

Match the following :

- 11. Hamilton's principal function (a) K 13
- 12. Moment of inertia tensor (b) ϕ 14
- 13. Boltzmann constant (c) I 12
- 14. Work function of the metal (d) T^* 15
- 15. Relativistic kinetic energy (e) S. 11

Answer in 1 or 2 sentences :

16. Write down Hamilton-Jacobi equation for Hamilton's principal function.

$$H(q_j, \frac{\partial S}{\partial q_j}) + \frac{\partial S}{\partial t} = 0$$

17. Define Euler's angles.

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18. State classical Maxwell-Boltzmann distribution law. \rightarrow tells how a total fixed amount of energy is distributed among the various members of an assembly in the most probable distribution.

19. What is meant by Fermi energy? \rightarrow identical but distinguishable any spins \rightarrow molecules of a gas

20. Write down the relativistic relation for the variation of mass with velocity.

$$M = \frac{M_0}{\sqrt{1 - v^2/c^2}}$$

19. Fermi energy (E_F)

At $T=0$, $E < E_F$

At absolute zero all possible quantum states of energy less than E_F are occupied & states of energy greater than E_F are empty.

At $T > 0$, $E = E_F$
 Thus Fermi energy E_F at $T > 0$ is that energy level in which 50% of the quantum states are occupied & 50% are empty.
 SECTION B - (5 x 6 = 30 marks)

Answer ALL questions, choosing either (a) or (b).

21. (a) Show that the transformation

$$P = q \cot p$$

$$Q = \log \left(\frac{\sin p}{q} \right)$$

is canonical.

Or

(b) Write a note on Hamilton's principal function.

22. (a) Deduce Euler's equations of motion of a rigid body.

Or

(b) Explain the terms normal co-ordinates and normal modes of vibration.

23. (a) State and explain the principle of equipartition of energy.

Or

(b) Establish Maxwell's law of distribution of velocities.

The most useful set of generalised co-ordinates for a rigid body are Euler's angles, which are the angles of rotation about specified axes, executed in specific sequence