Unit I UNIT AND DIMENSION

Answer the following Questions

1) The escape velocity of the satellite depends on mass of satellite, gravitational constant and radius of the satellite. Using the dimension method derive the relation of escape velocity.

2) The expression of force is given by $F = A\sqrt{X} + \frac{B}{\sqrt{t^3}} + \frac{B}{\sqrt{t}}$ where X and t are the displacement and time respectively. By using principle of homogeneity of dimension, find the dimensions of A, B and C.

3) The expression of density is ρ (density) $= \frac{A}{\sqrt{X}} + \frac{B}{\sqrt{X^3}}$ where X is the displacement. Find out the units of A and B.

4) Convert by using dimension method (a) 100 ergs into joule and b) 90 km/hr into m/s.

5) Taking force, length and time to be a fundamental quantity, find the dimensions of mass, power and density.

6) What is absolute error? The length of rod is measured in lab is 12.01 ± 0.002 cm. What does it mean?

7) A student writes $\sqrt{\frac{3v^2}{8\pi GR^2}}$ for critical density of the universe. Check the given equation is dimensionally correct or incorrect.

8) Find the dimension of torque, angular momentum, Planck's constant and coefficient of viscosity.

9) The length of the cubic room is 12 ± 0.2 cm. Find the volume and area of base with error.

10) What do you mean by significant figure? Simplify with correct significant figure

a) $\frac{2.0056 \times 8.2}{14.52}$ b) $\frac{2.056 \times 8}{4.52 \times 3.020}$ c) $2.048 + 8.20 + 14.2 - 20$

11) A meter scale used in lab measures a length of 75 cm. What might be possible absolute and percentage error?

12. a) Explain the terms heat and temperature.
b) What is thermometry ?
c) What do you mean by thermometric liquid?

2 a) Change 500k into celcius scale.
b) State zeroth law of thermodyanamics.
c) Convert 40^0 F into kelvin scale.

3 a) What are the difference between heat and temperature ?
b) At what temperature will the kelvin scale reading double the Fahrenheit scale reading ?
c) Does temperature depends on the amount of heat ?
d) Write down the relation between centigrade, Fahrenheit and reaumer scale.

4 a) Why platinum wire is used in resistance thermometers ?
b) Does it make sense that one body is twice of hot as another ?
c) A faulty thermometer has its fixed points marked at -2 and 98. What is the correct temperature on the celcius scale when the thermometer reads 20^0?
d) At what temperature, do the Fahrenheit scale and Celsius scale shows same reading?
e) At what temperature, do the Fahrenheit scale and kelvin scale shows the same reading ?

5 (a) At what temperature do the Fahrenheit scale shows double reading of Celsius scale?
(b) a faulty thermometer measures the temperature -10 degree and 70 degree . if the thermometer measures the temperature of a 45 degree . What is the correct temperature in calcius scale .
(c) A thermometer is used to measure the temperature of a cooling water. If the fall in temperature of water in celcius scale is 45 degree C. what is the fall in temperature in Fahrenheit scale?

(D) what is the temperature of vacuum?

(E) a thermometer has a spherical bulb . Which thermometer will response quickly for the temperature change?

6 (a) Show that 1 $calg^{-1}\,{}^0c^{-1} = 4200\ JKg^{-1}\,{}^0c^{-1}$.
(b) Define 1calorie heat.
(c) Why is it wise to wait for some time to measure the temperature of substance.
(d) There is a slight different in temperature of water between top and bottom point during waterfall, WHY?
(e) Explain why temperature readings of air are always taken with the thermometer in the shade.

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(a) Write down the principle of thermometry.
(b) Explain the term thermal equilibrium with example .
(c) Can an object be hotter than another if they are at the same temperature? explain.
(d) A centigrade thermometer reads 2^0c at the malting point of ice and 98 ^{0}c at the boiling point of water at normal pressure. What is the correct temperature when it reads 25^0c?
(e) Define pyrometer.

(a) what is the basic principle of thermometer ?
(b) Why , is mercury used as a thermometric substance ?
(c) What is thermal equilibrium ?
(d) Define absolute zero temperature
(e) Why heat flows from the body at higher mean temperature to the body at lower mean temperature?
(f) A thermometer has wrong calibration. it reads the malting point Ice -6^0c . it reads 70^0c in place of 60^0c.what is the tem of boiling points of water on thip scale?

9 (a) Why are the telephone weirs taut in winter and slackened in summer ?
(b).define linear and superficial expansivities.
(c).show that $\beta = 2 \propto$ where $\propto$ and $\beta$are linear and superficial expansivities.
(d).does the coefficient of linear expansion depend on length ? explain
(e). In railway track small gaps are provided between rails , why?

10 (a) what is meant by linear expansivity of steel is $1.2 * 10^{-5}\ ^0c^{-1}$?
(b).if there is small hole on the metal disc and the disc is heating . what happens to the size of the hole after heating ?
(c) among solid ,liquid and gas , which material expands more on heating ,why?
(d) why a pendulum clock goes slow in summer and fast in winter ?
(e).there is a possibility of cracking of window in very cold countries , Why?

11 (a) Show that $\gamma = 3\alpha$, where symbols have their usual meaning .
(b) Why does a thick glass tumbler crack when boiling water is poured on it.
(c) Why does solid expand on heating?
(d) Two bodies are made of same material . one of them is hollow but other is solid. Their initial volumes are same. What would be their final volume if they are heated to equal temperature?

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