

ROV DESIGN AND OIL SPILL RESPONSE WORKSHEET

Directions: As you watch the power point presentation, complete the following questions.

1. What is an ROV? (slide 2)

2. How can ROVs help us in the ocean? (slide 2)

3. How do we operate ROVs? (slide 3)

4. What are three environmental challenges to working in the Arctic? (slide 6)

1. _____

2. _____

3. _____

5. How could using ROVs help us in the Arctic? (slide 7&8)

VOCABULARY

1. ROV _____

2. umbilical _____

Oil Spill Response Challenge Objectives and Scoring (100 points total)

During a recent exploratory oil drilling mission, the Black Gold Oil Company (BGO) successfully located an offshore, ice-covered oil reserve and started extracting oil. The location was near a large opening completely surrounded by ice. While BGO was in the process of pumping oil, there was a magnitude 5.5 earthquake which resulted in part of the pumping equipment separating under the ice. The BGO had emergency response protocols in place and were able to shut down the pump within one hour, but not before oil was released both under the ice as well as into the large area of open water surrounded by ice.

BGO has contracted your company to build an ROV and then use it to locate, sample and identify ice-trapped oil, and help with both under-ice and ocean surface response operations:

Task 1: Perform a scouting mission to search for pools of oil trapped under the ice
5 points Simulated by driving the ROV back and forth to a small stationary underwater ring

Task 2: Take a sample from a pool of oil in the ice
5 points Simulated by surfacing the ROV inside a large floating ring and holding position for 5 seconds

Task 3: Return sample and have it analyzed
10 points Simulated by positioning the ROV in front of a stationary underwater square and holding position for 5 seconds

Task 4: Deliver a piece of equipment inside an underwater work station
20 points Simulated by flying ROV through a large stationary underwater ring (**5 points**), picking up an underwater small ring (**5 points**) and depositing small ring on a PVC arm (**10 points**)

Task 5: Transport floating equipment
10 points Simulated by throwing a beach ball out onto water's surface and returning it using the ROV

Task 6: Respond to an open water surface oil patch in a polynya, a stretch of open water surrounded by ice.
25 points Simulated by gathering and removing floating popcorn/ping-pong balls from the water's surface

Teamwork All team members participate in designing, building, and breaking down the ROV (**10 points**). All team members drive ROV during challenge (**5 points**). Team members give each other positive encouragement (**5 points**). Team members observe and obey all safety rules (**5 points**). Team members bicker, argue, or act with disrespect (**-5 points**).

In Water

Teams will have 15 minutes to test their ROVs in the water and make any changes to buoyancy, attachments, etc. Once the competition starts teams will **lose 5 points for each pool-side modification** to their ROV. Please do not pull the tether to speed recovery of items; teams will **lose 5 points each time they pull the tether**. There will be a “seal” in the water to help recover tangled machines however a team will **lose 5 points if they use the seal**.

COMPANY NAME: _____

TEAM MEMBERS: _____

Draw your ROV design below

ROV FRAME DESIGN

Approved by Teacher _____