

## SURFACE AREA TO VOLUME RATIO ASSESSMENT –TEACHER’S EDITION

### Part A: Calculations

Find the following:

#### **Surface Area: (Don't forget units!)**

- Find the area of a circle with radius 2 in.  
 *$4\pi \text{ in}^2$  or  $12.57 \text{ in}^2$*
- Find the surface area of a rectangular prism with length 31 cm, width 10.81 cm, and height .1 cm.  
 *$678.58 \text{ cm}^2$*
- Find the surface area of a sphere with radius 2 cm.  
 *$16\pi \text{ cm}^2$  or  $50.27 \text{ cm}^2$*

Area of a circle	$2\pi r$
Area of a rectangle	$l \times w$
Area of a triangle	$\frac{1}{2} b \times h$
Surface area of a sphere	$4\pi r^2$
Volume of a rectangular prism	$l \times w \times h$
Volume of a sphere	$\frac{4}{3}\pi r^3$

#### **Volume: (Don't forget units!)**

- Find the volume of a sphere with radius 2 cm.  
 *$33.51 \text{ cm}^3$*
- Find the volume of a rectangular prism with length 31 cm, width 10.81 cm, and height .1 cm.  
 *$33.51 \text{ cm}^3$*

#### **Surface area to Volume Ratio (Don't forget units!):**

- Find the surface area to volume ratio of a sphere with radius 2 cm.  
 *$1.5 \text{ cm}^{-1}$  (or /cm)*
- Find the surface area to volume ratio of a rectangular prism with length 31 cm, width 10.81 cm, and height .1 cm.  
 *$20.25 \text{ cm}^{-1}$*
- Find the surface area to volume ratio of a sphere with radius 0.00001 m.  
 *$30000 \text{ /cm}$*
- Why is SA/V ratio important to nanoscientists?

*Because nanoparticles are very small, the percentage of atoms on the surface of a nanoparticle is high compared to a macro- or even microscale particle. This means that changes in the SA/V can have a significant impact on the properties of nanoparticles.*

**Part B: Analysis**

1. From the calculation section in Part A, how did the surface area of the rectangular prism and sphere differ? How did the volume of the rectangular prism and sphere differ?

*The surface area of the rectangular prism was greater than the sphere. The volume of both shapes was the same.*

2. Why does the rectangular prism have a much higher surface area to volume ratio than the sphere?

*The rectangular prism has a higher surface area than the sphere, but has the same volume so the ratio is higher for the prism.*

**Part C: Short Answer Questions**

1. Why did the steel wool burn better than the steel nail?

*The steel wool has a higher surface area to volume ratio than the steel nail.*

2. How does the roughness of a surface lead to greater surface area to volume ratio? Give an example.

*The pits, folds, bumps, etc. lead to more surface area with the same volume.*

*Examples: The villi/intestinal folds in the small intestine, alveolae in lungs, powdered vs. solid reactants*

3. Name 3 examples of how nature and scientists take advantage of surface area to volume ratio, and explain how they do so.

*Answers may vary. Check the integration section for possible choices.*

4. Use the rest of the space provided to write an ending to the story. Be sure to use at least five vocabulary words in a way that demonstrates your knowledge of their definition.