

Thermodynamics

Question 1.

A vessel contains a mixture of one mole of oxygen and two moles of nitrogen at 300 K. The ratio of the average rotational kinetic energy per O_2 to per N_2 molecule is

- (a) 1 : 1
- (b) 1 : 2
- (c) 2 : 1
- (d) depends on the moment of inertia of the two molecules

▼ [Answer](#)

Answer: (a) 1 : 1

Question 2.

For a diatomic gas change in internal energy for a unit change in temperature for constant pressure and constant volume is U_1 and U_2 respectively. What is the ratio of U_1 and U_2 ?

- (a) 5 : 3
- (b) 3 : 5
- (c) 1 : 1
- (d) 5 : 7

▼ [Answer](#)

Answer: (c) 1 : 1

Question 3.

An ideal gas heat engine operates in Carnot cycle between 227°C and 127°C . It absorbs 6×10^4 cal of heat at higher temperature. Amount of heat converted to work is:

- (a) 2.4×10^4 cal
- (b) 6×10^4 cal
- (c) 1.2×10^4 cal
- (d) 4.8×10^4 cal

▼ [Answer](#)

Answer: (c) 1.2×10^4 cal

Question 4.

Which of the following parameters do not characterize the thermodynamic state of matter?

- (a) work
- (b) volume
- (c) pressure
- (d) temperature

▼ [Answer](#)

Answer: (a) work

Question 5.

A Carnot engine whose sink is at 300 K has an efficiency of 40%. By how much should the temperature of source be increased, so as to increase its efficiency by 50% of original efficiency?

- (a) 275 K
- (b) 325 K

- (c) 250 K
- (d) 380 K

▼ [Answer](#)

Answer: (c) 250 K

Question 6.

The translational kinetic energy of gas molecules at temperature T for one mole of a gas is

- (a) $(3/2) RT$
- (b) $(9/2) RT$
- (c) $(1/3) RT$
- (d) $(5/2) RT$

▼ [Answer](#)

Answer: (a) $(3/2) RT$

Question 7.

The temperature of reservoir of Carnots engine operating with an efficiency of 70% is 1000 kelvin. The temperature of its sink is

- (a) 300 K
- (b) 400 K
- (c) 500 K
- (d) 700 K

▼ [Answer](#)

Answer: (a) 300 K

Question 8.

A gas is taken through a number of thermodynamic states. What happens to its specific heat?

- (a) It is always constant.
- (b) It increases.
- (c) It decreases.
- (d) It can have any value depending upon the process of heat absorbed or evolved.

▼ [Answer](#)

Answer: (d) It can have any value depending upon the process of heat absorbed or evolved.

Question 9.

Directions: The following question has four choices out of which ONLY ONE is correct. A refrigerator with its power on, is kept in a closed room with its door open, then the temperature of the room will _____.

- (a) rise
- (b) fall
- (c) remain the same
- (d) depend on the area of the room

▼ [Answer](#)

Answer: (a) rise

Question 10.

Directions: The following question has four choices out of which ONLY ONE is correct. Which of the following is incorrect regarding the first law of thermodynamics? A. It is not applicable to any cyclic

process B. It is a restatement of the principle of conservation of energy C. It introduces the concept of the internal energy D. It introduces the concept of the entropy

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

▼ [Answer](#)

Answer: (a) A and D

Question 11.

For a diatomic gas change in internal energy for a unit change in temperature for constant pressure and constant volume is U_1 and U_2 respectively. What is the ratio of U_1 and U_2 ?

- (a) 5 : 3
- (b) 3 : 5
- (c) 1 : 1
- (d) 5 : 7

▼ [Answer](#)

Answer: (c) 1 : 1

Question 12.

An engine has an efficiency of $\frac{1}{6}$. When the temperature of sink is reduced by 62°C , its efficiency is doubled. Temperature of the source is:

- (a) 124°C
- (b) 37°C
- (c) 62°C
- (d) 99°C

▼ [Answer](#)

Answer: (d) 99°C

Question 13.

Directions: The following question has four choices out of which ONLY ONE is correct. A Carnots engine works as a refrigerator between 250 K and 300 K. If it receives 750 calories of heat from the reservoir at the lower temperature, the amount of heat rejected at the higher temperature is

- (a) 900 cal
- (b) 625 cal
- (c) 750 cal
- (d) 1000 cal

▼ [Answer](#)

Answer: (a) 900 cal

Question 14.

An ideal gas heat engine operates in a Carnot cycle between 227°C and 127°C . It absorbs 6 kcal at the higher temperature. The amount of heat (in kcal) converted into work is equal to:

- (a) 1.6
- (b) 1.2
- (c) 4.8
- (d) 3.5

▼ Answer

Answer: (b) 1.2

Question 15.

A vessel contains a mixture of one mole of oxygen and two moles of nitrogen at 300 K. The ratio of the average rotational kinetic energy per O_2 to per N_2 molecule is

- (a) 1 : 1
- (b) 1 : 2
- (c) 2 : 1
- (d) depends on the moment of inertia of the two molecules

▼ Answer

Answer: (a) 1 : 1

Question 16.

Which of the following statements is correct for any thermodynamic system?

- (a) The internal energy changes in all processes.
- (b) Internal energy and entropy are state functions.
- (c) The change in entropy can never be zero.
- (d) The work done in an adiabatic process is always zero.

▼ Answer

Answer: (b) Internal energy and entropy are state functions.

Question 17.

The temperature of reservoir of Carnots engine operating with an efficiency of 70% is 1000 kelvin. The temperature of its sink is

- (a) 300 K
- (b) 400 K
- (c) 500 K
- (d) 700 K

▼ Answer

Answer: (a) 300 K

Question 18.

Directions: The following question has four choices out of which ONLY ONE is correct. Which of the following is incorrect regarding the first law of thermodynamics? A. It is not applicable to any cyclic process B. It is a restatement of the principle of conservation of energy C. It introduces the concept of the internal energy D. It introduces the concept of the entropy

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

▼ Answer

Answer: (a) A and D

Question 19.

A black body at a temperature of 227°C radiates heat at the rate of $20 \text{ cal m}^{-2}\text{s}^{-1}$. When its temperature rises to 727°C , the heat radiated will be

- (a) 40 units
- (b) 160 units
- (c) 320 units
- (d) 640 units

▼ [Answer](#)

Answer: (c) 320 units

Question 20.

At a given volume and temperature, the pressure of a gas

- (a) varies inversely as its mass
- (b) varies inversely as the square of its mass
- (c) varies linearly as its mass
- (d) is independent of its mass

▼ [Answer](#)

Answer: (c) varies linearly as its mass
