Name:_____Date:_____Class:_____

# Student Worksheet

## *Optical Fiber Limbo: Guided Activity*

**Safety**
Optical fibers may break if bent too much. Clean up all broken fibers carefully for the splinters are difficult to see and can easily become attached to clothing and hands.

### Introduction

You will be testing the bending limits of various optical fibers, and then using an optical fiber to send a message.

**Materials**
- continuity tester
- assorted optical fibers
- ruler
- canvas square
- twisty ties
- laser pointer

**Question**

**How does bending an optical fiber affect its ability to contain and guide light?**

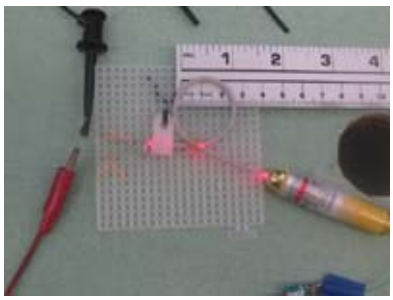
**Make a Prediction**

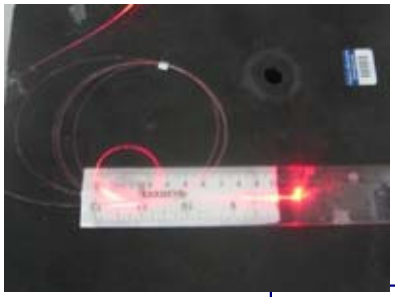
_____

_____

**Procedure: Part I**

1. Loop an optical fiber onto a canvas square as shown in the diagram to the right. Tie down the loop with twisty ties as the photo indicates.
2. Place one end of the fiber into the continuity checker and check that the light is being guided through the fiber by looking for light at the other end of the fiber.
3. Place a ruler under the loop such that the diameter of the loop can be easily measured.








*Developed by Marilyn Garza*
*Development and distribution partially funded by the*

NNIN Document: NNIN-1181
Rev: 11/09

4. Slowly pull the free end of the fiber so that the loop tightens. Stop when the loop begins to glow (indicating that light is escaping the fiber at that point).
5. Measure the diameter of the loop in centimeters and record the diameter and corresponding radius.

**Record Your Observations**

**Data Table: Bending radii of various optical fibers**

| Optical Fiber | Diameter of Loop (cm) | Bending Radius (cm) |
|---|---|---|
| | | |
| | | |
| | | |

**Analyze the Results**

1. Which type of optical fiber will give the smallest footprint? Why?

2. Does the diameter of the optical fiber affect its bending radius? Why or why not?

**Procedure: Part II**

1. Using the Morse code sheet (see the last page of this lab), translate a short phrase into Morse code to be sent through a 4 m long unjacketed optical fiber. Your teacher will pair you with another lab group to trade messages.

| Original Message: |
|---|
| |

| Message in Morse Code: |
|---|
| |

2. Write the message you received from the other group on the first line, then translate it on the second line:

_____

_____

**Record Your Observations**

1. Was the receiving team able to properly decode your message? _____
2. What were some problems encountered? _____

_____

_____

**Draw Conclusions**

1. In this activity, your group was directly linked to a receiving group by an optical fiber. However, it is not practical to provide 15 optical fibers to link your group to each of the rest of the lab groups. Propose a method to link all the groups in the class with the least number of optical fibers.

_____

_____

_____

_____

2. Often in communication lines, different messages need to be sent through an optical fiber at the same exact moment; however, the messages would then be jumbled together. Propose a method to solve this problem.

_____

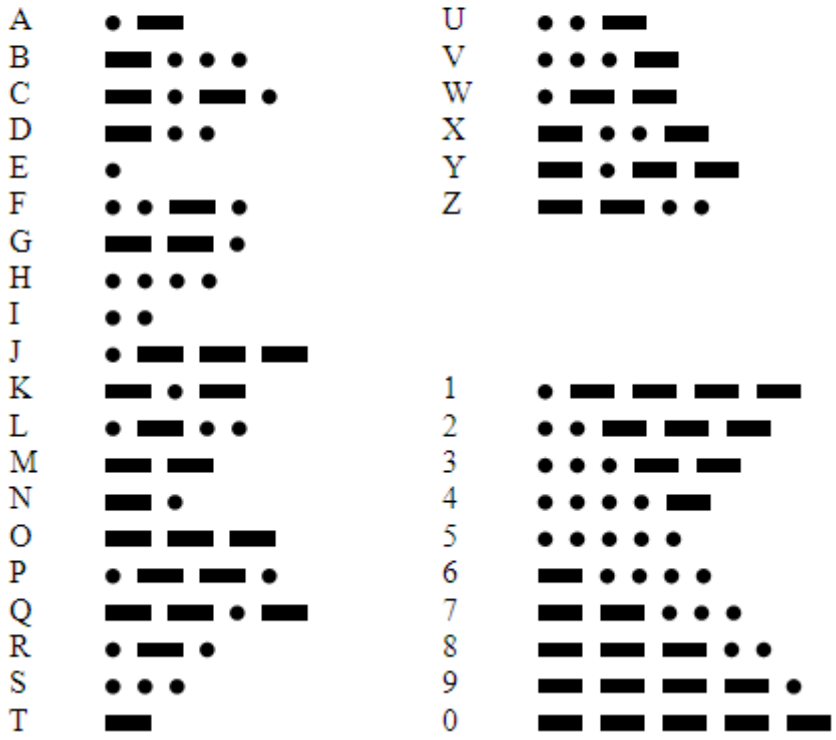
_____

_____

_____

# International Morse Code

1. A dash is equal to three dots.
2. The space between parts of the same letter is equal to one dot.
3. The space between two letters is equal to three dots.
4. The space between two words is equal to seven dots.




This image is from Wikipedia: http://en.wikipedia.org/wiki/Morse_code August 6, 2008

*Developed by xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx*
*Development and distribution partially funded by the*