

1. Pascal's Law simply stated, says this:
 - A. Bodies in motion tend to stay in motion.
 - B. Pressure applied on a confined fluid is transmitted in all directions with equal force.
 - C. Energy can not be created or destroyed
 - D. If flow rate of a fluid is increased the pressure is decreased.

2. Which of the following is not an expression of atmospheric pressure at sea level?
 - A. 0 psig
 - B. 14.7 psia
 - C. 34 in. Hg
 - D. 1.01 bar

3. When particles are moving through a pipe in straight parallel flow path it is called:
 - A. Venturi flow
 - B. Laminar flow
 - C. Bernoulli flow
 - D. Turbulent flow

4. A pilot, or sensing line is drawn as:
 - A. Solid line
 - B. Dotted line
 - C. Long dash line
 - D. Short dash line

5. Full film lubrication means:
 - A. Moving metal parts are held completely apart
 - B. Surfaces of moving parts can contact one another.
 - C. Stationary parts are floating on oil.
 - D. Moving parts are full of oil.

6. The most common method of measuring viscosity is by timing how long it takes to go through a capillary tube. What is this called?
 - A. Absolute Viscosity
 - B. Kinematic Viscosity
 - C. SUS Viscosity
 - D. SAE Viscosity

7. The pour point of a fluid should be:
 - A. 10⁰F above the lowest ambient temperature to be encountered
 - B. 20⁰F above the lowest ambient temperature to be encountered
 - C. 10⁰F below the lowest ambient temperature to be encountered
 - D. 20⁰F below the lowest ambient temperature to be encountered

8. Which type of fluid would not be used with neoprene seals

- A. Petroleum oils
- B. Vegetable oils
- C. Synthetic oils
- D. High Water based oils

9. Vegetable oils are also called _____ oils because they are biodegradable.

10. What is one method of measuring relative viscosity

11. What are two methods of measuring flow?

- A. _____
- B. _____

12. What are two numbering systems used to identify oils?

- A. _____
- B. _____

13. A hydraulic pump creates_____.

14. What does a line drawn to the bottom of the symbol of a reservoir mean

15. Why isn't the compressibility of oil a concern in ag systems?

16. What is the flash point of a fluid?

17. What are three advantages of hydraulic systems over other power transmission methods?

- A. _____
- B. _____
- C. _____

18. What is cavitation?

19. Why isn't a vacuum of over 12.2 psia recommended at the inlet of a pump?

20. How is pressure created in a hydraulic system?

21. What are four functions of a hydraulic fluid?

A. _____

B. _____

C. _____

D. _____

22. What are three problems if fluid viscosity is too high?

A. _____

B. _____

C. _____

23. What are three additives used in hydraulic fluids?

A. _____

B. _____

C. _____

24. Design a simple hydraulic system that can be used to lift a 20,000 lb. dead load 16 inches with a maximum pump pressure of 3600 psi and a 5% margin of error. How fast would the cylinder lift the weight if the flow of the pump is 18 gal.per min? How much hp is needed to power the system?

Diameter of cylinder_____

Velocity in Inches per sec_____

Horsepower_____

25. If oil weighs 58 lbs. per cubic ft. what is the pressure in psi at the bottom of a 15 ft. column?
26. If there are three check valves that create 150 psi at each valve, two of the valves are in parallel with the other what will the pressure be at the pump, as a result of the valves?
27. Draw the basic symbol for a bi-directional motor.
28. If a motor has a 2.3 cubic inch displacement how fast will it turn on a system that has a flow of 12.6 gpm?

Ag. Systems Management 499
Test 2 - Spring 2001
Elton Solseng

Name _____

1. In a system where components are less tolerant than the pump, what type of filter system should be used?
- A. return line filter
 - B. pressure line filter
 - C. inlet line filter
 - D. off-line filter
2. Connecting a 5/8 pipe in a system:
- A. Does not create any contamination
 - B. Creates a few particles most less than 5 microns in size
 - C. Creates about 200,000 particles of 50 microns or larger
 - D. Creates over 60,000 particle 5 microns or larger

3. When two metals contact there is a molecular attraction which is called:
 - A. Erosion
 - B. Adhesion
 - C. Cavitation
 - D. Abrasion

4. Surface degradation is the cause of what percent of the overall loss of machine usefulness?
 - A. 15%
 - B. 25%
 - C. 55%
 - D. 70%

5. When talking about microns relative size is important, a grain of salt is about:
 - A. 5 microns
 - B. 100 microns
 - C. 500 microns
 - D. 1000 microns

6. Which type of failure is hard to diagnose because it some times corrects itself?
 - A. Catastrophic Failure
 - B. Intermittent Failure
 - C. Transient Failure
 - D. Degradation Failure

7. If chemical or physical analysis of fluid precipitates and foreign particulates which type of sampling is acceptable?
 - A. Laminar dynamic sampling
 - B. Turbulent dynamic sampling
 - C. Static sampling
 - D. Boundary sampling

8. The ISO Contamination Code for a cleanliness level is 19/16/12 this is for:
 - A. The range numbers for 2,5 and 15 microns
 - B. The range numbers for 5,15 and 25 microns
 - C. The range numbers for 5,10 and 15 microns
 - D. The range numbers for 2,15 and 25 microns

9. When establishing a cleanliness code for a hydraulic system that does not use 100% petroleum oil, the target range should be set:
 - A. One range higher
 - B. 2 ranges higher
 - C. 1 range lower
 - D. 2 ranges lower

10. Which of the following is not a condition which would cause a range code one number higher if two or more conditions are present?
 - A. Starts at less than 0 degrees F

- B. Intermittent operation at over 160 degrees F
- C. High levels of vibration or shock loads
- D. Low pressure operation for extended periods

11. Return line filters are an excellent total system filter if what percent of the fluid volume is circulated every minute?

- A. 75%
- B. 50%
- C. 35%
- D. 20%

12. Which of the following is not a part of a inline piston pump?

- A. Load pins
- B. Swash plate
- C. Cam ring
- D. Cylinder block

13. How does fluid viscosity affect system failure?

14. What is the "Pickling Process" used for?

15. Are piston pumps balanced or unbalanced pumps?

16. Why is a bypass needed in a full flow filter?

17. What is one advantage of an off-line filter system?

18. How are strainers typically sized?

19. What are two filter rating methods?

- A. _____
- B. _____

20. What does a Beta number of $B_5=20$ mean?

21. Are hydraulic filters absorbent or adsorbent?

22. What is an advantage of depth type filter?

23. On what principle do most filter indicators work?

24. What are two methods pump capacity expressed?

A. _____

B. _____

25. Pump ratings are given at a specific _____ and _____.

26. What are two basic types of pumps?

A. _____

B. _____

27. A centrifugal pump is used, in hydraulic systems, for what purpose?

28. What are two causes of cavitation?

A. _____

B. _____

29. What is an advantage of a Vane type pump?

30. What are three types of gear pumps?

A. _____

B. _____

C. _____

31. How are the vanes held against the cam ring on piston pumps?

32. What are two general categories of sources of contamination?

A. _____

B. _____

33. When oil is tested for contaminants of what use is there in knowing the type of metal in the oil?

34. Why is there a difference in the size particles that affect high and low pressure systems?

35. What are two factors that should be considered when analyzing why and how components fail?

A. _____

B. _____

36. The hydraulic pump is the _____ of a hydraulic system.

37. Why shouldn't sample bottles be filled more than 70% full?

38. Where or what type of filter system should be used for pressure compensated systems?

39. What are two types of pumps that can be made into variable displacement pump?

A. _____

B. _____

40. What are three types of Automatic particle counters?

- A. _____
- B. _____
- C. _____

41. What is the advantage of a cartridge type vane pump?

42. What is an intra-vane pump or what is the benefit?

43. What is the cleanliness code for a fluid that has the following results when a particle count was done?

Particle size Range	No. of particles per ml
2 micron and above	16879
5 micron and above	5864
10 micron and above	1068
15 micron and above	278
25 micron and above	96
50 micron and above	25
75 micron and above	0.5

NUMBER OF PARTICLES PER 1 mL OF FLUID MORE THAN UP TO →			Range Code	NUMBER OF PARTICLES PER 1 mL OF FLUID MORE THAN UP TO →			Range Code
80,000	160,000		24	20	40		12
40,000	80,000		23	10	20		11
20,000	40,000		22	5	10		10
10,000	20,000		21	2.5	5		9
5,000	10,000		20	1.3	2.5		8
2500	5,000		19	.64	1.3		7
1300	2500		18	.32	.64		6
640	1300		17	.16	.32		5
320	640		16	.08	.16		4
160	320		15	.04	.08		3
80	160		14	.02	.04		2
40	80		13	.01	.02		1

Figure 6.25 ISO range code numbers.

44. What Horsepower prime mover is needed to power a hydraulic pump that has an output of 3700 psi, a flow of 24 gpm and an efficiency of 83%?

45. A piston pump has seven 1/2 inch diameter pistons the stroke is 3/4 inch. What is the total displacement per revolution?

- Which of the following would be used to allow a smaller prime mover to be used if the maximum pressure and maximum flow were not used at the same time?
 - Torque limited
 - Pressure limited
 - Load sensing
 - Flow limited
- What is the purpose of the bias piston in a variable displacement pump?
 - To keep the pump "biased" toward minimum displacement
 - To keep the pump "biased" toward maximum displacement
 - To keep the pump "biased" or changing displacement
 - There is no such thing as a bias piston in a variable displacement pump.
- Which schedule of pipe has the thickest wall?
 - Schedule 20
 - Schedule 40
 - Schedule 80
 - Schedule 160

4. O-ring fittings are preferred. What type of threads are used with O-rings?
 - A. NPT
 - B. NPTF
 - C. Straight threads
 - D. Reverse threads

5. Steel tubing specifications refer to the:
 - A. Outside diameter
 - B. Inside diameter
 - C. Wall thickness only
 - D. Thread pitch diameter

6. What organization sets up the standards for hydraulic hose?
 - A. ASAE
 - B. ASTM
 - C. NEMA
 - D. SAE

7. A face seal is recommended for what conditions?
 - A. Slow rotating shafts
 - B. Low pressure operations
 - C. Low pressure rotating shafts
 - D. High pressure rotating shafts

8. As a telescoping cylinder extends:
 - A. It slows down
 - B. It speeds up
 - C. It lifts more weight
 - D. Neither the force or the speed changes

9. Tandem cylinders are used to:
 - A. Slow down cylinder speed
 - B. Make the cylinder travel the same speed both directions
 - C. Lift more weight
 - D. Lift less weight more accurately

10. Who is credited with inventing the vane pump in 1930?
 - A. Robert Bosch
 - B. Harry Ferguson
 - C. Henry Ford
 - D. Harry Vickers

11. Why are double rod cylinders used?

12. What are two operating conditions that can help prevent leakage?

A. _____

B. _____

13. What are two functions of a reservoir?

A. _____

B. _____

14. What are two methods of attaching or connecting tubing?

A. _____

B. _____

15. What is the purpose of a baffle plate?

16. What are two methods of attaching a pipe to a fixture?

A. _____

B. _____

17. Why is flexible hose so popular in agriculture?

18. What are two means of rating of hydraulic cylinders?

A. _____

B. _____

19. If the diameter of a cylinder is decreased what happens to the speed, load pressure and the maximum force?

A. Speed _____

B. Load pressure _____

C. Max Force _____

20. What is the purpose of a cylinder cushion?

21. How many teeth provide power from an external gear motor?

-
22. What are two things that are used to rate hydraulic motors?
- A. _____
- B. _____
23. On a vane motor how is the torque calculated? What lever arm is used?
- _____
24. What are two classes of hydraulic motors?
- A. _____
- B. _____
25. What is one characteristics of a JIC Reservoir
- _____
26. What is an advantage of an overhead Stack reservoir?
- _____
27. Why does a vertical reservoir help quiet noise?
- _____
28. What are two considerations when sizing a reservoir?
- A. _____
- B. _____
29. A linear actuator is typically called a/an_____.
30. Internal losses eventually return to the _____.
31. Two rigidly connected parts are sealed by a/an _____ seal.
32. As a motor's displacement is increased what happens to the speed, load pressure and the max torque?
- A. Speed_____
- B. Load pressure_____
- C. Max torque_____

33. What is the difference between a direct drive and an orbiting internal gear motor?

34. What is the difference between NPT and NPTF?

35. Hydraulics today primarily use three types of connecting lines list two:

A. _____

B. _____

36. Why do modern tractors use a pressure limiting, load sensing compensator?

37. What can be done if there is a problem with o-ring extrusion?

38. What are three types of piston motors?

A. _____

B. _____

C. _____

39. What type of motor is the most efficient?

40. Where would a limited rotation motor be used?

41. Why shouldn't copper be used in hydraulic systems?

42. What are two types of dynamic seals?

A. _____

B. _____

43. Using the nomograph provided, what minimum size iron pipe would be needed to stay within recommended velocity levels if the maximum pump output is 9 GPM @ 2500 PSI?

_____ inches

44. How big should a tank for a system that outputs 30 gpm and 2000 psi be to satisfy the cooling?

45. A 6 inch diameter cylinder can operate to 3500 psi. What is the maximum force?

46. A 3 cubic inch displacement motor is operated at 2000 psi what is the theoretical torque?

1. Which of the following lowers the pressure on a part of the system so a pump isn't loaded?

- A. Relief
- B. Sequence
- C. Back pressure
- D. Unloading

2. What type of valve would be used if the pressure is to be maintained at reduced setting in certain portions of a system?

- A. Pressure reducing valve
- B. pressure relief
- C. Back pressure
- D. Unloading

3. Which of the following flow control methods works well for overrunning loads?

- A. Meter-in
- B. Meter-out
- C. Bleed-off
- D. Bleed-in

4. Which of the following method is the most popular for maintaining pressure in an accumulator?

- A. Weight loaded
- B. Gas charged
- C. Spring loaded
- D. Thermodynamic

5. Pressure switches are used to control:

- A. Micro switches that control solenoids
- B. Solenoids that control micro switches
- C. Micro switches that hydraulically operated directional control valve
- D. Pneumatics switches that control solenoids

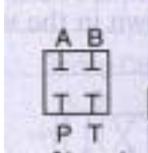
6. If a directional control valve has three active ports it is a:

- A. 4-way

- B. 3-way
- C. 3 position
- D. 2 way

7. To stop a valve spool at a position so it holds that position, what would be built into the valve?
- A. Spring centering
 - B. Manual
 - C. Spring offset
 - D. Detent

8. Which of the following best describes this symbol?



- A. Closed center
- B. Open center
- C. Float center
- D. Tandem center

9. Which of the following organizations **does not set** standards for hydraulic valves?
- A. ISO
 - B. CETOP
 - C. NFPA
 - D. NEMA

10. What is the pressure at which a relief starts to open called?

11. What type of valve is used to control a vertical cylinder so that it will not free fall because of gravity?

12. What are two ways directional control valves are classified?

A. _____

B. _____

13. A Brake valve is used for what purpose?

14. What controls the maximum pressure in a system?

15. What are two factors affecting flow rate through an orifice or restriction?

A. _____

B. _____

16. What are two types of flow control?

A. _____

B. _____

17. What does it mean if a valve is pilot operated?

18. What is the difference between a Bypass and a restrictor type flow control?

19. When it is necessary to slow a cylinder in the middle of its stroke, what type of valve is used?

20. Why are cartridge or stack valves used?

21. What are four uses or applications of an accumulator?

A. _____

B. _____

C. _____

D. _____

22. What are three types of accumulators?

A. _____

B. _____

C. _____

23. What type of gas is typically used in accumulators?

24. What does an intensifier do?

25. What are two types of pressure gauges?

A. _____

B. _____

26. What is a snubber as it refers to gauges?

27. What does a hydraulic intensifier do?

28. What are two sound deadening devices?

A. _____

B. _____

29. Why shouldn't long hoses be used to bend corners?

30. What are two types of flow meters?

A. _____

B. _____

31. To move a valve automatically to a center position a _____ would be used.

32. What are four actuating devices for hydraulic valves?

A. _____

B. _____

C. _____

D. _____

33. What is the difference between AC and DC solenoid valve current use?

34. Why are Two Stage valves used?

35. What is the purpose of a deceleration valve?

36. A valve that controls two opposing inlets using the same ball or poppet is called a/an:

37. The simplest control valve is a check valve. What is the symbol for a check valve?