13 3 Thermodynamics Answer Key

19 A system has internal energy equal to E_1, 450 J of heat is taken out of it and 600 J of work is done on it. The final energy of the system will be -
(1) (E_1 + 150) (2) (E_1 + 1050)
(3) (E_1 − 150) (4) None of these

20. The work done by a system is 8J when 40J heat is supplied to it. The change in internal energy of the system during the process :
(1) 32 J (2) 40 J
(3) 48 J (4) −32 J

21. If a gas absorbs 100 J of heat and expands by 500cm^3 against a constant pressure of 2×10^5 Nm^{-2}, the change in internal energy is:-
(1) - 300 J (2) - 100 J
(3) + 100 J (4) None of these

ENTHALPY [$\Delta H = \Delta E + P\Delta V / \Delta H = \Delta E + \Delta n_g RT$]

22. Internal energy change during a reversible isothermal expansion of an ideal gas is :-
(1) Always negative
(2) Always positive
(3) Zero
(4) May be positive or negative

23. Under which of the following conditions is the relation, $\Delta H = \Delta E + P\Delta V$ valid for a system :-
(1) Constant pressure
(2) Constant temperature
(3) Constant temperature and pressure
(4) Constant temperature, pressure and composition

24. The difference between heats of reaction at constant pressure and constant volume for the reaction $2C_6H_6(l) + 15O_2(g) \longrightarrow 12CO_2(g) + 6H_2O(l)$ at 25°C in KJ is
(1) + 7.43 (2) +3.72
(3) − 7.43 (4) − 3.72

25. For a gaseous reaction,
$A(g) + 3B(g) \longrightarrow 3C(g) + 3D(g)$
ΔE is 17 kCal at 27°C assuming R = 2 Cal K^{-1} mol^{-1}, the value of ΔH for the above reaction is:
(1) 15.8 Kcal (2) 18.2 Kcal
(3) 20.0 Kcal (4) 16.4 Kcal

26. Which of the following statements is correct for the reaction ;$CO(g) + \frac{1}{2} O_2(g) \longrightarrow CO_2(g)$ at constant temperature and pressure
(1) $\Delta H = \Delta E$ (2) $\Delta H < \Delta E$
(3) $\Delta H > \Delta E$ (4) None of the above

27. For the reaction $Ag_2O(s) \longrightarrow 2Ag(s) + \frac{1}{2}O_2(g)$, which one of the following is true :
(1) $\Delta H = \Delta E$ (2) $\Delta H = \frac{1}{2}\Delta E$
(3) $\Delta H < \Delta E$ (4) $\Delta H > \Delta E$

28. A mixture of 2 moles of carbon monoxide and one mole of oxygen in a closed vessel is ignited to get carbon dioxide. If ΔH is the enthalpy change and ΔE is the change in internal energy, then :-
(1) $\Delta H > \Delta E$ (2) $\Delta H < \Delta E$
(3) $\Delta H = \Delta E$ (4) Not definite

29. For the gaseous reaction involving the complete combustion of isobutane -
(1) $\Delta H = \Delta E$ (2) $\Delta H > \Delta E$
(3) $\Delta H = \Delta E = 0$ (4) $\Delta H < \Delta E$

30. For the reversible isothermal expansion of one mole of an ideal gas at 300 K, from a volume of 10 dm^3 to 20 dm^3, ΔH is -
(1) 1.73 kJ (2) −1.73 kJ
(3) 3.46 kJ (4) Zero

31. For $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ at 977°C, ΔH = 174 KJ/mol ; then ΔE is :-
(1) 160 kJ (2) 163.6 kJ
(3) 186.4 kJ (4) 180 kJ

32. Heat of reaction for , $CO(g) + \frac{1}{2}O_2(g) \rightarrow CO_2(g)$ at constant V is −67.71 K cal at 17°C. The heat of reaction at constant P at 17°C is :-
(1) −68.0 kCal (2) + 68.0 kCal
(3) − 67.42 kCal (4) None

33. The reaction :-

$$NH_2CN_{(s)} + \frac{3}{2}O_{2(g)} \rightarrow N_{2(g)} + CO_{2(g)} + H_2O_{(l)}$$

was carried out in a bomb calorimeter. The heat released was 743 kJ mol^{-1}. The value of ΔH_{300K} for this reaction would be :-
(1) − 740.5 kJ mol^{-1} (2) − 741.75 kJ mol^{-1}
(3) − 743.0 kJ mol^{-1} (4) − 744.25 kJ mol^{-1}

34. The enthalpy of vaporisation of water at 100°C is 40.63 kJ mol^{-1}. The value ΔE for this process would be:-
(1) 37.53 kJ mol^{-1} (2) 39.08 kJ mol^{-1}
(3) 42.19 kJ mol^{-1} (4) 43.73 kJ mol^{-1}

35. For the system $S(s) + O_2(g) \rightarrow SO_2(g)$:-
(1) $\Delta H = \Delta E$ (2) $\Delta H > \Delta E$
(3) $\Delta E > \Delta H$ (4) $\Delta H = 0$

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13 3 thermodynamics answer key is a critical resource for students and professionals alike who are delving into the vast and complex field of thermodynamics. This branch of physics deals with the relationship between heat, work, temperature, and energy. Understanding the principles of thermodynamics is essential for various applications in engineering, chemistry, and even biology. In this article, we will explore the fundamental concepts of thermodynamics, key principles, and provide a guide to the topics typically covered under this subject, along with insights into the answer key details that aid in mastering these concepts.

Understanding Thermodynamics

Thermodynamics is grounded in four fundamental laws that govern the behavior of energy in physical systems. These laws help explain how energy is transferred and transformed in various processes.

The Four Laws of Thermodynamics

1. Zeroth Law of Thermodynamics:
- Establishes the concept of temperature and thermal equilibrium. If two systems are each in thermal equilibrium with a third system, then they are in thermal equilibrium with each other.

2. First Law of Thermodynamics:
- This law is a statement of the conservation of energy, which states that energy cannot be created or destroyed, only transformed from one form to another. Mathematically, it is expressed as:

$$
\Delta U = Q - W
$$

where ΔU is the change in internal energy, Q is the heat added to the system, and W is the work done by the system.

3. Second Law of Thermodynamics:
- Introduces the concept of entropy, indicating that in any energy transfer or transformation, the total entropy of a closed system can never decrease. It also explains why some processes are irreversible.

4. Third Law of Thermodynamics:
- States that as the temperature approaches absolute zero, the entropy of a perfect crystal approaches a constant minimum.

Key Concepts in Thermodynamics

To grasp thermodynamics effectively, students must familiarize themselves with several key concepts:

1. Internal Energy

- Internal energy refers to the total energy within a system, encompassing kinetic and potential energies at the molecular level. It is influenced by temperature, volume, and the number of particles in the system.

2. Enthalpy

- Enthalpy is a thermodynamic quantity defined as the total heat content of a system. It is particularly useful in processes occurring at constant pressure and is given by:

$$
H = U + PV
$$

where H is enthalpy, U is internal energy, P is pressure, and V is volume.

3. Entropy

- Entropy is a measure of disorder or randomness in a system. It quantifies how much energy in a system is unavailable to do work. The greater the disorder, the higher the entropy.

4. Heat Transfer

- Heat transfer can occur through conduction, convection, and radiation. Understanding these mechanisms is essential for analyzing thermodynamic processes.

5. Thermodynamic Cycles

- A thermodynamic cycle consists of a series of processes that return a system to its initial state. Examples include the Carnot cycle and the Otto cycle, which are fundamental to understanding engines and refrigerators.

Applications of Thermodynamics

Thermodynamics has a wide range of applications across various fields:

- Engineering:
- Design of engines, refrigerators, and heat pumps.

- Chemistry:
- Understanding reaction spontaneity and equilibrium.

- Biology:
- Metabolic processes and energy transfer in living organisms.

- Meteorology:
- Weather prediction and the study of atmospheric phenomena.

13 3 Thermodynamics Answer Key Breakdown

When it comes to the 13 3 thermodynamics answer key, it typically refers to solutions to specific problems or exercises found in a textbook or educational resource. Here we will outline how to effectively use this answer key and the common types of problems it may cover.

Identifying Problem Types

1. Calculating Work Done:
- Problems may require calculating work done during expansion or compression of gases. Students need to apply the first law of thermodynamics.

2. Heat Exchange Calculations:
- Involves determining the heat absorbed or released in a chemical reaction or physical change, often using calorimetry.

3. Entropy Changes:
- Calculating the change in entropy for different processes, including isothermal and adiabatic processes.

4. Thermodynamic Cycles:
- Problems involving the analysis of cycles, such as calculating efficiency, work output, or changes in enthalpy.

5. Phase Changes:
- Understanding and calculating heat transfer during phase changes (e.g., melting, boiling).

Using the Answer Key Effectively

To maximize the benefits of the 13 3 thermodynamics answer key, consider the following tips:

- Self-Assessment:
- Attempt problems without looking at the answer key first. This practice will help identify areas where you need more understanding.

- Study Explanations:
- Don't just look at the answers; study the explanations provided for each solution. This will deepen your understanding of the concepts.

- Practice Similar Problems:
- Once you understand the solutions, practice similar problems to reinforce your knowledge.

- Group Study:
- Discuss problems and solutions with peers. Teaching others can enhance your own understanding.

Conclusion

The study of thermodynamics is foundational for anyone pursuing a career in the sciences or engineering. The 13 3 thermodynamics answer key serves as an invaluable tool for students, providing clarity and guidance on complex concepts and problem-solving techniques. By understanding the laws of thermodynamics, key principles, and applying the solutions in the answer key, learners can master the intricacies of energy transfer, heat, and work. Whether you are preparing for exams or looking to apply thermodynamic principles in real-world scenarios, a thorough grasp of these concepts is essential for success.

Frequently Asked Questions

What is the main focus of Chapter 13 in thermodynamics?

Chapter 13 typically focuses on the laws of thermodynamics, including concepts such as entropy, enthalpy, and the behavior of gases.

Where can I find the answer key for Chapter 13 in thermodynamics?

The answer key for Chapter 13 can usually be found in the textbook's companion website, instructor resources, or study guides provided by the publisher.

What are some common topics covered in the Chapter 13 thermodynamics answer key?

Common topics include calculations related to heat transfer, work done by systems, and the applications of the first and second laws of thermodynamics.

How can I effectively use the answer key for Chapter 13 thermodynamics?

You can use the answer key to check your work after completing practice problems, ensuring you understand the methods used to arrive at the solutions.

Are there any online resources for Chapter 13 thermodynamics problems?

Yes, many educational platforms offer online resources, including video tutorials, practice problems, and interactive simulations related to thermodynamics.

What are some tips for solving thermodynamics problems in Chapter 13?

Start by carefully reading the problem statement, identifying known and unknown variables, and applying the appropriate thermodynamic equations and principles.

What is the significance of entropy in thermodynamics as discussed in Chapter 13?

Entropy is a measure of the disorder of a system and is crucial in understanding the direction of spontaneous processes and the efficiency of energy conversions.

Can I find practice problems similar to those in Chapter 13 thermodynamics?

Yes, many textbooks and online resources provide additional practice problems that mimic those found in Chapter 13, often with varying difficulty levels.

How do I approach conceptual questions in thermodynamics from Chapter 13?

For conceptual questions, focus on understanding the underlying principles and theories in thermodynamics, and relate them to real-world examples for clarity.

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