An aluminium sphere is dipped into water. Which of the following is true?

(a) Buoyancy will be less in water at 0°C than that in water at 4°C.

(b) Buoyancy will be more in water at 0°C than that in water at 4°C.

(c) Buoyancy in water at 0°C will be same as that in water at 4°C.

(d) Buoyancy may be more or less in water at 4°C depending on the radius of the sphere.

Buoyant force (B_F) on an object of volume V_0 and density ρ_0, when immersed in liquid of density ρ_l is :- $V_0' \rho_l g$ {where V' = volume of liquid displaced by object}

Also, the density of water is maximum at 4°C.

Hence, $F_B = V' \rho_l g$ will be maximum at 4°C and less when at 0°C. {Option (a) ✓}

Also, F_B depends on volume of liquid displaced and not on its actual volume (i.e. Radius for a sphere).

⇒ Option (d) is incorrect.