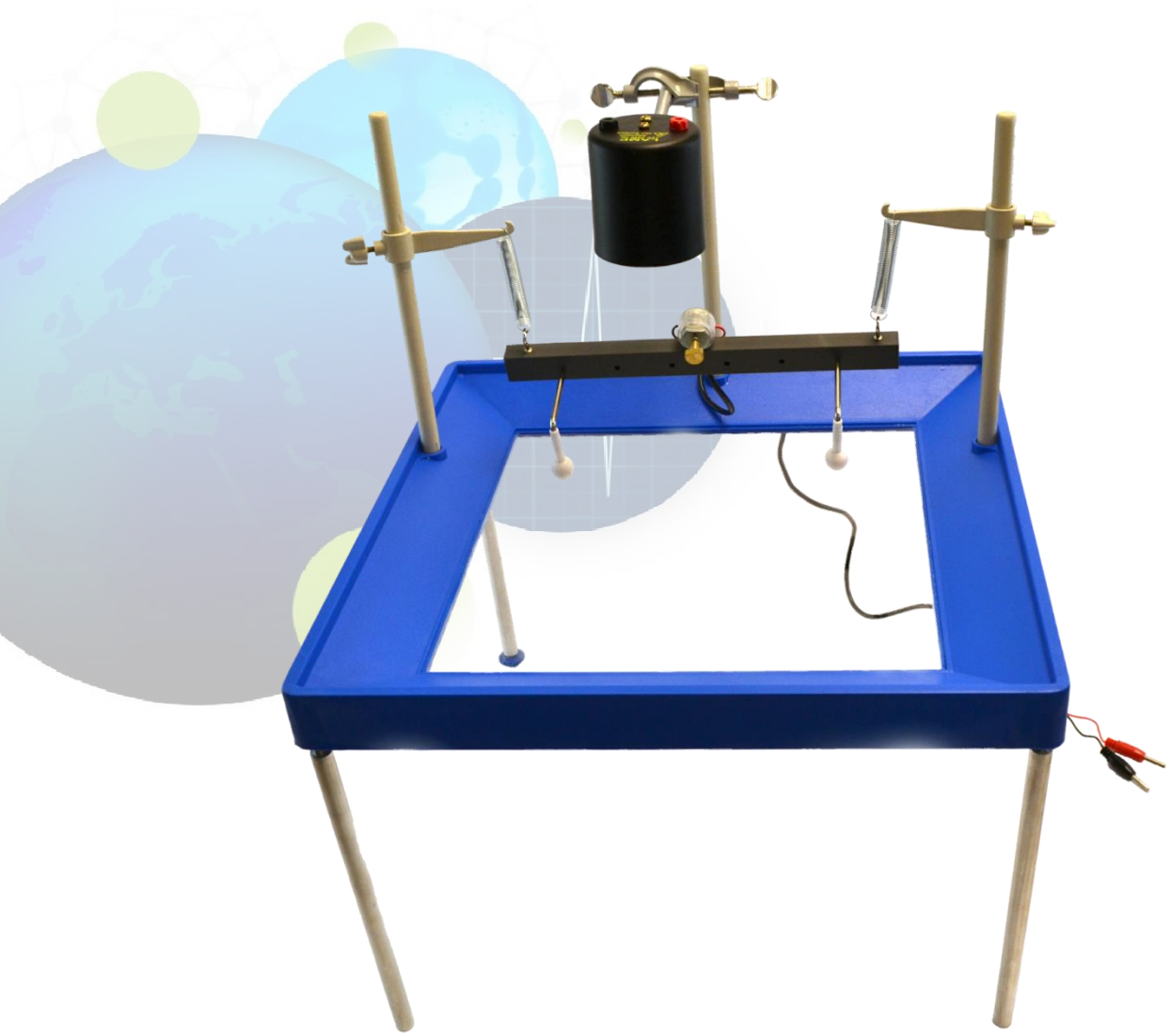
SPECIFICATION USER GUIDE

EDU044
Ripple Tank



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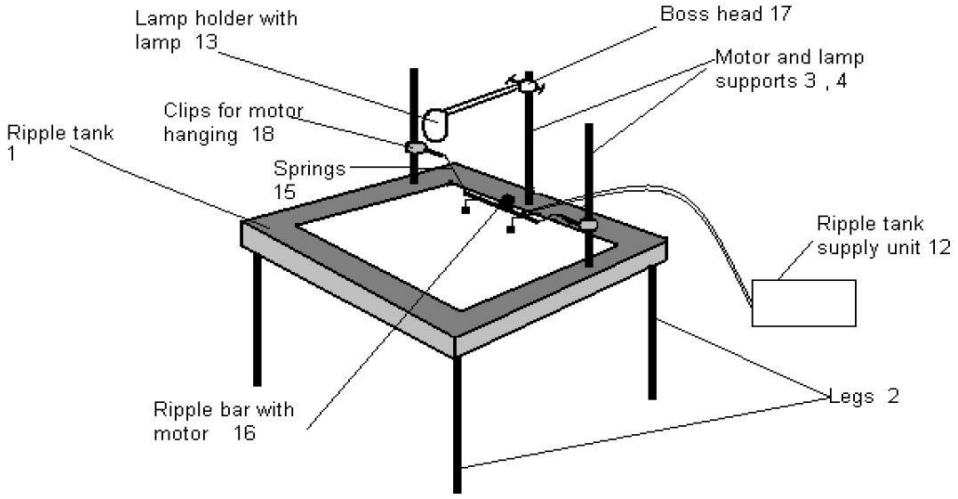
Assembly:

Assembly instructions are outlined below. These are followed by some teacher notes outlining how the ripple tank can be used to demonstrate reflection, refraction, diffraction and interference. There are also some simple pupil write-on worksheets to assist teachers in the delivery of the key wave properties described above.



Assembly Instructions:

Note : part numbers are given in bold text

1. Collect the seven rods and identify the four legs 2 (thicker at one end) and the three support rods 3 and 4. Push the four legs into the corners of the underside of the ripple tank 1.

2. Turn the ripple tank upright and then push the support rods 3 and 4 into place.
   Attach the boss head 17 to the lamp support 3, the middle rod.
   Connect the lamp holder and lamp 13 to the other side of the boss head.
   Ensure that the lamp's flex drops away from the ripple tank.

3. Attach the motor hanging clips 18 to the motor supports 4.
   Connect the springs 15 to the motor hanging clips.
   Attach the ripple bar with motor 16 to the other end of the springs.

4. Adjust the height of the ripple bar with motor 16 by moving the motor hanging clips 18 up or down as necessary. The ripple bar floats should be about 0.5cm above the surface of the ripple tank 1.

5. Connect the motor wires to the ripple tank supply unit 12.

6. Connect the lamp up to a suitable 6v power supply.

7. Fill the ripple tank with water to a depth of approximately 1 cm.

   The ripple tank is now ready to use!

Operating Instructions:

By turning the control on the ripple tank supply unit 12 it is possible to alter the speed of the motor. At a slower speed the vibrations produced by the motor give a wave with a longer wavelength.

You can use either a single float placed in one of the centre holes on the ripple bar or two floats. When using two floats it is normal to place them equal distance away from the centre of the ripple bar float. To get straight wave fronts it is necessary to remove the floats and drop the ripple bar itself down. Care should be taken not to submerge the bar in case the motor itself becomes wet.

It is best to place the ripple tank over a light coloured surface. White paper can be used to cover a dark surface if necessary. With larger groups of students, it can be better to set the ripple tank up on the floor.

Teacher Notes:

1. Reflection

    It is possible to demonstrate reflection of waves off both plain and curved surfaces using the ripple tank.
    Move the ripple float bar so that it will produce a straight wave (see operating instructions).
    Adjust the ripple tank supply unit to get a wave with a wavelength of approximately 1 cm.
    Place one of the straight metal reflectors at an angle of 45 ° and it should be possible to see the wave fronts reflecting. Sometimes it is necessary to adjust the motor speed to gain the clearest wave image under the ripple tank. The angle reflection can be altered by moving the reflector.
    Use the curved metal strip to demonstrate reflection at concave or convex surfaces.

    Student notes can be made using worksheet 1.

2. Refraction

    The clear plastic shapes will be needed to demonstrate refraction.
    The ripple float bar should be adjusted so that it gives a straight wave (see operating instructions).
    Place the rectangular shape so the it is submerged length wise away from the ripple float bar.
    The waves should pass over it but the water above it is much shallower than the rest of the ripple tank. It might be necessary to adjust the volume of water a little.
    It should be possible to see that the wave fronts passing over the rectangular shape are becoming refracted and getting closer together when compared to the rest of the ripple tank.
    The rectangular shapes position can be altered and the other shapes can also be used to demonstrate refraction further.

    Student notes can be made using worksheet 2

3. Diffraction

    The L shaped metal gates will be needed to demonstrate refraction.
    Set the ripple float bar so that a straight wave is produced (see operating instructions). Adjust the motor speed to get waves with a wave length of approximately 2 cm. Place two of the L shaped metal gates so that there is only about a 1 cm gap between them . A diffraction pattern similar to a single float pattern should be seen passing through the gate.
    By adjusting the speed of the motor the amount of diffraction can be changed. Opening up the gate will reduce the amount of diffraction.
    To show diffraction of a wave equivalent to a sound wave passing over a wall, use just one L shaped metal gate. The wave behind the gate will slowly spread out again after it has passed by. Waves with longer wavelengths will be diffracted more that those with shorter wavelengths.

    Student notes can be made using worksheet 3.

4. Interference

To demonstrate interference the ripple float bar will need to be fitted with two ball floats which should be separated by about ten cm. The motor speed can then be adjusted to get the best interference pattern. It should be possible to see regions of constructive and destructive interference. Adjusting the speed of the motor or the separation of the ball floats will alter the shape of the interference pattern.

Use of the 'Strobe' would enhance the quality of the interference pattern but care needs to be taken to spin the wheel at a suitable speed.

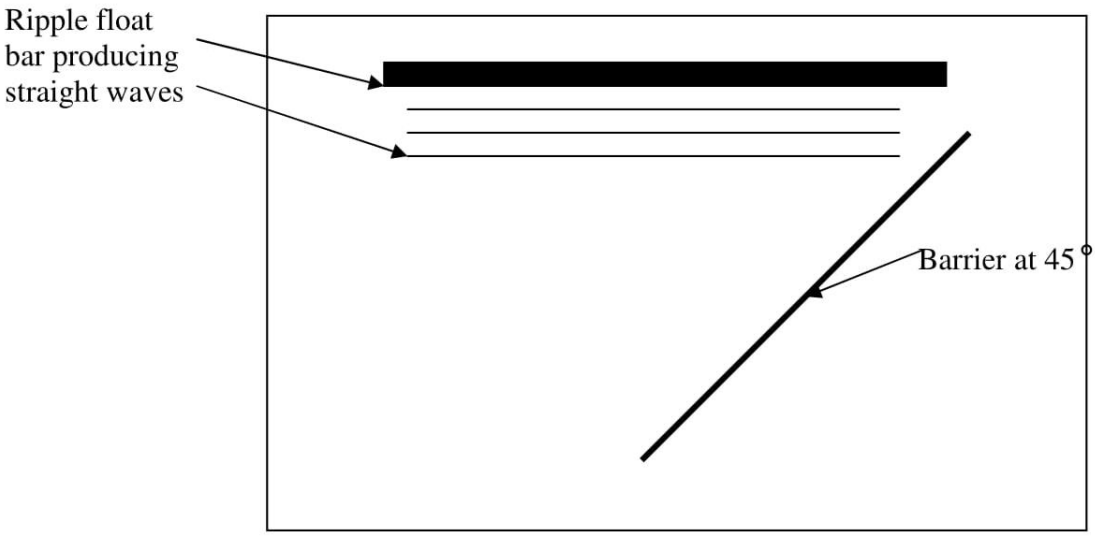
Name : _____

Reflection

Ripple tank worksheet 1

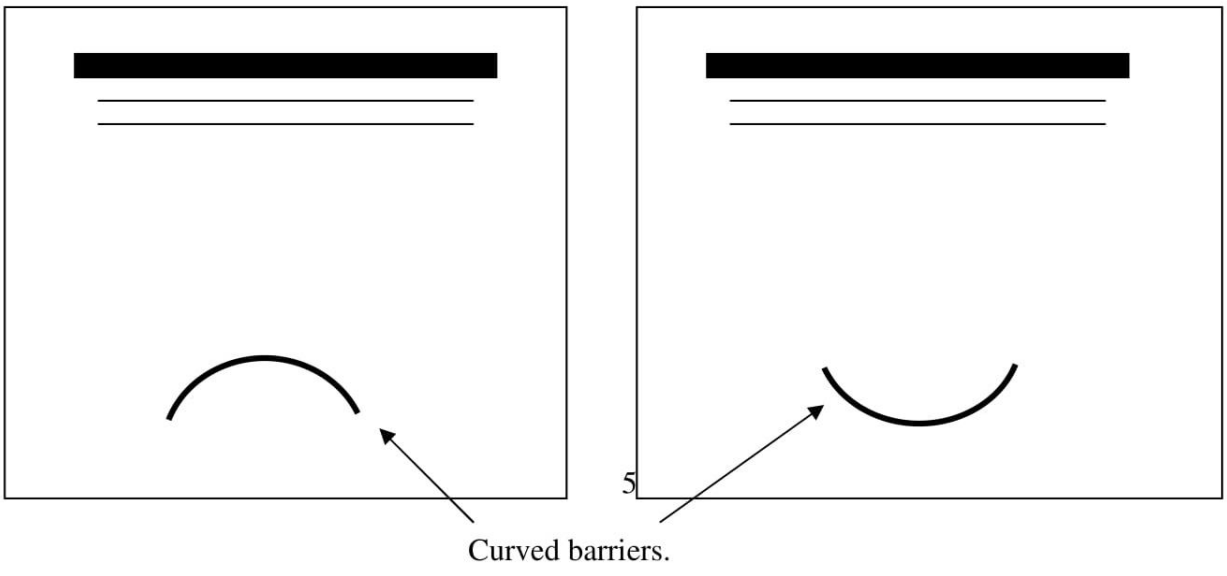
1. Reflection of a wave at a plain surface.

You have been shown how a straight water wave can be reflected by a barrier placed at 45°. Finish the diagram below to show what happens to the original wave once it hits the barrier.



2. Reflection of a wave at a curved surface.

Draw the original wave and the reflected wave that you would see when a flat wave was reflected off the curved barriers shown below.



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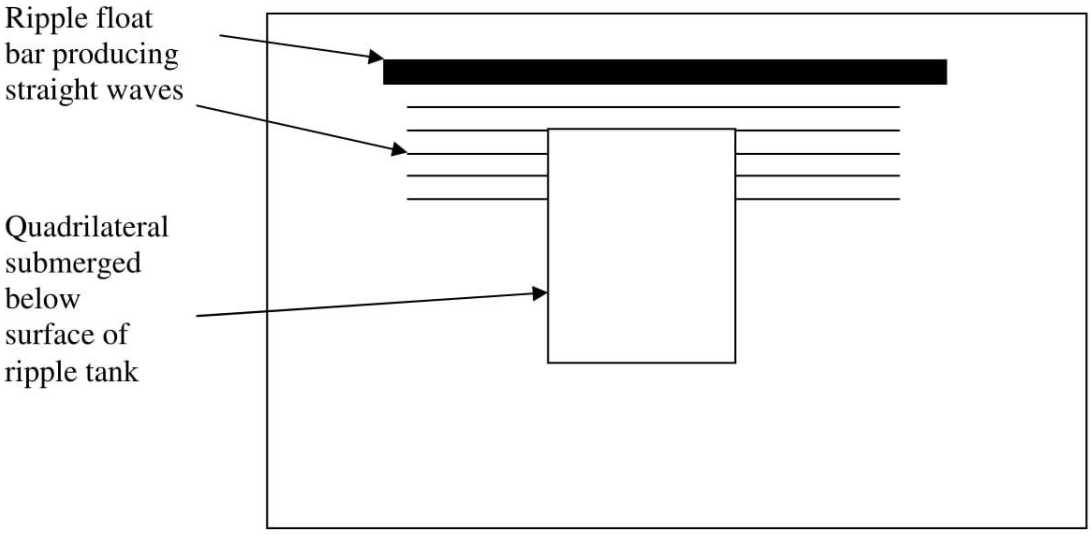
Refraction

Ripple tank worksheet 2

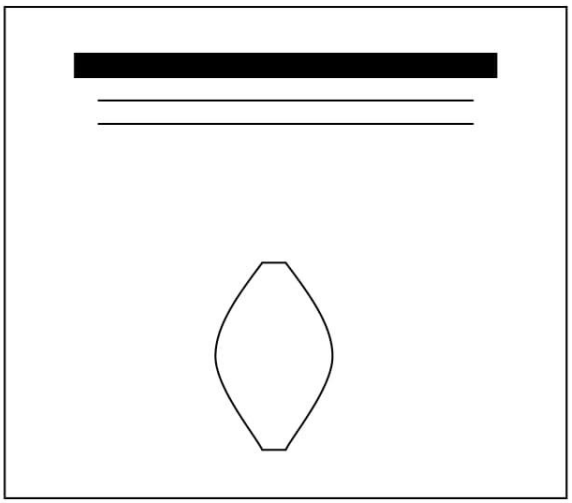
1. Refraction of a wave;

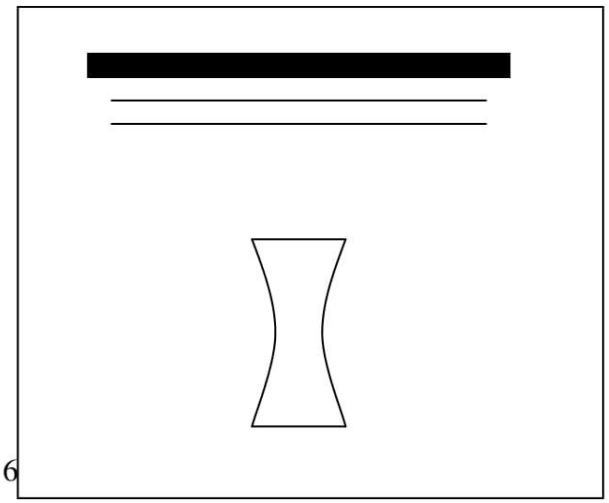
You have been shown how a straight water wave can be refracted when it passes over a regular quadrilateral. Finish the diagram below to show what happens to the original wave when it passes over the shape.



2. Refraction of a wave over different shapes.

Complete the diagrams below showing how the original wave from the ripple float bar is be refracted as it passes over each of the shapes below.





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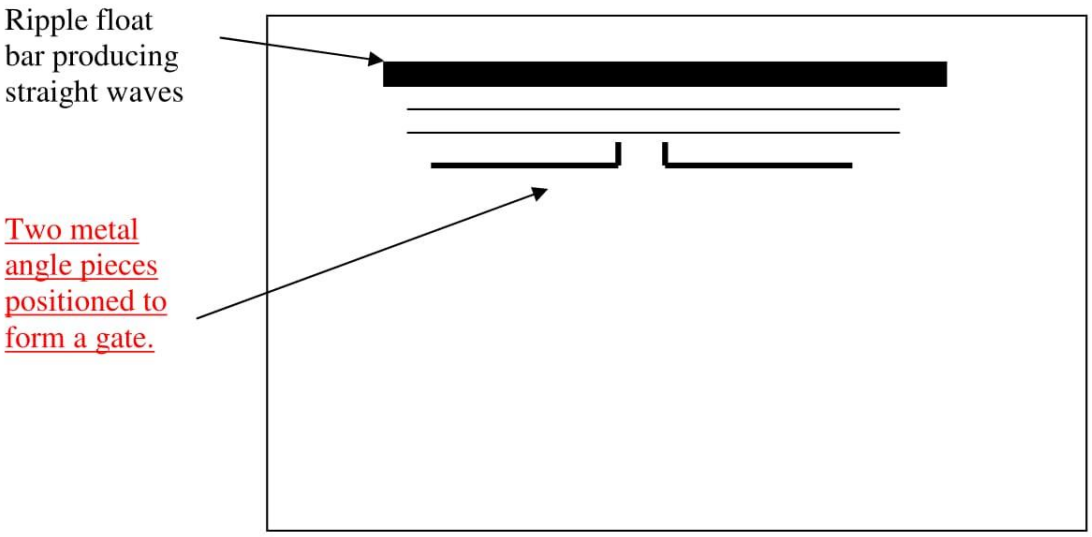
Diffraction

Ripple tank worksheet 3

1. Diffraction of a wave through a narrow opening;

You have been shown how a straight water wave can be diffracted when it passes through a narrow opening. Finish the diagram below to show what happens to the original wave when it passes through the gap.



2. Diffraction of a wave past a boundary.

Complete the diagrams below showing how a straight wave is be diffracted as it passes the objects shown.