

Thermodynamics – Exam 2 (NEET)

System, Properties, Process, First Law, Heat Capacity

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Q1. In which one of the following sets, all the properties belong to same category? (a) Mass, volume, pressure (b) Temperature, pressure, volume (c) Heat capacity, density, entropy (d) Enthalpy, internal energy, volume

Conceptual Approach

Extensive \propto matter (mass, volume, enthalpy, U). Intensive independent of matter (T, P, density).

Final Answer: (d) Enthalpy, Internal energy, Volume \rightarrow all extensive.

Q2. Freezing of a liquid in a system then: (a) $q = 0$ (b) $q > 0$ (c) $q < 0$ (d) depends

Conceptual Approach

Freezing releases heat to surroundings \rightarrow heat lost by system $\rightarrow q < 0$.

Final Answer: (c).

Q3. A system goes (i) $P_1, V \rightarrow 2P_1, V$, (ii) $P, V_1 \rightarrow P, 2V_1$. Work done? (a) 0, 0 (b) 0, $-PV_1$
(c) $-PV_1, 0$ (d) $-PV_1, -P_1V_1$

Conceptual Approach

(i) Volume constant $\rightarrow \Delta V = 0 \Rightarrow w = 0$. (ii) Const P, volume doubles $\rightarrow w = -P\Delta V = -P(V_2 - V_1) = -PV_1$.

Final Answer: (b).

Q4. Two moles of an ideal gas expand spontaneously into vacuum. The work done is: (a) 0 (b) 2 J (c) 4 J (d) 8 J

Conceptual Approach

Expansion in vacuum \rightarrow external pressure = 0 $\rightarrow w = 0$.

Final Answer: (a).

Q5. One mole of gas (3 L) expands against 1 atm to 13 L. Work = ? (a) $-10 \text{ atm}\cdot\text{L}$ (b) $-20 \text{ atm}\cdot\text{L}$ (c) $-39 \text{ atm}\cdot\text{L}$ (d) $-48 \text{ atm}\cdot\text{L}$

Conceptual Approach

$w = -P\Delta V = -1(13 - 3) = -10 \text{ L}\cdot\text{atm}$.

Final Answer: (a).

Q6. According to first law (q=heat, W=work by system): (a) $\Delta U = q - W$ (b) $\Delta U = q + W$
(c) $\Delta U = \Delta q + \Delta W$ (d) $\Delta U = q + \Delta W$

Conceptual Approach

Correct sign convention: $\Delta U = q - w$.

Final Answer: (a).

Q7. A system absorbs 600 J heat and does 300 J work. Find ΔU .

Conceptual Approach

$\Delta U = q - w = 600 - 300 = 300 \text{ J}$.

Final Answer: 300 J.

Q8. $q = 0.5 \text{ kJ}$, $\Delta U = 300 \text{ J}$. Find ΔV .

Conceptual Approach

$w = q - \Delta U = 500 - 300 = 200 \text{ J}$. Convert: $1 \text{ L}\cdot\text{atm} = 101.32 \text{ J}$. $\Delta V = 200/101.32 \approx 2 \text{ L}$.

Final Answer: 2 L.

Q9. If 100 cal (420 J) supplied and work=300 J, $\Delta U = ?$

Conceptual Approach

$\Delta U = 420 - 300 = 120 \text{ J}$.

Final Answer: 120 J.

Q10. Const V, gas absorbs 200 J. $\Delta U = ?$

Conceptual Approach

Isochoric $\rightarrow w = 0$, so $\Delta U = q = 200 \text{ J}$.

Final Answer: 200 J.

Q11. System energy= U_1 , heat lost=450 J, work on system=600 J. Final energy=?

Conceptual Approach

$q = -450$, work ON system $\rightarrow w = -600$. $\Delta U = -450 - (-600) = +150$. So $U = U_1 + 150$.

Final Answer: (a) $U_1 + 150$.

Q12. Isothermal expansion of ideal gas, U and H?

Conceptual Approach

Isothermal $\rightarrow \Delta U = 0$. For ideal gas, H depends on T \rightarrow also const.

Final Answer: (d) Both unchanged.

Q13. Isochoric process, increase in U = ?

Conceptual Approach

$w=0 \rightarrow \Delta U = q$.

Final Answer: (a) Equal to heat absorbed.

Q14. Isothermal expansion of ideal gas. Wrong statement?

Conceptual Approach

Isothermal \rightarrow T constant, U constant, $q=w$. Wrong: "work = U".

Final Answer: (d).

Q15. Adiabatic process, correct relation?

Conceptual Approach

Adiabatic $\rightarrow q = 0$.

Final Answer: (c).

Q16. In which process temperature increases?

Conceptual Approach

Adiabatic compression \rightarrow work on gas \rightarrow T rises.

Final Answer: (a).

Q17. Which equation is wrong?

Conceptual Approach

Cyclic: $U=0 \rightarrow q=-w$. So (a) $U=-w$ is wrong.

Final Answer: (a).

Q18. Spring compression: $w=10$ kJ, $q=-2$ kJ. Find U.

Conceptual Approach

$U=q-w=-2-(-10)=+8$ kJ.

Final Answer: 8 kJ.

Q19. Expansion 1→10 L against 1 bar. Work=?

Conceptual Approach

$V=9\text{ L}$. Work= $-PV=-9\text{ L}\cdot\text{bar}=-0.9\text{ kJ}$.

Final Answer: (b).

Q20. Thermodynamics is not concerned about...

Conceptual Approach

Thermo rate (kinetics).

Final Answer: (c).

Q21. State of a gas can be described by?

Conceptual Approach

Equation of state → P, V, T, n (amount).

Final Answer: (d).

Q22. Assertion: Mass and Volume are extensive. Reason: Mass/Volume is also extensive.

Conceptual Approach

Assertion true. But mass/volume=density → intensive. So reason false.

Final Answer: (c).
