

Shop Safety | Student Notes

Air Compressors

Oil vs. Oilless Compressors

When purchasing a _____, one quickly discovers that not all compressors need oil. Some are sealed units that _____ need oil, which makes them the cheaper of the two. But these units are shorter-lived and _____ than their counterparts. When using an oiled compressor, always make sure to maintain clean, full oil in the unit.

Gas vs. Electric Compressors

When in a shop environment, an electric compressor is most often used due to its _____ startup, relative quietness, and _____. But when mounted on a skid or truck, generally gasoline driven compressors are employed. When using a gas compressor, _____ make sure to keep gasoline and oil in _____ containers and maintain _____, full oil and gas in the engine, and never use them _____. Some electric motors can be lubricated, and if so, put a few drops of oil in _____ each use.



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Shop Safety | Student Notes

Air Compressors

Sound

All compressors, whether gas or electric, oiled or oilless, make a considerable amount of _____. Pneumatic tools are also notoriously loud. Ear _____ should always be _____ when running any compressor or pneumatic tool.

Moisture

Humidity in the air, when pumped into the compressor's tank, condenses at the _____. This can rust the inside of the tank, _____ the metal. If water is allowed to sit at the bottom of tanks for long enough, they can _____ violently when pressurized. _____ the compressor at the end of each _____ to remove this water. A water _____ is recommended to keep water vapor out of the air hoses. Due to its _____ nature, water in compressed air lines can _____ pneumatic tools and motors.



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Air Compressors

Air Hoses

Air hoses are usually made of _____ or plastic. When an air hose _____, it can whip around, damaging equipment and _____ workers. Because of this, _____, cracked, worn, or leaking air hoses should not be used. A hose guard valve can also be _____, which shuts off airflow when the hose breaks. Hoses should be rolled up to prevent _____, and vehicles should not drive over them. Clamps, tape, and other _____ leak fixes should not be employed either.

Pneumatic Tools

Pneumatic tools generate more _____ than similarly sized _____ tools, so be sure to have a good grip on drills and sanders to _____ them from _____ arms. Also, pneumatic tools generally have _____ RPMs than electric tools, so keep that in mind when using wire wheels, abrasive discs, or other _____ that have fly apart risks. Always make sure that the bit or wheel has the same or _____ rated RPMs as the tool. Pneumatic tools are also very loud, so be sure the muffler packing is in place and in good _____, and hearing _____ is used. Never use air _____ over 30 psi for cleaning skin or clothes and never _____ compressed air in a person's eyes, mouth, nose, etc.



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Shop Safety | Student Notes

Air Compressors

Answer Key

1. compressor, never, louder
2. rapid, durability, always, approved, clean
3. noise, protection, worn
4. bottom, weakening, rupture, drain, workday, separator, incompressible, ruin
5. rubber, ruptures, injuring, damaged, installed, tripping, temporary
6. power, electric, prevent, twisting, higher, attachments, higher, condition, protection, pressure



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Shop Safety | Quiz

Air Compressors

- Hearing protection should be used:
 - When using an oilless air compressor
 - When using an oiled air compressor
 - When using air tools
 - All of the above
- Air compressor tanks should be drained:
 - Every month
 - Every week
 - At the end of each workday
- An air hose can be used if:
 - In good overall condition
 - Cracked or weathered
 - Cracked or weathered, but repaired
 - Both a and c
- True or false: a gasoline-driven compressor can be used in a building.
 - True
 - False
- When using air tools, _____ remove the muffler packing.
 - Always
 - Never
 - Only when more power is needed
 - Sometimes

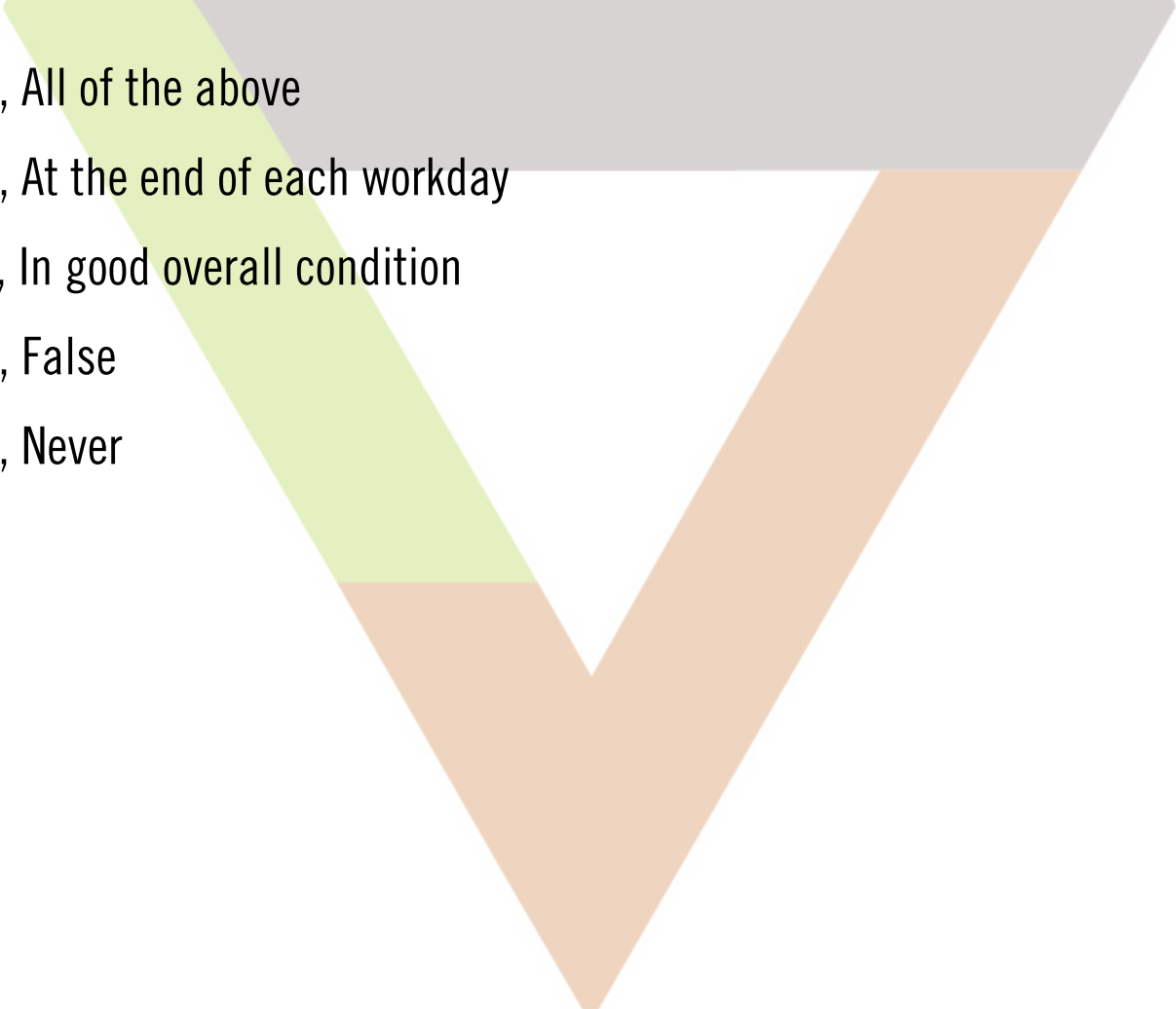


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Shop Safety | Quiz

Air Compressors

Answer Key

- 
1. D, All of the above
 2. C, At the end of each workday
 3. A, In good overall condition
 4. B, False
 5. B, Never



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Shop Safety | Student Notes

Bench Mounted Power Tools

General Safety

Bench or pedestal mounted power tools must be securely _____ to a solid surface prior to _____. Ensure that all safety guards are in place and properly adjusted and that _____ cords are in good condition. No _____ clothing or jewelry should be worn, and long hair should be _____. Safety glasses and hearing _____ should be worn, and a face shield is appropriate with any material that can shatter. Gloves should typically not be worn when working with _____ or reciprocating tools, as they can pull hands into the _____. Power should be disconnected _____ to making repairs or _____ to equipment.

Grinders

Bench grinders are an _____ way of shaping metal or _____ rust and paint. When using a stone _____ wheel, never grind with the side of the disc unless it is specifically _____ to do so. Never use a wheel with cracks or _____, as they can fly apart. Make sure the wheel is _____ for the speed at which the grinder spins. Before _____ a wheel, suspend it by its _____ hole and tap it with a nonmetallic object. If it rings, it is not _____. If a dull thud is heard, it is cracked and should not be used. Bench _____ must also be equipped with tool rests no more than 1/8th inch _____ from the wheel and spark guards 1/4th inch away.

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Bench Mounted Power Tools

Drill Press

Drill presses allow for fast, _____, precise drilling. Always clamp the workpiece to the table and have the press set to the correct _____ before drilling. Be sure the chuck key is _____ from the chuck before turning on the power, and do not grab the chuck to stop the machine after _____ off the power. When drilling a large hole, it is _____ to start with a smaller pilot hole and work up in steps to the final diameter.

Table Saw

Table saws are perfect for making _____, precise rip cuts in wood. Always use a push stick if hands would otherwise be within _____ inches of the blades during a cut. _____ the blade height so that it is only slightly (less than $\frac{1}{4}$ ") above the material being cut. Hold the _____ tight against the fence and support overhang to keep the wood from _____. When a piece of wood is caught between the blade and the fence, it can be violently flung towards the user.

_____ your body so it is not in line with the blade. Never make _____ using the fence. Use a miter gauge instead. _____ use the blade guard, riving knife, and anti-kickback pawls.



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Bench Mounted Power Tools

Bandsaw/Scroll Saw

Used for _____ curves in decorative work, scroll saws cut with a reciprocating motion. _____ use a sharp blade and ensure that it is installed _____ and correctly. Band saws are used for _____ or cutting curves in metal or wood. Metal cutting band saws are often automatic, using the weight of the saw itself to _____ a piece of metal. Always be sure to have plenty of coolant in the machine and monitor the condition of the wheels and blade. If the blade ever overheats, replace it. Make sure the _____ switch is in working order. _____ band saws require the workpiece to be moved. Ensure the blade is sharp and not _____, and the wheels are in good condition. Keep hands well _____ of the blade and use a push stick if necessary.



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Bench Mounted Power Tools

Answer Key

1. mounted, operation, electrical, loose, secured, protection, rotating, equipment, prior, adjustments
2. efficient, removing, grinding, designed, damage, rated, installing, center, cracked, grinders, away
3. repetitive, speed, removed, turning, advisable
4. long, two, adjust, workpiece, drooping, position, crosscut, always
5. tight, always, tightly, resawing, crosscut, shutoff, woodcutting, overheated, clear



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Shop Safety | Quiz

Bench Mounted Power Tools

1. When using a grinder:
 - a. Always use the proper guards
 - b. Make sure the guards are adjusted properly
 - c. Both a and b
 - d. Guards are optional
2. True or false: Wear gloves when using a drill press.
 - a. True
 - b. False
3. When making crosscuts on the table saw:
 - a. Use the fence
 - b. Use a miter gauge
 - c. Use a bevel holder
 - d. Use a carbide toothed blade
4. When using a miter saw, make sure:
 - a. The cut angle is locked in firmly
 - b. The fence is locked in firmly
 - c. The blade is locked in firmly
5. If bandsaw wheels lose balance and vibrate:
 - a. Bend them straight again
 - b. Use lighter cutting pressure
 - c. Check them and their shafts for straightness, and replace the bent part



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Shop Safety | Quiz

Bench Mounted Power Tools

Answer Key

1. C, Both A and B
2. B, False
3. B, Use a miter gauge
4. A, The cut angle is locked in firmly
5. C, Check them and their shafts for straightness and replace the bent part



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Power Hand Tools

Electric Power Tools

Electric power tools are cheap, easy to use, powerful, and efficient. When dealing with them you should always keep in mind:

- Electric shock is one of the _____ risks associated with electric power tools. Inspect cords for _____ prior to use. When possible, use a GFCI plug/outlet and never bend or cut the ground pin in order to use a non-grounded _____ cord or outlet.
- Do not carry tools by the _____, or yank on the cord to _____ it from the receptacle.
- Electric tools generate heat with use, so be sure to let the tool cool off if it gets too _____.
- Do not use electric tools in overly _____ environments.
- Disconnect tools from power when not in use, before servicing, and when changing _____, etc.
- Do not stall the electric motor, as this can melt the _____, cause smoke, and keep it from working.
- Never use an extension cord rated for less than the tool's maximum power draw, and always keep extension cords _____ up out of the way.



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Power Hand Tools

Pneumatic/Air Power Tools

Pneumatic or air tools are used in many garages, farms, and ranches due to their better durability, serviceability, and power. With air tools:

- Be aware that air tools get _____ with use. On cold days it may be advisable to wear _____.
- Be aware that air tools generate much more _____ and RPMs than comparably sized electric or battery tools and handle them accordingly.
- Air tools can be used without fear of _____ and so may be used in wet environments or where a sparking electric tool could otherwise be _____.
- Air tools are extremely loud, so wear hearing _____ when using them.
- Never use a worn, damaged, or cracked air hose and keep air hoses _____ up out of the way. Do not carry tools by the hose.



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Power Hand Tools

Gasoline Hand Tools

Gasoline-powered hand tools are found mainly in the form of string trimmers, edgers, blowers, and chainsaws.

- Always keep the spark arrester _____ and in place. This screen in the muffler helps prevent fires.
- Start the machine resting on the ground, using a foot to hold it in place in order to _____ injury.
- With two-stroke engines, always mix oil and gas per the manufacturer's instructions for optimum _____ efficiency, fuel usage, lubrication, and power.
- When string trimming or edging, eye _____ is especially important, as the strings or blades frequently fling rocks and debris in the user's direction.
- Keep gas and oil in approved containers and in a safe location as they are very _____.
- When using a chainsaw, always make sure to:
 - Wear chaps, helmet, eye and ear protection
 - Have a clear plan for both the direction of the tree falling and for your escape should the tree not go where planned
 - Support the wood and make relief cuts to prevent kickback. Anti-_____ chains are advisable.
 - Always use a sharp chain to prevent _____ the bar. Stop the saw or use the chain brake when carrying the saw.
 - Avoid running the _____ in dirt, as this can dull the chain and fling debris at the use.



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Power Hand Tools

Answer Key

1. primary, damage, extension, cord, unplug, hot, wet, blades, insulation, coiled
2. cold, gloves, power, electrocution, dangerous, protection, coiled
3. clean, prevent, cooling, protection, flammable, kickback, overheating, chain



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Shop Safety | Quiz

Power Hand Tools

1. Always keep air hoses and extension cords:
 - a. In OSHA-approved containers
 - b. In a corner
 - c. Coiled or wound up out of the way
 - d. On the floor
2. When an electric power tool gets hot:
 - a. Pour water on it
 - b. Use it, but at a reduced speed
 - c. Allow it to cool off before further use
3. A pneumatic tool generally makes _____ RPM's than a comparable electric tool.
 - a. More
 - b. Less
 - c. About the same
4. When starting gasoline driven hand tools:
 - a. Hold the rope and use the weight of the tool to start it
 - b. Hold the tool between your knees and start it
 - c. Have a friend hold the tool while you start it
 - d. Put the tool on the ground and hold it with a foot to start it
5. Chainsaw PPE includes:
 - a. Chaps, hard hat, earmuffs, safety glasses and gloves
 - b. Hard hat, safety glasses, earmuffs, and gloves
 - c. PPE is for sissies
 - d. Sunglasses, hard hat, earmuffs, and gloves



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Shop Safety | Quiz

Power Hand Tools

Answer Key

1. C, Coiled or wound up out of the way
2. C, Allow it to cool before further use
3. A, More
4. D, Put the tool on the ground and hold it with a foot to start it
5. A, Chaps, hard hat, ear muffs, safety glasses and gloves



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Shop Load Handling

Jacks

Mechanical jacks use devices such as _____ and screws to lift and lower loads. Screw jacks and scissor jacks are common _____ to vehicle spare kits. They use screw threads to lift the load. Another popular jack is the high-lift or farm jack. They use a series of levers and pins for _____. They are very useful for off-road or _____ vehicles. They are notorious, however, because when lowering a load the handle can swing down quickly with force. A tight grip should be maintained on the handle, and care should be taken to stay _____ the handle travel path.

Hydraulic jacks allow a small force _____ to one side of a pump to be translated into a large force on the other side. This force _____ provides great lifting _____ in a small package. They can be found usually as rolling floor jacks or bottle jacks. Floor jacks are very common in _____ environments because of their low position and maneuverability. Bottle jacks can be found with weight ratings of one to fifty tons.

When lifting a load with a jack, always make certain that the jack is on a firm, level surface. Any jack is _____ to falling over, but especially farm jacks, due to their height. Stay clear of equipment, and do not lie _____ without the use of static supports such as jack stands or wood blocks. Be aware of the center of gravity of the load and _____ any wheels that might allow the weight to shift. Also, choose a lifting point that can support the _____ of the load, such as the frame of a vehicle. Never exceed the rated capacity of the jack, as it can give a false sense of _____ and then fail catastrophically.

Shop Safety | Student Notes

Shop Load Handling

Hoisting

Chain hoists are a _____ addition to any workshop, and they can be found with very high _____ ratings. Electric and hydraulic hoists are also available. Inspect chains, ropes, or cables for _____ or wear prior to use. When overhead lifting, be sure that the hoist has a brake or load holding capability. Many electric winches do not have a _____ to keep the load from pulling the line back out. Probably the most _____ issue with overhead lifting is not the hoist, but the supporting structure. It is not advisable to hoist from the _____ or beams of a building unless they are designed to do so. Often hoists are _____ on homemade gantries, which is risky at best. Always ensure the hoist is mounted to a _____ anchor. Lift slowly and avoid swinging the load. Do not allow anyone underneath a suspended load.

Supporting the Load

Probably the most important aspect of _____ anything is keeping it from falling. Wood cribbing or blocks are acceptable when stacked properly on firm ground. Cinder blocks should not be used for _____ as they can fail unexpectedly. When lifting a _____, jack stands should be used to support the load. Never get under a vehicle with just a jack supporting it. Jacks have a smaller footprint than jack _____, leaving the vehicle _____ to falling off. Jacks can also bleed off or malfunction, allowing the load to fall. Jack stands are built with few or no _____ parts and as such are much better at holding _____ long term than jacks. Keep in mind that jack stands also have weight ratings.

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Shop Load Handling

Answer Key

1. levers, additions, lifting, oversize, outside, applied, multiplication, power, automotive, susceptible, underneath, block, weight, security
2. sensible, weight, damage, mechanism, frequent, trusses, mounted, capable
3. lifting, support, vehicle, stands, susceptible, moving, loads



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Shop Safety | Quiz

Shop Load Handling

1. True or False: A 20-ton bottle jack can safely lift 25 tons.
 - a. True
 - b. False
2. When lifting with a jack, it is ok if the ground is
 - a. Concrete
 - b. Mud
 - c. Sand
3. Hoists used for overhead lifting should always have a _____.
 - a. Chain
 - b. Hook
 - c. Brake system
 - d. Laser
4. Farm jacks are dangerous because _____.
 - a. Lasers
 - b. They fall over easily
 - c. You can get hit with the lever when lowering a load
 - d. B and C
5. True or false- when jack stands are unavailable, wood is acceptable for cribbing.
 - a. T, Only if stacked properly and on firm ground-
 - b. F
 - c. T



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Shop Safety | Quiz

Shop Load Handling

Answer Key

1. B, False
2. A, Concrete
3. C, Brake system
4. D, Both B and C
5. A, Only if stacked properly and on firm ground



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Torch Safety

Types of Torches

Oxy-acetylene torches use a _____ of highly flammable acetylene gas and oxygen to make a flame _____ 6,330 degrees Fahrenheit. This is the only torch able to cut steel. Oxy-acetylene torches are widely used to heat steel for bending and cutting, welding when electricity is not readily _____, and other specialty tasks such as underwater welding and cutting, heat treating stone, and fire polishing glass. Acetylene tanks and hoses are typically red, and oxygen tanks and hoses are usually green or _____.

Plumber's torches can be found in many shops as well since they are more compact. Most of these are propane-fueled, burning at about 3,500 degrees Fahrenheit. They are mainly used for _____ copper pipes or loosening stuck fasteners and are not powerful enough to cut, braze, or melt most _____. They can also be found fueled by butane, propylene, or a blend of gases.

Safety

The cylinders or "bottles" used to hold oxygen and acetylene gas are _____, and safe handling practices should be following during transportation and storage. When moving the cylinders, always _____ the regulator and install the valve cap. Cylinders should be kept in a vertical position and chained to a permanent structure during use and _____. An oxygen cylinder at 2,000 psi can become a lethal projectile if it falls over and the _____ valve is damaged.



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Torch Safety

Acetylene gas is _____ at pressures above 30 psi. It is stabilized for use by dissolving it in acetone and using a special porous _____ inside the gas cylinder. If an acetylene cylinder is transported horizontally then it should be allowed to _____ in the vertical position for as long as it was horizontal. This will prevent acetone from being withdrawn from the tank.

Gas cylinders, regulators, hoses, and torches should be _____ for damage prior to use. Regulators should be designed and labeled for the gas being used. Use a soapy water solution to _____ connections for leaks. Ensure that a hose check valve is in place to prevent gas mixing in the hoses. Keep hoses and tanks away from heat sources and open flames. _____ oil regulators, valves, or torches, as oil is flammable.

Gas valves on oxygen tanks are _____ to be opened fully during operation to prevent leaks. However, acetylene valves should not be _____ more than 1-1/2 turns. When using the torch, always light fuel first, then introduce oxygen. Use the correct tip size and pressure for the task being _____. A backfire can occur if the pressure is too _____ or the torch tip touches the work surface. During a backfire, the torch flame moves back into the tip and is extinguished with a loud pop. This is generally harmless, but a _____ can cause a flashback. This is often indicated by a loud hissing or whistling sound after a backfire.

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Torch Safety

The flame can travel back through the hoses and _____ the gas cylinder. Flashback arrestors should be employed to help _____ this. When finished, turn off the oxygen first and then the acetylene at the torch. Then close the valves on the gas cylinders. Finally, reopen the torch valves to bleed off any _____ gas in the hoses.

Although torches are not as _____ as arc welding, they still produce eye damaging light. Safety glasses with a filter shade of 2-5 should be worn based on the operation being performed. Wear flame-resistant _____ and gloves to protect the skin from sparks and slag, and do not roll up sleeves or pant legs. Many metals, alloys, and anti-rust coatings give off _____ fumes when heated. Galvanized metal is notorious for this. _____ make sure to be in a well-ventilated area when using a torch.

Finally, do not use oxygen as a _____ for compressed air to blow off clothes or surfaces. The oxygen is absorbed by clothing and makes them extra _____ in the event of ignition.



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Torch Safety

Answer Key

1. combination, burning, available, black, soldering, metal
2. pressurized, remove, storage, cylinder, unstable, material, equalize, inspected, check, never, unstable, material, equalize, inspected, check, never, designed, opened, performed, low, backfire, explode, prevent, excess, dangerous, clothing, harmful, always, substitute, flammable



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Shop Safety | Quiz

Torch Safety

1. When cutting steel, a _____ torch is used.
 - a. Propane
 - b. Butane
 - c. Oxyacetylene
 - d. Methane
2. Cylinders in transport should be kept _____.
 - a. Vertical, with the cap on
 - b. Vertical
 - c. Horizontal
 - d. At a 45 degree angle
3. True or False: Fuel cylinder regulators should be kept well oiled.
 - a. True
 - b. False
4. When using oxyacetylene, light which gas first?
 - a. Oxygen
 - b. Propane
 - c. MAPP
 - d. Acetylene
5. Using incorrect pressure or tip size can result in _____.
 - a. knickknack
 - b. paddywhack
 - c. flashback
 - d. trashesack



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Torch Safety

Answer Key

1. C, Oxyacetylene
2. A, Vertical, with a cap on
3. B, False
4. D, Acetylene
5. C, Flashback



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Shop Safety

Name: _____

1. Hearing protection should be used:
 - a. When using an oilless air compressor
 - b. When using an oiled air compressor
 - c. When using air tools
 - d. All of the above
2. Air compressor tanks should be drained:
 - a. Every month
 - b. Every week
 - c. At the end of each workday
3. An air hose can be used if:
 - a. In good overall condition
 - b. Cracked or weathered
 - c. Cracked or weathered, but repaired
 - d. Both a and c
4. True or false: a gasoline-driven compressor can be used in a building.
 - a. True
 - b. False
5. When using air tools, _____ remove the muffler packing.
 - a. Always
 - b. Never
 - c. Only when more power is needed
 - d. Sometimes



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Shop Safety

Name: _____

6. When using a grinder:
 - a. Always use the proper guards
 - b. Make sure the guards are adjusted properly
 - c. Both a and b
 - d. Guards are optional
7. True or false: Wear gloves when using a drill press.
 - a. True
 - b. False
8. When making crosscuts on the table saw:
 - a. Use the fence
 - b. Use a miter gauge
 - c. Use a bevel holder
 - d. Use a carbide toothed blade
9. When using a miter saw, make sure:
 - a. The cut angle is locked in firmly
 - b. The fence is locked in firmly
 - c. The blade is locked in firmly
10. If bandsaw wheels lose balance and vibrate:
 - a. Bend them straight again
 - b. Use lighter cutting pressure
 - c. Check them and their shafts for straightness, and replace the bent

part

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Shop Safety

Name: _____

11. Always keep air hoses and extension cords:
- a. In OSHA-approved containers
 - b. In a corner
 - c. Coiled or wound up out of the way
 - d. On the floor
12. When an electric power tool gets hot:
- a. Pour water on it
 - b. Use it, but at a reduced speed
 - c. Allow it to cool off before further use
13. A pneumatic tool generally makes _____ RPM's than a comparable electric tool.
- a. More
 - b. Less
 - c. About the same
14. When starting gasoline driven hand tools:
- a. Hold the rope and use the weight of the tool to start it
 - b. Hold the tool between your knees and start it
 - c. Have a friend hold the tool while you start it
 - d. Put the tool on the ground and hold it with a foot to start it
15. Chainsaw PPE includes:
- a. Chaps, hard hat, earmuffs, safety glasses and gloves
 - b. Hard hat, safety glasses, earmuffs, and gloves
 - c. PPE is for sissies
 - d. ~~Sunglasses, hard hat, earmuffs, and gloves~~



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Shop Safety | Comprehensive Exam

Shop Safety

Name: _____

16. True or False: A 20-ton bottle jack can safely lift 25 tons.
- a. True
 - b. False
17. When lifting with a jack, it is ok if the ground is
- a. Concrete
 - b. Mud
 - c. Sand
18. Hoists used for overhead lifting should always have a _____.
- a. Chain
 - b. Hook
 - c. Brake system
 - d. Laser
19. Farm jacks are dangerous because _____.
- a. Lasers
 - b. They fall over easily
 - c. You can get hit with the lever when lowering a load
 - d. B and C
20. True or false- when jack stands are unavailable, wood is acceptable for cribbing.
- a. T, Only if stacked properly and on firm ground-
 - b. F
 - c. T



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Shop Safety

Name: _____

21. When cutting steel, a _____ torch is used.
- a. Propane
 - b. Butane
 - c. Oxyacetylene
 - d. Methane
22. Cylinders in transport should be kept _____.
- a. Vertical, with the cap on
 - b. Vertical
 - c. Horizontal
 - d. At a 45 degree angle
23. True or False: Fuel cylinder regulators should be kept well oiled.
- a. True
 - b. False
24. When using oxyacetylene, light which gas first?
- a. Oxygen
 - b. Propane
 - c. MAPP
 - d. Acetylene
25. Using incorrect pressure or tip size can result in _____.
- a. knickknack
 - b. paddywhack
 - c. flashback
 - d. trashesack



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Shop Safety

Answer Key

1. D, All of the above
2. C, At the end of each workday
3. A, In good overall condition
4. B, False
5. B, Never
6. C, Both A and B
7. B, False
8. B, Use a miter gauge
9. A, The cut angle is locked in firmly
10. C, Check them and their shafts for straightness and replace the bent part
11. C, Coiled or wound up out of the way
12. C, Allow it to cool before further use
13. A, More
14. D, Put the tool on the ground and hold it with a foot to start it
15. A, Chaps, hard hat, ear muffs, safety glasses and gloves
16. B, False
17. A, Concrete
18. C, Brake system
19. D, Both B and C
20. A, Only if stacked properly and on firm ground
21. C, Oxyacetylene
22. A, Vertical, with a cap on
23. B, False
24. D, Acetylene
25. C, Flashback



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