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| Question B2 | | **Page 1/2** |
|  | | **Marks** |
| a) | Piperidine, coniine and sedamine are alkaloids. Alkaloids are organic compounds which can be found in plants. Many of them are poisonous. The death of Socrates was due to absorption of coniine. Coniine and sedamine are derivatives of piperidine. Sedamine is present in some sleeping pills. |  |
|  | Pipéridine.jpg  Coniine.jpg  Sédamine.jpg |  |
|  | piperidine coniine sedamine |  |
|  | All three compounds are amines. |  |
|  | 1. Explain why amines can act as bases. | 2 marks |
|  | 1. Classify each of the three amines represented above as primary, secondary or tertiary amines. | 2 marks |
|  | 1. Explain why piperidine and coniine are stronger bases in aqueous solution than ammonia, NH3(aq). | 2 marks |
|  | 1. Other than the amine group, identify another functional group present in sedamine. | 1 mark |
|  | 1. Which of these three compounds is/are optically active?   Justify your answer | 2 marks |
|  | Even if the higher molar mass is taken into account the boiling point of   sedamine is considerably higher than that of coniine.   |  |  | | --- | --- | | **Compound** | **Boiling point / °C** | | piperidine | 106 | | coniine | 166 | | sedamine | 331 |   . |  |
|  | 1. Suggest, with an explanation, one other reason why there is such a difference in the boiling points of these two compounds. | 2 marks |

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| Question B2 | | **Page 2/2** |
|  | | **Marks** |
| b) | Cadaverine can be made from the amino acid lysine.  Cadavérine.jpg  Lysine.jpg  cadaverine lysine |  |
|  | 1. Give the IUPAC names for lysine and cadaverine | 2 marks |
|  | The isoelectric point of lysine is 9.59. |  |
|  | 1. Draw the simplified structural formulas of lysine in strongly acidic, and strongly alkaline solutions. | 2 marks |
|  | Amino acids form a peptide bond when they react with another amino acid. |  |
|  | 1. Write the simplified structural formula of a dipeptide formed from two lysine molecules. | 2 marks |
|  | Cadaverine can form a polymer by reaction with oxalic acid.  oxalic acid  oxalic acid |  |
|  | 1. Draw a repeating unit of the polymer formed. | 2 marks |
| c) | Benzocaine is the active ingredient in many anaesthetic creams. It can be prepared from 4-aminobenzoic acid.  Acide 4-aminobenzoïque.jpg      **4-aminobenzoic acid**  In a laboratory experiment to prepare benzocaine, 17.5 cm3 of ethanol and 1.30 g of 4-aminobenzoic acid were placed in a 100 cm3 round-bottomed flask. 2.00 cm3 of concentrated sulphuric acid were slowly added. The mixture was heated under reflux for one hour. |  |
|  | 1. 4-aminobenzoic acid can exist as a zwitterion. Draw the structural formula of the zwitterionic form. | 2 marks |
|  | 1. Using simplified structural formulas of reactants and products, write the equation for the reaction taking place to produce benzocaine. | 2 marks |
|  | 1. Which of the two reactants was present in excess? Justify your answer by means of relevant calculations.   **Given:** Density of ethanol : 7.89 x 10-1 g cm-3  Molar atomic masses (in g mol-1):  H: 1.01 C: 12.0 N : 14.0 O: 16.0 | 2 marks |