Week-7 Assignment-1

The due date for submitting this assignment has passed. Due on 2018-03-14, 23:59 IST.

Submitted assignment

Week-7 Assignment-1

Answer all the questions:-

1) The triple point of oxygen which is used as one of the fixed point in International Practical Temperature Scale in Kelvin (K) is given by

- 54.3584
- 212.8765
- 100.3567
- 300.5643

No, the answer is incorrect.
Score: 0

Accepted Answers:
54.3584

2) As per the internationally accepted definition of the temperature scale, which of the following correctly defines 1 Kelvin?

- \((1/273.15)\)th of the normal freezing point of water
- \((1/273.16)\)th of the triple point of water
- 100 times the difference between the triple point of water and normal freezing point of water
- \((1/100)\)th of the difference between normal boiling point and normal freezing point

No, the answer is incorrect.
Score: 0

Accepted Answers:
\((1/273.16)\)th of the triple point of water

3) Output of a bimetallic element is

- Strain
- Pressure
- Displacement
- Voltage

No, the answer is incorrect.
Score: 0

Accepted Answers:
Strain

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4) A bimetallic element formed with stainless steel and invar at 100 °C is raised to 200 °C. Each strip has a thickness of 0.0107 cm. Calculate the radius of curvature (in cm) using the expression given below

\[ r = \frac{t}{6(\alpha_A - \alpha_B)(T - T_0)(1 + m)} \]

where \( r \) = radius of curvature
\( t \) = total strip thickness \((t_A + t_B)\)
\( n \) = elastic modulus ratio of low to high expansion material, \( E_B/E_A \)
\( m \) = thickness ratio of low to high expansion material, \( t_B/t_A \)

\( T \) = operating temperature rise
\( T_0 \) = initial temperature

Use the following data of the material properties:

For stainless steel, \( \alpha_A = 1.67 \times 10^{-5} \text{oC}^{-1} \) and \( E_A = 2 \times 10^6 \text{kg/cm}^2 \)

For invar, \( \alpha_B = 1.7 \times 10^{-6} \text{oC}^{-1} \) and \( E_B = 1.5 \times 10^6 \text{kg/cm}^2 \)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 6, 7

5) Which of the following is true for a bimetallic thermometer?

I. Two metals have same coefficients of thermal expansion
II. Two metals have different coefficients of thermal expansion
III. One metal is cold always
IV. If the total strip thickness increases, the radius of curvature increases

- All are true
- Only I, III and IV are true
- Only II, III and IV are true
- Only II and IV are true

No, the answer is incorrect.
Score: 0
Accepted Answers:
Only II and IV are true

6) Choose the correct option

Statement I: The purpose of the contraction chamber in liquid-in-glass thermometer is to increase the total stem length needed to reach the main scale.

Statement II: An expansion chamber is used in liquid-in-glass thermometer to prevent the build-up of pressure if the temperature of the liquid rises past the top of the scale.

- Both the statements are true
- Both the statements are false
- Statement I is true and statement II is false
7) A Pyrex thermometer is immersed to the 50 °C mark and it reads 300 °C. Ambient temperature at the midpoint of the exposed Hg column is 115 °C. The stem corrected temperature reading for a total immersion thermometer is (in °C) ____________

Given: net expansion coefficient of Hg in glass, \( K = 0.000174 \) at 300 °C

No, the answer is incorrect.
Score: 0
Accepted Answers:
Statement I is false and statement II is true

8) The sensing element of the industrial pressure thermometer is usually made of

- Brass
- Platinum
- Steel
- constantan

No, the answer is incorrect.
Score: 0
Accepted Answers:
Steel

9) The volume of the bulb of a pressure thermometer is 10 times the combined volume of the capillary and Bourdon tubes. If the ambient temperature falls by 20 °C from the calibration temperature then, what would be the error in temperature? (in °C)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(Type: Range) 1,3

10) A bimetallic strip is made of invar and steel strips of equal length. The bimetal is held rigidly at one end, with the invar strip on the top. The thermal expansion coefficients are given as: \( \alpha_{\text{invar}} = 1.7 \times 10^{-6} \, \text{°C}^{-1} \) and \( \alpha_{\text{steel}} = 1.67 \times 10^{-5} \, \text{°C}^{-1} \). If the bimetallic strip is now heated, it will bend

- Upward
- Downward

No, the answer is incorrect.
Score: 0
Accepted Answers:
Upward
11) Identify the wrong statement

- Temperature is related to the average kinetic energy of the molecules or atoms.
- Vapor pressure thermometers have uniformly divided scales.
- A bimetallic thermometer is unsuitable if the temperature change is rapid.
- A bimetallic strip made of two different materials bends during a rise in temperature on account of differences in coefficient of linear expansion.

**No, the answer is incorrect.**

Score: 0

Accepted Answers:
Vapor pressure thermometers have uniformly divided scales.

12) A constant-volume gas thermometer works on

- Gay-Lussac’s Law
- Boyle’s law
- Pascals law
- Charles law

**No, the answer is incorrect.**

Score: 0

Accepted Answers:
Gay-Lussac’s Law

13) The primary sensing element in a pressure thermometer is

- Bourdon tube
- Capillary tube
- Bulb
- Bulb together with capillary tube

**No, the answer is incorrect.**

Score: 0

Accepted Answers:
Bulb

14) A mercury-in-steel bulb thermometer employs a Bourdon pressure gauge that has a range of 0-5 MPa for a pointer movement of 300°. The dial of the pressure gauge is calibrated to read 0° at 0 °C and 300° at 200 °C. If the bulb is raised by half a metre higher (relative to Bourdon gauge), what is the apparent change in the temperature indicated by the thermometer?__________(in °C) (Given density of mercury = 13.6 g/cm³)

**No, the answer is incorrect.**

Score: 0

Accepted Answers:
(Type: Range) 2,3