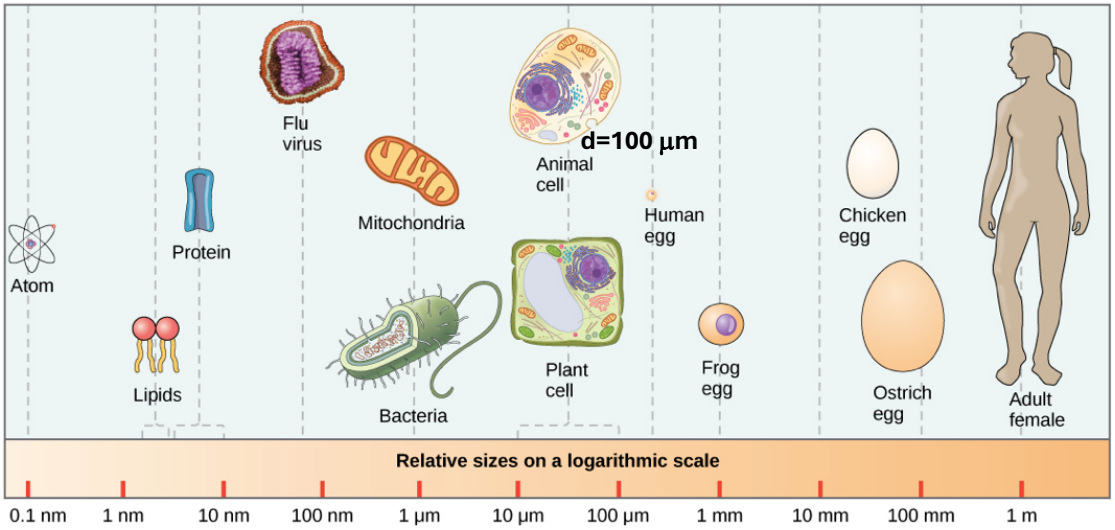
NAME: **ROLL NO:**

LS2103. Class Test-1. 18.08.2024 Time: 20 MINUTES.
Clear tick(s) for right answer(s) ONLY. Use back page for rough work.
Negative marks for wrong/ambiguous selection.

Unless otherwise given, refer to the comparative scale below for "diameters" in Q1 and Q2:



Q1. Assume one-third of the volume of a frog egg is filled with protein molecules of diameter 6 nm. The closest approximation to the number of protein molecules present is:

a) 10^{15} b) 10^{23} c) 10^{10} d) 10^{16}

Q2. The logarithm (to base 10) of the closest ratio of the surface area of a typical animal cell and a typical flu virus is:

a) 3 b) 9 c) 6 d) 12

Q3. The heat capacity (C) of a protein solution in equilibrium is shown to be the ratio of the (variance in energy) to ($k_B T^2$). The dimensions of C are:

a) $[M^0 L^2 T^{-2} K^{-1}]$ b) $[M^1 L^2 T^{-1} K^{-1}]$ c) $[M^1 L^2 T^{-2} K^{-1}]$ d) $[M^2 L^2 T^{-2} K^{-1}]$

Q4. Tick the correct statements pertaining to entropy (S) of ideal gas:

a) S depends on internal energy of the gas molecule
b) The energy derivative of S contains thermal information
c) S has a linear dependence on the density
d) S scales logarithmically with number of molecules

Q5. The speed (v) distribution, p(v), of small protein molecules in dilute solution is similar to ideal gas particles' distribution. Their average speed is given by:

a) $\int_0^\infty v\, p(v) dv$ b) $\int_{-\infty}^\infty v\, p(v) dv$

c) $\sqrt{\int_0^\infty v^2\, p(v) dv}$ d) $\int_{-\infty}^\infty v^2\, p(v) dv$