Q1:
First letting $A = (0,a) \times (0, \frac{\pi}{2}) \times (0, 2\pi)$ we see that $g(A) = V \setminus C$, for some content 0 set C. Thus by COV $\int_{g(A)} z = \int_A z \circ g \cdot |detg'|$. We see that $z \circ g = rsin\phi$ Computing g' get

$$g' = \begin{bmatrix} \cos\theta\cos\phi & -r\sin\phi\cos\theta & -r\cos\phi\sin\theta \\ \cos\phi\sin\theta & -r\sin\phi\sin\theta & r\cos\phi\cos\theta \\ \sin\phi & r\cos\phi & 0 \end{bmatrix}$$

We have that $|\det g'| = r^2\cos\phi$. This will be nonzero on the domain of g, so we can apply COV. We evaluate:

$$\begin{aligned}
\int_{g(A)} z &= \int_A z \circ g |\det g'| && \text{(by COV)} \\
&= \int_A r^3 sin\phi cos\phi \\
&= \int_0^a \int_0^{2\pi} \int_0^{\frac{\pi}{2}} r^3 \sin\phi\cos\phi \quad d\phi d\theta dr && \text{(by Fubini's Theorem)} \\
&= \int_0^a \int_0^{2\pi} r^3 \frac{\sin^2\phi}{2}\Big|_0^{\frac{\pi}{2}} \quad d\theta dr \\
&= \int_0^a \int_0^{2\pi} \frac{r^3}{2} \quad d\theta dr \\
&= \int_0^a \pi r^3 dr \\
&= \frac{\pi a^4}{4}
\end{aligned}$$