Precision, Accuracy & Periodicity

1) Two students report the following data for the density of an unknown metal:

	Student 1	Deviation	Student 2	Deviation
Trial 1	22.0 g/cm^3	+0.1	23.0 g/cm^3	+1.1
Trial 2	21.8 g/cm^3	-0.1	21.0 g/cm^3	-0.9
Trial 3	22.0 g/cm^3	+0.1	21.3 g/cm^3	-0.6
Trial 4	21.8 g/cm^3	-0.1	22.3 g/cm^3	+0.4
Average	21.9 g/cm^3	+/- 0.1	21.9 g/cm^3	+/- 0.8

• The accepted value is 21.8 g/cm^3 .

• The error is 0.4% in both cases: $(21.9 - 21.8)/21.8 \times 100 = 0.4\%$

Should both students receive the same grade? Explain your answer.

2) In the early 1870's, Mendeleev predicted three "new" elements, their atomic masses and their densities: "Ekaboron", atomic mass = 44; "Ekaaluminium", atomic mass = 68, density = 5.9 g/cm^3 and "Ekasilicon", atomic mass = 72, density = 5.5 g/cm^3 .

a) Identify the three elements by their modern names from their masses and relative locations in the periodic table.

Ekaboron =

Ekaaluminum =

Ekasilicon =

b) Calculate Mendeleev's % error in his predicted density of ekaluminium and predicted density of ekasilicon versus their currently accepted values: 5.904 g/cm³ and 5.323 g/cm³ respectively. (Show your calculations.)

c) A student was hired by a large international baseball bat manufacturer to determine the density of a sample of "ekaboron" oxide. The student's experimental results are shown below.

	g/cm ³
Trial 1	3.85
Trial 2	3.78
Trial 3	3.82

- 1. What value for the density should be reported?
- 2. What is the student's relative precision (average deviation)? Show your calculations.

3. If the accepted value for the density of the compound is 3.80 g/cm³, what is the student's error? (Show your calculation.)