

Name \_\_\_\_\_

## **CO2 Car / Catapult Review Sheet**

### **Define**

**Polyurethane** A urethane-based clear coat that can be used in place of oil varnishes. \*will dry faster than other varnishes but is not absorbed as well. This creates a shell-like coating on top of the finish

**Shellac** Fast drying and versatile, Shellac can be used as a clear coat finish as well as a primer/sealer

**Varnish** Used to coat all types of surfaces to protect them. There are a number of varnishes made for different uses.

**Spar Varnish** An oil-based varnish used for exterior and marine surfaces because it is highly resistant to water penetration.

**Semi-gloss** has some shine and is a little harder to maintain in that it will show scratches, dents and wear and tear sooner.

**Satin** matte finish and the easiest to maintain. Because it has a low sheen, it is very forgiving insofar as showing scratches, dents, and wear and tear over time.

**High Gloss** hardest to maintain in that it shows everything - dust, dirt, scratches, dents, and wear and tear in general the quickest

### **Define**

**Pilot Hole** a smaller hole drilled into a material prior to a larger hole being drilled, widening the hole to the desired width. Pilot holes are used when driving a screw. When a screw is driven into a material, it can act as a wedge, generating outward pressure which can cause many materials to split. Drilling a small pilot hole into the material, into which a screw is then driven, less 'wedging' takes place, thereby reducing the likelihood of the material being split.

**Countersink** is a conical hole cut into a manufactured object, or the cutter used to cut such a hole. Allows the head of a countersunk bolt or screw, when placed in the hole, to sit flush with or below the surface of the surrounding material.

**Counterbore** makes a flat-bottomed hole that might be used with a hex-headed cap screw

**Through Hole** refers to a hole that is reamed, drilled, milled etc., completely through the substrate. In other words, a through hole is a hole that goes all the way through something.

**Blind Hole** a hole that is reamed, drilled, or milled to a specified depth, thus without breaking through to the other side of the work piece.

## Twist bits

Usually referred to as twist drills, twist bits are probably the most common drilling tools used. The front edges cut the material and the spirals along the length remove the debris from the hole and tend to keep the bit straight.

They can be used on timber, metal, plastics and similar materials



## Spur point bit

Also known as a wood or dowel bit, they have a central point and two raised spurs that help keep the bit drilling straight. They are ideal for drilling holes for dowels as the sides of the holes are clean and parallel. Spur point bits should only be used for drilling wood or some plastics.



## Flat wood bit (Spade)

Intended for power drill use only, the centre point locates the bit and the flat steel on either side cuts away the timber. These bits are used to drill fairly large holes and they give a flat bottomed hole (with a central point) so are ideal where the head of a screw/bolt needs to be recessed into the timber - always use this bit before drilling the clearance hole for the bolt.



## Forstner bit

Used to form holes with a flat bottom, such as for kitchen cupboard hinges. Best used in a power drill held in a drill stand as there's little in the way of a central point. If used freehand, the positioning is difficult to control as there is no central pilot bit.



## Define

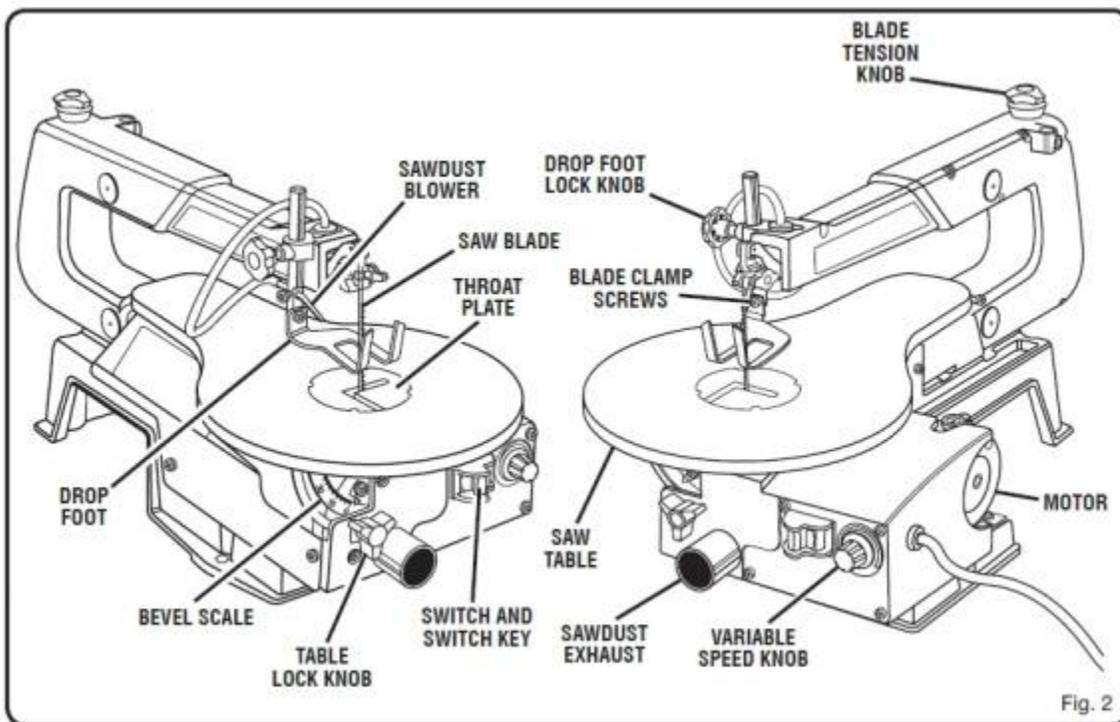
**Mass** Obviously, this is how large and heavy the car is. Simply put, the less weight your dragster has, the faster it will go. This is the most important factor that will figure into your design. Keep it light!

**Friction** The second most important fact you'll face. Because the dragster has parts moving against one another, friction is created. You can help reduce it by making sure the axles are free to rotate, and that the wheels and tires are not rubbing on the car body.

**Drag** Here's where aerodynamics come into play. As an object moves through the air, it is met with air resistance as speeds increase. This air resistance pushes against your CO2 car and prevents it from going as fast as it could in a vacuum. You can't completely ever reduce drag, but you can help reduce it by building a more aerodynamic car, but those are more difficult to create.

**Thrust** The gas escaping from the CO2 cartridge in the car. Pushes the car forward

## SCROLL SAW Parts



Operation &

## **Scroll Saw Notes**

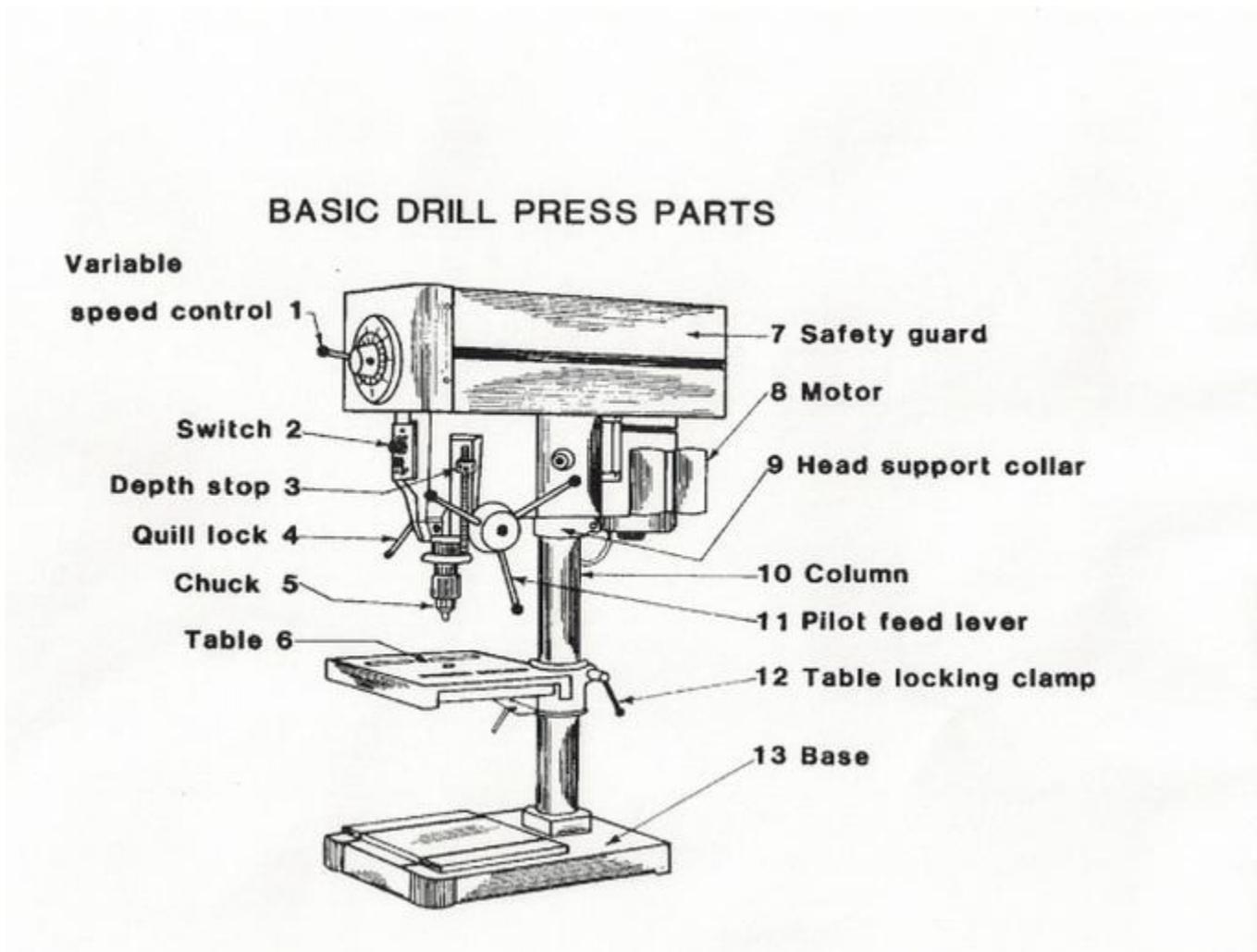
### **Requirements:**

Proper eye protection must be worn—operate only with instructor's permission and after proper instructions have been received.

1. Make all adjustments with the power OFF.
2. Make sure that you are lightly holding the wood flat against the table to keep the wood from bouncing around and possibly being thrown out.
3. Check to make sure that the teeth of the blade are pointing down and that the guide assembly is flush with the wood.
4. Use both hands to guide the wood through the cut. However, hands should remain to the side of the blade, never in direct line with the blade.
5. The scroll saw can hurt you as badly as the band saw. The smaller blade will not save your hand or fingers.
6. Never use your hand to clear the table. Always use a table broom or the chip blower.
7. Scroll saw blades break very easily, so take your time to make the right cuts. Remember, never force the wood and use the correct speed.
8. "Hard" woods and tight curves should be cut using the slower speed.
9. If the blade breaks, turn the machine off, unplug it, and tell the teacher immediately. Never try to fix it yourself.
10. You have to wait patiently and quietly for your turn on this machine, behind the yellow line, just like with any machine.
11. If for any reason you are not sure of the way to cut out an object, get your teacher's assistance. You may have to wait a little while, but you will be helped as soon as possible. Remember, have patience!
12. The machine must be turned off and at a complete standstill before you can leave it.

# DRILL PRESS

## Parts



## Operation & Safety

1. Always wear eye protection when operating.
2. All work must be clamped down.
3. One person at a time on the machine.
4. Remove all jewelry, pull back long hair, roll up long sleeves.
5. Wait for the machine to stop moving before removing your work.
6. Pull the handles towards you from the top.
7. Check the speed setting so that it is correct for your work. Holes over 1/2 in. should be bored at lowest speed.

8. Use only approved types of bits. Bits with feed screws or those that have excessive length should not be used.
9. Mount the bit securely in the chuck. Remove the key immediately.
10. If drilling completely through a piece of wood, place a scrap piece underneath so you do not drill the table of the drill press.
11. Drill at a medium pace.
12. Do not talk to someone while they are operating the drill press.
13. You must get instruction and permission before using.
14. Never let the arm spring up after drilling, you must gently guide it back up

2.

## Archimedes

287 - 212 B.C.E.

Archimedes is known as one of the three greatest mathematicians of all time, along with Newton and Gauss. He was known by many as "the wise one." Others referred to him as "the master." However, he was most well known as "the great geometer." Archimedes probably got his interest of mathematics from his father, Phidias, who was an astronomer. He was so interested in solving problems, that it more or less became his hobby. It was said that he was consumed with solving problems, that he often times forgot to eat. His real hunger was to learn as much as he could about mathematics. This led him to be a student in Euclid's school, to further his mathematical knowledge.

His fascination with solving problems, anywhere or anytime, made for some interesting stories. It was said that he would draw in dust, dirt, or whatever was available. He was also known for his drawing of geometric problems on his stomach with olive oil.

Archimedes' fame came from his relationship with Hiero, the king of Syracuse. He spent most of his time trying to solve problems for the king. His most well known solution was in regards to the golden crown. King Hiero was worried that the metalist who was making him a golden crown was replacing some of the gold with another metal. King Hiero called upon Archimedes to find a way to see if the crown was made of pure gold or a combination of metals. Archimedes came upon the solution on how to prove this as he was taking a bath. Upon entering a full tub of water, he noticed that the weight of his body displaced a certain amount of water. Knowing that this same principle could be used on the crown, he forgot himself with excitement. He jumped out of the tub and ran naked through the town, yelling "Eureka, Eureka."

Archimedes once made the statement, "Give me a long enough lever and a place to stand, and I will move the earth." After this statement, King Hiero asked him to prove it. This challenge was in regards to a huge ship in the harbor that couldn't be launched by all the men of Syracuse. Archimedes launched the ship with the help of

a large lever, proving his statement.

Some of his other inventions were the watering screw, and the miniature planetarium. However, his theoretical work was his main calling. The work with levers and pulleys helped make things easier. The discovery of the displacement of water in the bath tub led into hydrostatics. He also did work in integral calculus and work on pi.

King Hiero came to Archimedes to get help in developing weapons to fight the Roman general Marcellus, who attacked Syracuse by both land and sea. To stop the attacking soldiers. Archimedes invented the catapult. This hurled 500 pound boulders at the advancing soldiers. To stop the invasion by sea, he invented large claws that picked up Marcellus' ships, lifted them out of the water, and smashed them against the rocks. The ships that weren't close enough to capture with claws were destroyed by another

## CATAPULTS

Catapult Notes

# Catapults

## **Catapult**

A classic weapon appearing in many forms over the years

Is a generic name given to a weapon of war designed to hurl objects

- Greek Fire
- Bee Hives
- Biological - Dead diseased animal carcasses
- \* Psychological - enemies dead bodies

Comes from Greek word Katapultos meaning shield piercer

Heavy duty version of a sling shot

Used until replaced by explosive based projectile weapons (cannons)

## **Variations of the Catapult**

Ballista - similar to a Giant Crossbow and worked by using tension.

Mangonel - similar to a catapult which worked by using torsion or counterpoise.

Mangonels fired heavy projectiles from a bowl-shaped bucket at the end of its arm.

Trebuchet- similar to a catapult, or stave sling, which was used for hurling heavy stones to smash castle or city walls.

Onager - Onager is a type of catapult that uses torsional pressure, generally from twisted rope, to store energy for the shot

Gastrophete - first known catapult to be deployed in combat. Similar to a crossbow

## Time Line

4<sup>th</sup> Century BCE - China

6<sup>th</sup> Century AD - Arrived on European Battlefields

400 BC Syracuse (Greece)

Gastrophete

Ballista

Mangonel

6<sup>th</sup> Century AD - Traction Trebuchet(Bizzantine Armies)

1187 - Counterweight Trebuchet (Saladin)

Present day - Military uses steam to catapult aircraft off of ships.