UNIT = 16 FIRST LAW OF THERMODYNAMICS

MULTIPLE CHOICE QUESTIONS (BOOK XII)

1 What type of process occurs when a system exchanges both heat and work with its surroundings, and there is no change in internal energy?
(a) Isothermal process (b) Adiabatic process
(c) Isobaric process (d) Isochoric process

2. During an isobaric process, what remains constant?
(a) Temperature **(b) Pressure**
(c) Volume (d) Internal energy

3. In which thermodynamic process does a system exchange heat with its surroundings but does not change temperature?
(a) Isothermal process (b) Adiabatic process
(c) Isobaric process (d) Isochoric process

4. What is the characteristic of an adiabatic process?
(a) Constant pressure **(b) No heat exchange with the surroundings**
(c) Constant temperature (d) Constant volume

5. In an isochoric process, what is the primary feature?
(a) Constant temperature (b) No work done
(c) Constant volume (d) No heat exchange

6. What is internal energy in a thermodynamic system?
(a) The energy associated with motion
(b) The energy associated with the system's position
(c) The sum of kinetic and potential energy
(d) The total energy contained within the system

7. How is the change in internal energy (ΔU) defined in terms of heat(ΔQ and work (Δ W)
(a) $\Delta U = \Delta Q + \Delta W$ **(b) $\Delta U = \Delta Q - \Delta W$**
(c) $\Delta U = \Delta Q$ (d) $\Delta U = \Delta Q / \Delta W$

8. What is the internal energy of an ideal gas related to?
(a) Temperature only (b) Pressure only
(c) Volume only (d) Temperature, pressure, and volume

9. During an adiabatic expansion process, what happens to the internal energy of the system?
(a) Increases **(b) Decreases**
(c) Remains constant (d) Depends on the specific heat

10. What is the equation for the internal energy change of a system in an isochoric process?
(a) $\Delta U = \Delta Q + \Delta W$ (b) $\Delta U = \Delta Q - \Delta W$
(c) $\Delta U = \Delta Q$ (d) $\Delta U = \Delta Q / \Delta W$

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EXAMS PRACTICE MULTIPLE CHOICE QUESTIONS

1 First law of thermodynamics is based on?
(a) Conservation of energy (b) Conservation of mass
(c) Conservation of momentum (d) Conservation of work

2 Consider a gas contained in a rigid container of volume $20m^3$. What will be the change in internal energy if 50J of heat is provided to it? Assume the gas exerts a pressure of 1atm on the walls.
(a) 50J (b) 0
(c) 70J (d) 20J

3 Enthalpy is directly proportional to...
(a) Internal energy (b) Entropy
(c) Pressure (d) Volume

4 The internal energy of a system increases when:
(a) Work is done on the system
(b) Work is done by the system
(c) Heat is removed from the system
(d) The system expands without heat exchange

5 Which of the following processes involves no change in internal energy?
(a) Isothermal (c) Adiabatic
(c) Isobaric (d) Isochoric

6 If a gas absorbs 900 J of heat and does 500 J of work, what is the change in internal energy?
(a) 300 J (b) 700 J
(c) 400 J (d) 1400 J

7 During an isochoric process, the work done by the gas is:
(a) Positive (b) Negative
(c) Zero (d) Equal to the heat absorbed

8 Which of the following is an example of the First Law of Thermodynamics?
(a) Heat engines (b) Refrigerators
(c) Heat pumps **(d) All of the above**

9 Boyle's Law holds good for an ideal gas in a process called:
(a) Isobaric (b) Isochoric
(c) Isothermal (d) Adiabatic

10 If no heat flows into or out of a system, the process is called:
(a) Isobaric (b) Isothermal
(c) Isochoric **(d) Adiabatic**

11 During the adiabatic change, the pressure and the volume formula of a gas is given by:
(a) PV = constant **(b) $PV^{\gamma} = constant$**
(c) $VP^{\gamma} = constant$ (d) $(PV)^{\gamma} = constant$

12 Which one of the correct relation?

(a) $C_P + C_V = 0$ (b) $C_P = 1 + \frac{R}{C_V}$

(c) $1 = \frac{C_p}{C_V}$ **(d) $C_P = R + C_V$**

13 For a mono-atomic ideal gas C_v is

(a) 1.5 R (b) 2.5 R

(c) 3.5 R (d) 4.5 R

14 For a diatomic ideal gas C_v is

(a) 1.5 R **(b) 2.5 R**

(c) 3.5 R (d) 4.5 R

15 For a poly-atomic ideal gas C_v is

(a) 1 R (b) 2 R

(c) 3 R (d) 4 R

16 In a laboratory, a Bunsen burner is used to increase the temperature of lime from 10 °C to 50 °C with a thermal energy of 80000 J. If the mass of the lime is 20 kg the specific heat capacity of the lime would be

(a) 25 J/ kg °C (b) 50 J/ kg °C

(c) 75 J/ kg °C **(d) 100 J /kg °C**

17 The amount of energy required to change the liquid to gas and vice versa without any change in temperature is termed as

(a) Latent Heat of Fusion **(b) Latent Heat of Vaporization**

(c) Heat Capacity (c) Specific Heat Capacity

18 In an experiment, some amount of water requires 12600 J of thermal energy to raise it from 30 °C to 60 °C, the heat capacity of water is

(a) 300 J K (b) 420 J K

(c) 420 J K^{-1} (d) 300 J K^{-1}

19 The heat capacity of a chemical is 750 J $°C^{-1}$ and the mass is 15 kg. The heat capacity of the chemical would be

(a) 25 J kg^{-1} $°C^{-1}$ **(b) 50 J kg^{-1} $°C^{-1}$**

(c) 75 J kg^{-1} $°C^{-1}$ (d) 100 J kg^{-1} $°C^{-1}$

20 An iron ball with a mass of 20 kg is raised from a temperature of 20 °C to 80 °C if the thermal energy used by the iron ball is 598800 J the specific heat capacity of the iron ball would be

(a) 499 J kg^{-1} $°C^{-1}$ (b) 1000 J kg^{-1} $°C^{-1}$

(c) 1500 J kg^{-1} $°C^{-1}$ (d) 2000 J kg^{-1} $°C^{-1}$

21 If a cup of tea at 50 °C is allowed to cool to room temperature, the heat released would be (assume room temperature to be equal to 25 °C and heat capacity of the cup and tea to be = 5.0 kJ/K)

(a) 25 KJ (b) 50 KJ

(c) 125 KJ (d) 250 KJ

22 In a certain process, 400 J of heat is supplied to a system, and at the same time 150 J of work is done by the system. What is the increase in the internal energy of the system?

(a) 25 J **(b) 50 J**

(c) 125 J (d) 250 J