The absorbance of several standard solutions was analysed using a UV-visible spectrometer.

Concentration of I_2 % ($^m/_v$)	Absorbance
0.000	0.033
0.100	0.133
0.300	0.333
0.600	0.633
0.700	0.514
0.900	0.933

A 10.45g sample of fish meat was analysed for iodine (I_2) contamination. It was placed in a blender for 10 minutes after which distilled water was added to bring the volume to 50 mL. A 30.00mL sample of the mixture in the blender was filtered to remove all solid particles. 2.00 mL of the filtrate was placed in a flask with 18.00 mL of a starch solution. A 2.00 mL sample of this final solution was analysed using the same UV-visible spectrometer as that used above. The absorbance of the sample was 0.142.

1) Using the graph paper provided construct a calibration curve for the equipment used.
   1 mark for a heading
   2 marks, I mark for each labelled axis with proper units
   1 for a line of best fit that ignores the point (0.700,0.514)

   4 marks

2) Explain why the calibration curve does not pass through the point (0,0)
   Since there is no reference cell used in the particular model absorbance by solvent and container are possible explanations.

   1 mark

3) Calculate the molarity of I_2 (atomic mass of I = 126.90) in the 2.00 mL sample analysed in the UV-visible spectrometer.
   Using the calibration curve an absorbance of 0.142 gives a concentration of 0.109 %(m/v)
   That is 0.109 g/100mL
   - ⇨ *Convert 0.109 g of I_2 to mol*
     => 0.109 / 253.80 = 4.295 X 10^{-4}
   - ⇨ *4.295 X 10^{-4}/0.1 = 4.295 X 10^{-3}M*

   2 marks

4) Calculate the mass of Iodine (I_2) in the fish sample.
   Construct a flow chart in order to help you track back all the steps to the original sample.
   -the 2.00 mL sample analysed contained a concentration of 0.109 %m/v
   => that is for every 100 mL 0.109 grams of I_2 are present.
   => so in the 2.00 mL sample we have a mass of iodine equal to (0.109 X 2/100)= 0.00218 g

   1 mark

   => now this came from a 20 mL solution. Therefore the mass of iodine in the 20 mL sample is 0.00218 g X 10 = 0.0218 g

1 mark

=> The 20 mL sample was made from 2.00 mL of the filtrate which was taken from a 30.0 mL sample. So the mass of iodine in the 30.0 mL sample is 0.0218 X 15 = 0.327 g

1 mark

=> The 30.0 mL sample was taken from a 50.0 mL sample that contained all the original iodine in the fish meat. So the mass of iodine in the 10.45 g fish sample is 0.327 X 50/30 = 0.545 g

1 mark

5) Calculate the concentration of I_2 in the fish sample in

- % ($^{m}/_{m}$)

(0.545/10.45) X 100 = 5.22 %(m/m)

- ppm

  mg/Kg

  5.22 X 10^4 ppm

2+2 = 4 marks