**Solving Human Challenges Worksheet: Hints and Answers**

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| **Organism** | **Human challenge it solved/invention created** | **How/why it solved the human challenge** |
| Lotus Leaf | Painting Outdoors | **Hint:** *Does the water look like it is on a surface that is hydrophobic or hydrophilic? How do you know? (Students should understand this from AOS1; How do organisms function?) Why would this be an advantage when painting?*  **Answer:** The lotus leaf has a waxy hydrophobic surface meaning water repels this surface. In the rainy months, having a paint that has a waxy surface such as the lotus leaves, would be advantageous as water can damage and weather paint coats. Surfaces such as these would also reduce dust and dirt particles attaching to the paint layer. |
| Mosquito Proboscis/Mouthpart | Needle Scanning Electron Micrograph | **Hint:** *Can you feel a mosquito when it bites you? Why not? Look at the structure of its proboscis.*  **Answer:** The mosquito mouthpart structure and shape was mimicked to create pain free needles when piercing the skin. |
| Sharkskin Scanning Electron Micrograph | Sharkskin Swimsuit Worn By Michael Phelps | **Hint:** *Consider the direction of the shark scales, which are called ‘denticles.’ If you brushed your hand both ways on the skin, which way would feel rough, which way would feel smooth? How does that help swimmers?*  **Answer:** Shark skin scales, denticles, reduce drag by water flowing past the scales, increasing agility and a more streamlined movement. This concept was used on the exterior of swimsuits for Michael Phelps the 2008 Olympics to reduce underwater drag by Olympic swimmers, to be able to swim faster. |
| Whales- Ridges on Their Fins | Wind Turbine Blade | **Hint:** *Consider the size of whales, do you think they can move around easily and are agile? What do you think the ridges on the fins help it to do?*  **Answer:**The ridges on the whale’s fins reduce drag underwater and can increase lift when the whale needs to come up to the surface or to manoeuvre around to catch prey. The same concept has been applied to wind turbines to create more efficient and effective wind turbines to reduce drag. |
| Kingfisher about to dive into water (*Alcedo atthis*) | Shinkansen Bullet Train (Japan) | **Hint:** *The kingfisher bird, when hunting for fish, does not make a splash when entering the water due to its beak shape. Consider if a regular train were to travel at 320km/h, what would happen when it enters a narrow tunnel?*  **Answer:** The Kingfisher beak structured was used to solve the challenge of the original Japanese bullet trains creating a loud crashing or thunder sound every time it entered a tunnel. This was caused from the air being pushed forwards. Now the air flows past the train instead, and the loud sound no longer occurs when the Shinkansen enters tunnels. (Biozone 2017, p.156) |