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PHYSICS TEST - CHAPTER 8: HEAT AND THERMODYNAMICS

Name:		Roll No.		Section:

Total Time: 2:30 Hour
Time Allowed: 150 Minutes

Total Marks: 150

PAPER OBJECTIVE
SECTION-A (MARKS 150)

NOTE: Section-A is compulsory. All parts of this section are to be answered on these pages and handed over to the center superintendent. Deleting / overwriting is not allowed. Do not use lead pencil.

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

Questions	A	B	C	D	A B C D
1. Two bodies in thermal equilibrium have the same	volume	heat content	temperature	mass	○○●○
2. Zeroth law of thermodynamics is about	efficiency	thermal equilibrium	conservation of energy	entropy	○●○○
3. Internal energy of a system is the sum of molecular	nuclear energies only	kinetic energies only	rotational energies only	kinetic and potential energies	○○○●
4. Internal energy of an ideal gas is mainly	nuclear energy	chemical energy	potential energy	translational kinetic energy	○○○●
5. Internal energy of an ideal gas is directly proportional to its	pressure	absolute temperature	density	volume	○●○○
6. Internal energy is a	form of heat	form of work	function of path	function of state	○○○●
7. Change in internal energy depends only on	rate of heating	time taken	the path followed	initial and final states	○○○●
8. When temperature of a system rises, ΔU is	zero	negative	positive	infinite	○○●○
9. When temperature stays constant, ΔU for an ideal gas is	infinite	zero	positive	negative	○●○○
10. Internal energy of a real gas depends on temperature and	shape	volume	mass of container	colour	○●○○
11. Ideal gas equation is	PT = nRV	P = nRTV	PV = nRT	PV = RT/n	○○●○
12. Value of universal gas constant R is	9.8 m s^{-2}	1.38 × 10^{-23} J K^{-1}	8.314 J mol^{-1} K^{-1}	6.02 × 10^{23}	○○●○
13. Value of Boltzmann constant k is	6.02 × 10^{23} J K^{-1}	8.314 J K^{-1}	1.6 × 10^{-19} J K^{-1}	1.38 × 10^{-23} J K^{-1}	○○○●
14. Ideal gas equation in terms of molecules N is	P = NkV	PV = NkT	PV = kT/N	PV = N/kT	○●○○

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Questions	A	B	C	D	A B C D
15. Boltzmann constant equals	$R \times N_a$	N_a / R	R / n	R / N_a	○○○●
16. Average translational K.E. of a gas molecule is	(1/2) kT	kT^2	3kT	(3/2) kT	○○○●
17. Average K.E. of molecules doubles when absolute temperature	halves	quadruples	doubles	stays constant	○○●○
18. An ideal gas has molecules that collide	not at all	only with heat	inelastically	perfectly elastically	○○○●
19. An ideal gas has no	volume at all times	pressure	mass	intermolecular attractive forces	○○○●
20. A real gas behaves ideally at	low pressure and low temperature	high pressure and low temperature	high pressure and high temperature	low pressure and high temperature	○○○●
21. A real gas deviates most from ideal behaviour at	very large volume	low pressure	high pressure and low temperature	high temperature	○○●○
22. In kinetic theory, gas molecules are in	ordered motion	rest	random motion	circular motion only	○○●○
23. In kinetic theory, molecule size is	much smaller than their separation	equal to their separation	zero and infinite	larger than their separation	●○○○
24. Kinetic theory relates macroscopic properties to	colours	nothing	sizes of containers	microscopic properties	○○○●
25. Molecules exert force on each other only during	collisions	expansion	rest	cooling	●○○○
26. Work done by a gas at constant pressure is	PΔV	P/ΔV	P + ΔV	ΔV/P	●○○○
27. Work done by gas is positive when the gas	is cooled	expands	contracts	is at rest	○●○○
28. Work done on a gas is positive when the gas	is compressed	is at rest	expands	is heated at constant volume	●○○○
29. Work done by a gas equals the area under the	U–T graph	P–T graph	P–V graph	V–T graph	○○●○
30. Work done by a gas at constant volume is	infinite	zero	negative	positive	○●○○
31. A gas at 2×10^5 Pa expands from 1 m^3 to 3 m^3. Work done is	4×10^5 J	1×10^5 J	6×10^5 J	2×10^5 J	●○○○

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Questions	A	B	C	D	A B C D
32. A gas at 1×10^5 Pa is compressed from 4 m^3 to 1 m^3. Work done by the gas is	-3×10^5 J	3×10^5 J	-5×10^5 J	5×10^5 J	●○○○
33. Boyle's law states that at constant temperature	P/V = constant	P + V = constant	P/T = constant	PV = constant	○○○●
34. Boyle's law: a gas at 2 atm and 6 L is compressed to 3 L at constant T. New pressure is	12 atm	6 atm	4 atm	1 atm	○○●○
35. Charles's law states that at constant pressure	VT = constant	V/T = constant	P/T = constant	PV = constant	○●○○
36. Gay-Lussac's law states that at constant volume	P/T = constant	PV = constant	V/T = constant	PT = constant	●○○○
37. In gas laws, temperature must be in	any scale	kelvin	fahrenheit	celsius	○●○○
38. Absolute zero equals	0 °C	273 °C	−273 °C	−100 °C	○○●○
39. At constant pressure, a gas at 300 K is heated to 600 K. Its volume becomes	same	double	four times	half	○●○○
40. At constant volume, gas pressure at 300 K is 1 atm. At 600 K it is	4 atm	2 atm	1 atm	0.5 atm	○●○○
41. Charles's law graph of V against T (kelvin) is	a straight line through origin	a hyperbola	a circle	a parabola	●○○○
42. Boyle's law graph of P against V is	a circle	a straight line	a parabola	a hyperbola	○○○●
43. Temperature 27 °C in kelvin is	300 K	246 K	27 K	273 K	●○○○
44. Temperature 400 K in °C is	127 °C	400 °C	−127 °C	673 °C	●○○○
45. The first law of thermodynamics is based on conservation of	mass	charge	momentum	energy	○○○●
46. First law of thermodynamics is	Q = ΔU + W	ΔU = QW	Q = ΔU − W	W = ΔU + Q	●○○○
47. A system absorbs 500 J and does 200 J of work. ΔU is	700 J	100 J	300 J	−300 J	○○●○
48. A system absorbs 800 J and does 300 J work. ΔU is	1100 J	−500 J	500 J	240 J	○○●○

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Questions	A	B	C	D	A B C D
49. A gas gives out 100 J of heat and 50 J of work is done on it. ΔU is	150 J	−50 J	50 J	−150 J	○●○○
50. When heat is added to a system, internal energy	decreases	increases	becomes zero	stays same	○●○○
51. Pumping air into a tyre raises its internal energy by	magnetism	mechanical work	evaporation	cooling	○●○○
52. In an isothermal process, temperature is	constant	decreasing	zero	increasing	●○○○
53. In an isothermal process of an ideal gas, ΔU is	equal to Q + W	negative	zero	positive	○○●○
54. For an ideal gas, an isothermal process obeys	Charles's law	Avogadro's law	Boyle's law	Gay-Lussac's law	○○●○
55. In an isothermal expansion, heat absorbed equals	work done	zero	negative of work	change in internal energy	●○○○
56. Melting of ice at 0 °C is an	adiabatic process	isochoric process	isothermal process	isobaric process	○○●○
57. In an adiabatic process, heat exchanged is	infinite	zero	negative	positive	○●○○
58. In an adiabatic process, first law gives	ΔU = −W	ΔU = 0	ΔU = Q	Q = W	●○○○
59. When a gas expands adiabatically, its temperature	stays constant	increases	doubles	decreases	○○○●
60. When a gas is compressed adiabatically, its temperature	stays constant	increases	decreases	becomes zero	○●○○
61. An adiabatic process requires	constant volume	constant temperature	constant pressure	no heat transfer	○○○●
62. In an isochoric process,	temperature is constant	pressure is constant	volume is constant	heat is zero	○○●○
63. In an isochoric process, work done is	zero	PΔV	negative	positive	●○○○
64. In an isochoric process, heat added equals	change in internal energy	zero	work done	PΔV	●○○○
65. In an isobaric process,	temperature is constant	pressure is constant	heat is zero	volume is constant	○●○○

Questions	A	B	C	D	A B C D
66. In an isobaric process, work done equals	PΔV	Q	zero	ΔU	●○○○
67. A gas at 1 × 10⁵ Pa expands 2 m³ at constant pressure. Work is	4 × 10⁵ J	5 × 10⁴ J	2 × 10⁵ J	1 × 10⁵ J	○○●○
68. A heat engine converts	heat into work	electricity into heat	work into entropy	work into heat	●○○○
69. A heat engine needs a source and a	resistor	generator	sink	magnet	○○●○
70. Efficiency of a heat engine is	W × Qin	W / Qin	Qin / W	W / Qout	○●○○
71. Efficiency can also be written as	Qout/Qin	1 + Qout/Qin	Qin/Qout	1 − Qout/Qin	○○○●
72. An engine takes 1000 J and does 300 J work. Efficiency is	3%	33%	30%	70%	○○●○
73. An engine takes 2000 J and rejects 1500 J. Efficiency is	50%	33%	75%	25%	○○○●
74. An engine of 40% efficiency absorbs 5 kJ. Work done is	3 kJ	0.4 kJ	4 kJ	2 kJ	○○○●
75. An engine of 40% efficiency absorbs 5 kJ. Waste heat is	2 kJ	1 kJ	3 kJ	5 kJ	○○●○
76. No real heat engine can have efficiency of	30%	100%	40%	50%	○●○○
77. A reversible process can be undone	only by adding mass	never	only at 0 K	with no net change in surroundings	○○○●
78. Which is irreversible?	Ideal frictionless pendulum	Heat flow from hot to cold	Quasi-static isothermal change	Ideal Carnot cycle	○●○○
79. Friction makes a process	irreversible	isothermal	reversible	adiabatic	●○○○
80. Second law of thermodynamics states that heat cannot flow spontaneously from	hot body to cold body	air to water	cold body to hot body	body to its surroundings	○○●○
81. Kelvin-Planck statement says no engine can convert	heat into entropy	work into heat	any heat into work	all heat absorbed into work	○○○●
82. Clausius statement says heat does not flow by itself from	solid to liquid	hot to cold	gas to liquid	cold to hot	○○○●

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Questions	A	B	C	D	A B C D
83. A perfect engine with 100% efficiency would violate the	second law	first law	zeroth law	Boyle's law	●○○○
84. Carnot engine uses a	non-cyclic process	open cycle	reversible cycle	irreversible cycle	○○●○
85. Carnot cycle consists of	two isobaric and two isochoric	two isothermal and two adiabatic processes	four isothermal processes	four adiabatic processes	○●○○
86. The first step of Carnot cycle is	adiabatic expansion	adiabatic compression	isothermal compression	isothermal expansion	○○○●
87. Isothermal compression in Carnot cycle occurs at	the low temperature	zero kelvin	any temperature	the high temperature	●○○○
88. In a Carnot cycle, ΔU over one complete cycle is	equal to Q	zero	positive	negative	○●○○
89. Work in a Carnot cycle equals	$Q_1 + Q_2$	Q_1 / Q_2	$Q_1 - Q_2$	$Q_2 - Q_1$	○○●○
90. Efficiency of a Carnot engine is	T_2/T_1	$1 - T_2/T_1$	$1 - T_1/T_2$	T_1/T_2	○●○○
91. In the Carnot efficiency formula, T_1 is the temperature of the	hot reservoir	gas always	cold reservoir	atmosphere	●○○○
92. Carnot efficiency depends only on	temperatures of reservoirs	working substance	gas pressure	piston size	●○○○
93. Carnot engine works between 600 K and 300 K. Efficiency is	75%	100%	50%	25%	○○●○
94. Carnot engine works between 400 K and 300 K. Efficiency is	33%	75%	25%	40%	○○●○
95. An engine between 673 K and 303 K has efficiency about	45%	70%	55%	30%	○○●○
96. To raise efficiency of a Carnot engine, we should	increase hot reservoir temperature	raise cold reservoir temperature	lower hot reservoir temperature	increase piston size	●○○○
97. Carnot efficiency is 100% only if cold reservoir is at	room temperature	100 °C	absolute zero	0 °C	○○●○
98. Carnot's theorem says no engine between two temperatures is more efficient than a	diesel engine	petrol engine	steam engine	Carnot engine	○○○●
99. Real engines are less efficient than Carnot engines due to	high temperature	heat losses	low pressure	small size	○●○○

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Questions	A	B	C	D	A B C D
100. A refrigerator transfers heat from	air to vacuum	hot to cold body	solid to gas	cold to hot body	○○○●
101. A refrigerator requires	no energy	sunlight	cooling water only	work input	○○○●
102. Coefficient of performance of a refrigerator is	W / Q_2	Q_1 / Q_2	W / Q_1	Q_2 / W	○○○●
103. For a Carnot refrigerator, COP equals	T_2 / T_1	$T_2 / (T_1 - T_2)$	$(T_1 - T_2) / T_2$	T_1 / T_2	○●○○
104. Heat rejected to the room by a refrigerator Q_1 equals	$Q_2 + W$	$W - Q_2$	$Q_2 \times W$	$Q_2 - W$	●○○○
105. Refrigerator takes 300 J from inside using 100 J work. Heat to room is	100 J	400 J	300 J	200 J	○●○○
106. Refrigerator with Q_2 = 300 J and W = 100 J has COP	3	0.33	2	4	●○○○
107. A refrigerator with a larger COP is	always broken	a heat engine	less efficient	more efficient	○○○●
108. Entropy measures a system's	disorder or randomness	pressure only	temperature only	total mass	●○○○
109. Entropy was introduced by	Charles	Clausius	Carnot	Boyle	○●○○
110. Entropy is a	path variable	state variable	form of work	form of heat	○●○○
111. Entropy change when heat Q enters at temperature T is	$Q - T$	T / Q	Q / T	$Q\ T$	○○●○
112. SI unit of entropy is	$J\ K^{-1}$	W	K	J	●○○○
113. Entropy change is positive when heat is	removed from the system	not transferred	added to the system	converted to work	○○●○
114. Entropy change is negative when heat is	removed from the system	added to the system	doubled	zero	●○○○
115. Heat Q flows from T_1 to lower T_2. Net entropy change is	positive	negative	undefined	zero	●○○○
116. Melting of ice causes entropy to	become zero	stay same	decrease	increase	○○○●

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Questions	A	B	C	D	A B C D
117. Freezing of water causes entropy of the water to	stay same	decrease	increase	double	○●○○
118. In natural processes, entropy of the universe	decreases	oscillates between zero	stays zero	increases	○○○●
119. In a reversible process, entropy of the universe	decreases	increases	stays constant	doubles	○○●○
120. Entropy is a measure of the	degradation of energy	gain of mass	destruction of energy	creation of energy	●○○○
121. The ordered state has	no entropy	higher entropy	infinite entropy	lower entropy	○○○●
122. Gas expanding into a vacuum has entropy that	becomes zero	decreases	stays same	increases	○○○●
123. Solid → liquid → gas shows entropy	zero	constant	increasing	decreasing	○○●○
124. Heat 600 J enters at 300 K. Entropy change is	300 J K^{-1}	2 J K^{-1}	0.5 J K^{-1}	180 000 J K^{-1}	○●○○
125. Heat 400 J leaves a body at 200 K. Entropy change is	2 J K^{-1}	80 000 J K^{-1}	−0.5 J K^{-1}	−2 J K^{-1}	○○○●
126. Sweating cools the body because heat is carried away by	sound	evaporating sweat	magnetism	light	○●○○
127. A heat pump does the same job as a	refrigerator working in reverse	battery	steam turbine	transformer	●○○○
128. Pressure of a gas arises from	molecular colours	molecular collisions with walls	magnetism	gravity	○●○○
129. If volume of ideal gas halves at constant T, pressure	quadruples	doubles	halves	stays same	○●○○
130. Equal volumes of ideal gases at same T and P contain equal	numbers of molecules	masses	densities	speeds	●○○○
131. One mole of a substance contains	273 particles	6.02×10^{23} particles	1.38×10^{-23} particles	8.314 particles	○●○○
132. The number of moles n equals	$N \times N_a$	$N + N_a$	N / N_a	N_a / N	○○●○
133. Density of an ideal gas at a given T and P is proportional to	colour	molar mass	temperature	volume	○●○○

Questions	A	B	C	D	A B C D
134. Dimensions of the Boltzmann constant are	$ML^2T^{-2}K^{-1}$	$ML^{-1}T^{-2}$	MLT^{-2}	ML^2T^{-2}	●○○○
135. At constant temperature, internal energy of an ideal gas does not change when it	is cooled	is stirred hard	expands	is heated	○○●○
136. Work done in a cyclic process equals the	area enclosed on the P–V diagram	area under one curve only	volume change	temperature change	●○○○
137. Over one complete cycle, change in internal energy is	equal to work	negative	zero	positive	○○●○
138. Heat engines used in power stations are driven by	magnets	wind	high temperature steam	cold water	○○●○
139. Engine efficiency is increased by reducing	heat losses	fuel temperature	work output	hot temperature	●○○○
140. Metabolism obeys the	only Boyle's law	only Charles's law	first law of thermodynamics	no thermodynamic law	○○●○
141. A system at constant pressure of 5×10^4 Pa has volume change of 0.4 m^3. Work done is	8×10^3 J	1.25×10^5 J	2×10^5 J	2×10^4 J	○○○●
142. Sign of ΔU for a gas cooled at constant volume is	negative	positive	zero	undefined	●○○○
143. Heat is the energy transferred due to	volume only	mass	temperature difference	pressure only	○○●○
144. A system rubbed by friction gains	no energy	internal energy	only potential energy	only mass	○●○○
145. In an isothermal compression of an ideal gas, heat is	stored as ΔU	released by the gas	zero	absorbed by the gas	○●○○
146. A Carnot engine absorbs 800 J at 500 K and rejects heat at 300 K. Work done is	160 J	320 J	800 J	480 J	○●○○
147. Carnot refrigerator with T_2 = 270 K and T_1 = 300 K has COP	9	1.1	0.11	30	●○○○
148. The fraction of heat converted to work is the engine's	enthalpy	emissivity	entropy	efficiency	○○○●
149. The second law implies that every real engine rejects some	mass	work to the source	charge	heat to the sink	○○○●
150. Gas pressure in a closed rigid container rises on heating because molecules	become larger	stop moving	lose mass	strike walls harder and more often	○○○●

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