Quiz (Clinical Diagnoses)

1. The concentration of urea in urine is very useful for physicians to assess the function of kidneys of a patient. During the analysis of urine, a reagent that forms a coloured complex specifically with urea is added to the test sample. The intensity of the colour produced is directly proportional to the concentration of urea. As a result, the concentration of urea in the urine sample can be determined by colorimetry.

Concentration of urea in urine sample (M)	Absorbance
0	0.000
0.150	0.081
0.300	0.142
0.600	0.311
1.100	0.489
1.300	0.653
1.700	0.850

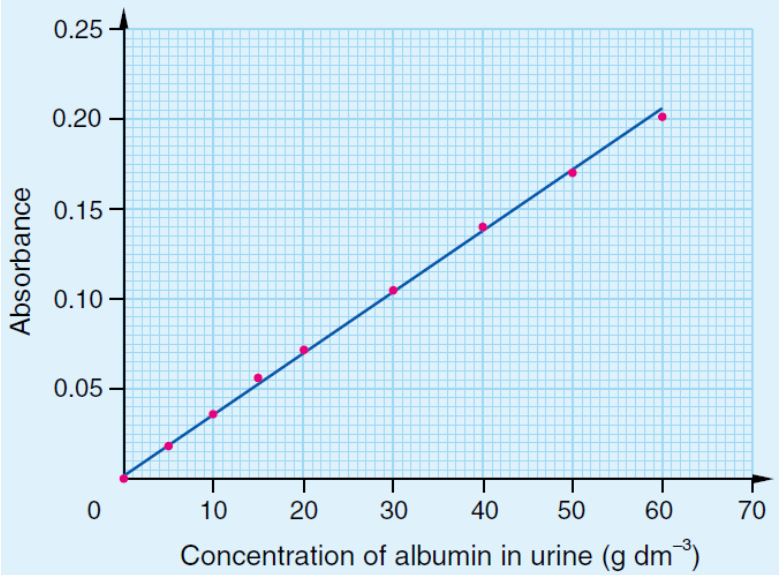
The following table shows the absorbance of different concentrations of urea in colorimetry:

(a) By using the above information, plot a calibration curve for urea.

(b) Given that the urine sample from John has an absorbance of 0.400, determine the concentration of urea in his urine.

(c) The normal range of concentrations of urea in urine is from 0.330M to 0.580M. Based on the concentration of urea in John's urine, what advice would you give John?

2. Albumin is the most abundant plasma protein in our body. The concentration of albumin in body fluids is an indicator of liver disease. The albumin concentration in body fluids can be measured by colorimetry. In practice, a chemical is added to form a coloured complex with albumin in the sample. The intensity of the coloured complex is directly proportional to the concentration of albumin. The following shows the calibration curve for albumin.



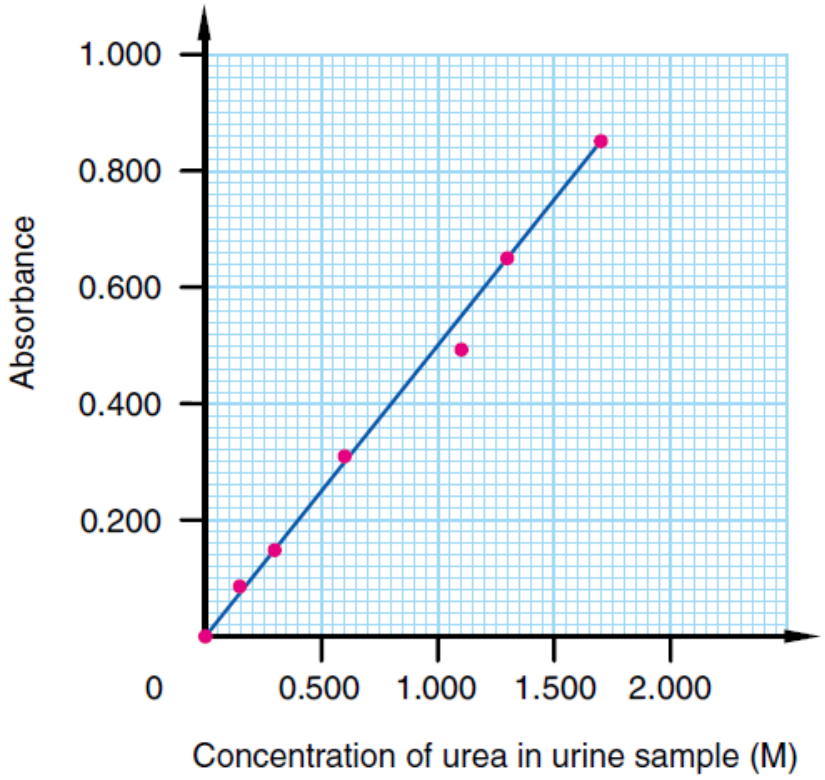
(a) What is the relationship between the concentration of albumin in urine and the absorbance?

(b) Given that the urine sample from Cindy has an absorbance of 0.197, determine the concentration of albumin in her urine.

(c) The normal range of concentrations of albumin in urine is 34–54 g dm^{-3}. What advice will you give to Cindy?

Suggested Answer

1. (a)



(b) From the calibration curve, the concentration of urea in John's urine is 0.800M.

(c) The concentration of urea in John's urine is above the normal range. He should consult a doctor to have further checking.

2. (a) The higher the concentration of albumin in urine is, the higher the absorbance is.

(b) From the calibration curve, the concentration of albumin in Cindy's urine = 57.5 g dm^{-3}.

(c) Since the concentration of albumin in Cindy's urine is above the normal range, she should consult a doctor to have further checking.