

Solutions

2.1 1–100 nm.

2.2 A coarse particle.

2.3 Increases 10×.

3.1 $SA = 6 \times 10^2 = 600 \text{ nm}^2$; $V = 10^3 = 1000 \text{ nm}^3$, so $SA:V = 600:1000 = 0.6:1$ (or 3:5).

3.2 Nanoparticles have a much higher surface-area-to-volume ratio than bulk material; a greater proportion of their atoms is on the surface; so more of the catalyst's surface contacts the reactants per unit mass; the reaction rate per gram is higher, so less catalyst is needed.

3.3 Benefit – the cream is transparent/not white while still blocking UV, and needs less material. Concern – the effects of nanoparticles absorbed through the skin on human health, and their environmental fate, are not fully known.