OCR

RECOGNISING ACHIEVEMENT

Subject: Gases, Liquids & Solids
Code: 2815/05

Session: January
Year: 2002

Mark Scheme

MAXIMUM MARK	~~60~~ 45

1 (a) Any two of

Particles do not attract each other / intermolecular forces are negligible

Volume of particles is negligible

Collisions are perfectly elastic (or equiv) [2]

(b) All gases show some forces of attraction (or they couldn't be liquefied)

Particles have a finite volume

Collisions with the walls of the vessel transfers energy to or from the gas
(2 of these) [2]

(c) Large H --C*l* dipole compared to atomic helium [1]

(d) (i) Vapour pressure would increase (1)

Each component exerts its own v.p. / decrease H-bonding (1)

(ii) Boiling point would decrease (1)

Mixture boils when combined v.p. = atmospheric pressure (1)
[4]
[Total : 9]

2 (a) (i) The equilibrium concentration of a gas in a solvent at a particular temperature is proportional to the partial pressure of the gas (or equiv) (1)

(ii) Gas must not react with the solvent (1)

Gas must be in the same atomic/molecular state in both phases (1)
NOT temperature must be constant (in definition)

[3]

(b) (i) $4 = \frac{[X]\ solv}{[X]H_2O}$ (1)

(ii) $4 = \frac{[89]}{[29]}$ therefore 8g extracted into X (1)

(iii) **1st ext** $4 = \frac{[x/50]}{[10-x]}$ therefore $\frac{x/50}{10-x}$ = $\frac{[160]}{100}$

therefore $\frac{2x}{10-x} = 4 \Rightarrow 2x = 40 - 4x$

$6x = 40$ therefore $x = 6.66$ (1)

thus 3 34g remain in water layer

2nd ext $\frac{y/50}{3\ 34-y} = \frac{100}{4} \Rightarrow 2y = 13.36 - 4y$

$\frac{2y}{3\ 34 - y}$

$6y = 13\ 36$ therefore $y = 2.23$ (1)

Total mass extracted = 8 89g (1)
[5]

[Total : 8]

3 (a) Allow 110 5 – 111 5 °C (1)

(b) In an ideal mixture the interactions between the two pure substances are the same as between particles of the two different substances (1)
There is no volume change on mixing (1)
There is no temperature change on mixing (1)
(any 2)

(c) (i) Presence of glass rods/beads
Counter current water flow
(Temperature control) 2 x 1 (2)

(ii) Material (metal vs glass)
No coolant
Mixture introduced part way up column
Presence of sieve plates/bubble caps Any 1 (1)
[3]

(d) (i) Number of steps on boiling point/composition diagram from starting composition to distillate composition (1)

(ii) Allow 4 - 5 (1)
Explanation or construction on diagram (1)

(iii) Smaller (1)
Each step produces a greater change in composition (1)
[5]

(e) A mixture boils when the total vapour pressure of the components equals atmospheric pressure (or equiv) (1)
The boiling point is lowered to below 100°C reducing the chance of decomposition (1)
[2]

(f) <u>Boiling point</u>
Attraction of ions for water molecules reduces the vapour pressure (1)
Higher temperature need for v.p. to reach atmospheric pressure (1)

<u>Freezing point</u>
Lowering the vapour pressure also reduces the freezing point to below zero (1)
Ions disrupt lattice formation (1)

Sketch could score one for each point [4]

[Total . 17]

4. (a) Marked from candidates phase diagram

Labelled axes	(1)
Both m ps shown	(1)
Eutectic point labelled	(1)
3 of the 4 areas labelled	(1)
	[4]

(b)

Description of cooling curve method	(1)
Description of shape of each curve	2 x (1)
Points described	2 x (1)
(A range of alternative descriptions would score marks, including diagrams)	
Quality of communication	(1)
	[6]

(c) Lowers the eutectic point
or produces new system
or produces new eutectic (1)
[1]

[Total : 11]