Class 11 Physics · Chapter 11: Thermodynamics

Worksheet · 20 marks · about 40 minutes · based on NCERT

Name _____ Class and section _____ Date _____

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1. A gas gives out 150 J of heat to its surroundings while its internal energy rises by 250 J. The work done on the gas by the piston is [1]

(a) 100 J
(b) −400 J
(c) 400 J
(d) −100 J

2. Which one of the following quantities, for a given mass of gas, depends only on the state of the gas and not on how the gas reached that state? [1]

(a) its internal energy
(b) the heat given to it
(c) the work done on it
(d) the heat it gives out in returning to its initial state

3. A gas is taken from state i to state f along path 1, absorbing 80 J of heat and doing 50 J of work. It is then brought back from f to i along a different path, on which 30 J of work is done on the gas. The heat absorbed by the gas on the return path is [1]

(a) −60 J
(b) 60 J
(c) 0 J
(d) −30 J

4. A quantity of heat raises the temperature of a 0.50 kg block of aluminium by 20 K. The same quantity of heat is given to a 0.50 kg block of copper. Using the specific heats 900 J kg^{-1} K^{-1} for aluminium and 386.4 J kg^{-1} K^{-1} for copper, the rise in temperature of the copper block is about [1]

(a) 8.6 K
(b) 46.6 K
(c) 20 K
(d) 23.3 K

5. Three bodies P, Q and R are tested in pairs. P is found to be in thermal equilibrium with R, and Q is also found to be in thermal equilibrium with R. P and Q are now placed in contact through a conducting wall. Then [1]

(a) heat flows from P to Q until their temperatures become equal
(b) heat flows from Q to P until their temperatures become equal
(c) no net heat flows between P and Q, since they are already in thermal equilibrium
(d) whether heat flows depends on the masses of P and Q

6. Why must a quasi-static process be, in principle, infinitely slow? Name one condition a real process must satisfy to approximate it. [2]

7. State the two main causes of irreversibility in natural processes, giving one example of each from everyday life. [2]

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8. The molar specific heat of an ideal gas at constant pressure is 29.1 J mol^{-1} K^{-1}. Find its molar specific heat at constant volume and the ratio γ. (R = 8.3 J mol^{-1} K^{-1}) [2]

9. State the Zeroth Law of thermodynamics. Explain how it leads to the idea of temperature, and how a thermometer makes use of it. [3]

10. State the Kelvin-Planck and the Clausius statements of the Second Law. A ship's engineer proposes to run the ship's engines by drawing heat from the sea water alone and converting it into work. Which statement forbids this, and why does the First Law not? [3]

11. A gas is taken round the cycle A → B → C → A. In A → B (constant volume) it absorbs 600 J of heat. In B → C (constant pressure) it absorbs 1000 J and does 400 J of work. In C → A it gives out 1350 J of heat. The change in internal energy in C → A is −1200 J. Find (a) the change in internal energy in A → B and in B → C, (b) the work done in C → A, and (c) the net work done by the gas in the cycle. [3]

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