**Teaching Notes and Key**

**1**a. Avg. mass = [(4900x12)+(50x13)]/4950 = 12.0101 mass units

The ratio is the number of heavy to the total atoms = 50/4950 = 0.0101

**2.**

Now

[(1000x12)+(45x13)]/59,450 = 21.1%;

[(1000x12)+(45x13)]/1045 = 12.0431 mass units

45/1,045 = 0.0431

Later

[(3900x12)+(5x13)]/59,450 = 78.9%

[(3900x12)+(5x13)]/3,905 = 12.0013 mass units

5/3,905 = 0.0013

d. Now has a higher ration of 1M than the Later pool.

e. Now has a higher ration of 1M than the Original pool and later has a lower ratio.

**3.**

Original 1M= [(0.0101/0.0101)-1] x1000 = 0.0‰

Now 1M= [(0.0431/0.0101)-1] x1000 = 2.7‰

Later 1M= [(0.0013/0.0101)-1] x1000 = -0.7‰

**4.**

1M Original = (1M Now x percent contrib.) +1M Later x percent contrib.)

= (2.7‰ x 0.211) + (-0.7‰ x 0.789) = 0.0‰

1M New = (2.7‰ x 0.5) + (-0.7‰ x 0.5) = +1.0‰

The new reservoir in more enriched than the Original reservoir since it has a higher contribution of enriched material (Now)

**5.**

The Original pool would gradually become more and more depleted in 1M since the cookie process preferentially takes the heavier 1M.

We should be able to distinguish the Original reservoir from the Now jar of M’s by looking at the 0M:1M ratio.