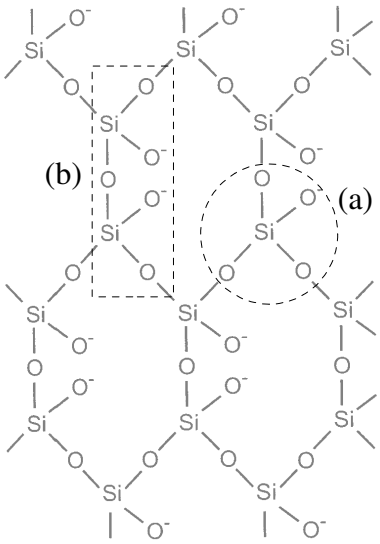
1.
   (a) SiO_3^{2-}
   (b) $Al_3(Si_3O_8)_3^{3-}$
   (c) $AlSiO_4^-$

2.
   (a) 20
   (b) 3

3. 

   (c) $Si_2O_5^{2-}$

4.
   (a) 6-
   (b) 2-
   (c) 4-

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

6. $K_3Na_3Si_2O_7$
7. 7-

8.
   (a) An equilibrium exists in the soil between the adsorbed ions on the clay surfaces and the ions dissolved in the soil water.

   $M^+_{(clay)} \rightleftharpoons M^+_{(aq)}$

   If a plant in the soil absorbs cations, the amount of $M^+_{(aq)}$ is reduced so more ions will be released from the clay to restore equilibrium, reducing the amount of cations adsorbed to the soil.
   (b) Acid rain increases the concentration of $H^+_{(aq)}$ in the soil solution. To restore equilibrium, H^+ ions will become adsorbed to the soil and metal cations will be leached from the clay in exchange, increasing the amount of metal cations in the soil solution (i.e. available to plants).

9. The surface of small silicate particles in clays is negatively charged so they distribute evenly throughout water rather than settling out. Aluminium ions have a high positive charge and so can attract the clay particles together into large enough particles (floc) to settle.

10.
   (a) A zeolite is an aluminosilicate that has a highly porous structure.
   (b) Zeolite pores have negative charges on their surface and hence the capacity to exchange cations, replacing Ca^{2+} and Mg^{2+} in solution with Na^+, softening the water.