8.
$$\frac{\sin\theta_a}{\sin\theta_s} = \frac{n_s}{n_a}$$
$$\frac{\sin 53.0°}{\sin 41.0°} = \frac{n_s}{1.00}$$
$$n_s = 1.22$$

9.
$$\frac{\sin\theta_a}{\sin\theta_w} = \frac{n_w}{n_a}$$
$$\frac{\sin 30.0°}{\sin\theta_w} = \frac{1.33}{1.00}$$
$$\theta_w = 22.1°$$

10.
$$\frac{\sin\theta_a}{\sin\theta_g} = \frac{n_g}{n_a}$$
$$\frac{\sin 90.0°}{\sin\theta_g} = \frac{1.50}{1.00}$$
$$\theta_g = 41.8°$$

11.
$$\frac{\sin\theta_w}{\sin\theta_l} = \frac{n_l}{n_w}$$
$$\frac{\sin 90.0°}{\sin\theta_l} = \frac{1.51}{1.33}$$
$$\theta_l = 61.7°$$

12.
$$\frac{\sin\theta_a}{\sin\theta_l} = \frac{n_l}{n_a}$$
$$\frac{\sin 90.0°}{\sin 48.8°} = \frac{n_l}{1.00}$$
$$n_l = 1.33$$

13.
$$\frac{\sin\theta_a}{\sin\theta_s} = \frac{n_s}{n_a}$$
$$\frac{\sin 90.0°}{\sin\theta_s} = \frac{1.81}{1.00}$$
$$\theta_s = 33.5°$$

14.
$$\frac{\sin\theta_a}{\sin\theta_s} = \frac{n_s}{n_a}$$
$$\frac{\sin 90.0°}{\sin 42.0°} = \frac{n_s}{1.00}$$
$$n_s = 1.49$$

15.
$$\frac{\sin\theta_a}{\sin\theta_l} = \frac{v_a}{v_l}$$
$$\frac{\sin 90.0°}{\sin\theta_l} = \frac{3.00\times10^8 \text{ m/s}}{2.25\times10^8 \text{ m/s}}$$
$$\theta_l = 48.6°$$

16.
$$\frac{\sin\theta_a}{\sin\theta_w} = \frac{n_w}{n_a}$$
$$\frac{\sin 55.0°}{\sin\theta_w} = \frac{1.33}{1.00}$$
$$\theta_w = 38.0°$$
$$\frac{\sin\theta_w}{\sin\theta_g} = \frac{n_g}{n_w}$$
$$\frac{\sin 38.0°}{\sin\theta_g} = \frac{1.50}{1.33}$$
$$\theta_g = 33.1°$$

17.
$$\frac{\sin\theta_g}{\sin\theta_w} = \frac{n_w}{n_g}$$
$$\frac{\sin 40.0°}{\sin\theta_w} = \frac{1.33}{1.50}$$
$$\theta_w = 46.5°$$
$$\frac{\sin\theta_w}{\sin\theta_a} = \frac{n_a}{n_w}$$
$$\frac{\sin 46.5°}{\sin\theta_a} = \frac{1.00}{1.33}$$
$$\theta_a = 74.6$$

$\therefore$ light reflects from this surface at 59.8°

18.
$$\frac{\sin\theta_a}{\sin\theta_l} = \frac{n_l}{n_a}$$
$$\frac{\sin 36°}{\sin\theta_l} = \frac{1.5}{1.00}$$
$$\theta_l = 23.1°$$

We must now find the incident angle at the second surface using geometry. This angle is 36.9°.
$$\frac{\sin\theta_l}{\sin\theta_a} = \frac{n_a}{n_l}$$
$$\frac{\sin 36.9°}{\sin\theta_a} = \frac{1.00}{1.5}$$
$$\theta_a = 64°$$