

**Production Exam
National FFA CDE
2007**

1. A CMT test appearance with a strong gel formation that tends to adhere to paddle and forms a distinct central peak would have a somatic cell count of _____ per milliliter.
 - a) Below 200,000
 - b) 150,000-500,000
 - c) 800,000-5,000,000
 - d) Over 5,000,000

2. The abundant material in milk that is essential for bone development is
 - a) Iodine
 - b) Magnesium
 - c) Phosphorus
 - d) Calcium

3. Oxidized flavor in milk is generally caused by
 - a) Growth of bacterial
 - b) Enzymatic breakdown of milk fat
 - c) Pumping of milk
 - d) Exposure to sunlight or fluorescent light

4. Milk with a high somatic cell count can cause
 - a) Reduced shelf life
 - b) Increased rancidity
 - c) Reduced cheese yield
 - d) All of the above

5. To make one pound of cheese, you need approximately _____ pounds of whole milk.
 - a) 21.8
 - b) 2.2
 - c) 10.6
 - d) 10.0

6. Which of the following fatty acids found in milk have been associated with health benefits in humans?
- a) Oleic acid
 - b) Conjugated Linoleic Acid
 - c) Butyric Acid
 - d) Lactic Acid
7. Grade A raw milk sampled at the producer farm should have a Standard Plate count per milliliter of aerobic bacteria that is
- a) Less than 1,000
 - b) Between 10,000 and 100,000
 - c) Not more than 100,000
 - d) Between 100,000 and 1,000,000
8. Public health standards for safety of Grade A raw milk include
- a) Flavor
 - b) Bacteria count
 - c) Protein content
 - d) All of these
 - e) None of these
9. Stainless steel equipment is used to produce and process milk because
- a) Surfaces can be polished to a smooth finish
 - b) Surfaces do not corrode easily
 - c) There is little chance for copper to get into milk
 - d) All of the above
10. Rancidity or lipolyzed flavor in milk results from
- a) Growth of acid producing bacteria
 - b) Release of amino acids from casein
 - c) Contamination of milk with antibiotics
 - d) Action of a natural enzyme of milk that splits fatty acids from milk fat
11. Somatic cells occur in large numbers in milk when
- a) Cows consumer too much protein
 - b) Milk from mastitis glands is placed in the bulk milk tank
 - c) Milking machines are badly soiled
 - d) Milk is held a long time at the dairy plant

12. Milk stone on dairy equipment is often caused by

- a) The use of hard water for cleaning and rinsing
- b) Failure to use acid-type cleaners on farms that have hard water
- c) Failure to use adequate detergent on farms that have hard water
- d) All of the above

13. The California Mastitis Test detects _____ in raw milk.

- a) Bacteria
- b) Foreign matters
- c) Somatic cells
- d) Red blood cells

14. When performing a CMT test, watch for color changes and gel formation. Milk from a normal quarter does which of the following?

- a) Forms a gelatinous mass clinging together in a strong reaction
- b) Flows freely without change in viscosity
- c) Forms small clumps in a moderate reaction
- d) Turns a deep purple color

15. When a large number of mammary glands yield a weak positive reaction to the California Mastitis Test, what percentage of them will likely be shedding mastitis causing bacteria?

- a) 25%
- b) 50%
- c) 75%
- d) 90%

16. The off-flavor that is seldom found except in pasteurized milk that has been stored too long is

- a) Foreign
- b) Unclean
- c) High acid
- d) Feed
- e) Fat/watery

17. When the purple color becomes intense in the CMT, it indicates _____ pH in the mammary gland.

- a) Basic or alkaline
- b) Neutral
- c) Acidic

d) Not related to change

18. Which of the following are required for milk from a dairy farm to be certified organic?

- a) Cows may not have been treated with antibiotics
- b) Insecticides may not have been used
- c) The farm must have been audited by a third party
- d) All of the above

19. Besides the most common human diseases caused by pathogens in raw milk, E-coli, Salmonella and Listeria, which of the following diseases may be transmitted to humans through consumption of raw milk?

- a) Tuberculosis
- b) Q-Fever
- c) Pneumonia
- d) Only A and B

20. Drug residues in milk are due to producers treating cattle

- a) In an extra-label manner
- b) In a manner as the label directs
- c) In accordance to the FDA=s regulations
- d) All of the above

21. Which of the following aspects of the Cooperatives Working Together programs are correct?

- a) Funded by voluntary contribution of 10 cents per cwt.
- b) Supports periodic herd retirement programs
- c) Supports export of dairy products
- d) All of the above

22. An infection caused by Mycobacterium paratuberculosis is more commonly known as

- a) Acidosis
- b) Johne=s Disease
- c) Ketosis
- d) Milk Fever

23. The _____ region had the highest cheese production in 2006.

- a) Atlantic
- b) Central

- c) West
- d) None of the above

24. While the legal limit for somatic cells in raw milk is 750,000/ml, the average in 2006 had declined below ____/ml

- a) 600,000
- b) 500,000
- c) 400,000
- d) 300,000

25. The Standard of Identity for ice cream requires that it contain a minimum of ____% milk fat

- a) 10
- b) 12
- c) 14
- d) 16

MARKETING 2007

26. According to the Food and Nutrition Board of the National Academy of Sciences, all people need at least _____ milligrams of calcium per day.
- a) 10
 - b) 100
 - c) 1,000
 - d) 1,000,000
27. _____ milk is made by removing about 60% of milk's water. It contains not less than 6.5% milk fat and not less than 23% by weight of total milk solids.
- a) Cultured
 - b) Nonfat dry
 - c) Evaporated
 - d) Sweetened condensed
28. The market prices used in the Federal Milk Mark Order program to establish class prices of milk are those of
- a) Butter, nonfat dry milk and cheddar cheese
 - b) Cottage cheese and ice cream
 - c) Fresh milk and cream
 - d) All varieties of cheese
29. Milk covered by Federal orders is often known as _____ or milk eligible for fluid use.
- a) AGrade A@
 - b) Manufacturing grade
 - c) All milk in the market regardless of grade
 - d) Both manufacturing grade and AGrade A@ milk in all markets
30. Mixture of milk and cream containing not less than 10.5 percent milkfat, but less than 18 percent milkfat, is definition of
- a) Light whipping cream
 - b) Light cream
 - c) Half-and-half
 - d) Heavy cream

31. Most recent data shows the most fluid milk was sold in what type of container?
- a) Paper
 - b) Plastic
 - c) Glass
 - d) Metal (tin) cans
32. The national program known as Cooperatives Working Together (CWT) increases amounts of milk products exported from the United States by
- a) Assuring that safety standards are met
 - b) Providing quality control to manufactures
 - c) Providing export bonuses to sellers
 - d) Clearing shipments of products during inspections by receiving countries.
33. The National Milk Producers Federation sponsors a program that is funded by dairy producers to reduce milk supply and increase demand for dairy products. This program is called
- a) Milk Income Loss Contract
 - b) Federal Support Price
 - c) Cooperatives Working Together
 - d) Unified Marketing Plan
34. Based on ice cream consumption figures, the second most popular flavor is
- a) Strawberry
 - b) Cookies n= cream
 - c) Vanilla
 - d) Chocolate
35. What percent of exported U.S. dairy products are sold without a subsidy?
- a) 0%
 - b) 50%
 - c) 80%
 - d) 95%
36. Demand for dairy products is typically the lowest in
- a) Spring
 - b) Summer
 - c) Fall
 - d) Winter

37. What percent of today=s youth consume the recommended amount of dairy products?
- a) 10%
 - b) 30%
 - c) 50%
 - d) 75%
38. Milk that is used to make butter is classified as which class in Federal Orders?
- a) Class I
 - b) Class II
 - c) Class III
 - d) Class IV
39. Milk prices on average are the lowest in
- a) Summer
 - b) Fall
 - c) Winter
 - d) Spring
40. Which element is the basic building block of protein?
- a) Nitrogen
 - b) Phosphorus
 - c) Potassium
 - d) Zinc
41. In 2006, the two leading varieties of cheese produced in the US were
- a) Italian and Cheddar
 - b) Italian and American
 - c) Cheddar and Mozzarella
 - d) American and Provolone
42. Milk is what percent water?
- a) 42 percent
 - b) 58 percent
 - c) 63 percent
 - d) 87 percent
43. Milk used to make ice cream would be priced in what Federal Order class?
- a) Class I
 - b) Class II

- c) Class III
- d) Class IV

44. What is the major cost item on most dairies?

- a) feed
- b) labor
- c) milking supplies
- d) A.I. breeding supplies

45. A cow's milk fat test that is lower than her protein test may be a sign of what?

- a) Acidosis
- b) Fatty liver
- c) Displaced abomasums
- d) Mastitis

46. Which of these is a good nutritional strategy to maintain milk production in hot weather?

- a) feed more grain
- b) increase protein concentrate
- c) add more fat
- d) all of the above

47. Milk over what somatic cell count cannot be legally shipped?

- a) 200,000
- b) 400,000
- c) 750,000
- d) 1,000,000

48. What piece of legislation made farmer cooperatives legal?

- a) Sherman Act
- b) Capper-Volstead Act
- c) Farm Bill
- d) Barkley Act

49. To be labeled Made with organic ingredients, a dairy product must contain _____% or more organic ingredients.

- a) 100
- b) 90
- c) 80

d) 70

50. According to NASS in 2006, what percent of dairy herds consist of less than 29 cows?

- a) 3 percent
- b) 12 percent
- c) 18 percent
- d) 28 percent

Dairy Foods Exams Production and Marketing
Answer Key

- | | |
|-------|-------|
| 1. D | 26. C |
| 2. D | 27. C |
| 3. D | 28. A |
| 4. D | 29. A |
| 5. D | 30. C |
| 6. B | 31. B |
| 7. C | 32. C |
| 8. B | 33. C |
| 9. D | 34. D |
| 10. D | 35. D |
| 11. B | 36. B |
| 12. D | 37. B |
| 13. C | 38. D |
| 14. B | 39. D |
| 15. A | 40. A |
| 16. B | 41. C |
| 17. A | 42. D |
| 18. D | 43. B |
| 19. D | 44. A |
| 20. A | 45. A |
| 21. D | 46. C |
| 22. B | 47. C |
| 23. C | 48. B |
| 24. D | 49. D |
| 25. A | 50. D |

Problem Solving

Total Milk Production (millions of pounds)											
West			Midwest			Northeast			Southeast		
	2001	2006		2001	2006		2001	2006		2001	2006
Alaska	14	10	Illinois	2020	1,978	Connecticut	456	367	Alabama	300	203
Arizona	3,073	3,954	Indiana	2,567	3,299	Delaware	150	122	Arkansas	432	265
California	33,217	38,830	Iowa	3,785	4,130	Maine	654	574	Florida	2,411	2,167
Colorado	1,970	2,547	Michigan	5,870	7,100	Maryland	1,294	1,093	Georgia	1,433	1,404
Hawaii	106	57	Minnesota	8,812	8,364	Massachusetts	357	278	Kentucky	1,660	1,301
Idaho	7,757	10,895	Missouri	1,949	1,840	New Hampshire	322	293	Louisiana	632	396
Kansas	1,610	2,343	Ohio	4,295	4,860	New Jersey	233	178	Mississippi	497	341
Montana	346	354	Wisconsin	22,199	23,398	New York	11,780	12,045	North Carolina	1,166	944
Nebraska	1,166	1,118				Pennsylvania	10,849	10,742	South Carolina	367	278
Nevada	485	558				Rhode Island	23	19	Tennessee	1,335	1,049
New Mexico	5,561	7,638				Vermont	2,669	2,592	Virginia	1,885	1,771
North Dakota	644	470				West Virginia	249	200			
Oklahoma	1,293	1,214									
Oregon	1,717	2,242									
South Dakota	1,580	1,505									
Texas	5,106	7,145									
Utah	1,635	1,745									
Washington	5,514	5,464									
Wyoming	63	118									
Total	72,857	88,207		51,497	54,969		29,036	28,503		12,118	10,119

- Based on the table above, which state had the largest percent increase in milk production from 2001 to 2006?
 - California
 - Idaho
 - Wyoming
 - Wisconsin
- In 2006, the West region produced the most milk in the United States. What percent of the total U.S. milk production came from the West Region during 2006?
 - 44%
 - 48%
 - 55%
 - 58%

3. What was the percent decrease in total production for the Southeast Region from 2001 to 2006?
- A. 17%
 - B. 21%
 - C. 32%
 - D. 35%
4. If Idaho's milk production continues to increase at the same rate it did from 2001 to 2006, what would the expected milk production be for 2011?
- A. 14,212 million
 - B. 14,757 million
 - C. 15,307 million
 - D. 16,228 million

U.S. Dairy Industry Statistics											
Average Production Per Cow											
West			Midwest			Northeast			Southeast		
	2001	2006		2001	2006		2001	2006		2001	2006
Alaska	13,055	12,250	Illinois	17,414	19,204	Connecticut	18,240	19,316	Alabama	14,286	14,500
Arizona	21,950	22,855	Indiana	16,778	19,994	Delaware	16,667	17,429	Arkansas	12,343	13,250
California	20,904	21,815	Iowa	18,024	20,146	Maine	17,211	17,938	Florida	15,758	16,417
Colorado	21,413	23,155	Michigan	19,373	22,188	Maryland	15,780	17,078	Georgia	16,663	18,234
Hawaii	14,107	13,256	Minnesota	17,278	18,587	Massachusetts	17,000	17,375	Kentucky	12,969	13,276
Idaho	21,194	22,326	Missouri	13,441	16,000	New Hampshire	17,889	19,533	Louisiana	11,704	12,375
Kansas	17,312	20,920	Ohio	16,519	17,737	New Jersey	16,643	16,182	Mississippi	14,200	14,826
Montana	18,211	18,632	Wisconsin	17,182	18,824	New York	17,530	18,879	North Carolina	17,403	18,510
Nebraska	16,194	18,328				Pennsylvania	18,112	19,390	South Carolina	17,476	16,353
Nevada	19,400	21,680				Rhode Island	16,571	17,273	Tennessee	14,511	15,657
New Mexico	20,750	21,515				Vermont	17,444	18,383	Virginia	15,975	17,363
North Dakota	14,000	14,688				West Virginia	15,563	15,385			
Oklahoma	14,528	16,630									
Oregon	18,074	19,000									
South Dakota	15,960	18,580									
Texas	15,711	21,328									
Utah	17,581	20,291									
Washington	22,324	23,055									
Wyoming	14,000	17,612									

5. Based on the table above, there are five states that showed a decrease in average production per cow from 2001 to 2006. Which of these states showed the largest decrease?
- A. South Carolina
 - B. Hawaii
 - C. New York
 - D. West Virginia

6. Total milk production showed a 16.5% decrease from 2001 to 2006. What was the percent increase in average production per cow from 2001 to 2006 for the Southeast region?
- A. 10.2%
 - B. 9.5%
 - C. 6.5%
 - D. 4.5%
7. Which region showed the greatest increase in average production per cow from 2001 to 2006?
- A. West
 - B. Midwest
 - C. Northeast
 - D. Southeast
8. If the Southeast region average milk production per cow continues at the same rate it did from 2001 to 2006, what would the expected average milk production per cow be for 2011?
- A. 15,000
 - B. 15,753
 - C. 16,102
 - D. 16,237

Situation A

Milk contains all of the major nutrients, i.e. fat (9 Calories per gram) , carbohydrate (4 calories per gram), and protein (4 Calories per gram) . A normal serving of milk is 8 ounces or 250 grams.

9. A consumer is considering the purchase of either whole milk (3.5% fat, 5% carbohydrate, and 3.2% protein) or low fat milk (2% fat, 6% carbohydrate and 3.7% protein) . If the low fat milk is purchased, how many fewer calories would be consumed in an 8oz. serving?
- A. 10
 - B. 19
 - C. 25
 - C. 30
10. Approximately how many more grams of protein would be consumed in one 8oz. serving of low fat milk?
- A. 0.5
 - B. 1.0
 - C. 1.3

D. 2.0

Situation B

The uniform price for May 2007 in the ABC Federal Order market was reported by the market administrator at \$13.50 per hundredweight for milk testing 3.5 percent milkfat. The butterfat differential was 15 cents per 0.1 percent milkfat. Producer A shipped in May 100,000 pounds of milk testing 3.7 percent milkfat to Handler B.

11. Producer A received _____ per hundredweight for his milk in May.
 - A. \$13.20
 - B. \$13.80
 - C. \$13.00
 - D. \$13.50
12. The total value of Producer A's milk deliveries in May was
 - A. \$1,320
 - B. \$1,350
 - C. \$13,200
 - D. \$13,800

Situation C

During June 2007, Producer C received an average price of \$12.00 per hundredweight for the 50,000 pounds of milk that was shipped to Handler D. In that month, all dairy farmers were assessed 15cents per hundredweight under the Dairy Promotion Program, 40 cents per hundredweight under the Dairy Collection Program to cover part of the cost of the whole-herd buyout program, and 12 cents per hundredweight to cover the government spending reductions required by the Gramm-Rudman-Hollings Act.

13. The total assessment paid by Producer C in June was _____ cents per hundredweight.
 - A. 40
 - B. 52
 - C. 67
 - D. 89
14. The effective milk price actually received by Producer C in June was _____ per hundredweight.
 - A. \$11.33
 - B. \$ 1185
 - C.\$ 11.00
 - D. \$ 11.48

15. Producer C was assessed a total of _____ on his milk marketed in June.

- A. \$200
- B. \$335
- C. \$260
- D. \$365

Problem Solving Key

1. C
2. B
3. A
4. C
5. A
6. D
7. B
8. D
9. B
10. C
11. B
12. D
13. C
14. A
15. B

Mark your answers on the answer sheet. . You may write on this paper. It will be turned in with the answer sheet.

Part 1. Calculate the price of Class III milk (used for cheese making) by summing the values of butterfat, protein and other solids.

Step 1. Calculate the **price of butterfat** using

NASS average price for AA grade butter = \$1.32/lb

make allowance = \$0.1202/lb

yield factor = 1.20.

Formula: Butterfat value/lb = (price of butter – make allowance) x yield factor

Solution: (_____ - _____) x _____ = \$_____/lb butterfat

1. Mark your answer:

- (2) **a. \$1.73** **b. \$1.45** **c. \$1.44** **d. \$1.18**

Step 2. Calculate the value of protein in Class III milk using

NASS weighted average cheese price = \$1.85/lb

make allowance of \$0.165/lb

yield factor attributable to protein = 1.38

yield factor attributable to fat = 1.57

butterfat price of \$1.40

average ratio of fat to protein in milk = 1.17.

Formula:
$$\text{Protein value/lb} = ((\text{cheese price} - \text{make allowance}) \times \text{protein's yield factor}) +$$
$$(((\text{cheese price} - \text{make allowance}) \times \text{fat's yield factor}) - \text{butterfat price} \times 0.9) \times \text{fat to protein ratio})$$

Solution: $((\text{_____} - \text{_____}) \times \text{_____}) +$

$$(((\text{_____} - \text{_____}) \times \text{_____}) - \text{_____} \times 0.9) \times \text{_____}) = \$\text{_____}/\text{lb protein}$$

2. Mark your answer:

- (2) **a. \$3.41** **b. \$3.96** **c. \$4.35** **d. \$7.07**

FFADFCDE07

Step 3. Calculate the value of “other solids” using

dry whey price = \$0.40/lb
make allowance = \$0.195/lb
yield factor = 1.03.

Formula:

“Other solids” value/lb = (dry whey price – make allowance) x yield factor

Solution: (_____ - _____) x _____ = \$ _____ /lb other solids

3. Mark your answer:

- (2) **a. \$0.21** **b. \$0.26** **c. \$0.56** **d. \$0.57**
-

Step 4. Calculate the Class III skim milk price of milk from producer #2994 whose milk tested 3.2% protein and 6.3% other solids. Assume the following prices: protein = \$3.10/lb and other solids = \$0.30 /lb.

Formula:

Class III skim milk price/cwt = (% protein x protein price/lb) + (% other solids x other solids price/lb)

Solution: (_____ x _____) + (_____ x _____) = \$ _____ /cwt Class III skim milk

4. Mark your answer:

- (2) **a. \$5.25** **b. \$8.03** **c. \$11.81** **d. \$12.90**
-

Step 5. Calculate the price per cwt of Class III whole milk by summing the values of the components of milk producer #4425. Use the following data for the calculation:

3.2% protein at \$3.10/lb
3.8% butterfat at \$1.50/lb
6.2% other solids at \$0.25/lb

Formula:

Class III milk price/cwt = (% protein x price/lb) + (% fat x price/lb) + (% other solids x price/ lb)

Solution: (_____ x _____) + (_____ x _____) + (_____ x _____) = \$ _____ /cwt Class III milk

5. Mark your answer:

- (2) **a. \$15.92** **b. \$17.17** **c. \$18.05** **d. \$28.36**

Part 2. Calculate the Price for Class IV milk (used to make butter and nonfat dry milk) by summing the values of Class IV skim milk and butterfat. There are three steps in this problem.

Step 1. Calculate the nonfat milk solids price using

Average NASS price of nonfat dry milk (NDM) = \$2.11/lb

Make allowance = \$0.157/lb

Yield factor = 0.99

Formula:

Nonfat solids price/lb = (NDM price - make allowance) x yield factor

Solution: (_____ - _____) x _____ = \$ _____ /lb NMS

6. Mark your answer:

- (2) a. \$1.32 b. \$1.93 c. \$3.64 d. \$13.31
-

Step 2. Calculate the value of Class IV skim milk containing 8.8% nonfat solids and the value of those solids is \$2.55/lb.

Formula:

Price of Class IV skim milk = % nonfat milk solids x price/lb of NMS

Solution: _____ x _____ = \$ _____ /cwt Class IV skim milk

7. Mark your answer:

- (2) a. \$2.24 b. \$28.97 c. \$11.35 d. \$22.44
-

Step 3. Calculate the Class IV milk price using a **skim milk price of 17.10/cwt**. (To obtain lb skim milk/lb milk, subtract from 1 the amount of milk fat (butterfat) in 1 lb of the milk. For example, if the milk fat test is 5%, $1.00 - 0.05 = 0.95$). **Assume a butterfat content of 3.6% and a butterfat price of \$1.60/lb.**

Formula:

Class IV milk price = (lb skim milk/lb milk x price/cwt) + (lb butterfat x price/lb)

Solution: (_____ x _____) + (_____ x _____) = \$ _____ /cwt Class IV milk

8. Mark your answer:

- (2) a. \$22.24 b. \$22.30 c. \$22.91 d. \$23.48
-
-

Part 3. Use the following values to calculate the prices of milk in Classes I and II. These are **not** the same values that you calculated above.

(NOTE: The Federal Order policy is that the skim milk price for Classes I and II are the higher of skim milk prices of Class III or IV.)

Class III skim milk	\$18.70/cwt	Protein	\$4.20/lb
Class IV skim milk	\$17.80/cwt	Class I differential	\$2.50/cwt
Butterfat	\$2.10/lb	Class II differential	\$1.10/cwt

Step 1. Calculate the value per cwt of Class I milk **containing 3.5%** butterfat.

Formula:

Class I value/cwt = (lb skim milk/lb milk x price/cwt) + (lb butterfat x price/lb) + Class I differential

Solution: (_____ x _____) + (_____ x _____) + _____ = \$_____/cwt **Class I milk**

9. Mark your answer:

- (2) a. \$27.90 b. \$27.02 c. \$26.18 d. \$25.62
-
-

Part 4. Assuming the following utilization percentages and prices for the four classes of milk in the market during the pay period, calculate the individual values of the four classes. Then calculate the overall value per hundred-weight (cwt) of milk from this producer.

Class	Utilization (%)	Price/cwt (\$)	Value (\$)
I	40	22.00	_____
II	15	20.20	_____
III	28	19.50	_____
IV	17	18.80	_____
All milk price/cwt			_____

10. Mark your answer:

- (2) a. \$15.15 b. \$15.49 c. \$20.49 d. \$30.25
-
-

Part 5. You will receive duplicate milk samples to test for titratable acidity. Add 6 drops of the pH indicator, phenolphthalein, and titrate to the first permanent shade of light pink. Choose the answer closest to your test result. You may titrate both samples as a control on your technique.

11. Mark your answer:

- (2) a. 0.15% b. 0.25% c. 0.35% d. 0.45% e. 0.50%

Part 6. Calculate the bacterial count per milliliter of the sample given your team in the form of two Petrifilm plates, one representing the 1:100 dilution and the other representing the 1:1000 dilution of the original sample. Count the colonies, select the plate having 25 to 250 colonies and multiply the result by the reciprocal of the dilution used.

12. Mark your answer:

- (2) a. Less than 2,500/mL
 b. 2,500 to 25,000/mL
 c. 26,000 to 50,000/mL
 d. 51,000 to 75,000/mL
 e. 76,000 to 100,000/mL

Part 7. A dairyman added 1 fl. oz. of a 10% stock solution of sodium hypochlorite (NaOCl) to 5 gallons (1 gal equals 128 fl. oz.) of water. Use the following formula to calculate the concentration in parts per million (ppm) of the resulting sanitizing solution:

$$\frac{\text{Fl. oz. of H}_2\text{O}}{1 \text{ fl. oz. NaOCl}} = \frac{\% \text{ NaOCl} \times 10,000}{\text{Concentration in ppm}}$$

(1) **13. Mark your answer:**

- a. 16 ppm b. 156 ppm c. 391 ppm d. 781 ppm