

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) $\text{Ppm} = \text{mg L}^{-1}$

(b)

(1) $\sim 4.5 \text{ ppm}$

(2) $\sim 6 \text{ ppm}$

(3) $\sim 8 \text{ ppm}$

(c) $\text{ppm} = \text{mg L}^{-1}$ 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 $0.11 \text{ g Mg per } 100 \text{ g of sugar}$, $\times 10^4$ gives $1.1 \times 10^3 \text{ g per tonne}$

ADDITIONAL 1 MARK FOR CORRECT SF

3.

(a)

(1) $\sim 450 \text{ ppm}$

(2) $\sim 450 \text{ mg L}^{-1}$

(b) $\div 100$ (since there are 100 10mL samples in a litre)
 $= 4.5 \text{ mg}$

- (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 correct SF