

PHY401A: Weekly Quizzes (Odd semester: 2022-23)

Total points: $5 \times 10 = 50$ Date: Tuesday Time: 13h15-13h25

Quiz no. 5 (more than one answer may be correct)

21. Which of the following Lagrangians would describe a free particle in one dimension?

- (a) $\ddot{q}\dot{q} - \dot{q}q$
- ☒ (b) \dot{q}^2
- ☒ (c) $\ddot{q}q$
- (d) $\ddot{q}\dot{q}$

22. Which one is NOT a necessary feature of an inertial frame of reference?

- (a) Isotropy of space
- (b) Observer
- ☒ (c) Orthogonal coordinate system
- (d) Uniform velocity with respect to another inertial frame of reference

23. Which quantity is conserved as a result of the time-reversal symmetry of a system?

- (a) The total energy
- (b) The energy function
- (c) The angular momentum
- ☒ (d) None of the above

24. If a one dimensional Lagrangian has explicit dependence on time,

- ☒ (a) the linear momentum would still be conserved if the Lagrangian remains unaltered under an infinitesimal translation of the generalized coordinates by a constant amount
- (b) the kinetic energy will never be a constant of motion
- ☒ (c) the energy function is NOT a Noether's invariant under an infinitesimal translation in time
- (d) the system must be non-conservative (no conservation of total mechanical energy)

25. The Lagrangian of a free particle

- (a) must not include generalized coordinates but may include time
- ☒ (b) must be a function of the speed of the particle
- ☒ (c) is consistent with the homogeneity of space and time and also with the isotropy of space
- ☒ (d) is consistent with Newton's first law of motion

No Rough Work is Allowed on this Page