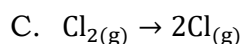
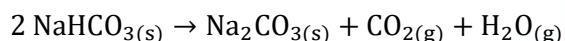


1. In which of the following processes entropy increases?

A. A liquid evaporates to vapour.
B. Temperature of a crystalline solid lowered from 130 K to 0 K.



Choose the correct answer from the options given below: **(2024)**

(a) A, B and D (b) A, C and D
(c) C and D (d) A and C

2. Match the List – I with List II.

List – I (Process)		List – II (Conditions)	
A.	Isothermal process	I.	No heat exchange
B.	Isochoric process	II.	Carried out at constant temperature
C.	Isobaric process	III.	Carried out at constant volume
D.	Adiabatic process	IV.	Carried out at constant pressure

Choose the correct answer from the options given below: **(2024)**

(a) A-IV, B-II, C-III, D-I
(b) A-I, B-II, C-III, D-IV
(c) A-II B-III, C-IV, D-I
(d) A-IV, B-III, C-II, D-I

3. The work done during reversible isothermal expansion of one mole of hydrogen gas at 25°C from pressure of 20 atmosphere to 10 atmosphere is:

(Given $R = 2.0 \text{ cal K}^{-1} \text{ mol}^{-1}$) **(2024)**

(a) -413.14 calories
(b) 413.14 calories
(c) 100 calories
(d) 0 calories

4. Consider the following reaction:
 $2\text{H}_2(g) + \text{O}_2(g) \rightarrow 2\text{H}_2\text{O}(g) \Delta_r H^\circ = -483.64 \text{ kJ}$

What is the enthalpy change for decomposition of one mole of water? (Choose the right option). **(2023)**

(a) 120.9 kJ (b) 241.82 kJ
(c) 18 kJ (d) 100 kJ

5. The equilibrium concentrations of the species in the reaction $\text{A} + \text{B} \rightleftharpoons \text{C} + \text{D}$ are 2, 3, 10 and 6 mol L⁻¹, respectively at 300 K. ΔG° for the reaction is: ($R = 2 \text{ cal/mol K}$) **(2023)**

(a) -137.26 cal (b) -1381.80 cal
(c) -13.73 cal (d) 1372.60 cal

6. Which amongst the following options is the correct relation between change in enthalpy and change in internal energy? **(2023)**

(a) $\Delta H = \Delta U + \Delta n_g RT$
(b) $\Delta H - \Delta U = -\Delta n_g RT$
(c) $\Delta H + \Delta U = \Delta n_g R$
(d) $\Delta H = \Delta U - \Delta n_g RT$

7. One mole of an ideal gas at 300 K is expanded isothermally from 1 L to 10 L volume. ΔU for this process is: **(2022)**
(Use $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

(a) 0 J (b) 1260 J
(c) 2520 J (d) 5040 J

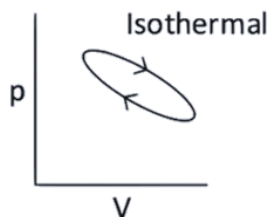
8. A vessel contains 3.2 g of dioxygen gas at STP (273.15 K and 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes one third of the original pressure. The volume of new vessel in L is: **(2022)**

(Given: molar volume at STP is 22.4 L)

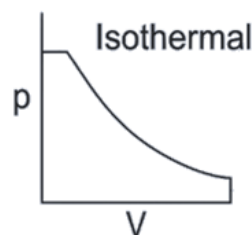
(a) 67.2 (b) 6.72
(c) 2.24 (d) 22.4

9. Which of the following p-V curve represents maximum work done? (2022)

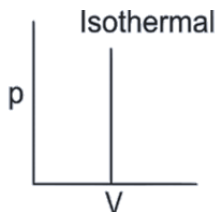
(a)



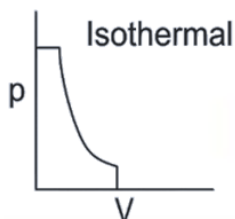
(b)



(c)



(d)



10. Which one among the following is the correct option for right relationship between C_P and C_V for one mole of ideal gas? (2021)

- (a) $C_P - C_V = R$
 (b) $C_P = RC_V$
 (c) $C_V = RC_P$
 (d) $C_P + C_V = R$

11. For irreversible expansion of an ideal gas under isothermal condition, the correct option is: (2021)

- (a) $\Delta U \neq 0, \Delta S_{total} \neq 0$
 (b) $\Delta U = 0, \Delta S_{total} \neq 0$
 (c) $\Delta U \neq 0, \Delta S_{total} = 0$
 (d) $\Delta U = 0, \Delta S_{total} = 0$

12. For the reaction, $2Cl(g) \rightarrow Cl_2(g)$, the correct option is: (2020)

- (a) $\Delta_r H > 0$ and $\Delta_r S < 0$
 (b) $\Delta_r H < 0$ and $\Delta_r S < 0$
 (c) $\Delta_r H < 0$ and $\Delta_r S > 0$
 (d) $\Delta_r H > 0$ and $\Delta_r S > 0$

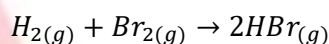
13. The correct option for free expansion of an ideal gas under adiabatic condition is: (2020)

- (a) $q = 0, \Delta T < 0$ and $w > 0$
 (b) $q < 0, \Delta T = 0$ and $w = 0$
 (c) $q > 0, \Delta T > 0$ and $w > 0$
 (d) $q = 0, \Delta T = 0$ and $w = 0$

14. If for a certain reaction $\Delta_r H$ is 30 kJ mol^{-1} at 450 K , the value of $\Delta_r S$ (in $\text{JK}^{-1} \text{ mol}^{-1}$) for which the same reaction will be spontaneous at the same temperature is (2020 Covid Re-NEET)

- (a) -33 (b) 33
 (c) -70 (d) 70

15. At standard conditions, if the change in the enthalpy for the following reaction is -109 kJ mol^{-1}



Given that bond energy of H_2 and Br_2 is 435 kJ mol^{-1} and 192 kJ mol^{-1} , respectively, what is the bond energy (in kJ mol^{-1}) of HBr ? (2020 Covid Re-NEET)

- (a) 736 (b) 518
 (c) 259 (d) 368

16. Under isothermal condition, a gas at 300 K expands from 0.1 L to 0.25 L against a constant external pressure of 2 bar . The work done by the gas is (Give that $1 \text{ L bar} = 100 \text{ J}$) (2019)

- (a) -30 J (b) 5 kJ
 (c) 25 J (d) 30 J

17. In which case change in entropy is negative? (2019)

- (a) Evaporation of water
 (b) Expansion of a gas at constant temperature
 (c) Sublimation of solid to gas
 (d) $2H(g) \rightarrow H_2(g)$

18. The bond dissociation energies of X_2 , Y_2 and XY are in the ratio of $1 : 0.5 : 1$. ΔH for the formation of XY is -200 kJ mol^{-1} . The bond dissociation energy of X_2 will be (2018)

- (a) 200 kJ mol^{-1}
 (b) 100 kJ mol^{-1}
 (c) 400 kJ mol^{-1}
 (d) 800 kJ mol^{-1}

- 19.** A gas is allowed to expand in a well insulated container against a constant external pressure of 2.5 atm from an initial volume of 2.50 L to a final volume of 4.50 L. The change in internal energy ΔU of the gas in joules will be:
(2017-Delhi)
(a) +505 J (b) 1136.25 J
(c) -500 J (d) -505 J
- 20.** For a given reaction, $\Delta H = 35.5 \text{ kJ mol}^{-1}$ and $\Delta S = 83.6 \text{ JK}^{-1}\text{mol}^{-1}$. The reaction is spontaneous at: (Assume that ΔH and ΔS do not vary with temperature)
(2017-Delhi)
(a) $T > 298 \text{ K}$
(b) $T < 425 \text{ K}$
(c) $T > 425 \text{ K}$
(d) All temperatures
- 21.** Of the following, the largest value of entropy at 25°C and 1 atm is that of :
(2017-Gujarat)
(a) CH_4 (b) H_2
(c) C_2H_6 (d) C_2H_2
- 22.** Under isothermal and reversible conditions, the term "free energy" in thermodynamics signifies :
(2017-Gujarat)
(a) Expansion work done on the system
(b) Non-expansion work done by the system
(c) Expansion work done by the system
(d) Non expansion work done on the system
- 23.** For a sample of perfect gas when its pressure is changed isothermally from P_i to P_f , the entropy change is given by:
(2016-II)
(a) $\Delta S = nRT \ln \left(\frac{P_f}{P_i} \right)$ (b) $\Delta S = nRT \ln \left(\frac{P_i}{P_f} \right)$
(c) $\Delta S = nR \ln \left(\frac{P_f}{P_i} \right)$ (d) $\Delta S = nR \ln \left(\frac{P_i}{P_f} \right)$
- 24.** The correct thermodynamic conditions for the spontaneous reaction at all temperatures is:
(2016-II)
(a) $\Delta H < 0$ and $\Delta S < 0$
(b) $\Delta H < 0$ and $\Delta S = 0$
(c) $\Delta H > 0$ and $\Delta S < 0$
(d) $\Delta H < 0$ and $\Delta S > 0$
- 25.** Consider the following liquid-vapour equilibrium.
 $\text{Liquid} \rightleftharpoons \text{Vapour}$. Which of the following relations is correct?
(2016-I)
(a) $\frac{d \ln P}{dT^2} = \frac{-\Delta H_v}{T^2}$ (b) $\frac{d \ln P}{dT} = \frac{-\Delta H_v}{RT^2}$
(c) $\frac{d \ln G}{dT^2} = \frac{\Delta H_v}{RT^2}$ (d) $\frac{d \ln P}{dT} = \frac{-\Delta H_v}{RT}$
- 26.** The heat of combustion of carbon to CO_2 is -393.5 kJ/mol . The heat released upon formation of 35.2 g of CO_2 from carbon and oxygen gas is:
(2015)
(a) +315 kJ (b) -630 kJ
(c) -3.15 kJ (d) -315 kJ
- 27.** For the reaction, $X_2O_4(l) \rightarrow 2XO_2(g)$, $\Delta U = 2.1 \text{ kcal}$, $\Delta S = 20 \text{ cal K}^{-1}$ at 300 K. Hence, ΔG is :
(2014)
(a) -2.7 kcal (b) 9.3 kcal
(c) -9.3 kcal (d) 2.7 kcal