

單選題(1-14)，每題 5 分，合計共 70 分。※ 注意：請於試卷內之「選擇題作答區」依序作答。

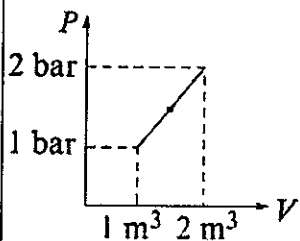
(1) Which of the following pair does show the extensive properties?

- (a) temperature and pressure
- (b) viscosity and surface tension
- (c) refraction index and specific heat
- (d) volume and heat capacity

(2) Which of following is incorrect about reversible process?

- (a) System remains always in thermodynamic equilibrium.
- (b) The process is extremely slow.
- (c) The process may be reversed at any stage only by making infinitesimally small change in opposite direction.
- (d) Reversible process may be performed in finite time.

(3) A system absorbs 100 kJ heat in the process shown in the following figure. What is ΔU for the system?



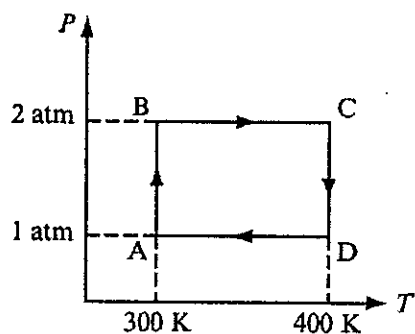
- (a) -50 kJ (b) +50 kJ (c) +150 kJ (d) -150 kJ

(4) The minimum work which must be done to compress 16 g of oxygen isothermally, at 300 K from a pressure of $1.013 \times 10^3 \text{ N/m}^2$ to $1.013 \times 10^5 \text{ N/m}^2$ is

- (a) 5727 J (b) 11.454 kJ (c) 123.255 kJ (d) 1232.55 J

(5) Two moles of helium gas undergoes a cyclic process as shown in the following figure. Assuming ideal behavior of gas, the net work done by the gas in this cyclic process is

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(a) 0 (b) $100R \ln 2$ (c) $100R \ln 4$ (d) $200R \ln 4$

(6) At 500 kbar and T K, the densities of graphite and diamond are 2.0 and 3.0 g/cm³, respectively. The value of $(\Delta H - \Delta U)$ for the conversion of 1 mole of graphite into diamond at 500 kbar and T K is

(a) 100 kJ (b) -100 kJ (c) 1000 kJ (d) -1000 kJ

(7) A diatomic ideal gas initially at 273 K is given 100 cal heat due to which system did 210 J work. Molar heat capacity of the gas for the process is (1 cal = 4.2 J)

(a) $3/2 R$ (b) $5/2 R$ (c) $5/4 R$ (d) $5 R$

(8) When one mole of an ideal gas is compressed to half of its initial volume and simultaneously heated to twice its temperature, the change in entropy is

(a) $C_v \ln 2$ (b) $C_p \ln 2$ (c) $R \ln 2$ (d) $(C_v - R) \ln 2$

(9) Oxygen gas weighing 64 g is expand from 1 atm to 0.25 atm at 30 °C. What is the entropy change, assuming the gas to be ideal?

(a) 23.24 J/K (b) 34.86 J/K (c) 46.48 J/K (d) 11.62 J/K

(10) Change in entropy is negative for

(a) Bromine (l) \rightarrow Bromine (g)

(b) $C(s) + H_2O(g) \rightarrow CO(g) + H_2(g)$

(c) $N_2(g, 10 \text{ atm}) \rightarrow N_2(g, 1 \text{ atm})$

(d) $Fe(10 \text{ mol}, 400 \text{ K}) \rightarrow Fe(1 \text{ mol}, 300 \text{ K})$

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(11) A spontaneous reaction is impossible if

- (a) both ΔH and ΔS are negative
- (b) both ΔH and ΔS are positive
- (c) ΔH is negative and ΔS is positive
- (d) ΔH is positive and ΔS is negative

(12) For a system in equilibrium, $\Delta G = 0$ under conditions of constant

- (a) temperature and pressure
- (b) temperature and volume
- (c) pressure and volume
- (d) energy and volume

(13) An average human produces about 10 MJ of heat each day through metabolic activity. If a human body were an isolated system of mass 80 kg with the heat capacity of water of 4.2 J/K-g, what temperature rise would the body experience?

- (a) 29.76 °C (b) 2.946 K (c) 2.976×10^4 °C (d) 0.029 °C

(14) The entropy change of 2 moles of an ideal gas whose adiabatic exponent $\gamma = 1.5$ if as a result of a certain process, the gas volume increased two times while pressure dropped four times, is

- (a) -11.64 J/K (b) +11.64 J/K (c) -34.92 J/K (d) +34.92 J/K

非選擇題(15-16)，共 30 分。 ※ 注意：請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

(15) An ideal gas with constant heat capacity undergoes a change of state from conditions T_1, P_1 to conditions T_2, P_2 . Determine ΔH (J/mol) and ΔS (J/mol-K) from the following cases: $T_1 = 300$ K, $P_1 = 1.2$ bar, $T_2 = 450$ K, $P_2 = 6$ bar, $C_p/R = 7/2$. (10 分)

(16) The PVT behavior of a certain gas is described by the equation of state

$P(V-c) = RT$ where c is constant. If in addition C_v is constant, show that

- (a) U is a function of T only. (6 分)
- (b) $C_p/C_v = \gamma = \text{const.}$ (6 分)
- (c) For a mechanically reversible adiabatic process, $P(V-c)^\gamma = \text{const.}$ (8 分)

試題隨卷繳回