

## Theoretical Exam



# APhO

Asian Physics Olympiad  
Dahran - Saudi Arabia 2025

# A3-1

Singapore English (Singapore)

## Atmospheric Physics (10.0 points)

### Part A. Surface Temperature of the Earth (1.2 points)

**A.1** (0.2 pt)

$$P_0 =$$

**A.2** (0.3 pt)

$$T_{g0} =$$

**A.3** (0.7 pt)

$$T_g =$$

### Part B. The absorption spectrum of atmospheric gases (1.8 points)

**B.1** (0.5 pt)

$$\omega_d =$$

**B.2** (0.2 pt)

$$E_p =$$

**B.3** (0.2 pt)

$$f - f_o =$$

**B.4** (0.2 pt)

$$C =$$

## Theoretical Exam



# APhO

Asian Physics Olympiad  
Dhahran - Saudi Arabia 2025

# A3-2

Singapore English (Singapore)

**B.5** (0.3 pt)

$$p_2(f) \propto$$

**B.6** (0.4 pt)

$$f^* - f_0 =$$

Sketch of  $p(f)$  as a function of  $f - f_0$ :

### Part C. Stability of air in the atmosphere (2.7 points)

**C.1** (0.3 pt)

$$\frac{dp}{dz} =$$

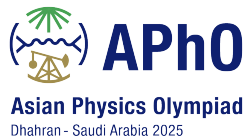
**C.2** (0.2 pt)

$$\frac{dp}{dz} =$$

**C.3** (0.2 pt)

$$p(z) =$$

## Theoretical Exam



# A3-3

Singapore English (Singapore)

**C.4** (0.6 pt)

$$\Gamma_a =$$

**C.5** (1.4 pt)

Equation of motion for  $\delta z$ :

Conditions for stable equilibrium:

$$\omega =$$

### Part D. Moisture (2.7 points)

**D.1** (0.5 pt)

$$\frac{dp_s}{dT} =$$

**D.2** (0.2 pt)

$$p_s(T) =$$

**D.3** (2.0 pt)

$$T_l =$$

### Part E. Sun halo (1.6 points)

**E.1** (0.8 pt)

$$\delta =$$

## Theoretical Exam



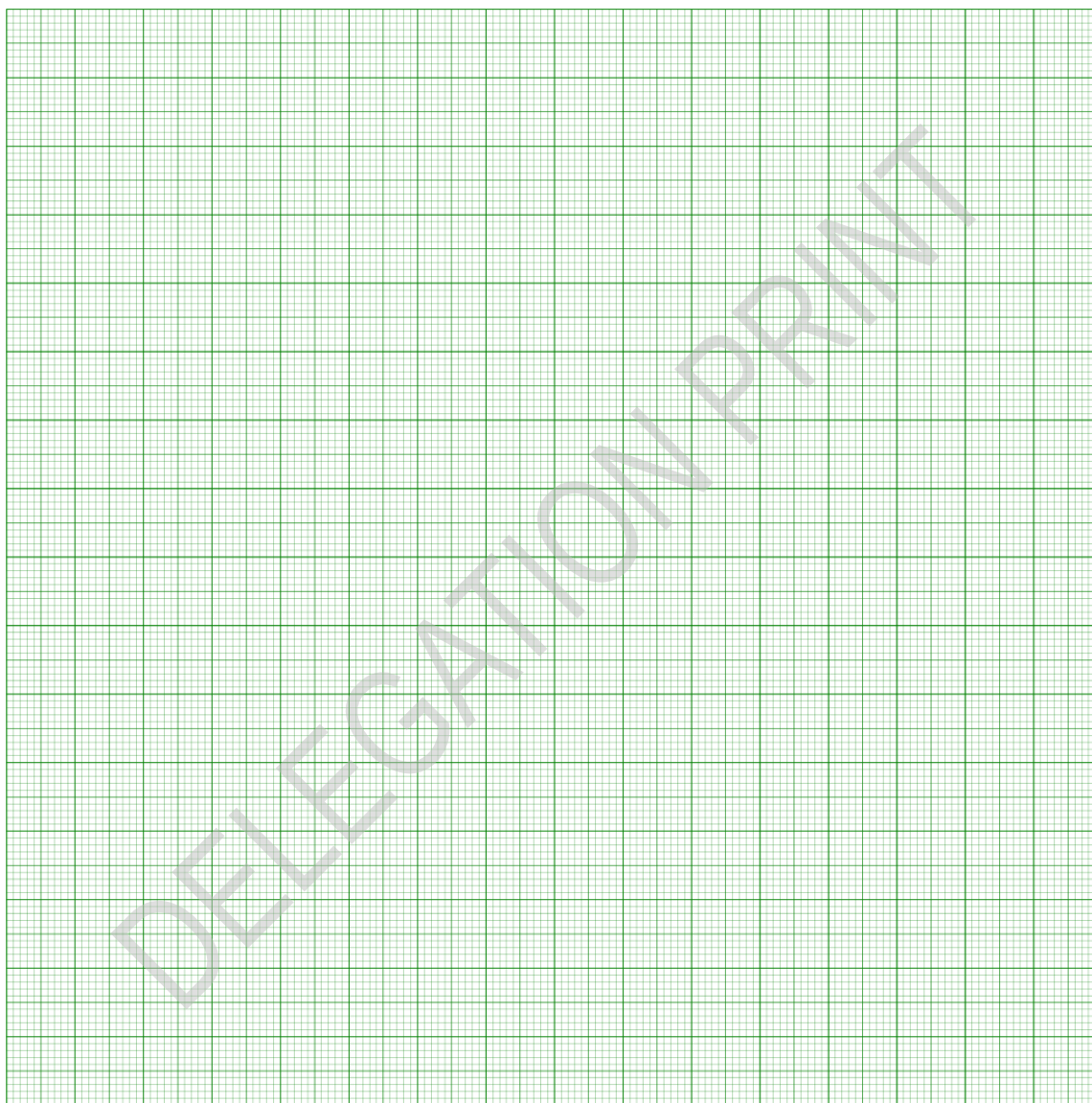
Asian Physics Olympiad  
Dhahran - Saudi Arabia 2025

# A3-4

Singapore English (Singapore)

**E.2** (0.6 pt)

Plot  $\delta$  as a function of  $\alpha$ :



**E.3** (0.2 pt)

Angle at which the halo appears with respect to the sun =