Q1 You put a thermometer in a pot of hot water and record the reading. Temperature of what have you recorded?

the temperature of the water

the temperature of the thermometer **Ans**

an equally weighted average (i.e. simple average) of the temperatures of the water and thermometer

a weighted average of the temperatures of the water and thermometer, with more emphasis on the temperature of the water

a weighted average of the water and thermometer, with more emphasis on the temperature of the thermometer.

Explanation: A liquid-in-tube thermometer actually measures its own temperature. If the thermometer stays in the hot water long enough, it will come to thermal equilibrium with the water and its temperature will be the same as that of the water.

Q2 Constant-volume gas thermometers using different gases all indicate nearly the same temperature when in contact with the same object if:

The volumes of the gasses inside are extremely large

The volumes of the gases inside are extremely small

The temperature is extremely low

The pressures are extremely large

The pressures are the same

The number of moles of the gases are extremely small **Ans**

Q3 A constant-volume gas thermometer is used to measure the temperature of an object. When the thermometer is in contact with water at its triple point (273.16K), the pressure in the thermometer is 8.5×10^4 Pa. When it is in contact with the object, the pressure is 9.65×10^4 Pa. The temperature of the object is:

370 K

241 K

310 K **Ans**

314 K

350 K

Solution:

$T = T_{TP}\left(\frac{P}{P_{TP}}\right)$=(273.16K)*(9.65/8.5) = 310.117 K

Q4 A Kelvin thermometer and a Fahrenheit thermometer both give the same reading for a certain sample. The corresponding Celsius temperature is (approximately):

574°C

232°C

301°C **Ans**

614°C

276°C

Solution: $T_C = T - 273.15, T_F = \frac{9}{5}T_C + 32\ F = \frac{9}{5}(T - 273.15) + 32\ F$;

(T_F-32) =9T/5 – 9*273.15/5 = 9T/5 – 491.67 ; => T – 32 = 9T/5 – 491.67 ; => (9/5-1) T=491.67 -32

=> T = (491.67-32) *5/4 = 574.586; T_F = 574.586 -> T_C = 301.4 C

Q5 A sample of an ideal gas undergoes an isothermal process starting with a pressure of 2×10^5Pa and a volume of 6 cm^3. Which of the following might be the pressure and volume of the final state?

1×10^5Pa and $10\ \mathrm{cm}^3$

3×10^5Pa and $6\ \mathrm{cm}^3$

4×10^5Pa and $4\ \mathrm{cm}^3$

6×10^5Pa and $2\ \mathrm{cm}^3$ **Ans**

8×10^5Pa and $2\ \mathrm{cm}^3$

Solution: PV=Constant

Q6 A Calorie is about:

4.2 J

250 J

4200 J **Ans**

8.3 J

0.24 J

Solution: A Calorie with a big C implies one kilo calorie: 1 calorie = 4.18 J, 1 Calorie = 1 kcal

Q7 Inside a room at a uniform comfortable temperature, metallic objects generally feel cooler to touch than wooden objects do. This is because,

a given mass of wood contains more internal energy than the same mass of metal.

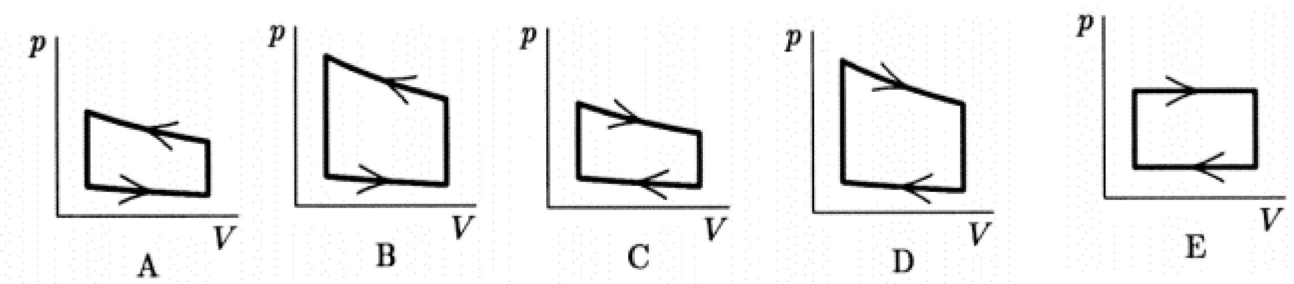
metal conducts heat better than wood. **Ans**

heat tends to flow from metal to wood.

the equilibrium temperature of metal in the room is lower than that of the wood.

The human body, being organic, resembles wood more closely than it resembles metal.

Q8 The pressure versus volume graphs for a certain gas undergoing five different cyclic processes are shown below. During which cycle does the gas do the greatest positive work?



Answer: D. The essential difference between B and D is in the sign of the work done. In D, the upper part has greater positive work done in the upper section of the cycle W_upper_ON = -integral(PdV), V=V1, V=V2, Since V2=V_final>0 we get W_ON<0, and W_BY>0 , hence the answer.

Q9 During an adiabatic process an amount of an ideal does 100 J of work and its temperature decreases by 5 K. During another process it does 25 J of work and its temperature decreases by 5 K. The heat capacity of the gas for the second process is:

20 J/K

24 J/K

5 J/K

15 J/K **Ans**

100 J/K

Solution: D: In the first process: $\Delta E_{int} = Q_{in} + W_{on} = W_{on} = -100\text{J}$

For the second process, say X : $\Delta E_{int} = -100J = Q_{in} + W_{on} = Q_{in} - 25\,J$ => $nC_X \Delta T = Q_{in} = -75\,J$

$\Rightarrow nC_X = \frac{-75}{-5}\frac{J}{K} = 15\,J/K$ GOOD

Q10 Of the following, which might NOT vanish over one cycle of a cyclic process? W is the work done on the system, Q is the energy absorbed as heat by the system, P is the pressure, V is the volume, and T is the temperature.

$W - Q$

ΔP

Q

ΔV

ΔT

Answer: Q , in a cyclic process, work done may not vanish (it is the negative of the area enclosed). Since the change of internal energy is zero, hence if W is non zero, so also Q (from the first law)

Q11 The state of a gas is changed slowly from state 1 to state 2. During this process, no work is done on or by the gas. This process must be:

isothermal

adiabatic

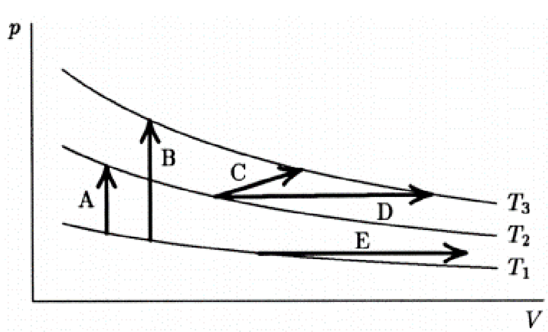
isochoric

isobaric

cyclic

Answer: C, NO work done as volume does not change.

Q12 The diagram shows five thermodynamic processes carried out on an ideal gas. For which of these processes, is the change of the internal energy of the gas is the greatest?



Answer: B, the maximum change of temperature.

Q13 The pressure of an ideal gas is doubled during a process in which the energy given up as heat by the gas equals the work done on the gas. As a result the volume is:

doubled

halved **Ans**

unchanged

need more information to answer

the process is impossible

Answer: B

$W_{on} = Q_{out} => -Q_{in} = W_{on} => W_{on} + Q_{in} = 0 = \Delta E_{int} =>$ Isothermal process.

PV=constant => pressure P-> 2P => V-> V/2