

# CHAPTER 4

## APPLICATION EQUIPMENT

### PRETEST

Answer the following questions true or false:

1. Stainless steel is the best nozzle material for extensive use.
  - A. true
  - B. false
2. Tungsten carbide and ceramic are inexpensive nozzle materials that may be subject to wear and corrosion.
  - A. true
  - B. false
3. Aluminum nozzles may corrode in the application of some fertilizers.
  - A. true
  - B. false
4. Low pressure field sprayers are often used to apply fertilizer-pesticide mixtures.
  - A. true
  - B. false
5. Ultra-low volume sprayers apply a diluted pesticide solution.
  - A. true
  - B. false
6. Brass is an inexpensive nozzle material that wears easily.
  - A. true
  - B. false
7. Plastic nozzles wear out easily but are required for the spraying of certain solvents.
  - A. true
  - B. false

Answer the following multiple choice questions:

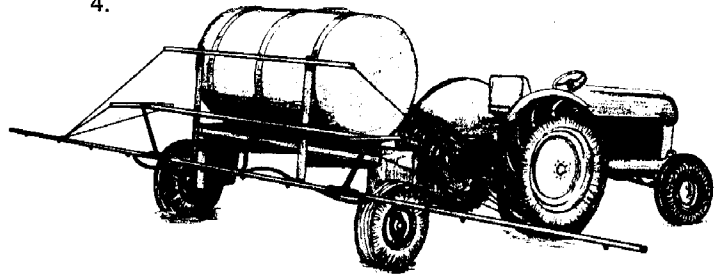
8. A spinning disc applicator is used to apply:
  - A. dust.
  - B. granules.
  - C. wettable powders.
  - D. All of these.

9. A solid stream nozzle would be used for:
- A. broadcast spraying.
  - B. spraying foliage.
  - C. injecting pesticide into the soil.
  - D. wide band spraying.
10. Which of these determines which nozzle material will be used?
- A. price.
  - B. corrosion.
  - C. resistance to abrasion.
  - D. All of these.
11. Which of these nozzle types would be used in overlapping groups for broadcast spraying?
- A. even flat fan.
  - B. regular flat fan.
  - C. full cone.
  - D. solid stream.
12. Which of these would be preferred for over the top spraying of foliage?
- A. flooding nozzle.
  - B. regular flat fan nozzle.
  - C. hollow cone nozzle.
  - D. broadcast nozzle.
13. Which of these could deliver a mist spray to the foliage on fruit trees?
- A. air blast sprayer.
  - B. high pressure sprayer.
  - C. hand sprayer.
  - D. All of these.
14. Which of these would be used to spray livestock?
- A. air blast sprayer.
  - B. high pressure sprayer.
  - C. low pressure field sprayer.
  - D. None of these.
15. Which of these would be used to spray pastures?
- A. air blast sprayer.
  - B. high pressure sprayer.
  - C. low pressure field sprayer.
  - D. hand sprayer.

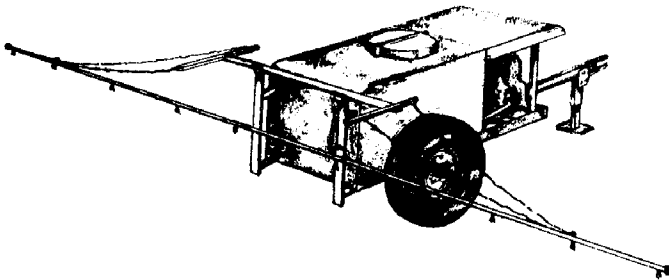
16. Match the following:

- A. Hand sprayer \_\_\_\_\_
- B. Low pressure field sprayer \_\_\_\_\_
- C. Air blast sprayer \_\_\_\_\_
- D. High pressure sprayer \_\_\_\_\_
- E. Hand duster \_\_\_\_\_
- F. Power duster \_\_\_\_\_
- G. Granular applicator \_\_\_\_\_

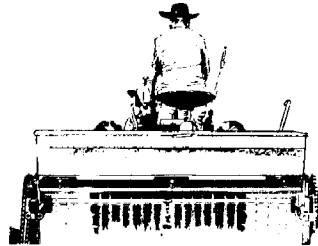
4.



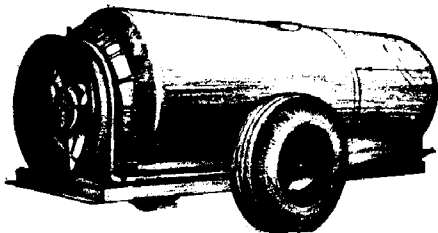
1.



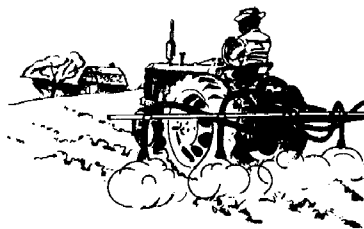
5.



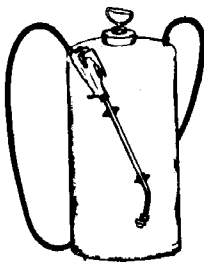
2.



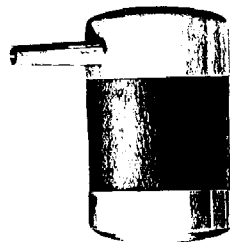
6.



3.



7.



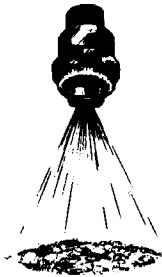
17. Match the following:

A. # \_\_\_\_\_

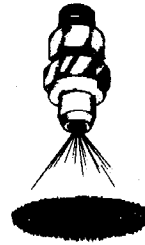


1. Even flat fan
2. Hollow cone
3. Boomless
4. Solid stream
5. Regular flat fan
6. Full cone
7. Flooding nozzle

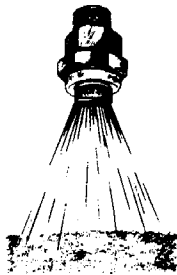
B. # \_\_\_\_\_



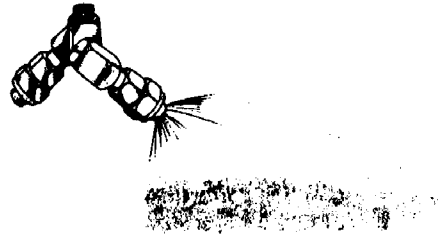
E. # \_\_\_\_\_



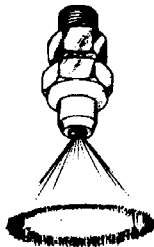
C. # \_\_\_\_\_



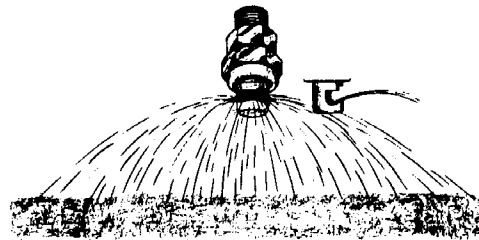
F. # \_\_\_\_\_



D. # \_\_\_\_\_



G. # \_\_\_\_\_



# CHAPTER 4

## APPLICATION EQUIPMENT

### LEARNING PROGRAM

1. The pesticide application equipment you use is important to the success of your pest control job. This chapter will cover the types of equipment you may want to use.

GO ON TO THE NEXT FRAME

### SPRAYERS

2. Sprayers are used to apply liquid formulations and those formulations that are to be mixed with water.

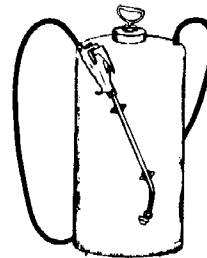
Which of these would be applied with a sprayer?

- A. Solutions.
- B. Wettable powders.
- C. Both of these.

3. The simplest type of sprayer is the *hand sprayer*.

This sprayer is good for:

- A. Large jobs.
- B. Small jobs.



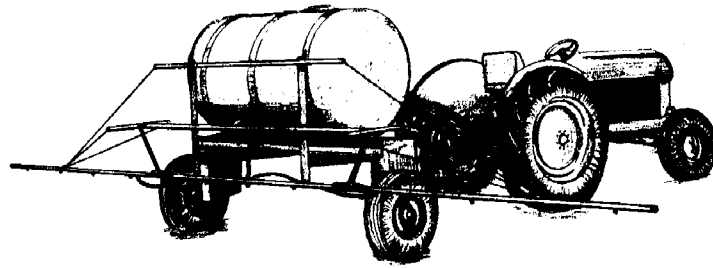
**C**  
Both of these.

**B**  
small jobs.

4. The hand sprayer is preferred over larger sprayers for treating:

- A. Large areas.
- B. Restricted areas.

5. Another type of sprayer is the *low pressure field sprayer*.



B  
Restricted areas.

This sprayer consists of a large tank, a pump, pressure regulator, strainer, etc. connected to a boom of nozzles. The pressure to force the liquid out of the nozzles comes from:

- A. The weight of liquid in the tank.
- B. A motor driven pump.

---

B  
A motor driven pump.

6. The rate of flow from a low pressure field sprayer is (high/low).

low.

7. Most low pressure field sprayers are used to treat field and forage crops, pastures and fence rows. They may also be used to apply fertilizer-pesticide mixtures.

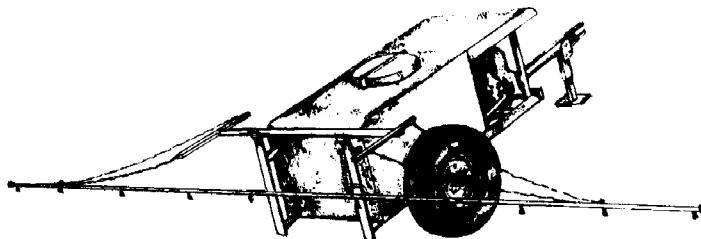
Low pressure field sprayers would be good for treatment of an:

- A. Alfalfa field.
- B. Apple orchard.

---

A  
Alfalfa field.

8. *High pressure sprayers* deliver high volume at high pressure.



Because of the force behind the pesticide, the high pressure sprayer can produce a (high/low) volume of pesticide.

high.

9. High pressure sprayers can give:

- A. Good pesticide penetration.
- B. Poor pesticide penetration.

---

A  
Good pesticide penetration.

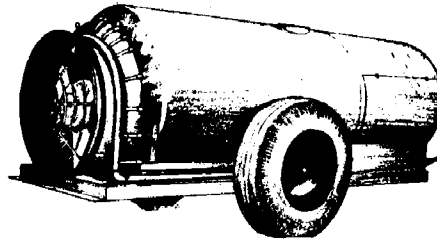
10. Because they can deliver high volumes of pesticides at high pressure into hard-to-get-at places, high pressure sprayers are used to spray fruits, vegetables, landscape plants and livestock.

High pressure sprayers would be preferred over low pressure field sprayers in the treatment of:

- A. Tomato plants.
- B. Pastures.

A  
Tomato plants.

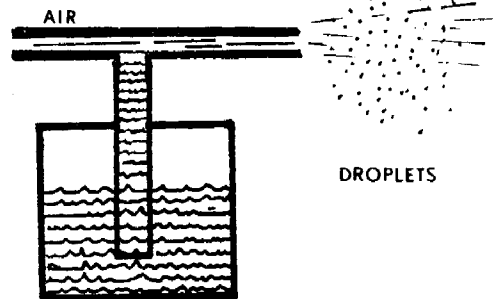
11. *Air blast sprayers* use a high speed air stream to break up the pesticide into droplets.



The air blast sprayer uses the force of a (fan/pump) to deliver the pesticide to its target.

fan.

12. The air blast sprayer works something like an atomizer.



The air blast sprayer produces:

- A. A heavy spray.
- B. A mist spray.

B  
A mist spray.

13. Air blast sprayers are used to spray fruit and vegetable crops.

The air blast sprayer would be preferred in the treatment of:

- A. The fruit and foliage of orange trees.
- B. Low growing hedges and landscape plants.

A  
The fruit and foliage of  
orange trees.

14. Because of the mist spray produced, the air blast sprayer is (more/less) subject to drifting than are some other sprayers.

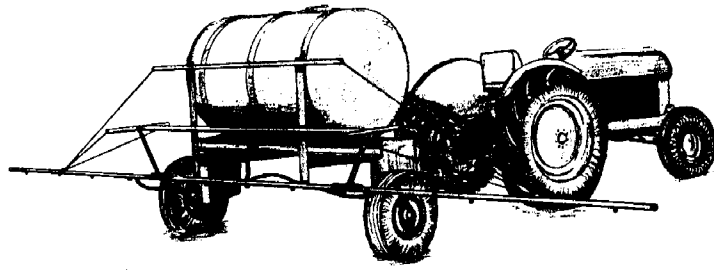
more.

15. Ultra-low volume solutions are highly concentrated formulations. In fact, they may even be pure pesticide.

The machine used to apply these solutions must be able to apply (light/heavy) applications.

light

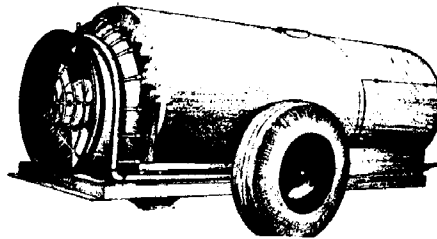
16. Identify this sprayer:



- A. Low pressure field sprayer.
- B. High pressure sprayer.
- C. Air blast sprayer.

A  
Low pressure field sprayer.

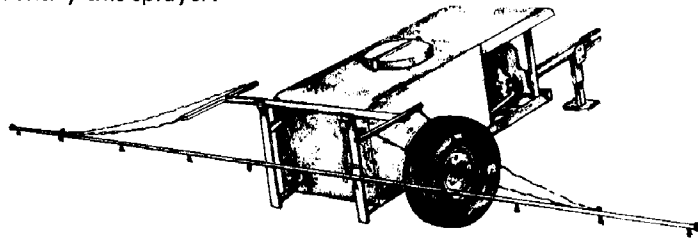
17. Identify this sprayer:



- A. Low pressure field sprayer.
- B. High pressure sprayer.
- C. Air blast sprayer.

C  
Air blast sprayer.

18. Identify this sprayer:



High pressure sprayer

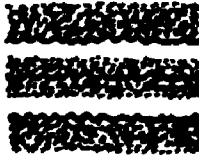
19. Match these:

- |                               |       |   |
|-------------------------------|-------|---|
| A. Hand sprayer               | _____ | 1. Delivers high volume for fruits, vegetables, landscape plants and livestock. |
| B. Low pressure field sprayer | _____ | 2. Produces mist spray.   |
| C. High pressure sprayer      | _____ | 3. Good for restricted areas.   |
| D. Ultra low volume sprayer   | _____ | 4. Are used to apply pesticides to many field crops.                            |
| E. Air blast sprayer          | _____ | 5. Applies highly concentrated pesticides at low volumes.                       |

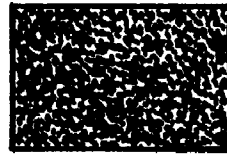
NOZZLES

20. The nozzle directs the spray of pesticide and determines how much area will be covered by the spray.

- A. 3
- B. 4
- C. 1
- D. 5
- E. 2



Band Coverage



Broadcast Coverage

Narrow band application and broadcast spraying may require (the same/ different) nozzle types.

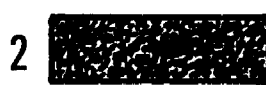
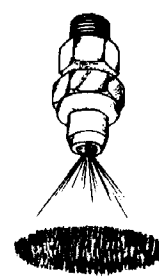
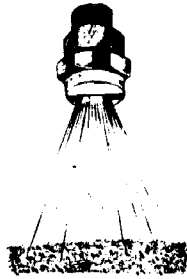
21. Match the nozzle spray pattern to the nozzle that produced it.

A. # \_\_\_\_\_

B. # \_\_\_\_\_

C. # \_\_\_\_\_

different.



22. The *solid stream nozzle* produces a narrow jet.

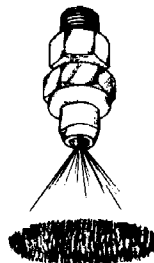
The *flat fan nozzle* produces a flat oval pattern.

The *cone nozzle* produces a circular pattern.

GO ON TO THE NEXT FRAME.

- A. 2
- B. 1
- C. 3

23. Label the nozzles below as solid stream, flat fan or cone.



\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Flat fan.  
Cone.  
Solid stream.

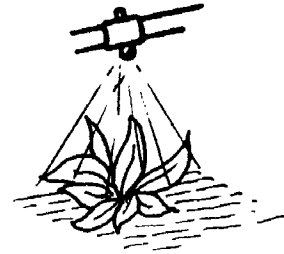
24. Which nozzle type would be more accurate for aiming at distant targets?

- A. Solid stream.
- B. Flat fan.
- C. Cone.

A  
Solid stream.

25. Which would produce more complete coverage of plant foliage in an over-the-top application?

- A. Solid stream.
- B. Flat fan.
- C. Cone.



C  
Cone.

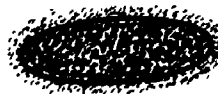
26. Which would be better for applying very narrow bands or injecting pesticide into the soil?

- A. Solid stream.
- B. Flat fan.
- C. Cone.

A  
Solid stream.

27. There are several types of flat fan nozzles. The *regular* flat fan nozzle makes a flat oval pattern with light edges.

Which picture shows this regular flat fan pattern?



A.



B.

A

28. The *even* flat fan nozzle makes a uniform pattern.

Label these patterns as regular or even flat fan.



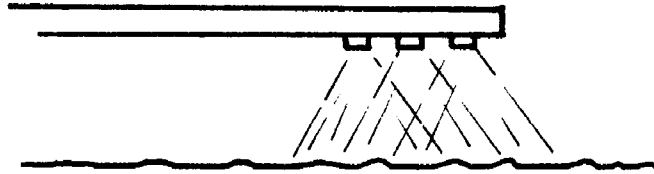
\_\_\_\_\_



\_\_\_\_\_

Regular flat fan.  
Even flat fan.

29. The regular flat fan nozzle is used on booms with the spray overlapping.



The regular flat fan nozzle is used for:

- A. Band spraying (narrow strips).
- B. Broadcast spraying.

**B**  
Broadcast spraying.

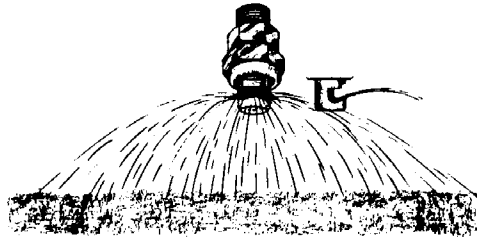
30. The even flat fan nozzle is used without overlapping.



The even flat fan nozzle is used for (band/broadcast) spraying.

band.

31. Another type of flat fan nozzle is the *flooding nozzle*. This makes a wide angle pattern.



The flooding nozzle is designed for:

- A. Band spraying.
- B. Broadcast spraying.

**B**  
Broadcast spraying.

32. Notice the path the liquid takes as it leaves the flooding nozzle.



The flooding nozzle appears to be a (high/low) pressure nozzle.

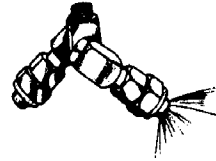
low.

33. Therefore, a flooding nozzle would more likely appear on a:

- A. Low pressure field sprayer.
- B. High pressure sprayer.

A  
Low pressure field sprayer.

34. A boomless nozzle is another wide angle flat fan nozzle. It is used on boomless sprayers and on the end of booms to widen the path of coverage.

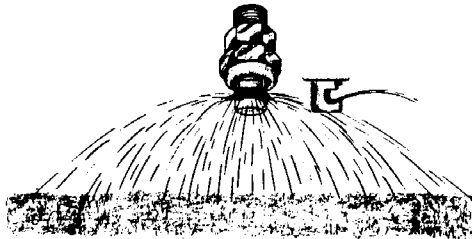


The boomless nozzle operates at a (higher/lower) pressure than the flooding nozzle.

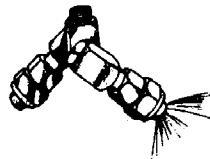
higher.

35. Which of these is the boomless nozzle?

A.

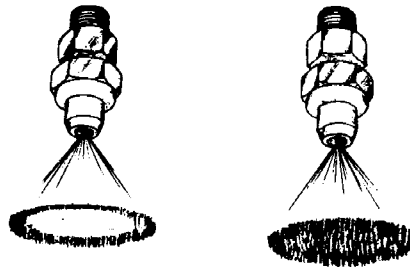


B.



B

36. There are two (2) types of cone spray nozzles.

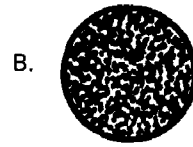
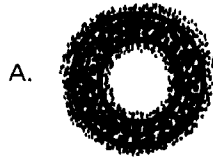


They are: the \_\_\_\_\_ cone and the \_\_\_\_\_ cone nozzle.

hollow.  
full.

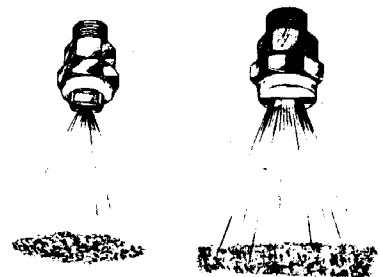
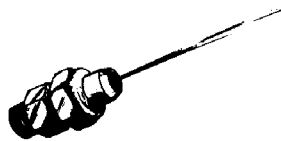
37. The hollow cone pattern is produced by one of two methods: (1) core and disc, or (2) whirl chamber.

The whirl chamber will produce which pattern below?



38. Identify these nozzles:

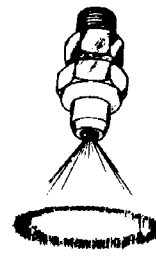
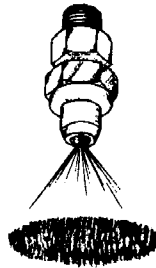
A



\_\_\_\_\_

\_\_\_\_\_

39. Identify these nozzles:

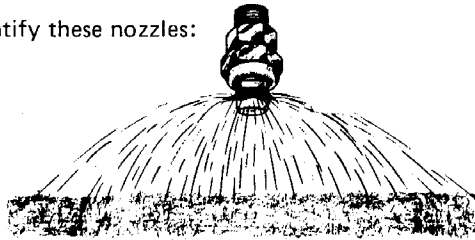


\_\_\_\_\_

\_\_\_\_\_

Solid stream.  
Regular flat fan.  
Even flat fan.

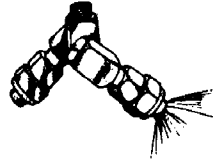
40. Identify these nozzles:



Full cone.  
Hollow cone.

\_\_\_\_\_

\_\_\_\_\_



\_\_\_\_\_

\_\_\_\_\_

41. Match these:

Flooding nozzle.  
Boomless nozzle.

- A. Solid stream \_\_\_\_\_
- B. Regular flat fan \_\_\_\_\_
- C. Even flat fan \_\_\_\_\_

- 1. Used to apply narrow band or to inject pesticide into soil.
- 2. Flat oval pattern with lighter edges, used on booms for broadcast spraying.
- 3. Uniform flat oval pattern used for band spraying.

42. Match these:

- A. 1
- B. 2
- C. 3

- A. Flooding nozzle \_\_\_\_\_
- B. Boomless nozzle \_\_\_\_\_
- C. Hollow cone nozzle \_\_\_\_\_
- D. Full cone nozzle \_\_\_\_\_

- 1. Works by either core and disc or whirl chamber.
- 2. Spray uniform throughout circular pattern.
- 3. Used on boomless sprayers or ends of boom to widen spray swath.
- 4. Low pressure nozzle used for broadcast spraying.

NOZZLE MATERIALS (SEE EXHIBIT 1, PAGE 4-17.)

- A. 4
- B. 3
- C. 1
- D. 2

43. Along with the correct choice of nozzle types, it is equally important to select nozzles made from materials that will not be damaged by the pesticide.

For example, wettable powder and flowable formulations can be abrasive. A nozzle used to apply wettable powders should be made from a (hard/soft) material.

hard.

44. One quality of nozzle material is resistance to \_\_\_\_\_.

Abrasion, or wear.	<p>45. Rust is an example of corrosion. Ordinary steel corrodes when exposed to air and water.</p> <p>Would ordinary steel be a good material for nozzles? (yes/no)</p>
no	<p>46. Nozzle material should be resistant to:</p> <p>A. Abrasion. B. Corrosion. C. Both of these.</p>
<p><b>C</b> Both of these.</p>	<p>47. Cost is another factor to consider when choosing nozzles. Materials that are resistant to both corrosion and abrasion may be expensive.</p> <p>Inexpensive materials may be used if corrosion and abrasion (are/are not) a problem.</p>
are not	<p>48. Look at Exhibit I. This Exhibit shows the common materials used in making nozzles.</p> <p>Check the features of brass nozzles. Should brass nozzles be used if the spraying liquid is abrasive? (yes/no)</p>
no	<p>49. Tungsten carbide or ceramic nozzles are hard and resist abrasion. Check information in Exhibit I.</p> <p>If abrasion is a problem, (brass/tungsten carbide) would be a better material.</p>
Tungsten-carbide.	<p>50. But if non-abrasive liquids are used under limited conditions, the cheaper (brass/tungsten carbide) nozzles would be preferred.</p>
brass.	<p>51. Plastics can be made resistant to corrosion.</p> <p>However, according to Exhibit I, the problem with plastics is that:</p> <p>A. They corrode. B. They wear easily. C. They swell in contact with some solvents.</p>
<p><b>C</b> They swell in contact with some solvents.</p>	<p>52. Aluminum nozzles:</p> <p>A. Resist corrosion. B. Resist most corrosive materials except some fertilizers.</p>
<p><b>B</b> Resist most corrosive materials except some fertilizers.</p>	<p>53. Stainless steel:</p> <p>A. Will not corrode. B. Resists abrasion. C. Both of these.</p>

C  
Both of these.

54. According to Exhibit 1, which is the best nozzle material for extensive use?

Stainless steel.

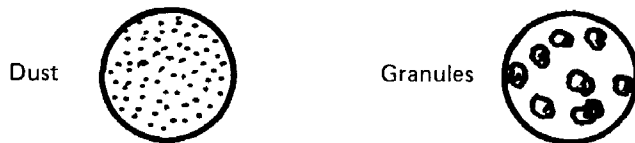
55. Match these:

- |                                 |       |  |
|---------------------------------|-------|--|
| A. Brass                        | _____ | 1. Swells when exposed to some solvents. |
| B. Stainless steel              | _____ | 2. Best material for extensive use.      |
| C. Plastic                      | _____ | 3. Best material for limited use.        |
| D. Aluminum                     | _____ | 4. Corroded by some fertilizers.         |
| E. Tungsten carbide and ceramic | _____ | 5. Expensive.                            |

- A. 3  
B. 2  
C. 1  
D. 4  
E. 5

#### DUST AND GRANULAR APPLICATORS

56. Pesticide dusts and granules are made to be applied dry and because of this, dusts and granules require different kinds of application equipment.



Which of the above can be blown to its target with a blast of air? (dust/granules)

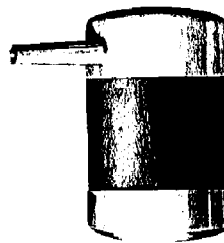
Dust.

57. Because of their size and weight, granule particles will have to be:

- A. Carried to their target by air currents.  
B. Thrown or dropped on their target.

B  
Thrown or dropped on their target.

58. The applicator pictured below works by squeezing. A puff of air carries the pesticide to its target.



This is a hand (duster/granular) applicator.

duster.

59. Like hand sprayers, hand dusters are used mainly around homes and in gardens.

Hand dusters are good for (large/small) jobs.

small

## CHAPTER 4, EXHIBIT I

YOU CAN GET NOZZLES IN MANY MATERIALS. HERE ARE THE MAIN FEATURES OF EACH KIND.

### *BRASS:*

- INEXPENSIVE,
- WEARS QUICKLY FROM ABRASION,
- PROBABLY THE BEST MATERIAL FOR LIMITED USE.

### *STAINLESS STEEL:*

- WILL NOT CORRODE,
- RESISTS ABRASION, ESPECIALLY IF IT IS HARDENED,
- PROBABLY THE BEST MATERIAL FOR EXTENSIVE USE.

### *PLASTIC:*

- RESISTS CORROSION AND ABRASION,
- SWELLS WHEN EXPOSED TO SOME SOLVENTS.

### *ALUMINUM:*

- RESISTS SOME CORROSIVE MATERIALS,
- IS EASILY CORRODED BY SOME FERTILIZERS.

### *TUNGSTEN CARBIDE AND CERAMIC:*

- HIGHLY RESISTANT TO ABRASION AND CORROSION,
- EXPENSIVE.



# CHAPTER 5

## USE AND MAINTENANCE OF PESTICIDE APPLICATION EQUIPMENT

### PRETEST

Answer the following true or false:

1. A change in sprayer pressure will change the flow rate but will not affect the nozzle patterns or spray droplet size.
  - A. true
  - B. false
2. In order to properly make emergency repairs in the field, the operator of the sprayer should dismount and remove his gloves and protective mask before working on the sprayer.
  - A. true
  - B. false
3. Sprayers should be calibrated by spraying pesticide formulation.
  - A. true
  - B. false
4. If you are calibrating a sprayer that has a 200-gallon capacity, you should spray an area large enough to use at least 20 gallons.
  - A. true
  - B. false
5. The best source of equipment operating information is from the operator's manual.
  - A. true
  - B. false
6. Nozzles that have a faulty spray pattern should be replaced.
  - A. true
  - B. false

Answer the following multiple choice questions:

7. Which of these can be used to clean nozzles?
  - A. clean knife.
  - B. screw driver.
  - C. heavy gauge steel wire.
  - D. wooden toothpick or toothbrush.
8. If the sprayer nozzles clog during spraying, the operator should:
  - A. increase pressure to break the clog.
  - B. stop the sprayer immediately, and unclog the nozzles before doing anything else.
  - C. turn the sprayer off and move it to the edge of the field before attempting to work on it.
  - D. continue spraying if enough nozzles are working. Fix the sprayer when all of the spray has been applied.

9. A sprayer is calibrated to apply 10 gallons per acre at a pressure of 20 psi. What pressure would be required to increase the output to 20 gallons per acre without changing the speed of travel or nozzle size?

- A. 40 psi
- B. 60 psi
- C. 80 psi
- D. None of these. A change in pressure could not be used to produce that large a change in sprayer output.

10. What is the best method to insure proper mixing of a wettable powder formulation?

- A. Add the pesticide, then stir the mixture as the tank fills.
- B. Make a slurry, and pour it into a partly filled tank before filling the tank. Agitate as the tank is filled.
- C. Fill the tank to 1/3 full of water, add the wettable powder, agitate and fill to capacity.
- D. Mix in a barrel until the powder and water are thoroughly mixed, then add to a full tank of water under agitation.

11. A sprayer is calibrated to apply 20 gallons per acre (gpa) at a speed of 4 miles per hour.

What would be the application rate if the sprayer were slowed to 2 miles per hour?

- A. 5 gpa
- B. 10 gpa
- C. 40 gpa
- D. There would be no change in application rate.

12. At which of the following amounts per acre should you stop and recalibrate your granular applicator if you need a recommended dosage of 7 pounds per acre?

- A. 6.3 lb. per acre.
- B. 6.8 lb. per acre.
- C. Both of these would require recalibration.
- D. Neither of these. They are both within the 5% limit so that recalibration is unnecessary.

13. In calibrating your sprayer with a 100-gallon capacity, you poured  $6\frac{1}{4}$  gallons of water back into the tank to fill it after spraying  $\frac{1}{4}$  of an acre.

What is the spray rate in gallons per acre of your sprayer?

- A.  $18\frac{3}{4}$  gpa
- B.  $15\frac{1}{4}$  gpa
- C.  $6\frac{1}{4}$  gpa
- D. 25 gpa

14. Your sprayer has 6 nozzles. In a one minute flow check you find the flow rates as shown below. Which of these nozzles will have to be replaced? (Choose all that apply.)

<u>NOZZLE</u>	<u>FLOW RATE (in fluid oz./min.)</u>
A	8.0
B	7.5
C	8.2
D	7.8
E	8.3
F	8.2

Problems — Fill in the blanks:

15. Your spray tank holds 200 gallons of spray. During calibration, you had to replace 8 gallons of water after spraying one acre.

This sprayer applies at a rate of \_\_\_\_\_ gpa.

A tank full of spray will cover \_\_\_\_\_ acres.

Label directions on a can of emulsifiable concentrate tell you to apply 2 pints of the formulation per acre. How many pints should you add to one tank load?

\_\_\_\_\_ pints

16. A sprayer with a 200-gallon tank is calibrated to apply 40 gallons per acre.

To apply 2 pounds of active ingredient per acre of a 50% wettable powder, you will need to add how many pounds of pesticide formulation into the tank?

A full tank will cover \_\_\_\_\_ acres.

This will require \_\_\_\_\_ pounds of active ingredient per tank.

You must add \_\_\_\_\_ pounds of 50% wettable powder formulation per tankful.

# CHAPTER 5

## USE AND MAINTENANCE OF PESTICIDE APPLICATION EQUIPMENT

### LEARNING PROGRAM

1. Proper use and maintenance of pesticide application equipment is essential for safe, effective pest control.

This chapter will cover some basic points about the operation, maintenance and calibration of this equipment.

GO ON TO THE NEXT FRAME

---

### SPRAYERS

2. The pesticide label specifies how much pesticide must be applied per acre. This is usually given in terms of the undiluted pesticide.

For example, a pesticide label states that 2 pints of the formulation must be applied per acre to kill a certain type of insect. This is 2 pints of:

- A. the pesticide as it comes from the container.
  - B. pesticide and water mixture.
- 

3. Pesticide formulations may have to be mixed with water before they can be applied.

A  
the pesticide as it comes from  
the container.

Suppose the pesticide label instructs you to apply 1 pint of formulation per acre. Your sprayer applies liquid at a rate of 10 gallons per acre.

The 1 pint of pesticide should be diluted with \_\_\_\_\_ gallons of water to treat one acre.

---

4. Suppose your sprayer tank holds 50 gallons. If you are to apply 1 pint of formulation per acre, how much formulation should you add to a full tank of water? (The sprayer applies at a rate of 10 gallons per acre.)

To find this, divide the amount of water in the tank by the number of gallons applied to one acre.

50 gallons will spray \_\_\_\_\_ acres.

At 1 pint per acre, this will require \_\_\_\_\_ pints of pesticide formulation.

5 (50/10 = 5)  
5

5. How many pints of formulation are required in this situation?

Tank capacity = 75 gallons

Sprayer applies 10 gallons per acre.

Instructions call for 2 pints of formulation per acre.

75 gallons will spray \_\_\_\_\_ acres.

You must add \_\_\_\_\_ pints of formulation to a tankful of water.

7.5 (75/10 = 7.5)  
15 (2 x 7.5 = 15)

6. Is it important to know how much liquid your sprayer applies per acre? (yes/no)

yes

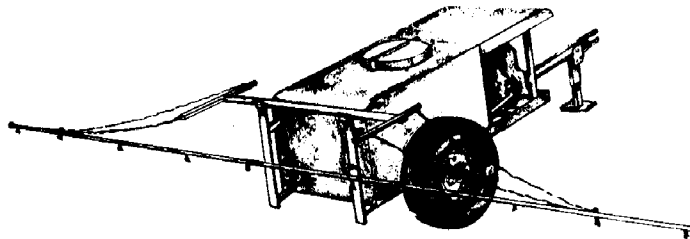
#### CALIBRATION OF SPRAYERS

7. Calibration is simply measuring your spray equipment output so that you can apply a desired rate of pesticide. There are many ways to calibrate a sprayer. Your extension agent can show you appropriate methods for your particular equipment.

The following is a basic method.

GO ON TO THE NEXT FRAME

8. To calibrate a sprayer, first choose the speed, pumping pressure and nozzles you want to use.



For reasons of safety, we will have a trial run on a measured area (such as one acre). The sprayer tank will be filled with:

- A. plain water.                      B. pesticide.

A  
plain water.

9. The spray tank is filled with water, and the sprayer is operated in place to fill the system. The tank is then topped off.

Next, the measured area is sprayed as though you were applying pesticide.

After spraying, the amount of water it takes to refill the tank is measured.

If you sprayed one acre, and it takes 6 gallons to refill the spray tank, the sprayer is applying at a rate of \_\_\_\_\_ per acre.

6 gallons

10. If your tank has a 100-gallon capacity or larger, you should spray an area large enough to use at least 10% of the tank capacity.

For a 100-gallon sprayer, you should spray at least \_\_\_\_\_ gallons of water to test the sprayer.

10 (100 x 10% = 10)

11. Suppose you spray an area of  $\frac{1}{4}$  acre and use 5 gallons of water. Your sprayer is applying liquid at a rate of \_\_\_\_\_ gallons per acre (gpa).

20

12. If the rate of spray is not correct for the purposes you have in mind, you will have to \_\_\_\_\_ the rate the sprayer is applying liquid.

change

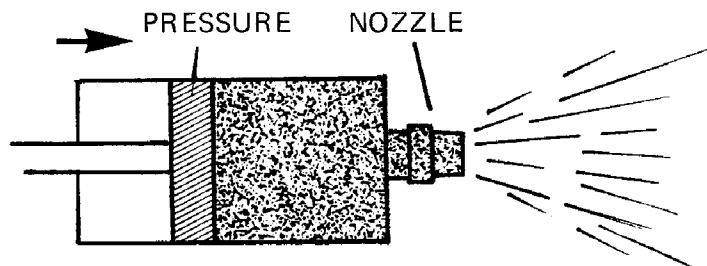
13. There are several factors that you can change to adjust the rate of pesticide applied per acre.

Flow rate from the nozzles is one factor.

The faster liquid flows from the nozzles, the \_\_\_\_\_ pesticide applied.

more

14. The flow rate depends on 2 things:



The amount of \_\_\_\_\_ applied to the liquid in the sprayer.

And the size of the \_\_\_\_\_ opening.

pressure  
nozzle

15. An increase in pressure will \_\_\_\_\_ flow rate.

A reduction in pressure will \_\_\_\_\_ flow rate.

increase  
reduce

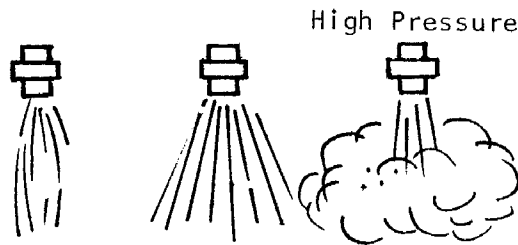
16. However, pressure must be increased four (4) times in order to double the flow rate.

If a sprayer applies 1 pint of liquid per minute at 25 pounds per square inch (psi), how much pressure is needed to increase the flow rate to 2 pints per minute?

- A. 50 psi  
B. 100 psi

17. Changes in pressure may change the nozzle pattern and droplet size.

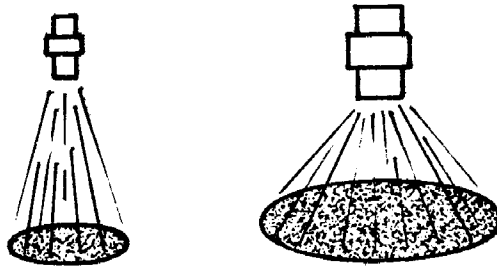
B  
100 psi  
(This is 4 times 25 psi.)



A change in nozzle pattern and droplet size (is/is not) always desirable.

18. Another way to change the flow rate is to use nozzles with larger or smaller openings.

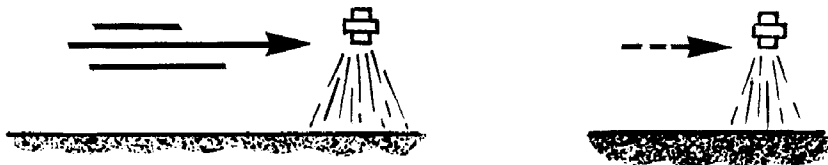
is not



If it is not desirable to change nozzle patterns or droplet size, then flow rate can be changed by using nozzles with larger or smaller

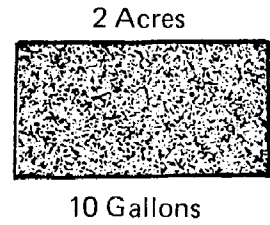
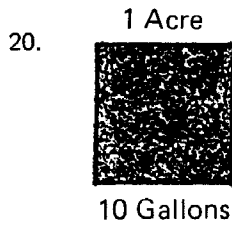
19. Another way to change the rate of application per acre is to change the ground speed of the sprayer.

openings



The slower the sprayer moves, the \_\_\_\_\_ spray is applied to the area.

more



In the situations above, both sprayers have sprayed 10 gallons. In the first picture the sprayer applies \_\_\_\_\_ gallons per acre.

In the second case, the faster moving sprayer applies only \_\_\_\_\_ gallons per acre.

10  
5

21. If the sprayer slows down and applies 10 gallons to  $\frac{1}{2}$  acre, the sprayer is applying liquid at a rate of \_\_\_\_\_ gallons per acre.

20

22. Increasing the ground speed of the sprayer means (more/less) spray per acre.

Slowing down the ground speed of the sprayer will (increase/decrease) the rate of application.

less  
increase

23. Increasing the speed of the tractor pulling the sprayer from 2 miles per hour to 4 miles per hour will (if pressure and nozzle size stay the same):

- A. cut the application rate in half.
- B. double the application rate.

If the application rate above was 10 gallons per acre at 2 miles per hour, what will the new application rate be?

\_\_\_\_\_

A  
cut the application rate in half.  
5 gallons per acre.

24. When pressure, speed or nozzle size have been changed, you should:

- A. try to figure out how much sprayer output has changed.
- B. recalibrate the sprayer by a trial run on a measured piece of land.

**B**  
recalibrate the sprayer by a trial run on a measured piece of land.  
(Nothing should be left to guesswork.)

25. Suppose you are recalibrating your sprayer and find that after spraying 1 acre with water, the tank needs 8 gallons to top it off.

The sprayer tank holds 50 gallons, and the pesticide label instructs you to apply 2 pints per acre.

Sprayer rate is \_\_\_\_\_ gpa.

The 50-gallon tank will spray \_\_\_\_\_ acres.

The number of pints per tankful is \_\_\_\_\_.

8  
6.25 (50/8 = 6.25)  
12.5 (6.25 x 2)

26. To apply pesticide evenly and accurately, the sprayer must:

- A. move at a constant speed.
- B. operate at a constant pressure.
- C. both of these.

#### APPLYING WETTABLE POWDER

**C**  
Both of these.

27. Wettable powders are designed to be applied with a sprayer.

A 50% wettable powder formulation is:

- A. all active ingredient.
- B. half active ingredient.

**B**  
half active ingredient.

28. There is \_\_\_\_\_ pounds of active ingredient in 1 pound of 50% wettable powder formulation.

$\frac{1}{2}$

29. There is \_\_\_\_\_ pounds of active ingredient in 1 pound of 25% wettable powder formulation.

$\frac{1}{4}$

30. If the label instructs you to apply 1 pound of active ingredient per acre, how much 50% wettable powder formulation must be applied per acre?

2 pounds

31. Your 50-gallon sprayer is calibrated to apply 10 gallons per acre. The label directions on the pesticide container instruct you to apply to 50% wettable powder formulation at a rate of 1 pound of *active ingredient* per acre.

How much wettable powder formulation should be added per tankful of water?

\_\_\_\_\_

MIXING WETTABLE POWDER

$$\frac{50 \text{ gallons}}{10 \text{ gallons per acre}} = 5 \text{ acres}$$

10 pounds of formulation is needed, (2 pounds per acre).

32. Wettable powder presents some problems in mixing.

Wettable powders do not dissolve in water. Instead, they form a mixture like flour and water.

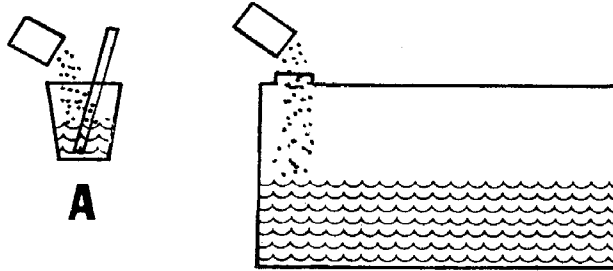
If you simply dump the bag of wettable powder into the sprayer tank you will get:

- A. an even mixture.
- B. an uneven mixture that may be full of lumps.

33. First, the wettable powder must be added to a clean bucket that is partially full of water. The resulting mixture, called a *slurry*, is then mixed well.

Which of these shows how a slurry is made?

B  
an uneven mixture that may be full of lumps.

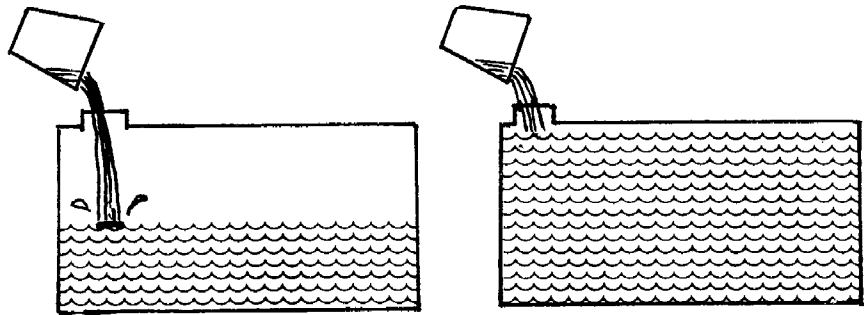


B

34. The slurry is then added to a partially filled tank. This makes uniform mixing possible.

The slurry should be added as shown in which picture?

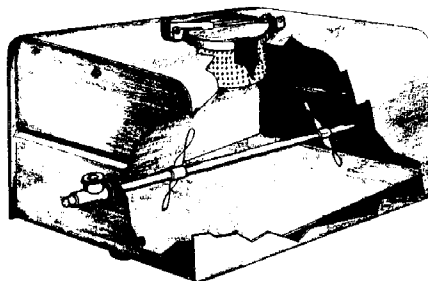
A



A

B

35. After the tank is filled with water, the contents must be agitated to keep the wettable powder from settling to the bottom.



A

While filling the partially filled tank with water, you must have the agitator (off/working).

working

36. To mix wettable powder, first put the powder into a clean bucket partially filled with \_\_\_\_\_.

By stirring the mixture you make a \_\_\_\_\_.

water  
slurry

37. Next, the slurry is added to a (completely/partially) filled spray tank.

partially

38. As water is added to fill the tank, the agitator should be \_\_\_\_\_ the liquid in the spray tank.

stirring

#### MAINTENANCE OF SPRAYERS

39. When operating a sprayer, it is better to:

- A. wait for trouble to occur.
- B. try to prevent trouble.

B  
try to prevent trouble.



40. One way to prevent trouble is to correctly follow instructions for sprayer operation.

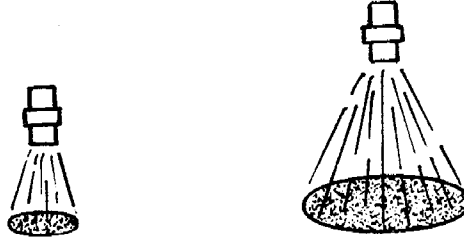
These instructions can be found in the operator's \_\_\_\_\_.

## USE AND CARE OF NOZZLES

manual

41. One source of potential trouble on a sprayer is the nozzles.

The height of the nozzles above the material being sprayed is important.



This nozzle height (affects/does not affect) the spray pattern.

affects

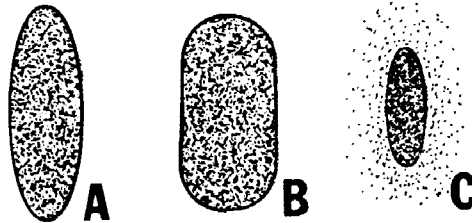
42. Before spraying, the nozzles must be adjusted to the proper \_\_\_\_\_ for the job.

43. All nozzles on the sprayer should be of the proper type and size for the job. Each nozzle in the system must deliver its rated amount of pesticide.

Nozzles that are not flowing at the proper rate or have faulty spray patterns should be replaced.

The spray patterns below are from flat fan nozzles. Which nozzle should be replaced?

height



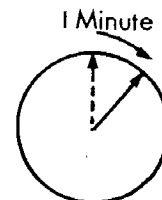
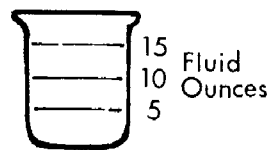
44. The flow rates of each nozzle should be checked.

Flow rate is the amount of liquid coming from the nozzle in a given period of time.

Flow rate can be measured in:

- A. fluid ounces.
- B. minutes.
- C. fluid ounces per minute.

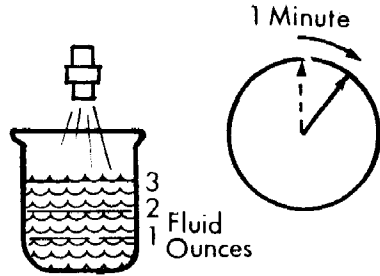
C



C  
fluid ounces per minute.

45. The flow rate of each nozzle can be checked by filling the sprayer with water and running each nozzle for a minute into a measuring jar.

What is the flow rate for the nozzle below?



3 fluid ounces per minute.

46. Any nozzle that has a flow rate of 5 percent more or less than the average of the nozzles in the system should be replaced.

Suppose the average of a boom of nozzles is 8 fl oz per minute. Five (5%) percent of 8 is 0.4. Which of the following nozzles should be replaced?

Nozzle	Flow Rate
A	8.3 fl. oz./min.
B	8.5 fl. oz./min.
C	7.8 fl. oz./min.
D	7.5 fl. oz./min.

B is more than 0.4 larger than 8.  
D is more than 0.4 smaller than 8.

47. What is the average flow of these 5 nozzles?

Nozzle	Flow Rate
A	10.0 fl. oz./min.
B	10.5 fl. oz./min.
C	9.5 fl. oz./min.
D	10.1 fl. oz./min.
E	9.9 fl. oz./min.

10.0 fl. oz./min.

48. What is 5% of 10.0 fl. oz./min.?

0.5 fl. oz./min.

49. What flow rate is 5% above 10.0 fl. oz./min.?  
What flow rate is 5% below 10.0 fl. oz./min.?

50. Which of these nozzles is 5% more or less than the average and should be replaced?

10.5 fl. oz./min.  
9.5 fl. oz./min.

<u>Nozzle</u>	<u>Flow Rate</u>
A	10.0 fl. oz./min.
B	10.5 fl. oz./min.
C	9.5 fl. oz./min.
D	10.1 fl. oz./min.
E	9.9 fl. oz./min.

51. Which of these nozzles should be replaced?

B  
C

<u>Nozzle</u>	<u>Flow Rate</u>
A	6.9 fl. oz./min.
B	7.0 fl. oz./min.
C	7.5 fl. oz./min.
D	6.5 fl. oz./min.
E	7.1 fl. oz./min.

Avg. flow - 7.0

5% of Avg. = .35

C and D should be replaced.

52. Nozzles that are clogged should be cleaned. This must be done with something that will not damage the nozzle opening.

The tool used to clean a nozzle should be made from a material that is (harder/softer) than the nozzle material.

53. Which of these is softer than such nozzle materials as brass or stainless steel?

softer

Choose all that apply.

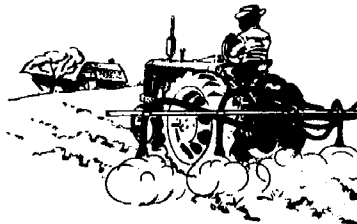
- steel wire.
- wooden toothpick.
- toothbrush.
- pocket knife.
- metal file.

wooden toothpick.  
toothbrush.

54. Nozzles should be cleaned only with a toothbrush or wooden toothpick. A piece of wire fencing or a nail (will/will not) damage the nozzle.

DUSTERS AND GRANULAR APPLICATORS

55. Dusters and granular applicators apply dry formulations dropping the formulation on the target or blowing it on the target.



will

The speed at which the formulation is fed depends on how fast the applicator is moving. Changes in the land speed of a duster or granular applicator (will change/will not change) the rate of delivery.▪

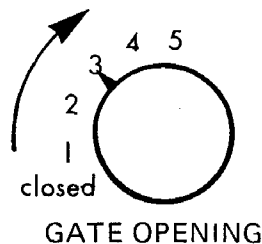
will change.

56. Bouncing a duster or granular applicator will:
- A. cause variations in delivery.
  - B. not affect application.

57. The manufacturer's operating manual will tell you how to set gate openings for the product you are going to use.

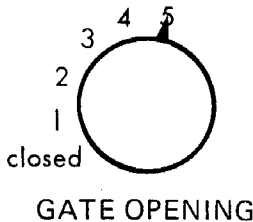
Gate openings may vary if they are not set from the same direction, such as from closed to open.

A  
cause variations in delivery.



GO ON TO THE NEXT FRAME

58. This setting was originally set by moving the dial from closed to the 3 position. Later it was set to 5. How should the control be reset to 3?



- A. Move it back to 3 from the 5 position.
- B. Move it to the closed position first, then to 3.

<p><b>B</b> move it to the closed position first, then to 3.</p>	<p>59. Calibration of a duster or granular applicator is similar to the calibration of a sprayer. One difference is the duster or granular applicator must be filled with pesticide formulation.</p> <p>Because it is applying actual pesticide, the calibration of a duster or granular applicator should be done on an area (larger/smaller) than that used for a sprayer.</p>
<p>smaller</p>	<p>60. To calibrate a duster or granular applicator, fill the hopper to a measured level. Operate the equipment over a measured area. This should be at least ¼ acre or 1,000 feet of row.</p> <p>Refill the hopper to the original level, carefully weighing the amount of pesticide needed. The amount needed to refill the hopper is the amount applied.</p> <p>If the weight of pesticide applied is 1 pound and the area treated is ¼ acre, the applicator is treating at a rate of _____ pounds per acre.</p>
<p>4</p>	<p>61. If the amount applied does not fall within 5% of the recommended dosage, reset the gate opening and recalibrate.</p> <p>Suppose the recommended dosage is 4 pounds per acre. Which of these would call for recalibration?</p> <p>A. application of 4.1 lbs./acre.  B. application of 4.2 lbs./acre.  C. application of 3.9 lbs./acre.  D. all of these.</p>
<p><b>B</b> application of 4.2 lbs. per acre. 5% of 4 is 0.2.</p>	<p>62. While spraying, dusting and applying granular formulations, you should keep a record of the total amount of area treated and the total amount of pesticide used. If there is any significant variation from the recommended dosage, you (should/should not) make the necessary adjustments.</p>
<p>should</p>	<p>63. A sprayer is calibrated by spraying a measured area with:</p> <p>A. plain water.  B. pesticide formulation.</p>
<p><b>A</b> plain water.</p>	<p>64. A sprayer with 100-gallon capacity requires 20 gallons of water to refill it after spraying 2 acres.</p> <p>If the pesticide label says to apply 1½ pints of formulation per acre, how much pesticide should be added to a tank of water in the above sprayer?</p>
<p>10 acres 15 pints</p>	<p>Number of acres the sprayer can spray = _____  Number of pints needed for this acreage = _____</p>