Important Microscopes and Telescopes Formulas PDF

Formulas
Examples
with Units

List of 21
Important Microscopes and Telescopes Formulas

1) Astronomical Telescope Formulas

1.1) Length of Astronomical Telescope Formula

Evaluate Formula

Formula

$$L_{telescope} = f_o + \frac{D \cdot f_e}{D + f_e}$$

Example with Units

$$103.4483\,\text{cm} = 100\,\text{cm} + \frac{25\,\text{cm} \cdot 4\,\text{cm}}{25\,\text{cm} + 4\,\text{cm}}$$

1.2) Length of Astronomical Telescope when Image Forms at Infinity Formula

Evaluate Formula

Formula

$$L_{telescope} = f_o + f_e$$

Example with Units

$$104\,\text{cm} = 100\,\text{cm} + 4\,\text{cm}$$

1.3) Magnifying Power of Astronomical Telescope when Image Forms at Infinity Formula

Evaluate Formula

Formula

$$M = \frac{f_o}{f_e}$$

Example with Units

$$25 = \frac{100\,\text{cm}}{4\,\text{cm}}$$

1.4) Magnifying Power of Galilean Telescope when Image Forms at Infinity Formula

Evaluate Formula

Formula

$$M = \frac{f_o}{f_e}$$

Example with Units

$$25 = \frac{100\,\text{cm}}{4\,\text{cm}}$$

2) Compound Microscope Formulas

2.1) Length of Compound Microscope Formula

Evaluate Formula

Formula

$$L = V_0 + \frac{D \cdot f_e}{D + f_e}$$

Example with Units

$$8.4483\,\text{cm} = 5\,\text{cm} + \frac{25\,\text{cm} \cdot 4\,\text{cm}}{25\,\text{cm} + 4\,\text{cm}}$$

2.2) Length of Compound Microscope when Image Forms at Infinity Formula

Evaluate Formula

Formula

$$L = V_0 + f_e$$

Example with Units

$$9\,\text{cm} = 5\,\text{cm} + 4\,\text{cm}$$

2.3) Magnification of Eyepiece when Image Formed at Least Distance of Distinct Vision Formula

Evaluate Formula

Formula

$$M_e = M \cdot \left(\frac{U_0 + f_o}{f_o} \right)$$

Example with Units

$$12.375 = 11 \cdot \left(\frac{12.5\,\text{cm} + 100\,\text{cm}}{100\,\text{cm}} \right)$$

2.4) Magnification of Objective Lens when Image Formed at Least Distance of Distinct Vision Formula

Evaluate Formula

Formula

$$M_o = \frac{M}{1 + \frac{D}{f_e}}$$

Example with Units

$$1.5172 = \frac{11}{1 + \frac{25\,\text{cm}}{4\,\text{cm}}}$$

2.5) Magnifying Power of Compound Microscope Formula

Evaluate Formula

Formula

$$M = \left(1 + \frac{D}{f_e} \right) \cdot \frac{V_0}{U_0}$$

Example with Units

$$2.9 = \left(1 + \frac{25\,\text{cm}}{4\,\text{cm}} \right) \cdot \frac{5\,\text{cm}}{12.5\,\text{cm}}$$

2.6) Magnifying Power of Compound Microscope at Infinity Formula

Evaluate Formula

Formula

$$M = \frac{V_0 \cdot D}{U_0 \cdot f_e}$$

Example with Units

$$2.5 = \frac{5\,\text{cm} \cdot 25\,\text{cm}}{12.5\,\text{cm} \cdot 4\,\text{cm}}$$

3) Resolving Limit Formulas

3.1) Resolving Limit of Microscope Formula

Evaluate Formula

Formula

$$RL = \frac{\lambda}{2 \cdot RI \cdot \sin(\theta)}$$

Example with Units

$$1.6E\text{-}9 = \frac{2.1\,\text{nm}}{2 \cdot 1.333 \cdot \sin(30°)}$$

3.2) Resolving Limit of Telescope Formula

Evaluate Formula

Formula

$$RL = 1.22 \cdot \frac{\lambda}{a}$$

Example with Units

$$7.3E\text{-}10 = 1.22 \cdot \frac{2.1\,\text{nm}}{3.5}$$

3.3) Resolving Power of Microscope Formula

Evaluate Formula

Formula

$$RP = \frac{2 \cdot RI \cdot \sin(\theta)}{\lambda}$$

Example with Units

$$6.3E{+}8 = \frac{2 \cdot 1.333 \cdot \sin(30°)}{2.1\,nm}$$

3.4) Resolving Power of Telescope Formula

Evaluate Formula

Formula

$$RP = \frac{a}{1.22 \cdot \lambda}$$

Example with Units

$$1.4E{+}9 = \frac{3.5}{1.22 \cdot 2.1\,nm}$$

4) Simple microscope Formulas

4.1) Focal Length of Simple Microscope when Image Forms at Least Distance of Distinct Vision Formula

Evaluate Formula

Formula

$$F_{convex\ lens} = \frac{D}{M - 1}$$

Example with Units

$$2.5\,cm = \frac{25\,cm}{11 - 1}$$

4.2) Magnifying Power of Simple Microscope Formula

Evaluate Formula

Formula

$$M = 1 + \frac{D}{F_{convex\ lens}}$$

Example with Units

$$5 = 1 + \frac{25\,cm}{6.25\,cm}$$

4.3) Magnifying Power of Simple Microscope when Image Formed at Infinity Formula

Evaluate Formula

Formula

$$M = \frac{D}{F_{convex\ lens}}$$

Example with Units

$$4 = \frac{25\,cm}{6.25\,cm}$$

5) Terrestrial Telescope Formulas

5.1) Length of Terrestrial Telescope Formula

Evaluate Formula

Formula

$$L_{telescope} = f_o + 4 \cdot f + \frac{D \cdot f_e}{D + f_e}$$

Example with Units

$$113.4483\,cm = 100\,cm + 4 \cdot 2.5\,cm + \frac{25\,cm \cdot 4\,cm}{25\,cm + 4\,cm}$$

5.2) Length of Terrestrial Telescope when Image Forms at Infinity Formula

Evaluate Formula

Formula

$$L_{telescope} = f_o + f_e + 4 \cdot f$$

Example with Units

$$114\,cm = 100\,cm + 4\,cm + 4 \cdot 2.5\,cm$$

5.3) Magnifying Power of Terrestrial Telescope when Image Forms at Infinity Formula

Evaluate Formula

Formula

$$M = \frac{f_o}{f_e}$$

Example with Units

$$25 = \frac{100\,\text{cm}}{4\,\text{cm}}$$

5.4) Magnifying Power of Terrestrial Telescope when Image Forms at Least Distance of Distinct Vision Formula

Evaluate Formula

Formula

$$M = \left(1 + \frac{f_e}{D}\right) \cdot \frac{f_o}{f_e}$$

Example with Units

$$29 = \left(1 + \frac{4\,\text{cm}}{25\,\text{cm}}\right) \cdot \frac{100\,\text{cm}}{4\,\text{cm}}$$

Variables used in list of Microscopes and Telescopes Formulas above

- **a** Aperture of Objective
- **D** Least Distance of Distinct Vision *(Centimeter)*
- **f** Focal Length of Erecting lens *(Centimeter)*
- $F_{convex\ lens}$ Focal Length of Convex Lens *(Centimeter)*
- f_e Focal Length of Eyepiece *(Centimeter)*
- f_o Focal Length of Objective *(Centimeter)*
- **L** Length of Microscope *(Centimeter)*
- $L_{telescope}$ Length of Telescope *(Centimeter)*
- **M** Magnifying Power
- M_e Magnification of Eyepiece
- M_o Magnification of Objective Lens
- **RI** Refractive Index
- **RL** Resolving Limit
- **RP** Resolving Power
- U_0 Object Distance *(Centimeter)*
- V_0 Distance between Two Lens *(Centimeter)*
- **θ** Theta *(Degree)*
- **λ** Wavelength *(Nanometer)*

Constants, Functions, Measurements used in list of Microscopes and Telescopes Formulas above

- Functions: **sin**, sin(Angle)
  Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- Measurement: **Length** in Centimeter (cm)
  Length Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Wavelength** in Nanometer (nm)
  Wavelength Unit Conversion

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