1. Label the (+) and (-) ends of the power source, ammeter and calorimeter in the diagram.

2. Look at the calorimeter and identify 5 parts (aside from the water) that could have absorbed heat.

3. Let's say that from $Q = mc\Delta T$, you measured a ΔT of 5.0 °C, and you calculated that the water absorbed 1452 J of heat.
    Let's say that 50 J of heat escaped into the air *outside of the calorimeter*.
    If a current of 1.0 A with a voltage of 3.0 V was applied to the calorimeter for 600 seconds, how much heat, in J per °C, did the calorimeter (excluding water) absorb?
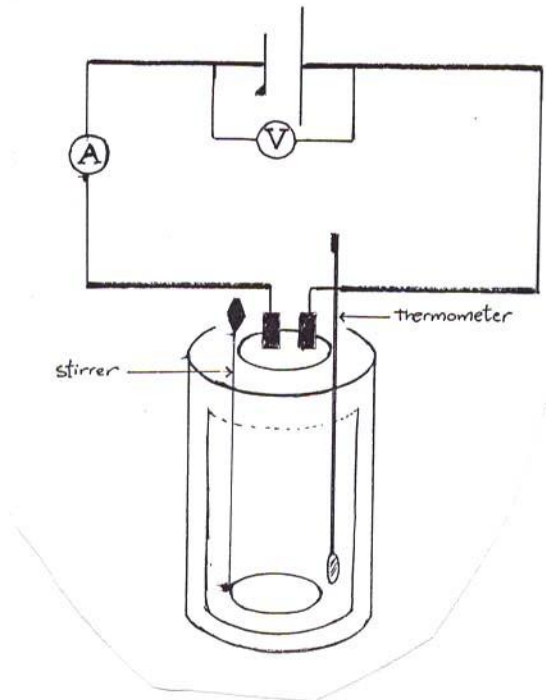
4. What could be done to reduce the amount of heat that escaped from the calorimeter?

5. a) The volume of 1000 pea beans was recorded. Draw the most likely distribution of volume. Use a histogram where volume is on the x-axis and frequency is on the y-axis.
    b) What advantage is there for a plant that produces small seeds?
    c) What advantage is there for a plant that produces large seeds?

6. a)When the switch is in the off position, does the light bulb still receive current?
    b) How would you attach a voltmeter to the light bulb? Pay attention to the polarity(+/-).
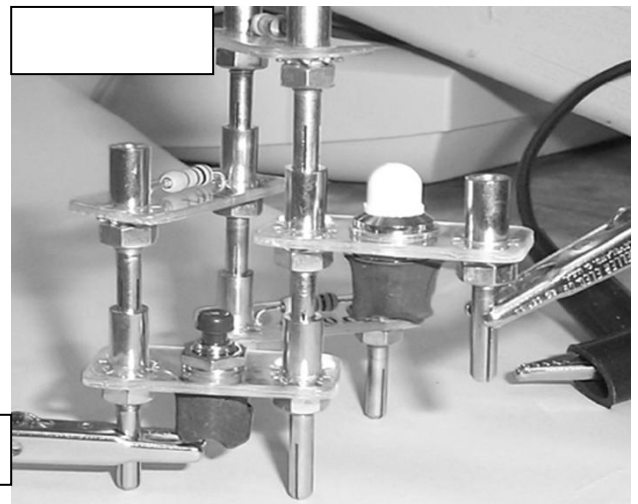
7. In the mole (bean) lab, you compared the mass of beans to that of the smallest beans. In the periodic table, which isotope are the masses of elements compared to?

8. a)   In the phosphate lab, how was concentration of phosphate related to colour observed?
    b)   Why is it important to measure the concentration of phosphate in grey water?

Answers:

1. See diagram
2. Air in calorimeter; insulation; metal cup; outer metal case of calorimeter; stirrer
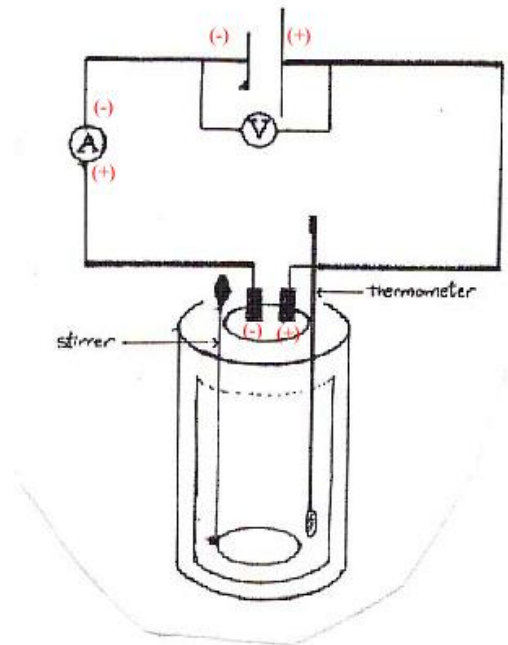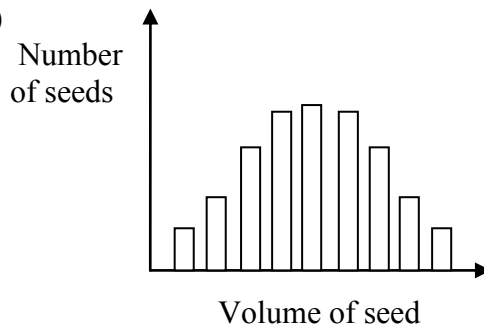3. Total heat going in:
   $E = VIt$
   $= (3)(1)(600) = 1800$ J

   Heat absorbed by water and calorimeter itself =
   1800-50 =1750 J.

   Heat absorbed by calorimeter itself = 1750 J –
   1452 J = 298 J
   in J per $^\circ$C:
   298 J/ 5 $^\circ$C = 59.6 J/ $^\circ$C

4. Improve insulation

5. a)

   Number of seeds (y-axis)
   Volume of seed (x-axis)

   b) less energy invested in producing seeds
   c) seeds have a better chance of surviving
6. a) yes
   b)

   (-)see diagram for electron direction
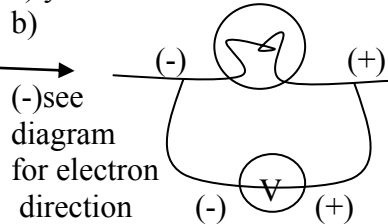
7. ^{12}C whose mass is exactly 12.00000…
8. A)The intensity of colour was directly proportional to the amount of phosphate.
   b) Phosphorus is essential to algae and often the limiting factor in their growth, meaning that it's the substance whose concentration is usually too low for them to reproduce quickly. But when we pollute to lakes with PO_4^{-3}, algal growth takes off exponentially.