Questions and Answers
To Aid Operators of the Babcock Test to Meet the Requirements of the Oregon Law

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Questions and Answers to Aid Operators of the Babcock Test

Following are sections of the law relating to requirements for licensed testers.

H. B. 207, session of 1915.

Licensed Testers Required

Section 5. All testing of milk or cream purchased on the basis of the amount of butter-fat contained therein, shall be done by a licensed tester who shall supervise and be responsible for the operation of the Babcock test of milk or cream. The license shall be issued to such person by the Dairy and Food Commissioner upon the presentation by the applicant of a certificate of proficiency properly filled out and signed by the Chief of the Dairy department of the Oregon Agricultural College and upon payment of a license fee as provided for in Section 8 of this Act.

The license shall be valid during the life of the licensee unless sooner revoked and shall be revoked by the Dairy and Food Commissioner if, after due notice the licensee has failed to comply with the laws, rules, and regulations under which the license was granted; PROVIDED, that the provisions of this section shall not apply to individuals, hotels, restaurants, or boarding houses buying milk or cream for private use."

Examination Board

Section 6. The Chief of the Dairy department of the Oregon Agricultural College and his assistants are created a board whose duty it shall be to examine into the qualifications of all applicants for such license, and every such applicant shall satisfy said board of his qualifications before any license shall be issued to him.

Examinations will be given as follows:

At Corvallis. Examinations will be held in Corvallis on the first Thursday of each month and the applicant must notify the department of his intention of taking the examination so that arrangements may be made to take care of all who apply.

At Portland. Examinations will be given by the Dairy and Food Commissioner at such times as may be arranged for by him.

License for Testers. Testers’ licenses will be issued to every person complying with the above sections and the rules of the Board of Examiners.

The candidate should secure application blanks for testers’ examination from the Dairy department, Oregon Agricultural College, Corvallis. Before a license can be issued, the candidate must pass the tester’s license examination held at the College or at Portland or other place designated by the Board.

The candidate for the tester’s license who passes the examination will receive a certificate of proficiency. Upon presentation of the certificate and payment of $1.00, the Dairy and Food Commissioner will issue such license.

Tester’s licenses are good during the life of the licensee unless revoked by the Dairy and Food Commissioner.

The tester’s license must be posted in plain sight in the testing room where the tester is employed. The license will be revoked if the licensee fails to comply with the laws, rules, and regulations under which the license was granted.
Examination of Applicants for Tester's License. The examination will consist of a laboratory exercise and a written test. The laboratory exercise will include the testing of various samples of milk and cream. In the written test the applicant will be required to answer a series of questions on the composition, sampling, and testing of milk and cream.

The following questions and answers may serve as a guide to the prospective candidate for a tester's license as showing the scope of the subject which he should know and on which he may be examined. The purpose is to put before him in a brief, clear, and definite form the information he needs. It should not be understood that the examination will include these questions word for word, nor that it will be confined to these questions only, nor that it will cover all these questions. The questions merely serve as a guide for the benefit of applicants for tester's licenses.

Milk Testing

Question 1. What apparatus and supplies are used in making a test of milk for butter-fat?

Answer. A Babcock tester or centrifuge, test bottles, pipette, acid measure, water bath, dividers, and sulfuric acid.

Q. 2. What is a standard milk test bottle?

A. A standard milk test bottle is a test bottle graduated to 8 percent with subdivisions of one-tenth percent. It must have been examined for accuracy and bear the letters S. G. O. (Standard Glassware Oregon).

Q. 3. What is the average composition of normal milk?

A. Water ......................................................... 87.0 percent
   Fat ............................................................ 4.0 percent
   Casein ....................................................... 3.0 percent
   Milk sugar .................................................. 4.8 percent
   Albumin ..................................................... .5 percent
   Ash ............................................................. .7 percent

   100.0 percent

Q. 4. What variations in fat content occur in normal milk?

A. Normal milk, ordinarily, contains from 3 percent to 6 percent of fat, although cases are not rare where a lower or higher fat content is found.

Q. 5. How should a sample of milk for testing be secured?

A. The milk should be thoroughly mixed by pouring from one can or bucket to another two or three times and the sample taken at once.

Q. 6. How should the milk sample be preserved?

A. Test if possible within twelve hours of the time the milk was drawn from the cow. If necessary, to preserve or keep longer, use a clean bottle with a tight seal such as bottles with patent tin caps, or screw tops, or cork or glass stoppers. Add corrosive sublimate or other preservative. Dissolve by shaking. Seal tightly and place where it is cool. If additional samples are taken into the same jar, mix after each addition by giving the bottle a rotary motion.
Q. 7. How should the milk sample be prepared for the test?
A. The cream must be uniformly mixed with the milk. This is best accomplished by pouring from one jar to another several times.

Q. 8. If the sample contains lumps of dried cream or butter, how should it be treated before testing?
A. Melt the fat by setting the jar into warm water. When dissolved, mix thoroughly, and measure into test bottle at once.

Q. 9. If the milk sample is sour and contains lumps of curd, how should it be treated?
A. Add a knife point full of soda lye; shake, and let stand until the curd is thoroughly dissolved. When this is done the sulfuric acid should be added a little at a time as the chemical action is violent.

Q. 10. How much milk and how much acid should be used?
A. 17.6 cubic centimeters of milk.
17.5 cubic centimeters of acid.

Q. 11. How is the milk measured and delivered into the test bottle?
A. With a pipette.

Q. 12. How are the milk and acid mixed?
A. With a rotary motion until the curd is completely dissolved.

Q. 13. What kind and strength of acid should be used?
A. Commercial sulfuric acid, specific gravity 1.82 to 1.83.

Q. 14. Why is acid used?
A. It dissolves the casein in the milk and through chemical action generates heat that liquifies the fat and aids in its separation.

Q. 15. What should be done if the acid is too weak?
A. If slightly too weak, use a trifle more acid; if much too weak, get a new supply.

Q. 16. What should be done if the acid is too strong?
A. If slightly too strong use a trifle less acid. If much too strong dilute with a small amount of water. Pour the acid into the water. To pour the water into the acid is dangerous.

Q. 17. At what temperature should the milk and acid be before mixing?
A. 55° to 70° F.

Q. 18. How should the bottles be whirled in the tester?
A. They should be whirled three times. First whirling, 5 minutes, fill with hot water to the bottom of the neck of the bottle. Second whirling, two minutes, fill with hot water until the fat column is contained within the graduated portion of the neck. Third whirling, one minute. This also applies to cream testing.

Q. 19. What is the correct speed of the tester?
A. From 675 to 925 revolutions a minute, depending upon diameter of the tester.
Q. 20. At what temperature should the test be read?
A. At 130° to 140° F. This is required by the law.

Q. 21. How should the temperature of the fat in the bottles be regulated?
A. Set the bottles in a water bath at 130° to 140° F. for five minutes. The water must reach to the top of the fat column.

Q. 22. What is the meniscus?
A. The curve at the bottom and top of the fat column.

Q. 23. How should the test be read?
A. The meniscus at both top and bottom should be included in the reading. The use of dividers will give more accurate and rapid reading.

Q. 24. What should be the appearance of the completed test?
A. The ends of the fat column should be clearly and sharply defined. The fat should be clear, free from specks or sediment, of a light yellow color, and be contained within the graduated portions of the neck of the bottle. The water below the fat should be clear.

Cream Testing

Q. 25. What is a standard cream test bottle?
A. Three types of bottles are accepted as standard cream test bottles, a 50-percent nine-gram, short-neck bottle; a 50-percent nine-gram, long-neck bottle; and a 50-percent 18-gram long-neck bottle. The bottles must have been examined for accuracy and bear the letters S. G. O. (Standard Glassware Oregon).

Q. 26. How should the cream sample be taken?
A. The cream should be mixed by pouring or stirring until it is uniform throughout and all lumps have disappeared. At least one ounce should be taken as a sample in order to provide for a retest in case of necessity.

Q. 27. How soon after taking should cream samples be tested?
A. As soon as possible. If the testing cannot be done at once, the samples must be put into tightly corked bottles to prevent evaporation, and kept in a cool place.

Q. 28. How should the cream sample be prepared for testing?
A. The sample must be thoroughly mixed so as to be uniform throughout. If lumps are present or particles of butter, heat to 110° F. until dissolved, mix and weigh into test bottles at once.

Q. 29. Why should the cream be weighed into the test bottle instead of measured?
A. Because measuring does not give an accurate test. The weight of the cream varies with its fat content and other conditions and it is difficult to transfer all the cream in the pipette into the cream bottle.

Q. 30. What is the correct weight of cream to use for testing?
A. 9 grams or 18 grams, depending upon the type of bottle used.
Q. 31. What precautions should be observed in weighing cream?
A. Use a sensitive balance, setting level, in good working order, and protected against drafts while weighing. If any cream is spilled on the balance, remove it before weighing is completed.

Q. 32. How much sulfuric acid should be used?
A. The amount varies with the amount and condition of the cream. Use less than with milk. The mixture of acid and cream just after shaking should be of a coffee-brown color. The mixing of a little water with the cream before adding the acid often results in a clearer test. Where this is done slightly more acid is required.

Q. 33. At what temperature should the cream tests be read?
A. At 130° to 140° F. This is required by the law.

Fig. 1. Milk tests should be read as illustrated.

Fig. 2. Reading fat column with the aid of glymol.

Q. 34. How is the temperature best regulated?
A. By setting the cream test bottles into a water bath at 130° to 140° F. for ten minutes. The water should reach to the top of the fat column.

Q. 35. How should the fat column be read?
A. The bottle should be held on a level with the eye and the reading should include one-third of the meniscus.

Q. 36. What aid is recommended in reading the fat column in cream testing?
A. The use of glymol or of fat-saturated alcohol. Glymol is a white mineral oil. It is inexpensive and can be secured from any druggist. Fat-saturated alcohol is made by adding butter-fat to alcohol until it will take up no more.

Q. 37. How are these materials used?
A. At the conclusion of the test and just before reading, a small amount of either the glymol or saturated alcohol is run down the side of the neck onto the top of the fat. This removes the meniscus and gives
a straight line to the top of the fat column. Quicker, easier, and more accurate reading is thus made possible. A pipette, burette, glass tube, or oil can with flexible bottom should be used for adding these materials. Coloring matter or saturated alcohol may be added to the glymol, thus making the dividing line more distinct.

Q. 38. Should glymol or saturated alcohol be used in the milk test?
A. No. It is necessary to include the meniscus in order to compensate for the loss of residual fat in the bulb of the bottle. If these materials were used the reading of the milk test would be too low.

Q. 39. What causes air bubbles on the top of the fat column?
A. Air bubbles are due to the use of hard water. If the water is hard, soften by boiling or by adding to it a few drops of sulfuric acid. Better still, use rain water or distilled water.

Q. 40. What causes a milky and curdy fat column?
A. Too little or too weak acid, or insufficient mixing.

Q. 41. What causes a dark and charred fat column?
A. Too much or too strong acid, milk too warm, standing too long after acid is added before mixing.

Q. 42. How are skimmed milk and buttermilk tested for fat content?
A. A special skim milk bottle should be used. The same amount of milk is taken as with whole milk. The larger proportion of casein in skimmed milk and buttermilk makes necessary the use of about 20 c.c. of acid. The small size of the fat globules requires that the centrifuge be run about ten minutes at the first whirling. The test is then completed as with whole milk.

Q. 43. How should test bottles be cleaned?
A. They should be emptied as soon as the test is completed while still hot. Wash with hot water and washing powder to remove all the fat. Rinse with clean hot water.

Q. 44. What do the letters S. G. O., which are etched on the test bottles, mean?
A. The letters S. G. O. stand for the words, “Standard Glassware Oregon.” They mean that the bottles bearing these letters have been examined by the Dairy department, Oregon Agricultural College, and found correct.

Q. 45. What is the purpose of the law requiring creameries and other manufacturers of dairy products to have in their employ licensed testers?
A. The purpose of this law is to insure accurate, honest, reliable tests for the protection of the milk producers and manufacturers alike.

Q. 46. Name four important requirements for accurate testing of milk and cream.
A. Fair and representative samples, correct measuring or weighing, accurate glassware, and correct reading of the test.