25. Equilibria

25.2 Partition coefficients

Paper 4

Marking Scheme

Q1.

(a)(i)	ratio of the concentrations of solute in two solvents	**1**
(a)(ii)	**M1** 10.5 = (y ÷ 25) ÷ ((0.74–y) ÷ 40) **M2** y = 0.642 g	**2**

Q2.

(d)(i)	(the) ratio of the concentrations (of a solute between) two solvents / two liquids (at) equilibrium [1]	**1**
(d)(ii)	mass = 5-x / x = 7.84 OR mass = x / 5-x = 7.84 mass = 0.5656 g mass = 4.43 g [1] min 2sf	**1**

(d)(iii)	Any numbers in which volume of water is 7.84 times volume of hexane e.g. 78.4 cm^3 water 10 cm^3 hexane [1] u / c e.g mass = 0.566 g 177.4 cm^3 water 22.6 cm^3 hexane ALLOW reverse ratio volume of hexane is 7.84 times volume of water when consistent with d(ii)	**1**
(d)(iv)	Q is $CH_3(CH_2)_4OH$ AND it is least polar / contains a large non-polar hydrocarbon chain / stronger id-id forces with hexane in Q OWTTE [1]	**1**

Q3.

(f)(i)	**M1** ratio of the concentration of a solute in two solvents **M2** at equilibrium	**2**

(f)(ii)	**M1** $K_{pc} = [procaine]_{oct} / [procaine]_{water}$ 1.77 = (x / 50)/(0.5 – x / 75) **M2** 1.77 = 1.5x / 0.5 – x 0.885 –1.77x = 1.5x x = 0.271 g min 2sf	**2**

Q4.

(a)(i)	ratio of concentration of the solute in two solvents at equilibrium [1]	**1**
(a)(ii)	3.50 = (1.62 / 100) / (0.38 / x) [1] x= **82** (cm^3) (82.0987654) [1] ecf M1 min 2sf	**2**

Q5.

(a)	M1 reference to **equilibrium** not being established / not at **equilibrium** [1] M2 concentration in water too high **or** conc in octan-1-ol too low owtte [1]	**2**
(b)(i)	1.1 / 1.13 / 1.127 / 1.1272 [1]	**1**
(b)(ii)	M1 6.760 = (0.762 – *x*) / *x* [1] M2 7.76*x* = 0.762 *x* = 0.0982 g (correct value scores 2) [1] M3 0.0982 / 74 = 0.0013 / 0.00133 mol [1]	**3**

Q6.

(a)	**M1** ratio of the concentration of a solute in the two immiscible solvents /liquids **M2** at equilibrium	**2**

(b)(i)	**M1** 79.4 = (0.4-x/25)/(x/125) **M2** x = **0.0237** g [2] min 2sf	**2**
(b)(ii)	(higher as) benzophenone is more non-polar/more soluble in octan-1-ol **ora**	**1**

Q7.

(c)(i)	K_{pc} = (0.935 / 50) / (0.065 / 50) K_{pc} = **14.4** (14.38) [1] min 3sf	**1**
(c)(ii)	**M1:** 14.4 = ((0.935 – x) / 50) / (x / 100) [1] ecf from **4(c)(i)** **M2:** x = **0.114** g [1] min 2sf ecf from M1	**2**