



# Contents

<b>Tire and Wheel (Pneumatic Suspension) Systems .....</b>	<b>2</b>
<b>Part One - Preparation .....</b>	<b>2</b>
I. Objectives .....	2
II. Materials Needed .....	2
III. Setting: .....	2
IV. Evaluation .....	2
<b>Part Two - Activity Instructions .....</b>	<b>3</b>
I. Tool Check! .....	3
II. Language Skills .....	3
III. System Understanding .....	3
IV. Process .....	3
Steps to Fix a Flat .....	4
V. Problem Solving/Diagnosis .....	5
VI. Review .....	5



## Tire and Wheel (Pneumatic Suspension) Systems

### Part One - Preparation

#### I. Objectives

- A. Student can identify a tire or tube in need of repair.
- B. Student can name the parts of the tire, tube and wheel and the tools used on them.
- C. Student becomes more familiar with the math concepts of circumference and diameter.
- D. Student becomes more familiar with the physics concepts of friction, leverage and force.
- E. Student can describe all the major steps of flat fixing and follow all the steps.

#### II. Materials Needed

##### Demonstration Parts

Cut in half tire  
Tube  
Wheel without tire and tube

##### Tools

Tire Irons  
Patch Kit - includes Glue, Patches,  
and Sand Paper

##### Other Materials

Rags  
Rubber Gloves  
Ball Point Pen

**III. Setting:** Workshop, with tool benches, bike repair stands and bike storage.

#### IV. Evaluation

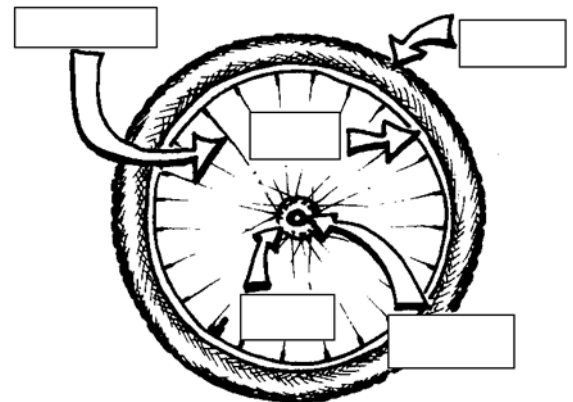
A. Teacher Observation During Work Session

B. Oral Review at end of work session.

- 1) **Language:** How many of the parts and specialty tools can students identify? Passively? Actively?
- 2) **Systems:** Can the student say what components are part of the system on which they worked? How do these components function as a whole?
- 3) **Process:** How many of the steps of the process can students name? Can they get the steps in the correct order?

C. Written Evaluation How well can student narrate what she did that day on her time sheet?

D. Test Can student identify the parts in this diagram?





## Part Two - Activity Instructions

**I. Tool Check!** Instructors enter tool area with students and confirm as a group that all tools are present.

### **II. Language Skills**

Over the course of the lesson we should introduce all of the terms below. At the end of the session it is often helpful to get each young person to touch each of these parts on his/her bike & say the name.

#### **Tire**

Tread  
Sidewall  
Bead  
Threads (embedded in the tire)

#### **Tube**

Valve  
Valve Stem  
Schraeder( or American) Valve (AV)  
Presta (or French) Valve (FV)  
Valve Cap

#### **Rim**

Rim Edges (hook bead)  
Valve Hole  
Bead Seat Diameter  
Rim Strip  
Spoke ends (spoke nipple heads)

#### **Necessary Tools**

Pressure Gauge  
Tire Irons (tire levers)  
Pump or Compressor  
Sandpaper  
Valve Core Remover  
Wrench (adjustable or fixed)

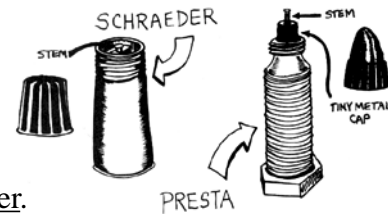
#### **Other Materials**

Patches  
Glue  
Bucket and Water  
Pen or Chalk

#### **Math Words**

Area (contact patch)  
Circumference  
Diameter

**Note:** To fix a flat you also deal with the rotational system in a hub, so there is more technical vocabulary that comes into play, Most importantly: axle, axle nut, axle washer, quick release skewer.  
Also: drop-outs, derailleur hanger.



**valve types**

### **III. System Understanding**

Try these (and other!) different ways of phrasing this question:

“What components are part of the pneumatic suspension system?” “How do they interact/affect each other/work together?” “How do they function as a whole?”

### **IV. Process**

**A. Goal** — What are we trying to get done when we fix a flat tire? The obvious answer is get our bike rideable again (by refilling the pneumatic suspension system!). Has anyone ever ridden a bike with no tire on its rim? What would happen if you rode that way for a while? to you? to the bike? A well done flat fixing job also makes sure that your bike:

- has nothing that is about to break (tires not frayed, or split, or bald)
- tires adequately inflated (to protect rims and prevent “snake-bite” flats)
- isn’t going to go flat again soon due to slow leak or bad valve
- has the best tire installed for the type of riding you’ll be doing



**B. Steps to Fix a Flat** — There are several steps to fixing a flat. Go over the name of each step, as a list. Then describe each step to the students and have them each carry out that step on their bike before you move the group onto the next step.

1. Evaluate Condition of existing parts, decide what to replace (examine tire before removing wheel from bike)

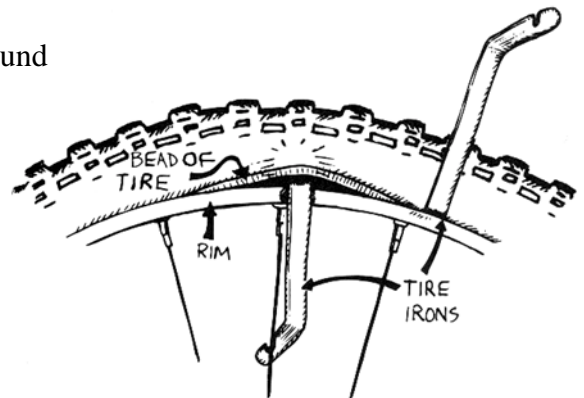
- Tire condition holes in sidewall? bald? cracks?
- Any obvious causes of flat? nails, tacks, etc.
- Tube condition valve leaks? valve stem straight? **spit test**
- what happened when the tire went flat -was it all of a sudden? slowly? how does this information give us clues about the cause of the flat?

2. Remove Wheel

- Tool concepts fixed vs. adjustable wrenches, vise grips/pliers (for round surfaces) vs. wrenches (for flat surfaces - point out parallel jaws)
- Work habits look carefully at order of components before taking apart.  
Where are the axle washers? With Bolt On wheels, put axle nuts back on axle if you have to take them all the way off (so you won't lose them!)

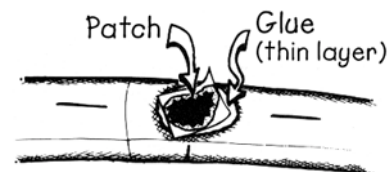
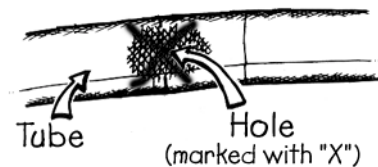
3. Remove Tire and Tube from Rim

- Let out remaining air
- Take one side of tire (bead) off the rim all the way around  
- proper use of tire iron  
- start opposite valve, end at valve (how?)
- Remove second side (show “upside-down U” move)
- Keep tire, tube and rim all together (in the same orientation with respect to each other) to help in your detective work locating the hole and cause!



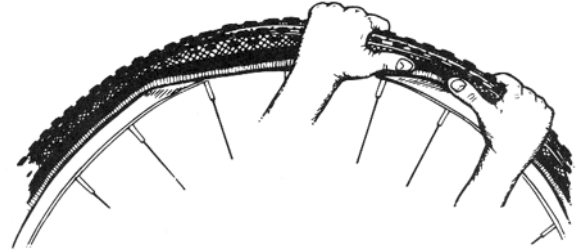
4. Find and Patch Hole

- Blow up tube, don't be afraid to make it 1½" to 2" in diameter  
- listen for air, feel with cheek or hand  
- use water to spot the leak if you can't hear or feel it
- Mark hole (a big “X” marks the spot!)
- Inspect rim and tire for causes at the spots that were next to this hole
- Patch hole  
- clean and sand surface well, flatten seams/ridges  
- not too much glue, let it dry first





4. Find and Patch Hole - continued
  - e) Fill it up (not so big this time!) and look for a 2nd hole
    - Why might a 2nd hole show up now that we didn't see/hear before?
  - f) Inspect the whole tire and rim carefully for rough edges, sharp things, holes, etc.
5. Remount Tire and Tube on Rim — No tools!! It's technique, not strength.
6. Inflate slowly, and check that tire is seated in rim
7. Remount Wheel in Frame
  - a) make sure it's centered (look at frame, not brake pads!)
  - b) make sure it's tightened (What could happen if your wheel falls off?)



## **V. Problem Solving/Diagnosis**

1. How can you tell if the hole was caused by a problem in the rim or by something that came through the tire?
2. What can you figure out from the information the bike rider gives you about how the tire went flat?
3. What other problem solving did we do?

## **VI. Review**

## **VII. Clean Up**

**VIII. Tool Check!** Leave tool area as a group after confirming that all tools are present.