Question 1

افهم السؤال أولاً وأجب عن المطلوب فقط ولا تزيد

a) Write down the followings: (i) The basic idea of the resistance thermometer. (ii) The definition of the linear thermal expansion. (iii) the definition of the latent heat of vaporization. (iv) The SI unit of thermal conductivity. [4 marks]

b) Draw only the heating curve of water. ارسم فقط مع كامل البيانات علي الرسم منحنى التسخين للماء [3 marks]

c) A constant-volume gas thermometer registers an absolute pressure of 70 KPa where it is at a temperature -20 °C. Calculate the pressure at the triple point of water, and calculate the temperature when the pressure is 30 KPa. [6 marks]

d) A 150 g of ice at 0°C is added to one Kg of water at 20.0°C. What is the final temperature of the system? Take the specific heat for water 4186 J/Kg°C and the latent heat of fusion for ice is 3.337×10^5 J/Kg. [6 marks]

Question 2

a) A long-thin wire (سلك طويل ورفيع) of steel was stretched at 15 °C between two rigid points so that the wire had an initial tensile stress of 1.2×10^7 Pa. (i) If the temperature increases gradually, (i) at what temperature the wire will be released from the stress and (ii) What is the magnitude of stress when the temperature reaches 40°C? Take the linear expansion coefficient of steel is 12×10^{-6} C^{-1} and the Young's modulus is 2×10^{11} Pa. [7 marks]

b) In an experiment to determinate the thermal conductivity of an insulating material, a box with a total surface are of 0.3 m^2 and a wall thickness of 7 mm is made of this material. A 40-W electric heater inside the box maintains the average temperature of the inside surface of the box is 20 °C above that of the outside surface. Find the thermal conductivity of this insulating material. [6 marks]

c) A square thin sheet of side length 10 cm is maintained at a temperature of 200 °C. Assuming it to be a black body. Calculate the net power radiated by the sheet to the surrounding atmosphere of temperature 30 °C. The Stefan-Boltzmann constant is 5.67×10^{-8} W/m^{2}K^4. [6 marks]

Question 3

a) Express the work done, w, on each of the following processes; (اكتب المعادلة فقط لكل إجراء)
(i) constant-pressure process, (ii) constant-volume process and (iii) isothermal process. [3 marks]

b) An ideal gas with an initial volume of 0.02 m^3 and an initial pressure of 3.0 MPa expands to final volume of 0.5 m^3. The relationship between pressure and volume during the expansion is PV = cnst. Determine, (i) the value of the constant, (ii) the work done, w, (iii) the heat, Q, and (iv) the change in the internal energy, ΔU. [8 marks]

c) An ideal gas is taken through a Carnot cycle. The isothermal expansion and compression processes were at 400°C and 50°C, respectively. If the gas absorbs 1200 J of heat during the isothermal expansion, find (i) the heat expelled to the cold reservoir in each cycle and (ii) the work done by the gas in each cycle. [6 marks]

من فضلك اقلب الورقة

Question 4

a) Write down the dimensions of the following physical quantities:, (i) density, (ii) force, (iii) strain and (iv) power. [4 marks]

b) The speed of a particle, v, varies in time according to the equation: $v = A - B t^2$, where t is the time. What are the dimensions of A and B? [5 marks]

c) Plot the stress-strain diagram of a normal ductile material. [3 marks]

d) A structural metal wire has a cross sectional area of 0.03 cm^2 and a length of 120 cm. A force of 600 N stretches it axially by 0.12 cm. (i) What is the stress in the road? (ii) What is the strain? (iii) What is Young's modulus of the metal wire? [6 marks]

Question 5

a) Plot the kinetic energy, potential energy and total energy of simple harmonic motion as a function of both, (i) distance of vibration, x, and (ii) time, t. [4 marks]

b) The equation of 1 Kg mass tied to a spring is described by $x = 0.1 \sin 10 \, t$ (m). Find the kinetic energy, potential energy, total energy and acceleration at a distance 0.04 m from the equilibrium position. [8 marks]

c) The following two waves interfere:
$$y_1 = 0.12 \sin [3 x - 40 \, t], \qquad y_2 = 0.12 \sin [3 x - 40 \, t - 0.5 \, \pi].$$
(i) Find the equation of the resultant wave. (ii) What is periodic time of the wave? (iii) What is the speed of the resultant wave? [8 marks]

Question 6

a) A string has a mass of 5.0 g and a length of 100 cm. What must the tension in the string be if the speed of the wave on it is 300 m/s? [5 marks]

b) Find the sound level in decibels of an intensity 10^{-7} W/m^2. Take $I_o = 10^{-12} \text{ W/m}^2$. [5 marks]

c) A train moving at a speed of 50 m/s sounds its whistle, which has a frequency of 450 Hz. Determine the frequencies heard by a stationary observer as the train approaches and then recedes from the observer. Take the velocity of sound in air 340 m/s. [7 marks]

مع أطيب التمنيات بالنجاح

انتهت الأسئلة