

### Quiz 6 (optional)

1. We saw that biology spans a huge length scale — from nano-world to the size of the whole earth. If we want to compare the motion of different organisms across scales, what one needs to do is the following. Express the speed in a dimensionless unit, where the speed is scaled by an appropriate velocity scale.
- (A) In the macroscopic world, the velocity of big animals depend on the length of the leg (**L**). A natural constant relevant for large sizes is the acceleration due to gravity **g**. Write down an expression using **g** and **L** that would give the dimension of speed. (1 Mark)
- (B) In the microscopic world, the speed of objects (molecular motors) will depend on the force produced (**f**) and the **viscous drag**. Write down an expression using **f** and **viscous drag** that would give the dimension of speed. (1 Mark)

**Submit after the end-semester test on 19th Sunday. Bring the solution to the end-semester test. Keep it in your bag. After the test is over, before leaving the hall, give it to the invigilator TA.**

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Interesting tidbit: Scientists found that when the speed of animals, expressed in the dimensionless unit (that is, speed divided by the answer you got in (A)), plotted against a dimensionless stride length (length of a walking stride divided by the leg length), data for all animals fell on exactly the same curve — a master curve! This helped scientists to predict the velocity of unknown animals like dinosaurs, knowing their leg size and stride length!