1.
(a) Fixed amounts of energy (quanta) are required to promote electrons into higher energy levels. Only some wavelengths of light, corresponding to these quanta are absorbed.
(b) The changes indicate movement of electrons from/to ground state to/from excited states. From/to gives an absorption spectrum; to/from an emission spectrum.
(c) Yes, the wavelengths will be the same since energy is conserved.

2.
(a) Ppm = mg L^{-1}
(b)
(1) ~4.5 ppm
(2) ~6 ppm
(3) ~8 ppm
(c) ppm = mg L^{-1} so divide by 1000 to get g L^{-1}
then divide by 10 to get g $(100\ mL)^{-1}$
(1) 0.00045 g
(2) 0.0006 g
(3) 0.0008 g
(d) $\frac{0.00045}{0.39}\times 100 = 0.115\%$

$\frac{0.0006}{0.53}\times 100 = 0.113\%$

$\frac{0.0008}{0.71}\times 100 = 0.113\%$

average 0.114%

= 0.11% to 2 s.f.

So 0.11g Mg per 100g of sugar, $\times 10^4$ gives 1.1×10^3 g per tonne

ADDITIONAL 1 MARK FOR CORRECT SF

3.
(a)
(1) ~450 ppm
(2) ~450 mg L^{-1}
(b) ÷100 (since there are 100 10mL samples in a litre)
= 4.5 mg
(c) During quantitative AAS the equipment is calibrated to only analyse one wavelength that is characteristic to (in this case) manganese ions. This wavelength will not be absorbed by other atoms and therefore they will not interfere with the results.

ADDITIONAL 1 MARK for corect SF