

**Revised August 2009**

## AP WORKSHEET 13s: ANSWERS

### Part A

(a) Rate of forward reaction = Rate of Backward reaction

$$(b) K_c = \frac{[\text{NO}]^4 [\text{H}_2\text{O}]^6}{[\text{NH}_3]^4 [\text{O}_2]^5}$$

(c) If a change is made to a system at equilibrium, the equilibrium will shift to oppose that change in order to re-establish the equilibrium.

(d) (i) LHS in order to remove the heat the equilibrium shifts to the endothermic side.

(ii) RHS in order to increase the pressure the equilibrium shifts to the side where there are more moles of gas.

(iii) RHS in order to replace the removed product.

### Part B

#### Type 1

- (a)  $2.22 \times 10^{-3}$   
(b)  $5.51 \times 10^{-3} \text{ M}$

#### Type 2

0.165

#### Type 3a

3.69 moles

#### Type 3b

5.38

#### Type 4

HI = 2.67 moles, I<sub>2</sub> = 0.165 moles, H<sub>2</sub> = 0.865 moles

#### Type 5

0.085

### Part C

- (a) Yes  
(b)  $2.72 \times 10^{-4} \text{ M}$   
(c)  $1.59 \times 10^{-5}$   
(d)  $1.05 \times 10^{-5}$ ;  $1.1 \times 10^{-10}$