

## Quiz On Information Learned From Chapter 1

1. Most hydraulic circuits are designed by:
  - A. mechanical engineers.
  - B. fluid power engineers.
  - C.** fluid power distributor salesmen.
2. Atmospheric pressure at sea level is equal to approximately:
  - A. 14.7 Hg
  - B.** 14.7 PSI
  - C. 30 PSI
3. Gauges that read Pounds Per Square Inch Absolute (PSIA):
  - A.** show atmospheric pressure on their scale.
  - B. do not show atmospheric pressure on their scale.
  - C. have nothing to do with atmospheric pressure.
4. Static head pressure of hydraulic oil is equal to approximately:
  - A. .1 PSI per foot of elevation.
  - B. .2 PSI per foot of elevation.
  - C.** .4 PSI per foot of elevation.
5. The power of vacuum comes from:
  - A. the power of a pump.
  - B.** earth's atmosphere.
  - C. the size of a pump.
6. Vacuum generators use:
  - A.** compressed air to create a vacuum.
  - B. an electric motor to create vacuum.
  - C. an air motor to create vacuum.
7. Pascal's Law states that pressure is produced by the pump and motor of a hydraulic system.
  - A. True
  - B.** False
8. Pressure in a fluid power system comes from:
  - A.** resistance to flow.
  - B. motor horsepower.
  - C. pump volume.
9. A pressure gauge reading of 100 BAR would be:
  - A. 2940 PSI
  - B. 1070 PSI
  - C.** 1450 PSI
10. When a gas or liquid is heated it will:
  - A. contract.
  - B. stay the same.
  - C.** expand.

## Quiz On Information Learned From Chapter 2

1. Hydraulic oil is compressible:
  - A. not at all.
  - B. by a great amount
  - C** by a small amount
  
2. Viscosity is a measure of the hydraulic fluids:
  - A. color.
  - B. temperature.
  - C** thickness.
  
3. Synthetic fluids:
  - A** cost more than mineral based fluids.
  - B. will not burn.
  - C. are compatible with most seal materials.
  
4. The main purpose for hydraulic fluids is:
  - A. to fill the tank.
  - B. to leak from every opening.
  - C** transmit energy, lubricate and seal.
  
5. Over heating hydraulic fluid:
  - A. makes it last longer.
  - B** deteriorates the additives .
  - C. makes it smell better.
  
6. New hydraulic oil is clean to:
  - A. 5 microns.
  - B. 10 microns.
  - C** 25 microns.
  
7. Viscosity Index is a measurement of the change of flow characteristics of a fluid from one temperature another.
  - A** True
  - B. False
  
8. Hydraulic fluid should be stored:
  - A. in a damp moist atmosphere.
  - B** in a closed and sealed container.
  - C. in an open container.
  
9. A high viscosity number gives:
  - A** better sealing characteristics.
  - B. poorer sealing characteristics.
  - C. has no effect on sealing characteristics.
  
10. Refined mineral oil has:
  - A. excellent lubricating qualities.
  - B. good lubricating qualities.
  - C** poor lubricating qualities.

### Quiz On Information Learned From Chapter 3

1. Which type of threads are recommended for plumbing hydraulic circuits?  
 A. SAE straight threads.  
 B. NPT tapered pipe threads.  
 C. BSP tapered pipe threads.
2. What is the minimum size pipe to handle 400 CFM air flow 500 feet?  
 A. 4"  
 B. 5"  
 C. 6"
3. What is the recommended feet per second (FPS) velocity for a suction line?  
 A. 2-4 FPS  
 B. 10-15 FPS  
 C. 30+ FPS
4. A Grid System for plant air piping requires:  
 A. several small compressors.  
 B. several large compressors.  
 C. one adequately sized compressor.
5. For hydraulic lines up to and including 2" use:  
 A. steel tubing.  
 B. black iron pipe.  
 C. plastic pipe.
6. Always take drop lines in an air piping circuit from the:  
 A. bottom of the header.  
 B. side of the header.  
 C. top of the header.
7. Elbows are better than smooth tubing bends.  
 A. True  
 B. False
8. The pipes in an air plumbing system should be:  
 A. sloped away from the receiver tank.  
 B. sloped toward the receiver tank.  
 C. level.
9. Hose size is designated by its:  
 A. I.D.  
 B. O.D.  
 C. N.D.
10. Velocity in hydraulic circuits return lines should be:  
 A. 2-4 FPS.  
 B. 10-15 FPS.  
 C. 15-20 FPS.

## Quiz On Information Learned From Chapter 5

1. Fluid Power circuits use schematic drawings to:  
 A. simplify component function details.  
 B. make it so only trained persons can understand the functions.  
 C. make the drawing look impressive.
2. A pneumatic symbol is:  
 A. different from a hydraulic part used for the same function.  
 B. the same as a hydraulic part used for the same function.  
 C. not to be compared to a hydraulic part used for the same function.
3. Pneumatic systems usually do not exceed:  
 A.  $\frac{1}{2}$ -1 HP.  
 B. 1-2 HP.  
 C. 2-3 HP.
4. Most hydraulic circuits:  
 A. operate from a central hydraulic power unit.  
 B. use air over oil power units.  
 C. have a dedicated power unit.
5. Hydraulic and pneumatic circuits:  
 A. perform the same way for all functions.  
 B. perform differently for all functions.  
 C. perform the same with some exceptions.
6. The lubricator in a pneumatic circuit is the:  
 A. first element in line.  
 B. second element in line.  
 C. last element in line.
7. Series circuits work on both hydraulic and pneumatic actuators.  
 A. True  
 B. False
8. Comparing first cost of hydraulic systems to pneumatic systems generally they are:  
 A. more expensive to purchase.  
 B. less expensive to purchase.  
 C. cost about the same.
9. Comparing operating cost of hydraulic systems to pneumatic systems generally they are.  
 A. more expensive to operate..  
 B. less expensive to operate.  
 C. cost about the same to operate.
10. The most common hydraulic fluid is:  
 A. mineral oil.  
 B. synthetic fluid.  
 C. water.

## Quiz On Information Learned From Chapter 6

- Air cooled heat exchangers:
  - are less expensive than water cooled heat exchangers.
  - are not as efficient as water cooled heat exchangers.
  - require a water hookup.
- Immersion type tank heaters watt density should never exceed:
  - 2-4 watt's per square inch.
  - 4-6 watt's per square inch.
  - 8-10 watt's per square inch.
- A hydraulic reservoir is normally sized at:
  - 1-2 times pump GPM flow.
  - 2-3 times pump GPM flow.
  - 4-6 times pump GPM flow.
- The main reason for the hydraulic tank is to:
  - hold enough fluid for the circuit.
  - deaerate the returned fluid.
  - cool the fluid.
- This symbol shows a line that:
  - returns below fluid level.
  - above fluid level.
  - on the same side as the suction line.
- Inlet and return lines should:
  - terminate below fluid level.
  - terminate above fluid level.
  - doesn't really matter.
- Always trust the sight glass for accurate fluid volume.
  - True
  - False
- The best layout for pump and reservoir is:
  - pump on top.
  - pump alongside.
  - pump underneath.
- All heat in a hydraulic system comes from:
  - wasted energy.
  - too large electric motor.
  - oversize piping and valves.
- A pneumatic systems reservoir is:
  - sized 3-4 times compressor CFM flow.
  - sized 6-8 times compressor flow.
  - the earth's atmosphere.



## Quiz On Information Learned From Chapter 7

1. One micrometer (Micron,  $\mu$ ) measures:  
 A. .000039"  
 B. .000020"  
 C. .000010"
2. Common filter locations are:  
 A. suction line, cylinder line and return line.  
 B. suction line, pressure line and return line.  
 C. pressure line, return line and pilot line.
3. A bi-directional filter uses:  
 A. four check valves to direct flow through the element.  
 B. filter elements that can take flow in either direction.  
 C. two filters in one housing.
4. An air line lubricator introduces:  
 A. a small amount of anti-freeze to the air line.  
 B. a small amount of oil to the air line..  
 C. a small amount of sealant to the air line.
5. Refrigeration type air dryers remove water from an air line by:  
 A. a chemical absorbent action.  
 B. a chemical adsorbent action.  
 C. reducing the temperature of the air.
6. Off line filtration loops can be used to:  
 A. filter the fluid.  
 B. cool the fluid.  
 C. heat the fluid.
7. Servo valve circuits require a non bypass pressure line filter.  
 A. True  
 B. False
8. ISO cleanliness level numbers:  
 A. start with higher numbers and go to lower numbers (16/14/11.)  
 B. start with lower numbers and go to higher numbers (11/14/16.)  
 C. do not have a particular number pattern.
9. A coalescing filter can remove particles down to:  
 A. .1 $\mu$   
 B. .2 $\mu$   
 C. .3 $\mu$
10. A "BETA RATIO" filter rating indicates:  
 A. what size and how many particles will be removed.  
 B. what size and what type particles will be removed.  
 C. the size and shape of the particles removed.

## Quiz On Information Learned From Chapter 8

1. A rule of thumb for air compressor output for each Horsepower is:
  - A. 2 SCFM @ 100 PSI
  - B. 3 SCFM @ 100 PSI
  - C.** 4 SCFM @ 100 PSI
  
2. Large air compressors load and unload as pressure drops and builds, small air compressors:
  - A. do the same.
  - B. never build enough pressure.
  - C.** turn on at a minimum pressure and off at a maximum pressure.
  
3. A hydraulic pump produces:
  - A.** flow in gallons per minute.
  - B. pressure in pounds per square inch (PSI).
  - C. both of the above.
  
4. A positive displacement pump:
  - A.** cannot turn if the outlet is blocked.
  - B. can turn with the outlet blocked.
  - C. can only turn with the outlet blocked.
  
5. Gear pumps:
  - A. can be variable volume.
  - B.** cannot be variable volume.
  - C. can be pressure compensated.
  
6. Vane pumps:
  - A.** can be variable volume.
  - B. cannot be variable volume.
  - C. cannot be pressure compensated.
  
7. Piston pumps .
  - A.** can be variable volume.
  - B. cannot be variable volume.
  - C. cannot be pressure compensated.
  
8. An open center circuit:
  - A. blocks pump flow in the center condition.
  - B. does not have a center condition.
  - C.** allows pump to go to tank in center condition.
  
9. A closed center circuit:
  - A.** blocks pump flow in the center condition.
  - B. does not have a center condition.
  - C. allows pump to go to tank in center condition.
  
10. This symbol is:
  - A. pressure compensated variable volume pump.
  - B.** fixed volume pump.
  - C. bi-directional pump.



## Quiz On Information Learned From Chapter 8 (Cont'd.)

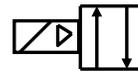
11. While the input shaft of a bi-directional pump is turning one direction of rotation. it:  
 A. can move fluid from either port.  
 B. can only move fluid from one port.  
 C. must have a suction line hooked to tank.
12. Wobble plate piston pumps:  
 A. must rotate the opposite direction to reverse flow.  
 B. can reverse flow while turning the same way.  
 C. cannot reverse flow at anytime.
13. Swash plate piston pumps:  
 A. have moveable or fixed angle swash plates.  
 B. are always bi-directional.  
 C. can only move fluid one way.
14. Bent axis pumps :  
 A. cannot be fixed volume.  
 B. have better high vacuum inlet characteristics.  
 C. cannot be bi-directional flow.
15. Load sensing pumps:  
 A. operate at load pressure plus load sense bias spring pressure.  
 B. operate at compensator pressure at all times.  
 C. cannot be variable volume.
16. Horsepower and torque limiting pumps:  
 A. use extra horsepower all the time.  
 B. use minimum horsepower all the time.  
 C. never use more than a preset horsepower regardless of pressure.
17. Pump shaft alignment is not important at any time.  
 A. True  
 B. False
18. Closed loop circuits:  
 A. use a makeup pump to keep the loop full.  
 B. must have extra large flow lines to keep the pump from cavitating.  
 C. cannot reverse the direction of an actuator.
19. A pump motor adapter is:  
 A. a device to keep the pump from cavitating.  
 B. a unit to match pump horsepower to motor horsepower.  
 C. a device to directly attach a pump to an electric motor.
20. Cavitation is caused by:  
 A. too little fluid volume at the pump inlet.  
 B. too much fluid volume at the pump inlet.  
 C. too much fluid volume at the pump outlet .

## Quiz On Information Learned From Chapter 9

- Components in a fixed volume pump circuit are protected from excess pressure by a/an:  
 A. relief valve.  
 B. counter balance valve.  
 C. reducing valve.
- Direct acting relief valves have \_\_\_\_\_ response than/as a pilot operated relief valve.  
 A. slower  
 B. same  
 C. faster
- Pilot operated relief valves have \_\_\_\_\_ pressure override than/as a direct acting relief valve.  
 A. more  
 B. less  
 C. the same
- Solenoid operated relief valves can be made from:  
 A. direct acting relief valves.  
 B. pilot operated relief valves.  
 C. either type relief valve.
- A vent port is found on:  
 A. pilot operated relief valves.  
 B. direct acting relief valves.  
 C. either type relief valve.
- Solenoid operated relief valves can be used:  
 A. on the case drain of a pump.  
 B. on the tank line of a pump.  
 C. to unload the pressure port of a pump.
- Unloading valves are commonly found on:  
 A. pressure compensated pump circuits.  
 B. hydraulic motor circuits.  
 C. HI-LO pump circuits.
- An unloading valve is set for higher pressure than the relief valve in a HI-LO pump circuit.  
 A. True  
 B. False
- Unloading valves are different from relief valves because they:  
 A. are externally piloted.  
 B. do not control pressure.  
 C. Are normally open.
- Using a HI-LO pump circuit:  
 A. requires less horsepower.  
 B. requires more horsepower.  
 C. Requires about the same horsepower.

## Quiz On Information Learned From Chapter 10 (Cont'd.)

11. Direct solenoid operated valves:
- A. are only DC current activated.
  - B. are only AC current activated.
  - C.** operate off either AC or DC current.
12. Solenoid pilot operated valves must have \_\_\_\_\_ pilot pressure minimum.
- A. 25-50 PSI
  - B.** 50-75 PSI
  - C. 75-100 PSI
13. The “X” port on a solenoid pilot operated valve is for external:
- A. drain
  - B.** pilot pressure
  - C. either drain or pilot pressure
14. The “Y” port on a solenoid pilot operated valve is for external:
- A.** drain
  - B. pilot pressure
  - C. either drain or pilot pressure
15. Stroke limiters on the working spool of a solenoid pilot operated valve can:
- A. slow spool travel.
  - B. speed up spool travel
  - C.** control actuator speed.
16. A D10 size valve can flow up to:
- A. 80 GPM.
  - B. 90 GPM.
  - C.** 100 GPM.
17. This symbol is for a:
- A. hydraulic solenoid pilot operator.
  - B.** pneumatic solenoid pilot operator.
  - C. direct acting operator.



18. An open crossover (transition) valve blocks flow as it changes position.
- A. True
  - B.** False
19. Pneumatic directional control valves:
- A. are always sub-plate mounted.
  - B. are always in-line mounted.
  - C.** may be sub-plate or in-line mounted.
20. A Series bar manifold can have up to:
- A. one station.
  - B. two stations.
  - C.** three stations.

## Quiz On Information Learned From Chapter 11

- Slip-in cartridge valves are:
  - 2-Way normally open.
  - 2-Way normally closed.
  - 3-Way pilot operated.
- Slip-in cartridge valves have \_\_\_\_\_ response than/as a spool valve.
  - slower
  - same
  - faster
- It takes \_\_\_\_\_ slip-in cartridge valves to operate a double acting cylinder.
  - two
  - three
  - four
- To control the speed of an actuator powered by slip-in cartridge valves use a:
  - reducing valve.
  - flow control valve.
  - poppet stroke limiter
- Load induced pressure can hold a running away load in place by using a cover with:
  - shuttle valve.
  - pilot operated check valve.
  - stroke limiter.
- A slip-in cartridge 4-Way valve setup can be setup as:
  - two different center conditions.
  - three different center conditions.
  - four different center conditions.
- A slip-in cartridge relief valve uses a:
  - 1:2 area ratio poppet.
  - 1:1.1 area ratio poppet.
  - 1:1 area ratio poppet.
- Slip-in cartridge valves with working pressure at either port must always have pilot pressure on the poppet to stay closed.
  - True
  - False
- A slip-in cartridge relief valve operates the same as:
  - a pilot operated poppet relief valve.
  - a pilot operated balanced piston relief valve.
  - a direct acting relief valve.
- Unloading valves are different from relief valves because they:
  - are externally piloted.
  - do not control pressure.
  - Are normally open.

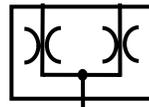
## Quiz On Information Learned From Chapter 12

1. Infinitely variable valves are for:
  - A. hydraulic circuits only.
  - B. pneumatic circuits only.
  - C. both hydraulic and pneumatic circuits.
  
2. Proportional and servo directional control valves have \_\_\_\_\_ flow response than conventional directional control valves.
  - A. slower
  - B. the same
  - C. faster
  
3. A Hydro-stat module under a proportional control valve:
  - A. gives a consistent pressure at its outlet.
  - B. gives a consistent flow at its outlet.
  - C. sets maximum pilot pressure.
  
4. An LVDT on a proportional directional control valve tells the electronic control:
  - A. how much flow is going through the it.
  - B. what the pressure is at its outlet.
  - C. what position the spool is in.
  
5. A proportional valve circuit \_\_\_\_\_ a feedback device from the actuator it controls.
  - A. may have
  - B. always has
  - C. never has
  
6. Electro-mechanically controlled servo valves are:
  - A. more contamination tolerant.
  - B. less contamination tolerant.
  - D. Have about the same contamination tolerance.
  
7. A servo valve circuit \_\_\_\_\_ has a feedback signal to the electronic controller:
  - A. sometime
  - B. never
  - C. always
  
- Infinitely variable directional control valves should be mounted as close as possible to the actuator.
  - A. True
  - B. False
  
9. Always size infinitely variable directional control valves:
  - A. with a high pressure drop.
  - B. with a low pressure drop.
  - D. it really does not matter what the pressure drop is.
  
10. A servo valve circuit for actuator positioning uses a/an:
  - A. encoder.
  - B. linear transducer.
  - D. load cell.

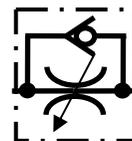
## Quiz On Information Learned From Chapter 13

1. A needle valve controls flow in:  
 A. both directions.  
 B. one direction.  
 C. neither direction.
2. Pressure compensated flow control valves maintain a constant flow:  
 A. because they have a special needle valve.  
 B. when pressure stays under 2,000 PSI.  
 C. because they maintain a constant pressure drop across the orifice.
3. A 3-port flow control:  
 A. can control different flows to several actuators at once.  
 B. can only control one actuator at a time  
 C. operates at maximum pressure for the whole cycle.
4. A 50-50 spool type flow divider valve can:  
 A. split flow in both directions.  
 B. only split flow in one direction.  
 C. is not used to split flow.
5. A priority flow dividers priority outlet:  
 A. changes flow as inlet flow changes.  
 B. changes flow as inlet pressure changes.  
 C. has constant flow when inlet flow is equal to or greater than its volume.
6. Pressure at the inlet of a spool type flow divider is:  
 A. equal to the lowest outlet pressure.  
 B. equal to the highest outlet pressure.  
 C. equal to the average of the sum of the outlet pressures.
7. Motor flow dividers use:  
 A. hydraulic motors in series to split flow.  
 B. hydraulic motors in parallel to split flow.  
 C. flow control valves to split flow.
8. Pressure at the inlet of a motor flow divider is:  
 A. equal to the lowest outlet pressure.  
 B. equal to the highest outlet pressure.  
 C. equal to the average of the sum of the outlet pressures.

9. This symbol is for a:  
 A. motor flow divider.  
 B. priority flow divider.  
 C. spool type flow divider.

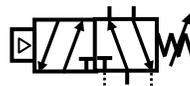


10. This symbol is for a:  
 A. pressure compensated flow control.  
 B. non-compensated flow control.  
 C. 3-port flow control.



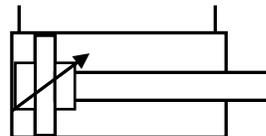
## Quiz On Information Learned From Chapter 14

1. An air line regulator is:  
 A. normally open.  
 B. normally closed.  
 C. normally neutral
2. An air sequence valve is usually a:  
 A. pilot operated 3-Way valve.  
 B. pilot operated 4-Way valve.  
 C. pilot operated 5-Way valve.
3. Hydraulic sequence valves are normally used in conjunction with:  
 A. a multi cylinder circuit with flow control valves.  
 B. multi cylinder circuits and single directional control valve.  
 C. multi cylinder circuits in place of relief valve.
4. Hydraulic kick down sequence valves :  
 A. open at set pressure and maintain inlet pressure.  
 B. open at set pressure and drop inlet pressure to outlet port pressure.  
 C. closes at set pressure.
5. Internally piloted counter balance valves main advantage is:  
 A. jerky action as the load is lowered.  
 B. never need to be re-adjusted at load change.  
 C. smooth controlled extend action of the load.
6. Externally piloted counter balance valves:  
 A. drop all back pressure at load contact.  
 B. must be adjusted for load changes.  
 C. have very smooth and controlled action on load extend.
7. Hydraulic reducing valves maintain pressure by:  
 A. opening when reaching set pressure.  
 B. closing when reaching set pressure.  
 C. sending fluid to tank at set pressure.
8. Hydraulic reducing valves:  
 A. never need a bypass check valve.  
 B. always need a bypass check valve.  
 C. need a bypass check valve when flow must be reversed..
9. Hydraulic reducing relieving valves:  
 A. send pump flow to tank just above set pressure.  
 B. send actuator flow to tank just above set pressure.  
 C. never send any system flow to tank.
10. This symbol is for a:  
 A. sequence valve.  
 B. counter balance valve.  
 C. reducing valve.



## Quiz On Information Learned From Chapter 15

1. A ram cylinder can only have \_\_\_\_\_ in one direction.  
A. movement  
**B.** force  
C. rotation
2. A ram cylinder has:  
A. a piston with seals to guide it.  
B. no piston or seals to guide it.  
**C.** a non sealing guide only.
3. The area of a cylinder is figured with the formula:  
A.  $F=PA$   
**B.**  $\pi r^2$   
C.  $\pi d^2$
4. Cylinder force or thrust is figured by the formula:  
**A.**  $F=PA$   
B.  $\pi r^2$   
C.  $\pi d^2$
5. A 2:1 area ratio cylinder has a rod that is:  
A. half the diameter of the piston.  
B. twice the diameter of the piston.  
**C.** half the area of the piston.
6. A double rod end cylinder with the same pressure at either end can have:  
A. equal force and speed in both directions of travel.  
B. higher force in one direction of travel.  
**C.** either of the above.
7. With the same pressure at either end a single rod end cylinder has:  
A. equal force in both directions of travel.  
**B.** more force extending.  
C. more force retracting.
8. Cable cylinders are:  
A. twice as long as their stroke.  
B. three times as long as their stroke.  
**C.** slightly longer than their stroke..
9. Non-Rotating rod cylinders:  
A. allow no radial movement of the piston rod.  
**B.** only allow some radial movement of the piston rod.  
C. can allow a lot of radial movement of the piston rod.
10. This symbol is for a:  
A. non-cushioned cylinder.  
B. cushion rod end only cylinder.  
**C.** cushion both ends cylinder.



## Quiz On Information Learned From Chapter 15 (Cont'd.)

11. Tandem cylinders can have almost \_\_\_\_\_ the force as a single cylinder.
- A. twice
  - B. three times
  - C. four times
12. Diaphragm cylinders have:
- A. small area and long strokes.
  - B. large area and long strokes.
  - C. large area and short stroke.
13. Always size an air cylinder with at least:
- A. 10% more force than required.
  - B. 25% more force than required.
  - C. 75% more force than required.
14. A cylinder with an actual 2:1 rod in a regeneration circuit will:
- A. extend twice as fast as retract.
  - B. extend and retract at the same speed.
  - C. cannot regenerate a 2:1 rod cylinder.
15. Hydraulic motors are usually rated in:
- A. pounds force.
  - B. lb. in., lb. ft. or newton meters torque.
  - C. horsepower.
16. Gear on gear hydraulic motors offer:
- A. high torque low RPM output.
  - B. high RPM low torque output.
  - C. high RPM nominal torque output.
17. Axial or inline piston motors offer:
- A. high torque low RPM output.
  - B. high RPM high torque output.
  - C. both of the above.
18. Radial piston hydraulic motors offer:
- A. high torque low RPM output.
  - B. high RPM low torque output.
  - C. high RPM nominal torque output.
19. Single vane rotary actuators give up to:
- A. 90° rotary output.
  - B. 180° rotary output.
  - C. 270° rotary output.
20. This symbol is for a:
- A. hydraulic rotary actuator.
  - B. pneumatic rotary actuator.
  - C. neither of the above.



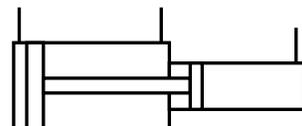
## Quiz On Information Learned From Chapter 16

1. A weight loaded accumulator:
  - A. loses pressure as fluid discharges.
  - B. gains pressure as fluid discharges.
  - C** stays the same pressure as fluid discharges.
2. A spring loaded accumulator:
  - A** loses pressure as fluid discharges.
  - B. gains pressure as fluid discharges.
  - C. stays the same pressure as fluid discharges.
3. Gas charged accumulators use:
  - A. oxygen.
  - B** nitrogen.
  - C. argon.
4. The most common accumulator circuit is:
  - A** supplementing pump flow.
  - B. making up for system leaks.
  - C. emergency power supply.
5. Precharge pressure should be checked at least every:
  - A. 1-2 month.
  - B. 2-3 months.
  - C** 3-6 months.
6. An accumulator may be used to:
  - A. make a pump run faster.
  - B. make a valve shift quicker.
  - C** make up for system leaks.
7. Accumulator pre-charge pressure is normally.
  - A. 95% of minimum system pressure.
  - B** 85% of minimum system pressure.
  - C. 75% of minimum system pressure.
8. When the pump is on an accumulator dump valve keeps fluid:
  - A. from going to the accumulator.
  - B. from going to the circuit.
  - C** from going to tank.
9. An unloading relief valve sends:
  - A. pump flow to tank at system pressure.
  - B. accumulator flow to tank at system pressure.
  - C** pump flow to tank at 25-100 PSI.
10. This symbol is:
  - A** weight loaded accumulator.
  - B. gas charged accumulator.
  - C. spring loaded accumulator.



## Quiz On Information Learned From Chapter 17

- Air-Oil systems use \_\_\_\_\_ as power and \_\_\_\_\_ as the controlling medium.:
  - oil, air
  - water, oil
  - air, oil
- Attached oil control units can control cylinder action:
  - both ways.
  - extend only.
  - retract only.
- Large diameter Air-Oil tanks:
  - increase pressure at the outlet.
  - decrease pressure at the outlet.
  - have no effect on pressure at the outlet.
- Size oil flow lines in an Air-Oil circuit for:
  - 2-4 FPS velocity.
  - 4-8 FPS velocity.
  - 10-15 FPS velocity.
- Tandem cylinders can be used in:
  - synchronizing circuits.
  - mid stroke stop circuits.
  - two speed circuits
  - all of the above.
- Air to oil intensifier oil output volume is equal to:
  - air input volume.
  - a large portion of air input volume.
  - a small portion of air input volume.
- Air to oil intensifier output pressure is controlled by.
  - the area ratio of the pistons and/or rams involved.
  - the length of stroke.
  - what size the outlet port is.
- Air to air intensifiers:
  - run continuously regardless of output pressure.
  - stall when output pressure on the intensifier piston reaches input pressure.
  - stall when output pressure on the intensifier piston tries to go higher than input pressure times area ratio.
- Air to air intensifiers are good for:
  - high volumes of air at increased pressure.
  - medium volumes of air at increased pressure.
  - low volumes of air at increased pressure.
- This symbol is for a/an:
  - double rod cylinder.
  - intensifier.
  - Hi-Lo pump.



## Quiz On Information Learned From Chapter 18

- Quick exhaust valves allow:
  - air to exit the cylinder rapidly.
  - oil to exit the cylinder rapidly
  - both of the above.
- A quick exhaust valve is always mounted:
  - close to the directional valve port.
  - at the directional valves inlet port.
  - close to the cylinder port.
- Speed control mufflers only work as:
  - meter out flow controls.
  - meter in flow controls.
  - bleed-off flow controls.
- A pressure gauge reading PSIA shows:
  - only positive pressure.
  - only negative pressure.
  - both positive and negative pressure.
- This is a symbol for a:
  - temperature gauge
  - pressure gauge.
  - flow meter.
- Flow meters can measure flow in:
  - MPH.
  - RPM.
  - CFM.
- Shuttle valves allow flow in.
  - one direction only.
  - both directions.
  - either direction after reaching set pressure.
- Rotary unions can pass:
  - air only.
  - air and oil.
  - air, oil and electrical.
- Quick disconnects for air circuits:
  - block flow from both lines.
  - block flow from the machine side only.
  - block flow from the supply side only.
- A pressure switch indicates an actuator:
  - has completed its stroke.
  - is half way through its stroke.
  - has built pressure no matter the position.



## Quiz On Information Learned From Chapter 19

1. An “AND” element has an output when it has \_\_\_\_\_ input/s.

- A. one
- B. two**
- C. three

2. An “OR” element has an output when it has \_\_\_\_\_ input/s.

- A. one**
- B. two
- E. three

3. “NOT” elements are:

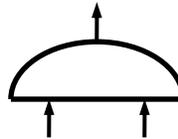
- A. normally passing elements.**
- B. normally non-passing elements.
- C. normally exhausting elements.

4. “YES” elements can be used as:

- A. amplifiers.**
- B. normally passing elements.
- C. 4-way valves.

5. This is a symbol for a/an:

- A. “OR” element**
- B. “NOT” element.
- C. “AND” element.



6. “FLIP-FLOP” elements are the same as a:

- A. 5-Way valve.**
- B. 4-Way valve.**
- C. 3-Way valve.

7. “OR” elements are the same as:

- A. directional control valves.
- B. shuttle valves.**
- C. flow control valves.

8. A “TIME ON” time delay:

- A. passes air after it times out.**
- B. blocks air after it times out.
- C. none of the above.

9. A “NAND” element needs:

- A. one signal to block through flow.
- B. two signals to block through flow.**
- C. three signals to block flow.

10. A “NOR” element needs:

- A. one signal to block through flow.**
- B. two signals to block through flow.
- C. three signals to block flow.