Wkst 2.2: I. R. E. Analysis

1-	$2\ Al_2S_{3(g)}$	+	$9\ O_{2(g)}$	⇔	$2\ Al_2O_{3(g)}$	+	$6\ SO_{2(g)}$
Initial	26 M		20. M		16 M		18 M
Reaction	+ 2 M		+ 9 M	←	- 2 M		- 6 M
Equilibrium	28 M		29 M		14 M		12 M

$K_{352°C} = 5.1 \times 10^{-8}$

2-	$4\ BH_{3(g)}$	+	$P_{4(g)}$	⇔	$6\ H_{2(g)}$	+	$4\ BP_{(g)}$
Initial	14 M		22 M		9 M		17 M
Reaction	- 4 M		- 1 M	→	+ 6 M		+ 4 M
Equilibrium	10. M		21 M		15 M		21 M

$K_{450K} = 1.1 \times 10^{7}$

3-	$2\ C_5H_{10(g)}$	+	$15\ O_{2(g)}$	⇔	$10\ CO_{2(g)}$	+	$10\ H_2O_{(l)}$
Initial	3.60 M		1.50 M		6.50 M		X
Reaction	+ 0.220 M		+ 1.65 M	←	- 1.10 M		X
Equilibrium	3.82 M		3.15 M		5.40 M		X

$K_{290K} = 4.84 \times 10^{-2}$

4-	$SiF_{4(g)}$	+	$O_{2(g)}$	⇔	$SiO_{2(g)}$	+	$2\ F_{2\,(g)}$
Initial	6.0 M		15.0 M		----------		----------
Reaction	- 5.0 M		- 5.0 M	→	+ 5.0 M		+ 10. M
Equilibrium	1.0 M		10.0 M		5.0 M		10. M

$K = 50.$

5-	$4\ Ru^{+3}_{(aq)}$	+	$3\ Mn^{+4}_{(aq)}$	⇔	$3\ Mn_{(s)}$	+	$4\ Ru^{+6}_{(aq)}$
Initial	0.44 M		0.78 M		----------		----------
Reaction	- 0.33 M		- 0.25 M	→	+ 0.25 M		+ 0.33 M
Equilibrium	0.11 M		0.53 M		0.25 M		0.33 M

$K = 5.4 \times 10^{2}$

6-	$6\ NO_{(g)}$	+	$2\ As_{(g)}$	+	$H_2O_{(g)}$	⇔	$3\ N_2O_{(g)}$	+	$2\ HAsO_{2(g)}$
Initial	5.50 M		7.00 M		4.00 M		1.50 M		6.00 M
Reaction	+ 1.9 M		+ 0.64 M		+ 0.32 M	←	- 0.96 M		- 0.64 M
Equilibrium	7.4 M		7.64 M		4.32 M		0.54 M		5.36 M

$K = 1.1 \times 10^{-7}$

7.

	$SiH_{4(g)}$	+	$2\ O_{2(g)}$	⇔	$SiO_{2(g)}$	+	$2\ H_2O_{(g)}$
Initial	--------		21 M		16 M		26 M
Reaction	+ y		+ 2y	←	- y		- 2y
Equilibrium	y		21 + 2y		16 - y		26 - 2y

$K_{515K} = 0.250$

Determine $[SiH_4]_e$, $[O_2]_e$, $[H_2O]_e$, $[SiO_2]_e$

Setting limits: 13 M > y > 0 M

$K = [SiO_2]\,[H_2O]^2 / [SiH_4]\,[O_2]^2$

$0.250 = (16 - y)\,(26 - 2y)^2 / (y)\,(21 + 2y)^2$

Using trial and error and ignoring sig. figs., we get

$[SiH_4]_e \approx 6.25$ M
$[O_2]_e \approx 33.5$ M
$[SiO_2]_e \approx 9.75$ M
$[H_2O]_e \approx 13.5$ M