

## Assessment A: answers

### Question 1

Faced with the choice of diverting acid mine drainage through a limestone-dominated environment and a granitic environment, (1) which would be the best choice in order to raise the pH? (0.2 points) (2) Why? (0.2 points)

*Limestone. (2) The limestone rocks can help neutralise the AMD. Granitic rocks cannot (not able to buffer the pH towards neutral values).*

### Question 2

Sampling some groundwater used for drinking water in rural Nova Scotia, you find 0.02 mM As. (1) Convert this to ppb (use [www.webelements.com](http://www.webelements.com) to find the atomic weight of As). You need to show your unit calculations (2) Based on the Canadian drinking water limit, is this water safe for human consumption?

*(1)  $0.02 \text{ mM} = 0.02 \times 10^{-3} \text{ Mole/L} \times 74.92 \text{ g/Mole} = 0.0014984 \text{ g/L} = 1498.4 \text{ ppb}$  (2) no (Canadian limit is 10 ppb)*

### Question 3

You find a lake, downstream of some abandoned mine tailings, contains 2 ppb of mercury (Hg). (1) Convert this concentration to nmol/L (nanomoles per litre). (Use [www.webelements.com](http://www.webelements.com) to find the atomic weight of Hg). (0.2 point) (2) What metal do you think was mined to leave Hg-rich tailings? (0.2 points)

*9.97 nmole/L (2) Hg is used to extract gold. It could also be a Hg mine*

### Question 4

Adding lime to mine tailings can help attenuate acid mine drainage by raising the pOH.  
*False*

### Question 5

Iron is the fourth most abundant element in the earth's crust  
*True*

### Question 6

An acidic lake has a pOH greater than 7  
*True*

### Question 7

Planet Earth is 4.6 million years old  
*False*

**Question 8**

Under reducing conditions, iron exists as ferric iron

*False*

**Question 9**

Define acid mine drainage

*Acidic leachate or solution originating from the chemical and microbial oxidation of metal sulfides (or pyrite) present in mining residues or mine tailings. It is highly acidic and contains large quantities of dissolved toxic heavy metals and sulfate.*

**Question 10**

Name 3 processes used to attenuate acid mine drainage in mine tailings

*lime addition to mine tailings 2- vegetation cover 3- water cover (submerged tailings)*

**Question 11**

Asbestos mines generate more acid mine drainage (AMD) than base-metal mines

*False*

**Question 12**

What does the following equation represent?  $2 \text{ZnS} (s) + 3 \text{O}_2 = 2 \text{ZnO} (s) + 2 \text{SO}_2$

*Oxidation of zinc sulfides under oxic conditions*