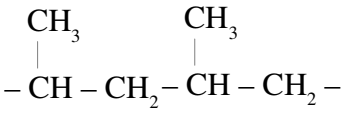
Summative Test - Materials

1.

(a) (any  or its mirror)

(b) Condensation

(c)  

(d) 

(e) *Examples of answers:*

Advantages:

- cheaper and less dense (lighter) than glass so is a useful alternative
- cheaper and less dense than metal and do not corrode
- usually have a long life

Disadvantages:

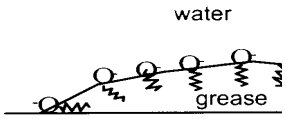
- susceptible to degradation by UV light
- mostly only useful at very low temperatures
- litter problems due to low biodegradability
- hard to separate filler from polymer therefore hard to recycle
- burning can lead to toxic products on decomposition

(f) *Structural:* Thermoplastics have only dispersion forces and hydrogen bonds between chains, thermosets have highly cross-linked network structures.
Physical: Thermoplastics soften when heated and return to their original condition when cooled. Thermosets will not soften when heated.

2.

(a) alkaline hydrolysis

(b) Polar head in water, non-polar tail in grease. This micelle can be pulled off with the water.

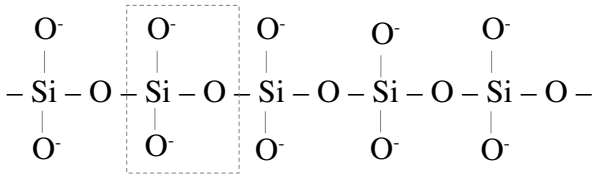


(c) Hard water contains Mg^{2+} and Ca^{2+} ions. These form a precipitate with the soap anion; it will no longer have a charged/polar head to attract to the water.

(d) As hard water passes over the zeolite, the Ca^{2+} and Mg^{2+} ions in the water displace the Na^{+} ions from the surface. Sodium ions will not form a precipitate with soap anions.

3.

(a)



(b) SiO_3^{2-}

(c) Each silicon atom is covalently bonded to 4 oxygen atoms which are tetrahedrally arranged around it.

(d) 4-

(e) $Fe_2(Si_2O_5)_3$

(f) 2

4.

(a) oxygen from -1 to -2

(b) oxidizing agent

(c) 7

(d) (examples)

Enzymes are able to remove stains even at low temperature

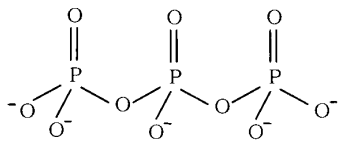
Enzymes may easily break down biological stains such as blood and sweat

Enzymes assist in the breakdown of proteins, fats and oils and can digest 'fine fluff' cellulose

(e) Water (or another polar substance). Polar substances most easily dissolve in polar substances, since they have comparable bonding types.

5.

(a)



(b) *Two of the following:*

They produce slightly alkaline conditions, which are favourable for detergent action.

They remove free hard water ions from the water by forming water-soluble complex ions with them.

They act as deflocculants to keep clay particles in suspension so they don't settle back on whatever is being washed.

(c) The growth of algae is increased by additional nutrients in the water (eutrophication), and a layer is formed over the surface of bodies of water, causing underwater plants which photosynthesise to die. (The amount of oxygen available in the water is affected and marine animals suffocate. Toxins are released into the water making the water unusable).