Physics Grade 12 Unit 1

Thermodynamics (33 Questions)

5. Temperature of a body is a measure of the

(A) heat content of a body.
(B) average molecular kinetic energy.
(C) average pressure in a gas.
(D) heat of vaporization of a liquid.

12. Which of the following statement is **NOT** true?

(A) If a heat Q is transferred from a hot reservoir at temperature T_h to a cold reservoir at temperature T_c, the entropy of the cold reservoir increases.
(B) The increase in entropy of the cold reservoir is greater than the decrease in entropy of the hot reservoir.
(C) The change in entropy of the system between any two equilibrium states does not depend only on the initial and final states.
(D) Metals are good heat conductors because of their large number of electrons.

34. A gas is compressed at a constant pressure of $8\times10^{+4}\ N/m^2$, from a volume of $9\times10^{-3}m^3$ to a volume of $3\times10^{-3}m^3$. In the process 400 J of heat energy flows out of the gas. What are the work done by the gas and the change in internal energy of the gas?

(A) -567 J, -167 J
(B) -560 J, -160 J
(C) -589 J, -189 J
(D) -540 J, -140 J

26. A sample of argon gas (molar mass 40 g) is at four times the absolute temperature of a sample of hydrogen gas (molar mass 2 g). The ratio of the rms speed of the argon molecules to that of the hydrogen is:

A) 1:5
B) $1:\sqrt{5}$
C) 5:1
D) $\sqrt{5}:1$

27. A Carnot heat engine operates between 127^0C and 227^0C. What is its efficiency?

A) 20%
B) 40%
C) 25%
D) 44%

28. The pressure of a gas, in a container with a piston of cross-sectional area 0.2 m^2, is maintained at 5000 Pa. If60 J of heat is slowly added and the piston is pushed out ward a distanceof4 cm, what is the change in internal energy of the system?

A) 40 J
B) 35 J
C) 20 J
D) 10 J

7. The temperature of a gas is due to

(A) the kinetic energy of the molecules.
(B) the potential energy of the molecules.
(C) the attractive force between the molecules.
(D) the repulsive forces between the molecules.

15. What does a curve drawn between two points on P-V diagram represent?

(A) The state of the system.
(B) A thermodynamic process.
(C) Work done in a cyclic process.
(D) Work done on or by the system.

39. Which statement is **NOT** among the assumptions made in the kinetic theory of gases?

(A) There is no interaction between particles or between particles and the wall except during collision.
(B) Collisions between particles, and between particles and walls are perfectly elastic.
(C) The volume occupied by the particle is negligible compared to the volume of the gas as a whole.
(D) The distribution of velocities of particles is uniform.

4. Suppose two molecules of different mass are kept at the same temperature. Which one the following statements is NOT true?

A. Both remain at rest. B. Both move with the same speed.
C. The lighter molecule moves faster. D. The heavier molecule moves faster.

11. In a reversible thermodynamic process, the system

A. is always close to equilibrium states
B. might never be close to any equilibrium states
C. is close to equilibrium states only at the beginning and end
D. is closeto equilibrium states throughout, except at the beginning and end

20. An ordinary refrigerator is turned on and its door is open in a thermally insulated kitchen. What is the temperature of the room?

A. increases according to the first law of thermodynamics
B. decreases according to the first law of thermodynamics
C. remains constant according to the first law of thermodynamics
D. remains constant according to the second law of thermodynamics

47. Gas at a pressure P is contained in a vessel. If the masses of all the molecules are doubled & their speeds are halfed, then what will be the resulting pressure?

A. 2P B. $\frac{P}{3}$ C. $\frac{P}{2}$ D. 3P

14. A cup of coffee at a temperature of 80°C is placed on table in a 20°C room. What happens to the thermal energy and molecular motion of the coffee when it is left on the table?
    A. The thermal energy decreases and the molecules move more slowly.
    B. The thermal energy increases and the molecules move more slowly.
    C. The thermal energy decreases and the molecules move faster.
    D. The thermal energy increases and the molecules move faster.

31. Which of the following combinations of properties would be most desirable for a heat sink in a machine?
    A. High specific heat and low conductivity.
    B. Low specific heat and low conductivity.
    C. High specific heat and high conductivity.
    D. Low specific heat and low conductivity.

33. The Change in Entropy is zero for:

A. reversible isobaric processes.
B. reversible adiabatic processes.
C. reversible isothermal processes.
D. reversible processes during which no work is done.

42. An ideal gas is at a temperature of 300k. If we wish to double the root mean square (rms) speed of the molecules of the gas, to what value must we raise its temperature?
    A. 450 B. 600k C. 800k D. 1200k

47. A heat engine is being designed to have a Carnot efficiency of 65.0% when operating between two energy reservoirs. If the temperature of the cold reservoir is 20.0°C, what must be the temperature of the hot reservoir?

A. 57^0C B. 310^0C C. 564^0C D. 807^0C

27. A given weight of gas has a temperature of 27°C and volume V. Keeping the pressure constant, the volume is increased to 3V by varying the temperature. What is fine temperature of the gas?

A. 81°C B. 546°C C. 627°C D. 900°C

28. The First Law of Thermodynamics takes the form dU=dW. This equation is valid if the process is _____.

A. Isobaric B. Isochoric C. Isothermal D. Adiabatic

29. An ideal gas undergoes an isothermal process starting with a pressure of $2x10^5$pa and a volume of $6cm^3$. Which one of the following might be the pressure and volume of the final state?

A. $4x10^5$pa and 4 cm^3
B. $4x10^5$pa and 3 cm^3
C. $5x10^5$pa and 3 cm^3
D. 10^5pa and 10 cm^3

30. Which one of the following is NOT correct?

A. The entropy of the universe increases in all natural processes.
B. No heat energy operating in a cycle can absorb energy from a reservoir and use it entirely to do work.
C. When a system undergoes a change in state, the change in its internal energy is the difference between the energy transferred to it by heat and the work done on it.
D. The entropy of an isolated system reaches its maximum value when the system is in equilibrium state.

21. A device for transforming heat energy to mechanical energy is referred to as:

(A) transformer.
(B) refrigerant
(C) generator
(D) engine.

22. The number of joules of heat energy required to raise the temperature of a body by 1 K is:
(A) Heat capacity.
(B) Specific heat capacity.
(C) Expansion coefficient.
(D) Calorific value.

30. Two bodies that are separately in thermal equilibrium with third body must be in thermal equilibrium with each other. This statement is statement of:
(A) the first law of thermodynamics.
(B) the zeroth law of thermodynamics.
(C) the second law of thermodynamics.
(D) the third law of thermodynamics.

22. If the internal energy of the system decreases, then what can be concluded about the heat and the work done?
(A) Heat is added to the system and work is done by the system.
(B) Heat is removed from the system and work is done by the system.
(C) Heat is removed from the system and work is done on the system.
(D) Heat is added to the system and work is done on the system.

23. If a thermodynamic system undergoes a process in which its internal energy increased by 400 J while doing 200 J of work on its surrounding, then what is the energy absorbed in or extracted from it in the form of heat?
(A) -600 J (B) -200 J (C) 600 J (D) 200 J

24. Which of the following statement is **NOT** correct?
(A) The spontaneous transfer of energy from a cooler body to hotter body is quite possible.
(B) A system can absorb heat from a hot reservoir and can convert it entirely into work without additional changes in the system and its surroundings.
(C) No process is possible in which there is an overall decrease in the entropy of the universe.
(D) The complete conversion of energy from hot source into work is not possible.

25. A heat engine operating between 100 °C and 700 °C has efficiency equal to 40% of the maximum theoretical efficiency. How much energy does this engine extract from the hot reservoir in order to do 5000 J of mechanical work?

(A) 810.4 J (C) 20.3 J

(B) 81.0 J (D) 20259.32 J

27. The direction of heat flow is from:

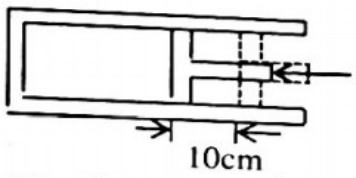
(A) high pressure to low pressure

(B) high temperature to low temperature

(C) high density to low density

(D)a point of higher emissivity to lower one

28. External force of 220N applied on a piston of a cylinder containing 1.25g of ammonia gas move 10cm as shown in the diagram below. Assuming adiabatic process, what is the rise in temperature of the gas? (Specific heat capacity of ammonia, c = 2200J/Kg °K)



(A) 4 °K (B) 8 °K (C) 0.004 °K (D) 0.008 °K

29. Which of the following statement is correct?
(Here ρ is the density of an ideal gas, m is the mass of the gas and c is speed of particles)

(A) P(pressure of an ideal gas) = $\frac{1}{2}\rho\langle c^2\rangle$

(B) For a mixture of two gases in equilibrium in a container, $\frac{\rho_2}{\rho_1} = \sqrt{\frac{\langle c_1^2\rangle}{\langle c_2^2\rangle}}$.

(C) For a mixture of two gases in equilibrium in a container, $\frac{p_2}{p_1} = \sqrt{\frac{\langle c_2^2\rangle}{\langle c_1^2\rangle}}$

(D) For a mixture of two different gases with equal partial pressure and equal number of molecules in a container, $\frac{m_2}{m_1} = \frac{\langle c_1^2\rangle}{\langle c_2^2\rangle}$.

30. Which of the following statement is NOT correct?

(A) No process is possible in which there is an overall decrease in the entropy of the universe.

(B) The spontaneous transfer of energy from cooler body to a hotter body is not possible.

(C) Spreading out of random kinetic energy through heating does not represent an overall increase in entropy.

(D) The complete conversion of energy from a hot source into work is not possible.