

BRAINSTORMING TEST

TOPIC; PHYSICAL EQUILIBRIA

SUB-TOPIC; MISCIBLE LIQUID MIXTURES

NAME.....

Instructions; Attempt all questions in this paper.

1. (a) State Raoult's law of ideal solutions. (01mark)

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(b) What is meant by?

(i) An ideal solution (01 mark)

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(ii) Partial vapour pressure (01 mark)

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C) State three properties of an ideal solution
(1½ marks)

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d) A mixture of liquids Y and Z obeys Raoult's law. If the vapour pressure of Y and Z are 9.50KNm^{-2} and 3.20KNm^{-2} respectively at 20°C

(i) Calculate the composition of the vapour containing 0.6 moles of Y and 0.2 moles of Z all at 20°C .
(04 marks)

(ii) State which of the two liquids is more volatile. Give a reason for your answer. (01mark)

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b) The boiling points of liquids Y and Z are 368°C and 395°C respectively

(i) Sketch a labeled boiling point - composition diagram of the mixture of the liquids. (04marks)

(ii) Using the diagram, describe how pure liquid Z can be obtained from a mixture containing 50% Z. (03marks)

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c) Explain why some liquids show negative deviation from Raoult's law. (03marks)

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d) If the mixture of liquids Y and Z in (b) was to deviate negatively from Raoult's law,
sketch a labelled boiling point - composition diagram for the mixture. (03marks)

2. (a) (i) what is meant by a constant boiling point mixture
(01 mark)

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(ii) Give two types of constant boiling mixtures. (01mark)

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(iii) Outline one difference between the two types of constant boiling mixtures stated above. (01mark)

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(iv) State two similarities of Azeotropic mixtures and pure substances or compounds (01mark)

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(v) State two reasons why azeotropes are considered to be mixtures and not compounds. (02marks)

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(vi) State any three methods of separating components of an azeotropic mixture.

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(vii) Give a reason why a constant boiling point mixture can not be separated by fractional distillation. (01mark)

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b) The total vapour pressure of a mixture of propanone and trichloromethane, and the mole fraction of trichloromethane at a constant temperature are given in the table below;

Mole fraction of trichloromethane	0.0	0.2	0.4	0.6	0.8	1.0
Vapour pressure of the mixture(mmHg)	347	305	267	244	256	293

(i) Plot a graph of total vapour pressure of the mixture against the mole fraction of trichloromethane.

(ii) Using the graph, deduce how the mixture deviates from Raoult's law.

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(ii) Give a reason for your answer. (01mark)

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(iii) Explain the cause for the deviation you have stated in b(ii) above.(3mks)

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(iv) Determine the composition of the azeotrope.
(01 mark)

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(c) Methanoic acid with boiling point 80°C , and water with boiling point 100°C , are miscible in all proportions. They form a maximum boiling point mixture containing 77% methanoic acid which boils at 108°C .

(i) Sketch a labelled boiling point - composition diagram for the mixture of methanoic acid and water. (03marks)

(ii) Explain the factor that lead to methanoic acid and water forming a maximum boiling point mixture.

(03 marks)

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(iii) Describe briefly what happens when a mixture containing 40% methanoic acid is distilled. (04marks)

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