**1. UNITS AND DIMENSIONS**

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| **Differentiation** | **Integration** |
| **1.**  **2.**  **3.**  **4.**  **5.**  **6.**  **7.**  **8.** | provided  Here c is constant of integration |

**1. Simple Conversion of Units**

1 kg m-3 = 10-3 g cm-3 1 g cm-3 = 103 kg m-3 1N = 105 dyn 1 amu = 1.66 x 10-27 kg 1 AU = 1.496 x 1011 m 1 ly = 9.46 x 1015 m 1 persec = 3.08 x 1016 m 1 = 10-10 m = 0.1 nm

**2. Order of Magnitude** To determine the order of magnitude of a number N, we express it as N = *n* x 10*x* If 0.5 < n 5, then *x* will be the order of magnitude of N.

**3. Indirect Methods for Long Distances**  1. *Reflection or echo method*   or  2. Triangulation method (i) Height of an accessible object  *h = x tan * where *x* is the distance of observation point from the foot of the object. (ii) Height of an inaccessible object  where *d* is the distance between the two observation points. 3. *Parallax method. The distance of an astronomical object*   4. Size of the an astronomical object, Linear diameter = Distance x angular diameter or 

**4. Indirect Methods of Small Distances**: - 1. Molar volume = Volume of 1 mole of a gas at S.T.P = 22.4 L 2. Volume of a sphere =  3. Thickness of an oil film =  **5. Magnification of Sizes** 1. Linear magnification =  2. Linear magnification = 

**6. Measurement of Time** Fractional error in time = 

**7. Significant Figures** 1. Rules for rounding off a measurement. (i) If the digit to be dropped is smaller than 5, then the preceding digit is left unchanged. (ii) If the digit to be dropped is greater than 5, then the preceding digit is increased by 1. (iii) If the digit to be dropped is 5 followed by non-zero digits, then the preceding digit is increased by 1. (iv) If the digit to be dropped is 5, then the preceding digit is left unchanged it is even. (v) If the digit to be dropped is 5, then the preceding digit is increased by 1 if it is odd.

**2.** Rules for determining the number of significant figures. (i) All non-zero digits are significant. So 13.75 has four significant figures. (ii) All zero between two non-zero digits are significant. Thus 100.05 km has five significant figures. (iii) All zeros to the right of a non-zero digit but to the left of an understood decimal point are not significant. For example, 86400 has three significant figures. But such zeros are significant if they came from a measurement. For example, 86400 s has five significant figures. (iv) All zeros to the right of a non-zero digit but to the left of a decimal point are significant. For example 648700. Has six significant figure. (v) All zeros to the right of a decimal point are significant. So 161 cm, 1610 cm and 161.00 cm have three, four and five significant figures respectively. (vi) All zeros to the right of a decimal point but to the left of a non-zero digit are not significant. So 0.161 cm and 0.161 cm, both have three significant figures. Moreover, zero conventionally placed to the left to the decimal point is not significant. (vii) *The number of significant figures does not depend on the system of units.* So 16.4 cm, 0.164m and 0.000164 km, all have three significance figures.

**8. Errors in Measurements** 1. True value. If *a­1, a2, a3,…..an* are the readings of an experiment, then true value of the quantity is given by the arithmetic mean,  2. Absolute error = True value – Measured value or  3. Final absolute error = Arithmetic mean of absolute errors   4. Relative error or fractional error  or  5. Percentage error = 

**9. Combination of Errors** 1. If *Z = A + B*, then the maximum possible error in Z,  2. If *Z = A-B*, then the maximum possible error in Z, *∆Z = ∆A + ∆B*  3. If *Z = AB*, then the maximum fractional error in Z  4. If Z = A/B, then the maximum fractional error in Z,  5. If Z = An, then the maximum fractional error in Z,  6. If Z =, then the maximum fractional error in Z,  The percentage error in Z 