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The construction and evaluation of a nutrition knowledge test for senior high school

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BOSTON UNIVERSITY
SCHOOL OF EDUCATION

Thesis

THE CONSTRUCTION AND EVALUATION OF
A NUTRITION KNOWLEDGE TEST
FOR SENIOR HIGH SCHOOL

Submitted by

Ivy Gaynor Beckles

(B.S. in Ed., Framingham Teachers College, 1946)

In partial fulfillment of requirements for
the degree of Master of Education

1948

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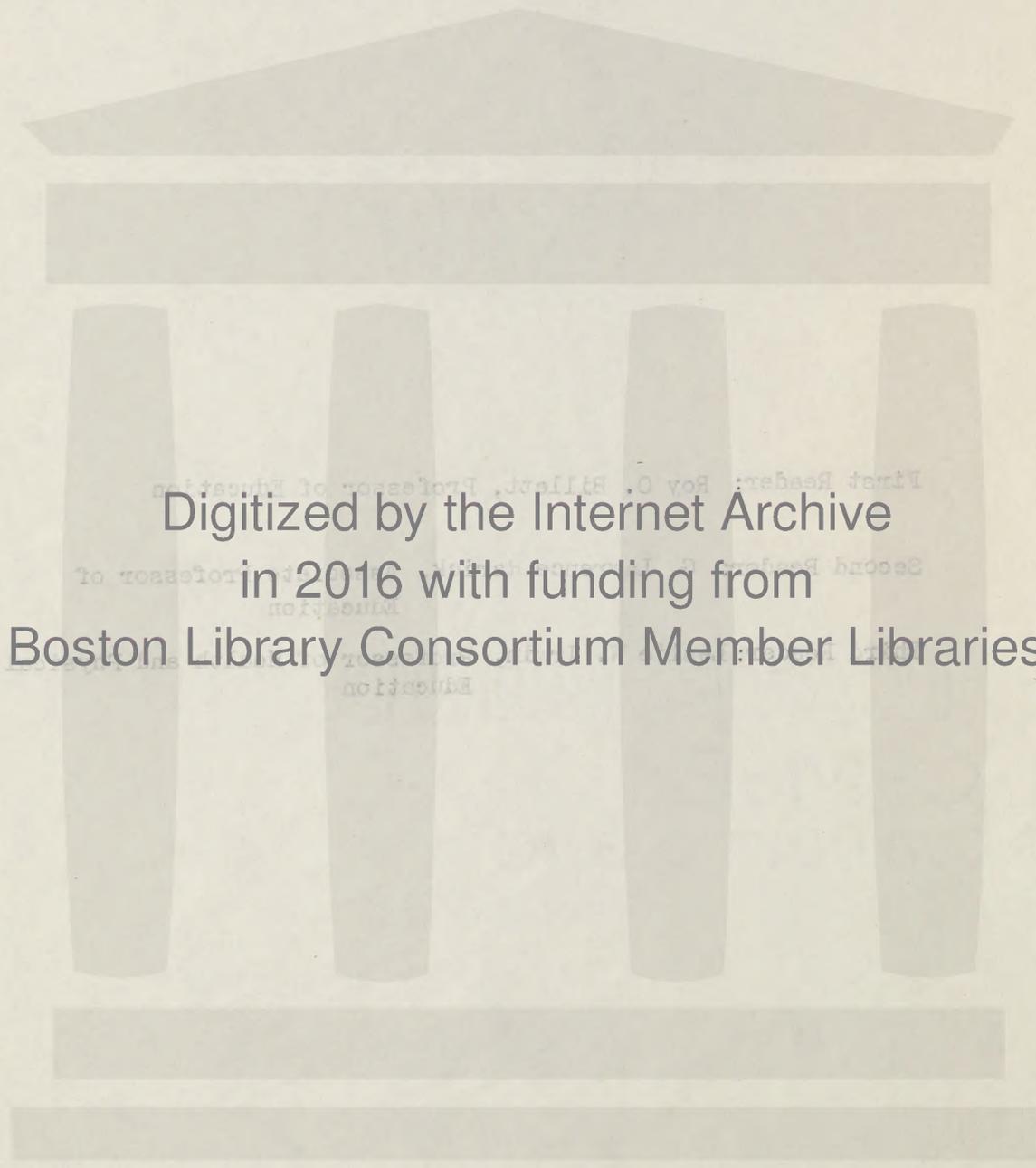
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CHAPTER I

STATEMENT OF THE PROBLEM AND REVIEW OF RESEARCH

The primary purpose of this study was the construction of a test which would measure the general knowledge of nutrition possessed by students in senior high school.

The science of nutrition has developed rapidly since the turn of the century. A tremendous number of dietary studies and experiments with animals and humans have been conducted, which have re-

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sulted in the acquisition of an extensive amount of new nutritional knowledge.

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In the light of this progress, far more is known about the essentials of the normal diet which increases the ability of workers in the field of nutrition to make modifications of the diet to better serve our psychological needs.

McLester^{3/} ably expressed the progress made in nutrition when he says,

^{1/} E. V. McCollum, Eliza Great-Kells and Harry W. Day, The Newer Knowledge of Nutrition, New York: The Macmillan Company, 1934, pp. 1-29.

^{2/} E. V. McCollum, and Emestine Becker, Food, Nutrition and Health, Baltimore: The Lost Baltimore Press, pp. 3-8.

^{3/} Estelle A. Wesley and Grace Gordon, The Art and Science of Nutrition, St. Louis: The C. V. Mosby Company, 1944, p. 27.

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Nutrition now occupies the center of the stage. Formerly she played only a minor, somewhat unattractive role and her lines were few, but today she enjoys a leading part in the spotlight and an even greater brilliance of performance is promised.

Sherman, ^{1/} a leading authority in the field of nutrition, is of the opinion that there are abundant rewards in health to be gained when careful consideration is given to the dietary needs. He expresses his beliefs in the following excerpt:

Present knowledge of nutrition and food values plainly show the way, first to the avoidance of nutritional deficiencies and then to the attainment of higher levels of health than we would otherwise enjoy.

In fact, it is quite conceivable that in the simple matters of the daily choice and use of foods lies our most important and practicable opportunity to build for efficiency and happiness both of our lives and of those who are growing up under our care.

Progressive educators realizing the importance of food to the health and well-being of the individual are now focusing more attention upon adequate nutrition instruction for adolescents.

Roberts, ^{2/} long considered one of the leaders in the field of nutrition education for boys and girls makes the following statements which are pertinent to this study:

1. During adolescence there are basic health needs and problems brought about by the profound physiological changes which are taking place during this period and which calls for a vital type of education for healthful, wholesome living.

^{1/} Henry C. Sherman, Food and Health, New York: The Macmillan Company, 1939, p. 185-186.

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2. There is also an increased demand of the adolescent for independence and a reluctance to accept the say-so of his elders. This requires that he be given both before and during this time such training as will enable him to be safely trusted with the management of his own program of living.
3. Furthermore, it should be kept in mind that the majority of high school students will go out shortly to establish homes of their own and that the education given them now for their own guidance may soon be put into practice in the rearing of their own children.

^{1/} Stare, M. D., in the Department of Nutrition, Harvard School of Public Health and Nations Health, says,

Nutrition education is a part of health education and should be taught as such since good nutrition is essential to good health both physical and mental.

^{2/} Mendel, another leader in the field, states his views when he says,

Human welfare is closely bound up with the provision of food, and in the orderly conduct of our daily life the nutrition as well as the various forms of activity of the body play an important part.

The knowledge of nutrition which has been gained by means of scientific research indicates the importance of nutrition to the health and well-being of the individual.

^{3/} McLester effectively stresses this point when he says,

1/ Frederick J. Stare, "Ideal Intake of Calories and Specific Nutrients," American Journal of Public Health and Nations Health, Volume 37: 516, May, 1947.

2/ Lafayette B. Mendel, Nutrition The Chemistry of Life, New Haven: Yale University Press, 1923, p. 1.

3/ James McLester, "Nutrition and The Future of Man," Journal of American Medical Associations, Volume 104 - 736, June, 1935.

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3/ McLeister effectively stresses this point when he says,

1/ Frederick J. Stone, "Ideal Intake of Calories and Specific Nutrients," American Journal of Public Health and National Health, Volume 27: 212, May, 1937.

2/ Lafayette B. Mendel, Nutrition The Chemistry of Life, New Haven: Yale University Press, 1933, p. 1.

3/ James McLeister, "Nutrition and The Future of Man," Journal of American Medical Association, Volume 104 - 736, June, 1933.

In the past, science has conferred on those peoples who availed themselves of the newer knowledge of infectious diseases better health and a greater average length of life. In the future it promises to those races who will take advantage of the newer knowledge of nutrition a larger stature, greater vigor, increased longevity, and a higher level of cultural attainment. To a measurable degree, man is now master of his own destiny where once he was subject only to the grim hand of Fate.

In view of these studies the writer justifies the building of a test, which might be used to indicate what part, if any, of this nutritional knowledge is being made accessible to the adolescent student.

For the purpose of this study, tests in the areas of general health were set aside as not suitable. An examination was made of the Gates-Strang Health Knowledge test.^{1/} This test consists of 64 multiple-choice questions in which the pupils are required to select the most appropriate of five alternatives which range from very poor to ideal.

This test seeks to measure knowledge in the following fields of health:-

1. Nutrition
2. Communicable diseases
3. Sanitation
4. Safety
5. First Aid
6. Social and Mental Health

This test because of its limited sampling obviously was not feasible for testing the nutritional knowledge possessed by high

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school students. A more comprehensive test was necessary.

A study of research in the field of nutrition testing, revealed the fact that there are no standardized tests available.

The problem then was the construction of a nutrition test simple enough to be within the ability of high school students. This test should interrogate the pupils' knowledge of the value of the essential food substances and their relationship to his well-being.

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CHAPTER II

CONSTRUCTION OF THE TEST

The first step in the construction of the test was an analysis of the following authoritative books in the field of nutrition: -

1. American National Red Cross, Food and Nutrition, ABC 928, Washington, U. S. 1941.
2. Bogert, Jess L., Nutrition and Physical Fitness, Philadelphia: W. B. Saunders Company, 1943.
3. Cowell, M., Mitchell, Helen, S., Nutrition in Health and Disease, Philadelphia: J. B. Lippincott Company, 1941.
4. Davis, Adelle, Vitality Through Planned Nutrition, New York: The Macmillan Company, 1945.
5. Eddy, Walter H., We Need Vitamins, New York, Reinhold Publishing Corporation, 1942.
6. Fishbein, Morris, The National Nutrition, New York: The Bobbs-Merrill Company, 1942.
7. Howley, Estelle E., Carden, Grace, The Art and Science of Nutrition, St. Louis: The C. V. Mosby Company, 1944.
8. MacLeod, Grace., Taylor, Clara, Rose's Foundation of Nutrition, New York: The Macmillan

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3. Cooper, Lenna F., Barber, Edith, M., Mitchell, Helen, S., Nutrition in Health and Disease, Philadelphia: J. B. Lippincott Company, 1941.
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9. Sherman, Henry C., Lanford, Caroline, Essentials of Nutrition, The Macmillan Company, 1945.
10. Sherman, Henry C., Chemistry of Foods and Nutrition, New York: The Macmillan Company, 1941.
11. Taylor, C. M., Food Values in Shares and Weight, New York: The Macmillan Company, 1942.
12. Yearbook of Agriculture, 1939. Human Nutrition, U. S. Department of Agriculture, Washington, D. C.

The second step was the setting up of objectives for this study.

The following list of fundamental nutritional truths are expressed as declarative sentences and represent the objectives of the test. They were selected in terms of the need of the adolescent and their social usefulness to him.

- I. The body needs carbohydrates and fats primarily for heat and energy.
 - a. Carbohydrates are used primarily by the body for heat and other forms of energy.
 - b. Sugars and starches are two important forms of carbohydrate.
 - c. The body stores excess carbohydrate as fat.
 - d. Sugars and starches have a high caloric value.
 - e. The natural sweets provided by fruits are more nutritious for children than candy.
 - f. Cellulose is a form of carbohydrate.
 - g. Cellulose gives bulk or roughage to the diet.
 - h. Practically all fruits and vegetables contain cellulose.
 - i. The calorie is a unit for measuring heat.
 - j. In nutrition the calorie may be used in measuring the fuel value of foods.
 - k. The caloric needs of the body depend upon the activities of the individual.

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 - k. The caloric needs of the body depend upon the activities of the individual.

- l. Normally growing children need more food per pound of body weight than adults.
- m. Overeating is one of the primary causes of overweight.
- n. The caloric intake of a reducing diet should be insufficient in meeting the body's energy need.
- o. Fats are utilized by the body as sources of energy.
- p. Fatty foods are digested more slowly than carbohydrate foods.

II. The body needs protein primarily for growth and repair.

- a. Proteins are necessary in building and repairing body tissues.
- b. Proteins are necessary for life and growth.
- c. Proteins are made up of simpler substances called amino acids.
- d. Plant proteins such as cereals and legumes are by themselves poor sources of the essential amino acids.
- e. Animal proteins such as meats, fish, milk and cheese furnishes the best sources of protein.
- f. Animal proteins are superior to plant proteins.

III. The body needs minerals, especially calcium, phosphorous, iron, and iodine for normal cellular and skeleton growth.

- a. Calcium in the diet is necessary for developing normal bone and tooth structure.
- b. Milk and cheese are rich sources of calcium.
- c. Calcium, Phosphorous and vitamin D helps in building strong bones.
- d. During growth the body needs an abundance of calcium in the diet.
- e. A child should have a quart of milk a day.
- f. Iron is necessary for the formation of normal red blood.
- g. Molasses is a rich source of iron.
- h. Iodine is necessary for the formation of thyroxin.
- i. Fish is a richer source of iodine than most foods.

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IV. The body needs certain protective foods which are present in vitamins, and assists in the normal growth and development of the body.

- a. Vitamins are necessary for health and growth.
- b. Fruits and vegetables furnish the body with minerals and vitamins.
- c. Vitamin A is present in animal livers, milk, eggs.
- d. Yellow and green vegetables contain carotene or vitamin A value.
- e. The body changes the carotene into vitamin A.
- f. The dark green leaves of vegetables are richer in vitamin A value than the lighter leaves.
- g. Thiamine is found chiefly in the germ of seeds.
- h. Whole grain cereals and pork are excellent sources of thiamine.
- i. Glandular organs such as liver and heart are the best sources of riboflavin.
- j. Fish oils are excellent sources of vitamin D.
- k. Ascorbic acid or vitamin C is not stored by the body, therefore it must be provided daily by the diet.
- l. Citrous fruits such as oranges and grapefruit are rich sources of vitamin C.
- m. Minerals and vitamins are present in the protective foods.
- n. Milk is a protective food.
- o. Enriched white bread contains as many vitamins as whole grain bread.

V. Food deficiencies in the diet may lead to marked deficiency diseases.

- a. Nutritional anemia is caused by a deficiency of iron in the diet.
- b. The deficiency disease beri-beri may be prevented by foods containing thiamine.
- c. The deficiency disease scurvy is caused by a deficiency of vitamin C.
- d. The deficiency disease rickets is caused by a deficiency of vitamin D.
- e. Night blindness is the result of a diet deficient in vitamin A.

IV. The body needs certain protective foods which

are present in vitamins, and essential in the normal growth and development of the body.

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- f. An iodine deficient diet may result in an abnormal condition of the thyroid gland called goiter.
 - g. A diet deficient in protein will limit growth.

VI. Some fads, fallacies and superstitions that are not based on scientific research.

- a. Acid foods should not be eaten because they cause acid stomach.
- b. Fatty foods should not be eaten with fruits.
- c. Eggs are more digestible raw than when cooked.
- d. Lobster and ice cream should not be eaten in the same meal.
- e. Celery is especially good for the nervous system.
- f. Tea contains stimulants which are harmful to growing children.
- g. Proteins and starch should not be eaten at the same meal.
- h. Honey is good for sweetening sour stomach.
- i. Citrous fruits are ultimately base-forming in the body.
- j. Pasteurized milk undergoes a process whereby the harmful bacteria present are killed.
- k. Enriched flour means that iron and the vitamins riboflavin, thiamine and niacin have been added.

VII. An adequate food supply for a family is not wholly dependent on the amount of money paid for food.

- a. A balanced meal supplies the calories, proteins, minerals and vitamins needed by the body.
- b. Meals may be inexpensive and well balanced.
- c. A good diet is one that contains an adequate amount of protective foods.
- d. The meals that are the best nutritionally are usually the most expensive.
- e. Fortified margarines are as nutritious as butter.

- f. An iodine deficient diet may result in an abnormal condition of the thyroid gland called goiter.
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- h. Honey is good for sweetening sour stomach.
- i. Citrus fruits are ultimately base-forming in the body.
- j. Pasteurized milk undergoes a process whereby the harmful bacteria present are killed.
- k. Refined flour means that iron and the vitamins riboflavin, thiamine and niacin have been added.

VII. An adequate food supply for a family is

- not wholly dependent on the amount of money paid for food.
- a. A balanced meal supplies the calories, proteins, minerals and vitamins needed by the body.
- b. Meals may be inexpensive and well balanced.
- c. A good diet is one that contains an adequate amount of protective foods.
- d. The meals that are the best nutritionally are usually the most expensive.
- e. Fortified margarine is as nutritious as butter.

VIII. There are some evidences of good nutrition which may be discerned by the adolescent.

- a. The size of an individual is not a good guide to nutritional state.
- b. Straight bones are a sign of good nutrition.
- c. The appetite is a satisfactory guide to good nutrition.
- d. Decayed teeth is a sign of poor nutrition.

IX. There are important ways to conserve food nutrients in the preparation of foods.

- a. The way in which foods are prepared affect their nutritive value.
- b. Proper storage of foods aid in conserving their nutritive value.
- c. The diet should contain a raw fruit or vegetable each **day**.
- d. The juices of canned fruits and vegetables should be used in order to obtain all the food value possible.

X. It is possible to choose a day's diet that is suitable nutritionally and pleasing to the sight and taste, and which is adopted to the needs of the individual.

The test consists of 135 items and is divided into two sections.

Section I consists of 75 true-false questions and seeks to measure the pupils understanding of current nutritional knowledge as it applies to his body's requirement.

It is important that the pupils not only possess a knowledge

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Section II of this test contains 60 multiple-choice questions and seeks to measure the ability of the pupils to apply this knowledge in the more practical phases of their daily living.

The test was tried out the second and third weeks in June on a total population of 150 children.

The groups tested included 50 twelfth grade pupils who had studied nutrition in biology classes, 50 eleventh grade pupils who had studied no nutrition, and 50 tenth grade students who had studied nutrition in biology classes.

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Your Name _____ Date test was taken _____

In what grade are you now? _____ Your age? _____ Sex(underline) boy-girl

Your School _____ City _____

Have you studied biology? Encircle: yes no

If "yes" for how long did you study biology? _____ years

Have you studied chemistry? Encircle: yes no

If "yes" for how long did you study chemistry? _____ years

Have you ever studied a course called Nutrition? Encircle: yes no

If "yes" for how long did you study nutrition? _____ years

Have you ever studied a course called science or general science?
Encircle: yes no

If "yes" for how long did you study science? _____ years

Have you ever studied a course called home economics or household arts?
Encircle: yes no

If "yes" for how long did you study home economics or household arts?
_____ years

Directions:

This is a test of your knowledge of nutrition. It has two sections. The directions for each section are printed at the beginning of the section. When you are told to begin, turn to Section I, read the directions, and proceed at once to answer the questions.

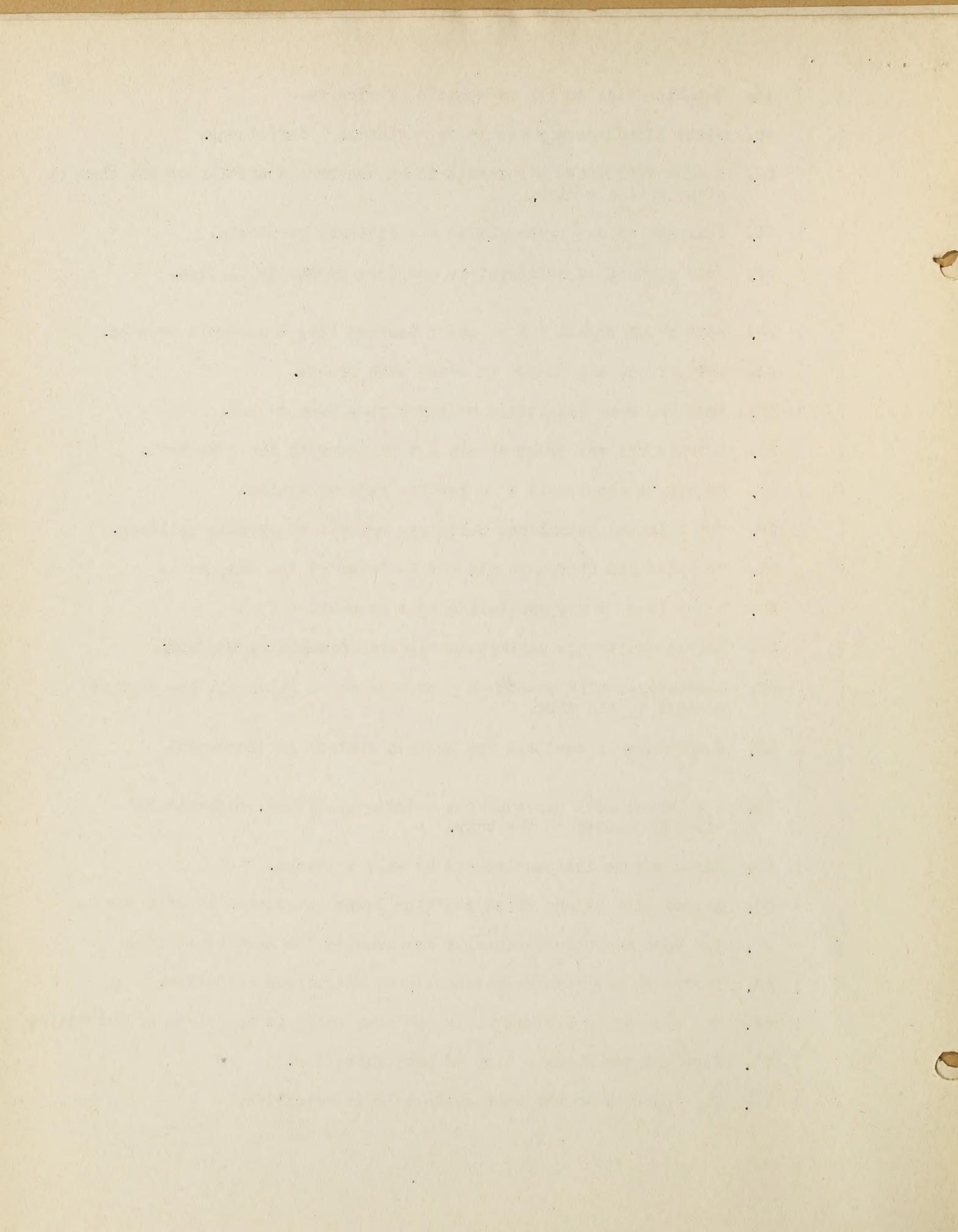
Directions: Some of the following statements are true and some are false. If the statement is true, put a / in the parenthesis and a 0 if false.

Sample: (/) Egg yolk is a natural source of vitamin D.

- () 1. Carbohydrates supply the body with energy.
- () 2. Sugar is a form of carbohydrate.
- () 3. The body may store excess carbohydrate as fat.
- () 4. Sugar and starches are especially high in calories.
- () 5. The natural sweets are more nutritious for children than candy.
- () 6. Cellulose gives bulk to the diet.
- () 7. Most raw fruits and vegetables contain cellulose.
- () 8. The calorie is a unit for measuring heat.
- () 9. The caloric needs of the body vary with the amount of muscular activity.
- () 10. Normally growing children need more food per pound of body weight than adults.
- () 11. Individuals who are reducing should eat less energy foods.
- () 12. Individuals who are reducing should eat less protein foods.
- () 13. The body utilizes fat for energy.
- () 14. Fatty foods are digested more rapidly than carbohydrate foods.
- () 15. Proteins are necessary in building and repairing body tissues.
- () 16. A lumberjack requires a great deal of meat in his diet to provide energy.
- () 17. Protein is an economical source of energy.
- () 18. Cereals are economical sources of proteins.
- () 19. Fresh fruits are the best sources of protein.
- () 20. Cheese is rich in protein.
- () 21. Animal proteins are usually superior to plant proteins.

- () 22. Calcium is necessary for building strong bones and teeth.
- () 23. Milk is a rich source of calcium.
- () 24. Calcium, phosphorus and vitamin C is necessary in the diet for the normal development of bone structure.
- () 25. A child should have a quart of milk a day to insure an adequate calcium intake.
- () 26. Growing children need more calcium than adults.
- () 27. Cheese is an excellent source of calcium.
- () 28. Iron is necessary for building red blood.
- () 29. Molasses is a rich source of iron.
- () 30. Iodine is necessary for the formation of hemoglobin.
- () 31. Fish is a richer source of iodine than most foods.
- () 32. Vitamins are necessary for health and growth.
- () 33. Vegetables furnish the body with minerals and vitamins.
- () 34. Yellow and green vegetables are good sources of vitamin A.
- () 35. Yellow and green vegetables contain carotene.
- () 36. The body is able to change carotene into vitamin A.
- () 37. Dark green leafy vegetables are richer in carotene content than the lighter ones.
- () 38. Thiamine or vitamin B₁ is found chiefly in the germ of seeds.
- () 39. Glandular organs are better sources of riboflavin than muscle meat.
- () 40. The primary reason for giving children cod liver oil is that it contains vitamin D.
- () 41. Ascorbic acid or vitamin C should be provided daily in the diet.
- () 42. Minerals and vitamins are present in the protective foods.
- () 43. Milk is a protective food.
- () 44. Enriched white bread contains as many vitamins as whole grain bread.
- () 45. Nutritional anemia is caused by a deficiency of vitamin D in the diet.
- () 46. The disease beri-beri is due primarily to an iron-deficient diet.
- () 47. Ascorbic acid or vitamin C will help to prevent scurvy.

- () 48. Sunshine aids in the prevention of rickets.
- () 49. Night blindness may result from vitamin A deficiency.
- () 50. Iodine deficiency may result in an abnormal condition of the thyroid gland called goiter.
- () 51. Pellagra is due primarily to a deficiency of niacin.
- () 52. When protein is deficient in the diet growth is limited.
- () 53. Acid foods should not be eaten because they cause acid stomach.
- () 54. Fatty foods should not be eaten with fruits.
- () 55. Eggs are more digestible when raw than when cooked.
- () 56. Lobster and ice cream should not be eaten in the same meal.
- () 57. Celery is especially good for the nervous system.
- () 58. Tea contains stimulants which are harmful to growing children.
- () 59. Proteins and starch should not be eaten at the same meal.
- () 60. Honey is good for sweetening sour stomach.
- () 61. Citrus fruits are ultimately alkaline forming in the body.
- () 62. Pasteurized milk undergoes a process which kills all the bacteria present in the milk.
- () 63. When flour is enriched the protein content is increased.
- () 64. A balanced meal provides the calories, proteins, minerals and vitamins needed by the body.
- () 65. Meals may be inexpensive and be well balanced.
- () 66. A good diet is one which contains large quantities of rich foods.
- () 67. The best meals nutritionally are usually the most expensive.
- () 68. Fortified margerines are usually as nutritious as butter.
- () 69. The size of an individual is the best guide to his state of nutrition.
- () 70. Straight bones are a sign of good nutrition.
- () 71. The appetite is the best guide to good nutrition.

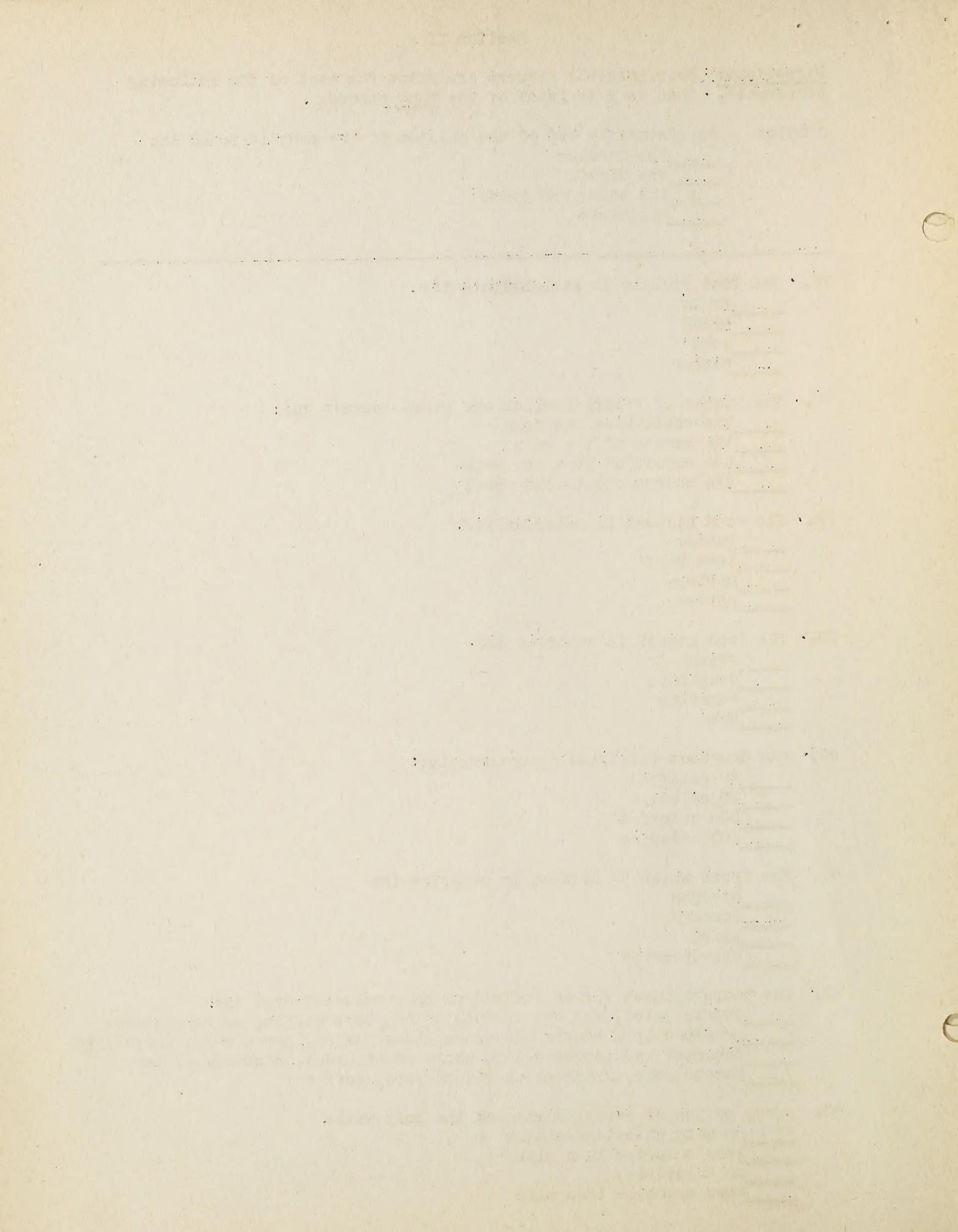


- () 72. The way in which foods are prepared affect their nutritive value.
- () 73. Proper storage of foods aids in conserving their nutritive value.
- () 74. The diet should contain a raw fruit or vegetable each day.
- () 75. The juices of canned vegetables should be thrown away.

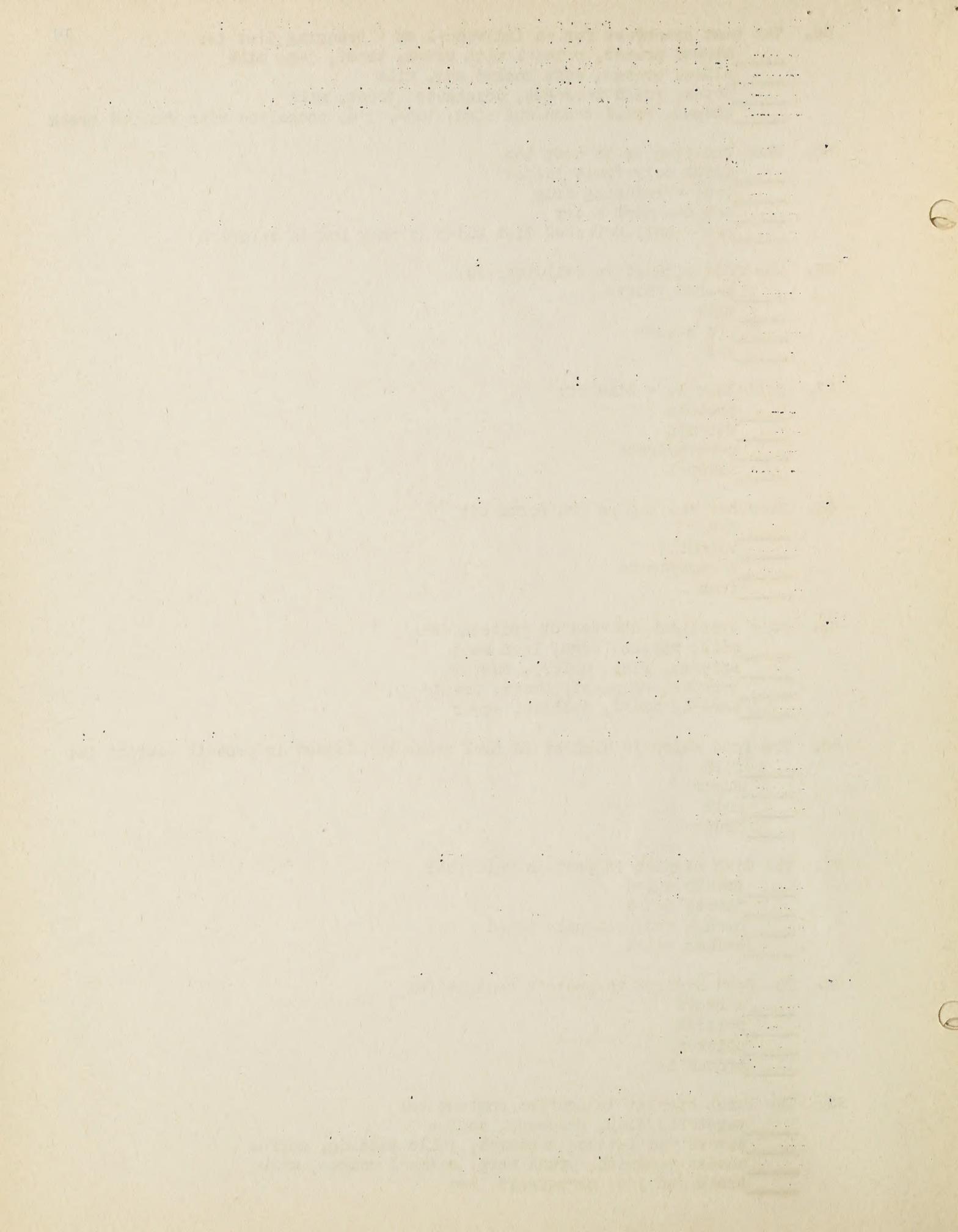
Directions: Four possible answers are given for each of the following statements. Make an x in front of the best answer.

Sample: Approximately 99% of the calcium of the body is found in:
 _____ the muscles
 _____ the blood
 x the bones and teeth
 _____ the liver

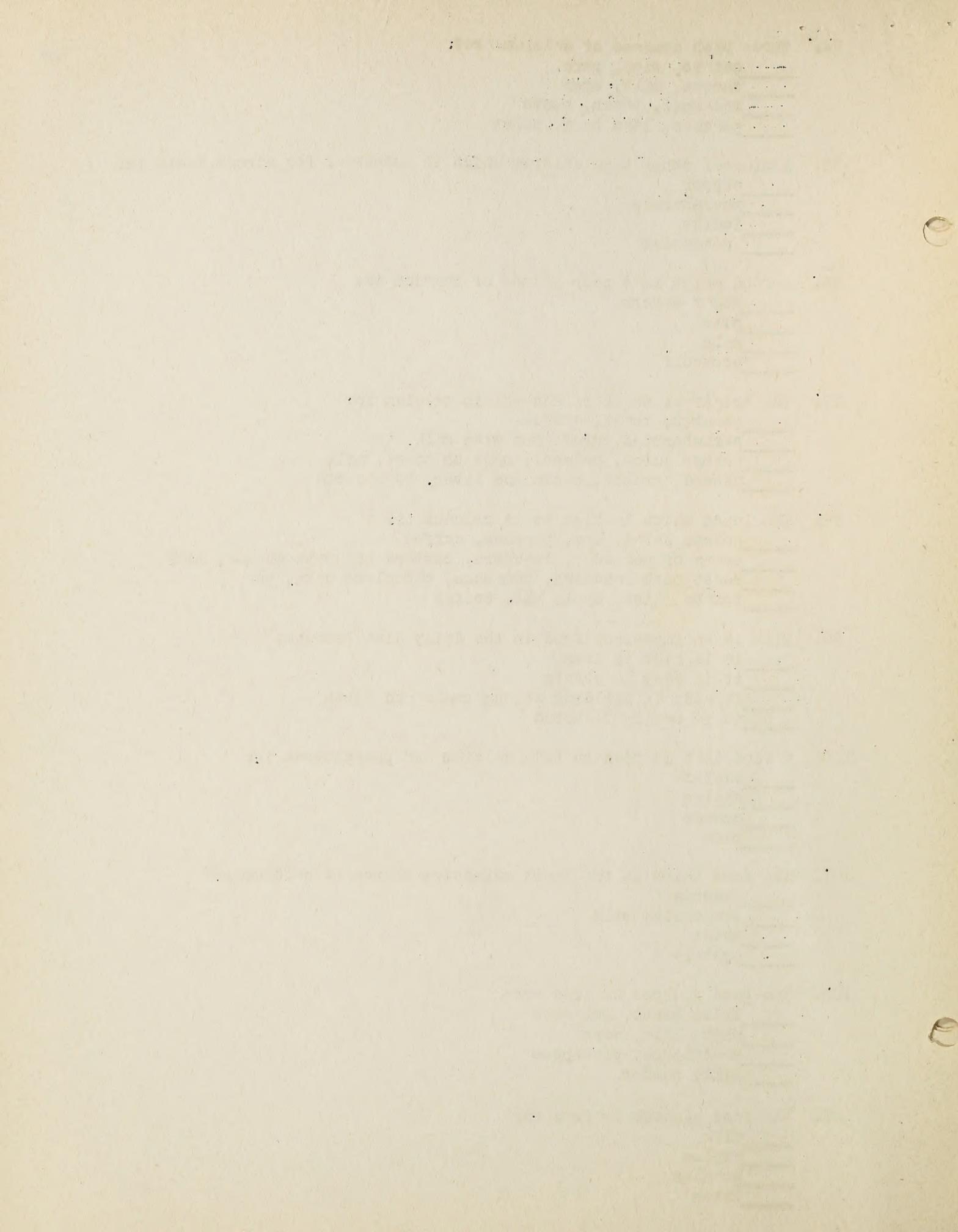
76. The food richest in carbohydrates is:
 _____ fruit
 _____ bread
 _____ meat
 _____ butter
77. The number of calories which one burns depends on:
 _____ the activities one does
 _____ the season of the year
 _____ the amount of meat one eats
 _____ the things one thinks about
78. The food highest in calories is:
 _____ butter
 _____ lean beef
 _____ cabbage
 _____ apples
79. The food lowest in calories is:
 _____ cream
 _____ doughnuts
 _____ tomatoes
 _____ ham
80. One doughnut furnishes approximately:
 _____ 50 calories
 _____ 25 calories
 _____ 200 calories
 _____ 500 calories
81. The fruit which is highest in calories is:
 _____ oranges
 _____ bananas
 _____ pears
 _____ strawberries
82. The poorest lunch for an individual on a reducing diet is:
 _____ tomato juice, egg and lettuce salad, bran muffin, orange sherbet
 _____ potato chips, banana and cream cheese salad, pecan roll, fudge cake
 _____ cucumber and tomato salad, whole wheat bread, cantaloupe, tea
 _____ tomato soup, crackers, baked custard, coffee
83. A cup of tea or coffee furnished the body with:
 _____ as many calories as milk
 _____ less calories than milk
 _____ no calories
 _____ more calories than milk



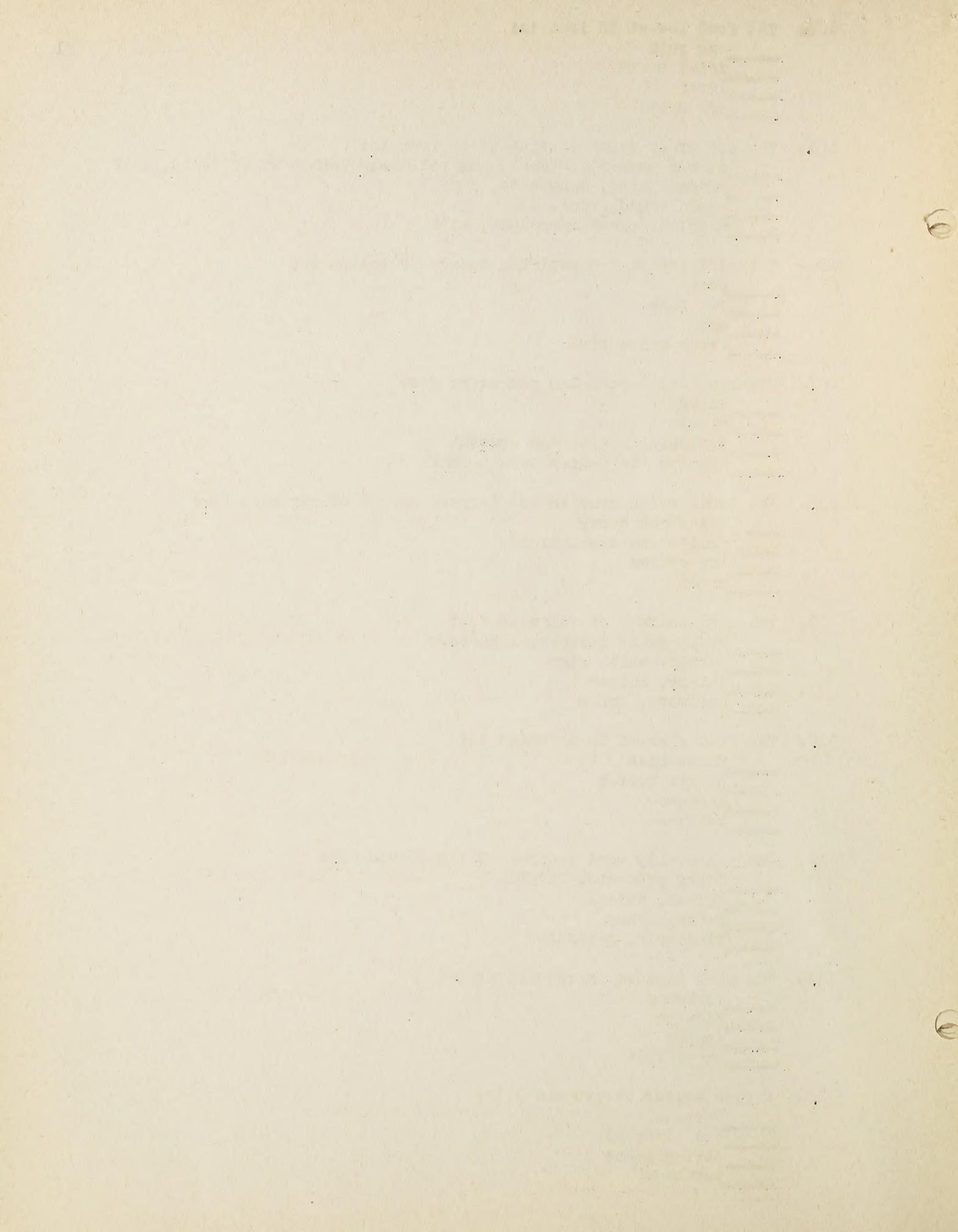
84. The best breakfast for an individual on a reducing diet is:
 stewed prunes, oatmeal with cream, toast, jam, milk
 sliced orange, soft cooked egg, milk
 dates, fried sausages, doughnuts, toast, milk
 grapes, fried bacon and eggs, buns, jam, chocolate with whipped cream
85. When reducing it is best to:
 drink only fruit juices
 take a reducing drug
 eat one meal a day
 eat a well balanced diet which is only low in calories
86. The food richest in cellulose is:
 mashed potato
 milk
 raw celery
 fat
87. Cellulose is a kind of:
 protein
 vitamin
 carbohydrate
 mineral
88. Starches and sugars are forms of:
 fat
 vitamins
 carbohydrate
 iron
89. Four excellent sources of protein are:
 milk, cheese, eggs, lean meat
 spinach, rice, celery, butter
 carrots, eggplant, bread, potato
 cereal, bread, cabbage, sugar
90. The food which is highest in fuel value but lowest in protein content is:
 fish
 sugar
 milk
 fruits
91. The dish highest in protein value is:
 potato salad
 tomato salad
 orange and pineapple salad
 salmon salad
92. The food highest in protein content is:
 carrots
 raisins
 chicken
 broccoli
93. The lunch highest in protein content is:
 vegetable soup, crackers, coffee
 tomato and lettuce sandwich, jello pudding, coffee
 cheese sandwich, prune whip, oatmeal cookies, milk
 bread and jam, grapefruit, tea



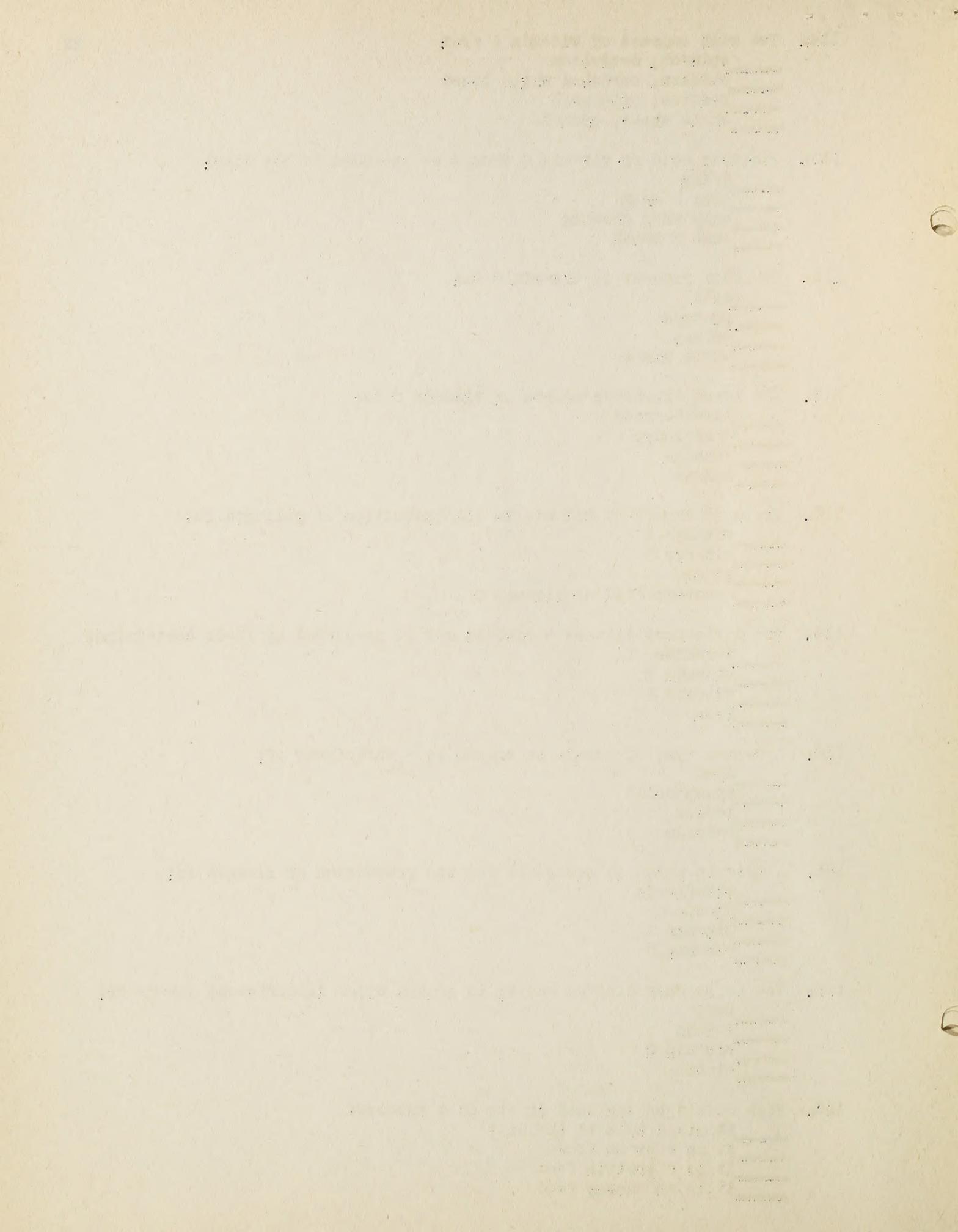
94. Three rich sources of calcium are:
_____ potato, rice, pork
_____ cheese, milk, eggs
_____ macaroni, bacon, beets
_____ peaches, lean beef, pears
95. A mineral other than calcium which is essential for strong teeth is:
_____ copper
_____ phosphorous
_____ iodine
_____ potassium
96. A food which is a poor source of calcium is:
_____ sugar wafers
_____ nuts
_____ kale
_____ broccoli
97. The breakfast which is highest in calcium is:
_____ peaches, toast, coffee
_____ strawberries, cornflakes with milk, tea
_____ orange juice, oatmeal, eggs on toast, milk
_____ stewed apricot, bacon and liver, toast, tea
98. The lunch which is highest in calcium is:
_____ potato salad, ham, peaches, coffee
_____ cream of pea soup, crackers, custard pie with cheese, milk
_____ roast pork sandwich, tomatoes, chocolate cake, tea
_____ tomato juice, apple pie, coffee
99. Milk is an important food in the daily diet because:
_____ it is high in iron
_____ it is easy to obtain
_____ it aids in building strong bones and teeth
_____ it is easily flavored
100. A food that is rich in both calcium and phosphorous is:
_____ butter
_____ apples
_____ cheese
_____ rice
101. The food which is the least expensive source of calcium is:
_____ almonds
_____ evaporated milk
_____ dates
_____ oysters
102. Two good sources of iron are:
_____ dried beans, molasses
_____ white rice, corn
_____ cantaloupe, pineapple
_____ milk, butter
103. The food highest in iron is:
_____ milk
_____ apples
_____ peaches
_____ liver



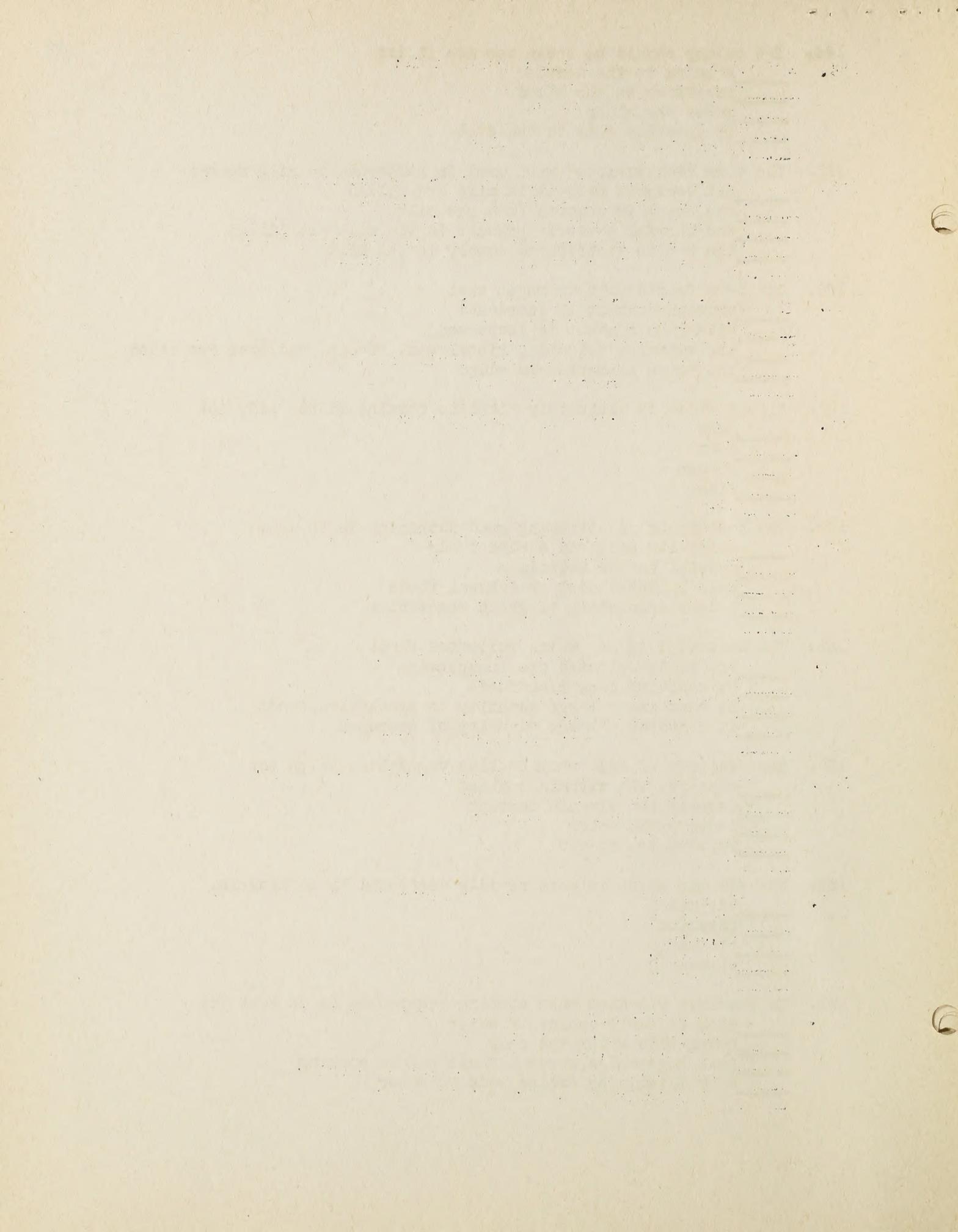
104. The food lowest in iron is:
 egg yolk
 dried beans
 liver
 egg white
105. The breakfast which is richest in iron is:
 stewed prunes, oatmeal, scrambled egg, whole wheat toast, milk
 orange juice, doughnuts, coffee
 apple sauce, buns, tea
 muffins, peach marmalade, milk
106. A food which is a dependable source of iodine is:
 pork
 sea fish
 eggs
 fresh water fish
107. Vitamins are especially necessary for:
 energy
 fiber
 promoting health and growth
 keeping the temperature normal
108. The foods which contain the largest amount of vitamins are:
 sugar and candy
 fruits and vegetables
 ice creams
 bread
109. Two good sources of thiamine are:
 whole grain cereals, lean pork
 turnip, white rice
 celery, butter
 apricots, cream
110. The food richest in thiamine is:
 white rice
 peanut butter
 bananas
 lettuce
111. Two especially good sources of riboflavin are:
 dairy products, liver
 squash, onions
 pears, honey
 pineapple, parsnips
112. The food highest in riboflavin is:
 apricots
 kidneys
 apples
 grapefruit
113. A rich source of vitamin D is:
 lettuce
 cod liver oil
 string beans
 potatoes



114. Two rich sources of vitamin A are:
 spinach, dandelion
 chicken, enriched white bread
 raisins, pineapple
 whole wheat, cereals
115. Ascorbic acid or vitamin C should be included in the diet:
 daily
 once a week
 only when growing
 once a month
116. The food richest in vitamin C is:
 milk
 oranges
 prunes
 whole wheat
117. The least expensive source of vitamin C is:
 strawberries
 cantaloupe
 cabbage
 lemons
118. The most important vitamin in the prevention of pellagra is:
 vitamin A
 vitamin D
 niacin
 ascorbic acid or vitamin C
119. The deficiency disease beri-beri may be prevented by foods containing:
 thiamine
 vitamin C
 vitamin A
 iron
120. A common type of anemia is caused by a deficiency of:
 iron
 phosphorous
 iodine
 calcium
121. A vitamin which is necessary for the prevention of rickets is:
 riboflavin
 niacin
 vitamin A
 vitamin D
122. The deficiency disease scurvy is caused by an insufficient intake of:
 iron
 iodine
 vitamin C
 niacin
123. Fish should be included in the diet because:
 it gives bulk to the diet
 it is a brain food
 it is a protein food
 it is an energy food



124. Raw celery should be eaten because it is:
 calming to the nerves
 purifying to the blood
 makes one sleep
 it provides bulk to the diet
125. The term "Pasteurized" when used in reference to milk means:
 all bacteria present in milk are killed
 the cream is removed from the milk
 the harmful bacteria present in the milk are killed
 the fat is distributed evenly in the milk
126. The term "enriched" food means the:
 protein content is increased
 vitamin D content is increased
 the vitamins thiamine, riboflavin, niacin, and iron are added
 the trace elements are added
127. A food which is ultimately alkaline forming in the body is:
 eggs
 meat
 orange
 fish
128. The best means of obtaining good nutrition is to use:
 specially prepared health foods
 special health medicines
 well balanced diet of natural foods
 a diet consisting of green vegetables
129. The best diet is one which indicates that:
 the foods selected are inexpensive
 it contains many rich foods
 it contains a large quantity of protective foods
 it contains a large quantity of starches
130. The addition of soda when cooking vegetables helps to:
 conserve the vitamin content
 destroy the vitamin content
 destroy the color
 improve the flavor
131. The vitamin which is most readily destroyed by cooking is.
 vitamin A
 thiamine
 vitamin C
 vitamin D
132. To conserve vitamins when cooking vegetables it is best to:
 cook in small amount of water
 cover with water and cook
 soak vegetables several hours before cooking
 cook quickly by adding soda to water



133. The best breakfast for a growing child is:
_____, _____ pineapple juice, cornflakes, toast, tea
_____, _____ orange juice, oatmeal with cream, egg on toast, milk
_____, _____ apple sauce, muffins, doughnuts, milk
_____, _____ grapes, buns, milk
134. The best lunch for a growing child is:
_____, _____ jelly sandwich, sugar cookie, candy bar
_____, _____ saltines, angel cake, apple, milk
_____, _____ peanut butter sandwich, molasses cookie, orange, milk
_____, _____ cream cheese sandwich, apple pie, ice cream, tonic
135. The best dinner for a growing child is:
_____, _____ ham, potato chips, bread, gingerbread, tea
_____, _____ fried potatoes, crackers, tapioca pudding, gingerale
_____, _____ roast beef, baked potato, carrots, tomato salad, bread and butter
_____, _____ fresh fruit cup, milk
_____, _____ steak and fried onions, hot muffins, chocolate cake, gingerale

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CHAPTER III

THE ANALYSIS OF DATA

The test described in Chapter II was built for the purpose of determining the amount of nutrition knowledge possessed by high school pupils with nutrition instruction and those without instruction. An analysis of the data from this point of view will center around the amount of accomplishment of the pupils tested.

It was first considered desirable to get a comparison of the scores made by the pupils at the various grade levels.

CHAPTER III

THE ANALYSIS OF DATA

CHAPTER III

THE ANALYSIS OF DATA

PART I

A COMPARISON OF RANGE OF SCORES BY GRADE LEVEL

CHAPTER III

THE ANALYSIS OF DATA

Total
Scores

Total

The test described in Chapter II was built for the purpose of determining the amount of nutrition knowledge possessed by high school pupils with nutrition instruction and those without instruction. An analysis of the data from this point of view will center around the amount of accomplishment of the pupils tested.

It was first considered desirable to get a comparison of the scores made by the pupils at the various grade levels.

104 - 108				31
94 - 98	14	3		19
89 - 93	5	11		14
84 - 88		4		4
79 - 83		9		9
74 - 78		1		1
69 - 73		5		6
64 - 68		1		1
60 - 64		0		0
55 - 59		2		2
50 - 54		1		1
Number	50	50	50	150
Mean	103.80	88.20	118.20	
S. D.	7.06	13.23	7.07	

CHAPTER III

THE ANALYSIS OF DATA

The test described in Chapter II was built for the purpose of determining the amount of nutrition knowledge possessed by high school pupils with nutrition instruction and those without instruction. An analysis of the data from this point of view will center around the amount of accomplishment of the pupils tested.

It was first considered desirable to get a comparison of the scores made by the pupils at the various grade levels.

TABLE I

A COMPARISON OF RANGE OF SCORES BY GRADE LEVEL

Total Scores	Grades			Total
	10	11	12	
124 - 128			2	2
119 - 123			13	13
114 - 118	3		5	8
109 - 113	13	4	14	31
104 - 108	11	3	9	23
99 - 103	6	5	5	16
94 - 98	14	3	2	19
89 - 93	3	11		14
84 - 88		4		4
79 - 83		9		9
74 - 78		1		1
69 - 73		6		6
64 - 68		1		1
60 - 64		0		0
55 - 59		2		2
50 - 54		1		1
Number	50	50	50	150
Mean	103.60	88.20	113.20	
S. D.	7.06	13.22	7.07	

TABLE I
A COMPARISON OF RANGE OF SCORES BY GRADE LEVEL

Total Scores	Grades			Total
	10	11	12	
124 - 128		2	2	2
119 - 123			12	12
114 - 118	2		2	8
109 - 113	12	4	14	31
104 - 108	11	2	2	23
99 - 103	2	2	2	12
94 - 98	14	2	2	19
89 - 93	2	11		14
84 - 88		4		4
79 - 83		2		2
74 - 78		1		1
69 - 73		2		2
64 - 68		1		1
60 - 64		0		0
55 - 59		2		2
50 - 54		1		1
Number	20	20	20	120
Mean	102.80	88.20	112.20	
S. D.	7.08	12.22	7.07	

Table I shows the range of total scores among the fifty tenth grade pupils to be from 89 - 118 with a mean score of 103.60 and a standard deviation of 7.06. A range of total scores for fifty eleventh grade pupils to be from 54 - 113 with a mean of 88.20 and a standard deviation of 13.22. A range of the total scores of fifty twelfth grade pupils to be from 94 - 128 with a mean of 113.20 and a standard deviation of 7.07.

In order to judge the statistical significance of the difference obtained in this thesis Mills ^{1/} criteria was used.

The value of T (the difference between the hypothetical value and the observed mean, in units of a standard error of the mean) corresponding to a probability of 1/100 is 2.576. One hundredth part of the area under a normal curve lies at a distance, from the mean, on the axis, of 2.576 standard deviations or more.

Accordingly, tests of significance may be applied with direct reference to T, interpreted as a normal deviate (i. e., as a deviation from the mean of a normal distribution expressed in units of deviation.) A value of T of 2.576 indicates that the results are not inconsistent with the hypothesis in question.

Tables II, III and IV shows the differences between the means of grades 10, 11 and 12.

^{1/} Frederick C. Mills, Statistical Methods, New York: Henry Holt and Company, 1938, p. 471.

Table I shows the range of total scores among the fifty tenth grade pupils to be from 89 - 118 with a mean score of 103.80 and a standard deviation of 7.08. A range of total scores for fifty eleventh grade pupils to be from 84 - 118 with a mean of 88.20 and a standard deviation of 13.23. A range of the total scores of fifty twelfth grade pupils to be from 94 - 128 with a mean of 113.20 and a standard deviation of 7.07.

In order to judge the statistical significance of the difference obtained in this thesis Millie's criteria was used.

The value of T (the difference between the hypothetical value and the observed mean, in units of a standard error of the mean) corresponding to a probability of 1/100 is 2.576. One hundredth part of the area under a normal curve lies at a distance, from the mean, on the axis, of 2.576 standard deviations or more. Accordingly, tests of significance may be applied with direct reference to T, interpreted as a normal deviate (i. e., as a deviation from the mean of a normal distribution expressed in units of deviation). A value of T of 2.576 indicates that the results are not inconsistent with the hypothesis in question.

Tables II, III and IV show the differences between the means of grades 10, 11 and 12.

TABLE II
 COMPARISON OF TOTAL SCORES OF GRADES
 ELEVEN AND TWELVE

Grade	Number Cases	Mean	S.D.	S.E.M.			
11th	50	88.20	13.22	1.87			
					Diff.	S.E.Diff.	C.R.
12th	50	113.20	7.07	1.00	25	2.02	12.38

Table II shows the difference between the means of grade 11 without instruction and grade 12 with instruction to be 25 with a standard error of the difference of 2.02 giving a critical ratio of 12.38. This difference is statistically significant, in favor of the twelfth grade. Assuming that the intelligence spread is the same because both groups have made normal progress through school, such a difference in all probability is due to the fact that the twelfth graders have received specific nutrition training whereas the eleventh graders have had no such opportunity.

TABLE II
COMPARISON OF TOTAL SCORES OF GRADES
ELEVEN AND TWELVE

Grade	Number Cases	Mean	S.D.	S.E.M.
11th	50	68.20	13.22	1.87
Diff. S.E. Diff. C.R.				
12th	50	73.20	7.07	1.00
			2.02	12.38

Table II shows the difference between the means of grade 11

without instruction and grade 12 with instruction to be 5 with a standard error of the difference of 2.02 giving a critical ratio of 12.38. This difference is statistically significant, in favor of the twelfth grade. Assuming that the intelligence spread is the same because both groups have made normal progress through school, such a difference in all probability is due to the fact that the twelfth graders have received specific nutrition training whereas the eleventh graders have had no such opportunity.

TABLE III
COMPARISON OF SCORES OF GRADES
TEN AND TWELVE

Grade	Number Cases	Mean	S.D.	S.E.M.			
10th	50	103.60	7.06	.998			
					Diff.	S.E.Diff.	C.R.
12th	50	113.20	7.07	1.00	9.60	1.41	6.81

Table III indicates the difference between the mean of grade 10 with nutrition instruction and grade 12 also with instruction to be 9.60 with a standard error of the difference of 1.41 giving a critical ratio of 6.81 which is statistically significant in favor of the twelfth grade. Grade twelve having had two courses in biology which gave particular emphasis upon nutritional knowledge was able to perform at a significantly higher level on this test.

TABLE IV
COMPARISON OF TOTAL SCORES OF GRADES
TEN AND ELEVEN

Grade	Number Cases	Mean	S.D.	S.E.M.			
10th	50	103.60	13.22	1.87			
					Diff.	S.E.Diff.	C.R.
11th	50	88.20	7.06	.998	15.40	2.02	7.62

Table IV reveals that the difference between the means of grade 10 with instruction and grade 11 without instruction to be 15.40 with a standard error of the difference of 2.02, giving a critical ratio of 7.62 which is statistically significant in favor of the tenth grade. Assuming that the intelligence spread is the same because both groups have made normal progress through school, such a difference in all probability is due to the fact that the tenth graders have received specific nutrition training whereas the eleventh graders have had no such opportunity.

TABLE IV
COMPARISON OF TOTAL SCORES OF GRADES
TEN AND ELEVEN

Grade	Number Cases	Mean	S.D.	S.E.M.
Tenth	50	103.60	13.22	1.87
Eleven	50	88.20	7.06	998 15.40
Diff. S.E. Diff. C.M.				
				2.02
				7.62

Table IV reveals that the difference between the means of grade 10 with instruction and grade 11 without instruction to be 15.40 with a standard error of the difference of 2.02, giving a critical ratio of 7.62 which is statistically significant in favor of the tenth grade. Assuming that the intelligence spread is the same because both groups have made normal progress through school, such a difference in all probability is due to the fact that the tenth graders have received specific nutrition training whereas the eleventh graders have had no such opportunity.

An item analysis was made of the one hundred thirty-five items contained in the two sections of the test in order to determine which items could be retained. Tests of the twenty-five highest and the twenty-five lowest cases were analyzed. Responses to items were tabulated as right or wrong and transferred into percentages for the total group.

The Edgerton^{1/} tables were then used for the purpose of obtaining the Standard Error and the Standard Error squared for each item. The final step comprised the computation of the Standard Error of the difference and the Critical Ratios for each item.

Mills^{2/} makes the following statements:

If a given difference between hypothetical and observed values would occur as a result of chance only one time out of one hundred, or less frequently, we may say that the difference is significant. This means that results are not inconsistent with the hypothesis we have set up. If the discrepancy between theory and observation might occur more frequently than one time out of one hundred solely because of the play of chance, we may say the difference is not clearly significant.

The results are not inconsistent with the hypothesis. The value of T (the difference between the hypothetical value and the observed mean, in units of the standard error of the mean) corresponding to a probability of 1/100 is 2.576. One hundredth part of the area under a normal curve lies at a distance from the mean, on the axis, of 2.576 standard deviations or more. Accordingly, tests of significance may be applied with direct

^{1/} Harold A. Edgerton and Donald G. Patterson, "Tables of Standard Errors and Probable Errors of Percentages for Varying Numbers of Cases," Journal of Applied Psychology, Volume 10: 378-379, September, 1926.

^{2/} Mills, Op., Cit., p. 471.

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If a given difference between hypothetical and observed values would occur as a result of chance only one time out of one hundred, or less frequently, we may say that the difference is significant. This means that results are not inconsistent with the hypothesis we have set up. If the discrepancy between theory and observation might occur more frequently than one time out of one hundred solely because of the play of chance, we may say the difference is not clearly significant.

The results are not inconsistent with the hypothesis. The value of T (the difference between the hypothetical value and the observed mean, in units of the standard error of the mean) corresponding to a probability of 1/100 is 2.576. One hundredth part of the area under a normal curve lies at a distance from the mean, on the axis, of 2.576 standard deviations or more. Accordingly, tests of significance may be applied with direct

Harold A. Edgerton and Donald G. Patterson, "Tables of Standard Errors and Probable Errors of Percentages for Varying Numbers of Cases," Journal of Applied Psychology, Volume 10: 378-379, September, 1925.

reference to T, interpreted as a normal deviate (i. e., as a deviate from the mean of a normal distribution expressed in units of standard deviation.)

A value of T of 2.576 or more indicates a significant difference, while a value of less than 2.576 indicates that the results are not inconsistent with the hypothesis in question.

Number of

Items

In the light of the above information, any item with a

Critical Ratio of 2.576 or better was interpreted as statistically significant and a valid test item. Tables V and VI show the results of the item analysis arranged by sections.

Item	Section	Number of Items	Number of Correct Responses	Number of Total Responses	Critical Ratio
1.	1	24	67	27	2.57
2.	1	27	66	23	0.76
3.	1	26	27	19	1.54
4.	1	26	24	25	1.28
5.	1	29	76	11	1.04
6.	1	24	24	40	1.10
7.	1	29	10	39	1.29
8.	1	100	64	32	0.97
9.	1	27	78	21	0.91
10.	1	100	28	19	0.97
11.	1	26	20	22	1.15
12.	1	21	21	23	1.27
13.	1	23	35	25	1.29
14.	1	27	21	15	0.93
15.	1	24	78	16	0.95

All items with the exception of items 3, 5, 8, 9, 12, 14 and 15 are statistically significant.

reference to T, interpreted as a normal
 deviate (i. e., as a deviate from the
 mean of a normal distribution expressed
 in units of standard deviation).
 A value of T of 2.576 or more indicates
 a significant difference, while a value
 of less than 2.576 indicates that the
 results are not inconsistent with the
 hypothesis in question.

In the light of the above information, any item with a
 Critical Ratio of 2.576 or better was interpreted as statistically
 significant and a valid test item. Tables V and VI show the re-
 sults of the item analysis arranged by sections.

TABLE V
INDIVIDUAL ITEM ANALYSIS -- SECTION ONE

Number of Items	Percentage of		Diff. %	S. E. Diff.	C. R.
	Correct Responses High 25 Pupils	Responses Low 25 Pupils			
1.	94	67	27	105	2.57 ✓
2.	97	86	11	076	1.44
3.	86	67	19	116	1.64
4.	89	54	35	118	2.98
5.	89	78	11	104	1.05
6.	94	54	40	110	3.63
7.	89	50	39	118	3.30
8.	100	68	32	097	3.29
9.	97	76	21	091	2.30
10.	100	92	18	057	3.15
11.	85	30	55	115	4.77
12.	81	51	30	127	2.36
13.	70	35	35	132	2.87
14.	97	81	16	085	1.88 ✓
15.	94	78	16	095	1.67

All items with the exception of item 2, 3, 5, 9, 12, 14 and 15 are statistically significant.

TABLE V
INDIVIDUAL ITEM ANALYSIS -- SECTION ONE

Item	Percentage of		Diff. %	S. E. Diff.	C. R.
	Correct Responses	High SS			
	High SS Pupils	Low SS Pupils			
1.	94	87	27	102	2.27
2.	97	88	11	076	1.44
3.	88	87	19	116	1.84
4.	89	84	35	118	2.98
5.	89	78	11	104	1.05
6.	94	84	40	110	2.83
7.	89	80	39	118	2.30
8.	100	88	32	097	2.23
9.	97	78	21	091	2.30
10.	100	92	18	087	2.12
11.	88	80	32	112	4.77
12.	81	81	30	127	2.38
13.	70	85	35	122	2.87
14.	97	81	18	085	1.88
15.	84	78	16	082	1.87

All items with the exception of item 8, 2, 5, 9, 12, 14 and 15 are statistically significant.

TABLE V (Cont.)
INDIVIDUAL ITEM ANALYSIS -- SECTION ONE

Number of Items	Percentage of		Diff. %	S. E. Diff.	C. R.
	Correct Responses High 25 Pupils	Low 25 Pupils			
16.	64	27	37	130	2.84
17.	89	43	46	117	3.93
18.	64	51	13	138	.94
19.	100	60	40	100	4.00
20.	91	83	08	094	.85
21.	91	51	40	115	3.10
22.	100	95	05	048	1.04
23.	100	95	05	048	1.04
24.	27	11	16	108	1.72
25.	91	32	59	109	5.41
26.	100	84	16	075	2.11
27.	81	41	40	125	3.20
28.	100	94	06	051	1.17
29.	85	67	16	117	1.37
30.	72	29	43	127	3.39

All items except 18, 20, 22, 23, 24, 26, 28 and 29 show
Critical Ratios which are statistically significant.

INDIVIDUAL ITEM ANALYSIS -- SECTION ONE
 TABLE V (Cont.)

Items	Percentage of		Diff. %	S. E. Diff.	C. R.
	High SS Pupils	Low SS Pupils			
16.	84	27	57	130	2.84
17.	89	48	41	117	3.93
18.	84	51	33	138	.94
19.	100	60	40	100	4.00
20.	91	83	8	094	.82
21.	91	51	40	115	3.10
22.	100	95	5	048	1.04
23.	100	95	5	048	1.04
24.	27	11	16	108	1.78
25.	91	32	59	109	2.41
26.	100	84	16	075	3.11
27.	81	41	40	123	3.20
28.	100	94	6	031	1.11
29.	85	57	16	117	1.37
30.	72	29	43	127	3.29

All items except 18, 20, 22, 23, 24, 26, 28 and 29 show

Critical Ratios which are statistically significant.

TABLE V (Cont.)
 INDIVIDUAL ITEM ANALYSIS -- SECTION ONE

Number of Items	Percentage of Correct Responses		<u>Diff.%</u>	<u>S. E. Diff.</u>	<u>C. R.</u>
	High 25 Pupils	Low 25 Pupils			
31.	97	67	30	099	3.03
32.	97	94	03	058	.51
33.	100	76	24	087	2.75
34.	94	67	27	105	2.47
35.	81	28	53	119	4.45
36.	81	43	38	126	3.01
37.	72	27	45	108	4.03
38.	89	41	48	116	4.14
39.	59	11	48	115	4.17
40.	100	84	16	075	2.11
41.	100	79	21	083	2.53
42.	86	67	19	116	1.81
43.	94	84	10	086	1.16
44.	67	27	40	129	3.34
45.	91	50	41	114	3.57

All items except 32, 34, 40, 41, 42 and 43 are statistically significant.

(Cont.) TABLE V
INDIVIDUAL ITEM ANALYSIS -- SECTION ONE

Item	Percentage of		Diff. %	S. E. Diff.	C. R.
	High SS Pupils	Low SS Pupils			
21.	97	87	30	099	2.03
22.	97	94	03	088	.51
23.	100	78	24	087	2.75
24.	94	87	27	108	2.47
25.	81	88	23	119	4.45
26.	81	43	38	128	3.01
27.	72	27	45	108	4.03
28.	89	41	48	116	4.14
29.	89	11	48	118	4.17
30.	100	84	16	075	2.11
31.	100	79	21	083	2.33
32.	88	87	19	118	1.81
33.	94	84	10	086	1.18
34.	87	27	40	129	2.34
35.	91	80	41	114	2.57

All items except 28, 34, 40, 41, 42 and 43 are statistically

significant.

TABLE V (Cont.)

INDIVIDUAL ITEM ANALYSIS -- SECTION ONE

Number of Items	Percentage of		Diff. %	S. E. Diff.	C. R.
	Correct Responses High 25 Pupils	Responses Low 25 Pupils			
46.	91	50	41	114	3.57
47.	100	52	48	101	4.75
48.	100	75	24	089	2.71
49.	100	86	14	071	1.97
50.	97	67	30	099	3.03
51.	78	35	43	126	3.41
52.	97	59	38	103	3.68
53.	100	84	16	075	2.13
54.	89	51	38	117	3.24
55.	78	35	43	126	3.41
56.	70	27	43	127	3.46
57.	81	19	62	110	5.63
58.	91	59	32	099	3.24
59.	97	78	18	089	2.02
60.	94	59	25	107	2.31

All items with the exception of 49, 53, 59 and 60 show Critical Ratios of 2.576 or better and are statistically significant.

INDIVIDUAL ITEM ANALYSIS -- SECTION ONE
 TABLE V (Cont.)

Number of Items	Percentage of Correct Responses		Diff. %	S. E. Diff.	C. R.
	High ES Pupils	Low ES Pupils			
46.	91	50	41	114	3.37
47.	100	52	48	101	4.75
48.	100	75	24	089	2.71
49.	100	86	14	071	1.97
50.	97	87	30	099	3.03
51.	78	32	43	126	3.41
52.	97	39	38	103	3.68
53.	100	84	16	075	2.13
54.	89	51	38	117	3.24
55.	78	32	43	126	3.41
56.	70	27	43	127	3.43
57.	81	19	62	110	2.83
58.	91	39	32	099	3.24
59.	97	78	18	089	2.03
60.	94	39	32	107	3.31

All items with the exception of 49, 52, 59 and 60 show Critical Ratios of 2.576 or better and are statistically significant.

TABLE V (Cont.)
INDIVIDUAL ITEM ANALYSIS -- SECTION ONE

Number of Items	Percentage of Correct Responses		<u>Diff.%</u>	<u>S. E. Diff.</u>	<u>C. R.</u>
	High 25 Pupils	Low 25 Pupils			
61.	83	40	43	072	5.97
62.	67	32	35	131	2.67
63.	83	27	56	116	4.82
64.	91	89	02	086	.23
65.	97	91	06	066	.90
66.	97	81	16	085	1.88
67.	32	19	13	121	1.07
68.	91	67	24	109	2.11
69.	89	78	11	103	1.07
70.	94	81	13	091	1.42
71.	78	51	27	129	2.09
72.	97	83	14	082	1.70
73.	97	83	14	082	1.70
74.	97	94	03	057	.52
75.	94	91	03	073	1.41

Items 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74 and 75 are below the criteria of 2.576 and are not statistically significant.

TABLE V (Cont.)
INDIVIDUAL ITEM ANALYSIS -- SECTION ONE

Item	Percentage of		Diff. %	S. E. Diff.	O. R.
	High SS Pupils	Low SS Pupils			
61.	82	40	43	075	2.97
62.	67	32	35	131	2.67
63.	83	27	56	116	4.82
64.	91	89	02	086	.23
65.	97	91	06	086	.90
66.	97	81	16	085	1.88
67.	32	19	13	131	1.07
68.	91	67	24	109	2.11
69.	89	78	11	103	1.07
70.	94	81	13	091	1.42
71.	78	21	57	139	2.09
72.	97	83	14	083	1.70
73.	97	83	14	083	1.70
74.	97	94	03	087	.52
75.	94	91	03	073	1.41

Items 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74 and 75 are below the criteria of 2.576 and are not statistically significant.

TABLE VI
INDIVIDUAL ITEM ANALYSIS -- SECTION TWO

Number of Items	Percentage of Correct Responses		Diff. %	S. E. Diff.	C. R.
	High 25 Pupils	Low 25 Pupils			
76.	89	59	30	120	2.50
77.	100	97	03	039	.76
78.	100	67	33	091	3.62
79.	94	67	27	105	2.57
80.	67	19	48	122	3.11
81.	78	40	38	128	2.97
82.	100	97	03	039	.76
83.	70	35	35	131	2.65
84.	100	97	03	039	.76
85.	97	91	05	066	.75
86.	100	51	49	101	4.85
87.	40	19	21	071	2.95
88.	100	85	16	077	2.07
89.	100	86	14	071	1.97

Table VI reveals that items 76, 77, 82, 84, 85, 88 and 89 are not statistically significant.

All items except 76, 77, 82, 84, 85, 88 and 89 are statistically significant.

TABLE VI
PERCENTAGE OF RESPONSES TO QUESTIONS

Item	Percentage of		Number of Items
	Correct Responses	Wrong Responses	
1	88	12	1
2	97	3	1
3	100	0	1
4	97	3	1
5	97	3	1
6	97	3	1
7	97	3	1
8	97	3	1
9	97	3	1
10	97	3	1
11	97	3	1
12	97	3	1
13	97	3	1
14	97	3	1
15	97	3	1
16	97	3	1
17	97	3	1
18	97	3	1
19	97	3	1
20	97	3	1
21	97	3	1
22	97	3	1
23	97	3	1
24	97	3	1
25	97	3	1
26	97	3	1
27	97	3	1
28	97	3	1
29	97	3	1
30	97	3	1
31	97	3	1
32	97	3	1
33	97	3	1
34	97	3	1
35	97	3	1
36	97	3	1
37	97	3	1
38	97	3	1
39	97	3	1
40	97	3	1
41	97	3	1
42	97	3	1
43	97	3	1
44	97	3	1
45	97	3	1
46	97	3	1
47	97	3	1
48	97	3	1
49	97	3	1
50	97	3	1
51	97	3	1
52	97	3	1
53	97	3	1
54	97	3	1
55	97	3	1
56	97	3	1
57	97	3	1
58	97	3	1
59	97	3	1
60	97	3	1
61	97	3	1
62	97	3	1
63	97	3	1
64	97	3	1
65	97	3	1
66	97	3	1
67	97	3	1
68	97	3	1
69	97	3	1
70	97	3	1
71	97	3	1
72	97	3	1
73	97	3	1
74	97	3	1
75	97	3	1
76	97	3	1
77	97	3	1
78	97	3	1
79	97	3	1
80	97	3	1
81	97	3	1
82	97	3	1
83	97	3	1
84	97	3	1
85	97	3	1
86	97	3	1
87	97	3	1
88	97	3	1
89	97	3	1
90	97	3	1
91	97	3	1
92	97	3	1
93	97	3	1
94	97	3	1
95	97	3	1
96	97	3	1
97	97	3	1
98	97	3	1
99	97	3	1
100	97	3	1

Table VI reveals that items 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, and 100 are not statistically significant.

TABLE VI (Cont.)
INDIVIDUAL ITEM ANALYSIS -- SECTION TWO

Number of Items	Percentage of		<u>Diff. %</u>	<u>S. E. Diff.</u>	<u>C. R.</u>
	<u>Correct Responses</u> High 25 Pupils	<u>Low 25</u> Pupils			
90.	91	40	51	113	4.51
91.	100	40	60	100	6.00
92.	97	51	46	105	4.31
93.	97	42	25	103	2.42
94.	100	86	14	077	1.81
95.	100	78	22	085	2.58
96.	91	59	32	113	2.83
97.	94	79	16	095	1.68
98.	94	67	24	105	2.28
99.	100	97	03	099	.30
100.	94	62	32	107	2.99
101.	100	78	22	085	2.58
102.	97	54	43	105	4.09
103.	97	72	25	096	2.71
104.	83	51	32	124	2.58

All items except 93, 94, 97, 98 and 99 are statistically significant.

INDIVIDUAL ITEM ANALYSIS -- SECTION TWO
 TABLE VI (Cont.)

Number of Items	Percentage of Correct Responses		Diff. %	S. E. Diff.	O. R.
	High 25 Popula	Low 25 Popula			
90.	91	40	51	113	4.81
91.	100	40	60	100	8.00
92.	97	51	46	105	4.31
93.	97	42	55	103	2.42
94.	100	88	12	077	1.81
95.	100	78	22	085	2.58
96.	91	59	32	113	2.88
97.	94	79	15	095	1.68
98.	94	67	27	103	2.38
99.	100	97	03	099	.30
100.	94	63	31	107	2.92
101.	100	78	22	085	2.58
102.	97	54	43	105	4.09
103.	97	75	22	095	2.71
104.	83	51	32	124	2.58

All items except 92, 94, 97, 98 and 99 are statistically significant.

TABLE VI (Cont.)
INDIVIDUAL ITEM ANALYSIS -- SECTION TWO

Number of Items	Percentage of		Diff.%	S. E. Diff.	C. R.
	Correct High 25 Pupils	Responses Low 25 Pupils			
105.	97	67	30	099	3.03
106.	100	55	45	100	4.50
107.	97	62	35	102	3.43
108.	97	94	03	058	.51
109.	91	29	62	107	5.81
110.	70	10	60	109	5.50
111.	91	32	58	108	5.36
112.	83	19	64	108	5.92
113.	97	86	11	077	1.42
114.	97	40	57	103	5.53
115.	100	86	14	071	1.97
116.	100	72	28	085	3.04
117.	40	10	30	102	2.93
118.	78	10	68	101	6.73
119.	89	10	79	087	9.07

All items except 108, 113 and 115 are statistically significant.

TABLE VI (Cont.)
INDIVIDUAL ITEM ANALYSIS -- SECTION TWO

Items	Percentage of		Diff. %	S. E. Diff.	C. R.
	High 25 Pupils	Low 25 Pupils			
108.	97	87	30	099	3.03
106.	100	55	45	100	4.50
107.	97	83	35	103	3.43
108.	97	94	03	088	.51
109.	91	89	02	107	3.81
110.	70	10	60	109	2.30
111.	91	83	08	108	2.38
112.	83	19	64	108	3.93
113.	97	86	11	077	1.43
114.	97	40	57	103	2.53
115.	100	86	14	071	1.97
116.	100	75	25	086	3.04
117.	40	10	30	103	2.93
118.	78	10	68	101	2.73
119.	89	10	79	087	2.07

All items except 108, 113 and 115 are statistically

significant.

TABLE VI (Cont.)

INDIVIDUAL ITEM ANALYSIS -- SECTION TWO

Number of Items	Percentage of Correct Responses		Diff. %	S. E. Diff.	C. R.
	High 25 Pupils	Low 25 Pupils			
120.	89	41	48	116	4.14
121.	100	62	38	093	4.01
122.	100	62	38	093	4.01
123.	86	40	46	119	3.86
124.	86	19	65	103	6.31
125.	86	67	19	109	1.74
126.	75	40	35	130	2.61
127.	75	35	40	128	3.12
128.	100	83	17	077	2.21
129.	100	79	21	083	2.53
130.	62	10	52	112	4.64
131.	48	10	38	116	3.27
132.	67	40	27	135	2.00
133.	100	91	9	060	1.50
134.	100	86	14	071	1.97
135.	100	91	9	065	1.50

All items except 125, 132, 133, 134 and 135 are statistically significant.

INDIVIDUAL ITEM ANALYSIS -- SECTION TWO
TABLE VI (Cont.)

Item	Percentage of		Diff. %	S. E. Diff.	C. R.
	High Sc Pupils	Low Sc Pupils			
130.	89	41	48	116	4.14
131.	100	68	38	093	4.01
132.	100	68	38	093	4.01
133.	88	40	48	119	3.88
134.	88	19	68	103	6.31
135.	88	67	19	109	1.74
136.	75	40	35	130	3.61
137.	75	38	40	138	3.13
138.	100	83	17	077	3.21
139.	100	79	21	083	3.33
130.	68	10	58	112	4.64
131.	48	10	38	116	3.27
132.	67	40	27	132	3.00
133.	100	91	9	080	1.30
134.	100	88	12	071	1.37
135.	100	91	9	082	1.30

All items except 135, 132, 133, 134 and 135 are statistically

significant.

A study of Table V shows items 2, 3, 5, 9, 12, 14, 15, 18, 20, 22, 23, 24, 26, 28, 29, 32, 34, 40, 41, 42, 43, 49, 53, 59, 60, 64, 65, 66, 67, 68, 69, 70, 72, 73, 74 and 75, falling below the criterion of 2.576 and should be discarded.

A study of Table VI reveals items 76, 77, 82, 84, 85, 88, 89, 93, 94, 97, 98, 99, 108, 113, 115, 125, 132, 133, 134 and 135 are below the criterion and have no statistical significance.

Of the one hundred thirty-five items analyzed in the two sections of the test 79 proved to be statistically significant.

A study of the percentages will reveal that the Critical Ratios ran low in the majority of cases not because of difficulty but because of the ease of the items.

CHAPTER IV

SUMMARY AND CONCLUSIONS

A study of Table V shows items 2, 3, 5, 9, 12, 14, 15, 18, 20, 22, 23, 24, 26, 28, 29, 32, 34, 40, 41, 42, 43, 45, 49, 52, 53, 59, 60, 64, 65, 66, 67, 68, 69, 70, 72, 73, 74 and 75, falling below the criterion of 2.576 and should be discarded.

A study of Table VI reveals items 76, 77, 82, 84, 85, 88, 89, 92, 94, 97, 98, 99, 106, 112, 113, 115, 122, 123, 124 and 125 are below the criterion and have no statistical significance.

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CHAPTER IV

SUMMARY AND CONCLUSIONS

The purpose of this investigation was the construction and evaluation of a nutrition knowledge test for senior high school.

The test was administered to one hundred and fifty children in schools in a metropolitan area.

The study was limited in that there were no intelligence quotients for the group tested; the test was tried out only in two schools, and in these schools that it was tried out only on the experimental group. The data obtained from this administration was analyzed statistically with the following

CHAPTER IV --

SUMMARY AND CONCLUSIONS

1. The knowledge tested was within the ability of these high school pupils.
2. The pupils who have had nutrition instruction were able to perform at a significantly higher level on the test than those pupils who have had no instruction.
3. The item analysis revealed 79 out of the 133 items to be statistically significant and discriminating.
4. Thirty-six of the fifty-six items lacking statistical significance were found in Section I.

CHAPTER IV

SUMMARY AND CONCLUSIONS

the other twenty items were found in Section II.
This indicates that both section I and II should
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CHAPTER 7

SUGGESTIONS FOR FURTHER RESEARCH

the other twenty items were found in Section II.
This indicates that both section I and II should
be revised.

CHAPTER V

SUGGESTIONS FOR FURTHER RESEARCH

1. The test should be tried out on a larger number of children chosen from areas other than the ones used in this study.
2. A study should be made to determine the effect of intelligence quotient on accomplishments within the various grade level.
3. It would be of interest to discover relative difference in accomplishments of boys and girls on the test. This could be done by comparing scores on the test between the two sections.
4. A study should be made using a controlled and experimental group.
5. It would be of interest to compare these high school scores with scores obtained on a college group.

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APPENDIX

APPENDIX

for the sections of the test will provide the total score.

APPENDIX

A. DIRECTIONS FOR ADMINISTERING TEST:

When the test is to be given, the desks should be cleared, the room comfortable and the pupils supplied with pencils.

Distribute the tests, instructing class not to write anything until they are told.

After the directions on the front page have been read by the class have them fill in the necessary information. Instruct class they are to turn to Section I of the test, read the directions carefully and start.

Tell class they will be allowed 15 minutes to answer the 75 questions.

At the end of 15 minutes have class turn to Section II. Tell them they will be allowed 15 minutes to answer the 60 questions.

At the end of the fifteen minutes the tests are collected.

B. DIRECTIONS FOR SCORING:

The correct answers for the 135 items of the test are given in the answer key. To score the test, a check is put in the left margin opposite each correct response.

All items have the same value. The pupils score is the total number of correct responses. The highest possible score on Section I is 75, and on Section II is 60. Adding the scores

APPENDIX

A. DIRECTIONS FOR ADMINISTERING TEST:

When the test is to be given, the desks should be cleared, the room comfortable and the pupils supplied with pencils. Distribute the tests, instructing class not to write anything until they are told.

After the directions on the front page have been read by the class have them fill in the necessary information. Instruct class they are to turn to Section I of the test, read the directions carefully and start.

Tell class they will be allowed 15 minutes to answer the 75 questions.

At the end of 15 minutes have class turn to Section II. Tell them they will be allowed 15 minutes to answer the 50 questions.

At the end of the fifteen minutes the tests are collected.

B. DIRECTIONS FOR SCORING:

The correct answers for the 125 items of the test are given in the answer key. To score the test, a check is put in the left margin opposite each correct response.

All items have the same value. The pupils score is the total number of correct responses. The highest possible score on Section I is 75, and on Section II is 50. Adding the scores

for the sections of the test will provide the total score.

END FOR THIS

for the sections of the test will provide the total score.

KEY

SECTION I

- | | | |
|---------|---------|---------|
| 1. (+) | 22. (+) | 43. (+) |
| 2. (+) | 23. (+) | 44. (+) |
| 3. (+) | 24. (+) | 45. (+) |
| 4. (+) | 25. (+) | 46. (+) |
| 5. (+) | 26. (+) | 47. (+) |
| 6. (+) | 27. (+) | 48. (+) |
| 7. (+) | 28. (+) | 49. (+) |
| 8. (+) | 29. (+) | 50. (+) |
| 9. (+) | 30. (+) | 51. (+) |
| 10. (+) | 31. (+) | 52. (+) |

KEY FOR TEST

- | | | |
|---------|---------|---------|
| 12. (+) | 32. (+) | 53. (+) |
| 13. (+) | 33. (+) | 54. (+) |
| 14. (+) | 34. (+) | 55. (+) |
| 15. (+) | 35. (+) | 56. (+) |
| 16. (+) | 36. (+) | 57. (+) |
| 17. (+) | 37. (+) | 58. (+) |
| 18. (+) | 38. (+) | 59. (+) |
| 19. (+) | 39. (+) | 60. (+) |
| 20. (+) | 40. (+) | 61. (+) |
| 21. (+) | 41. (+) | 62. (+) |
| 22. (+) | 42. (+) | 63. (+) |

KEY FOR TEST

SECTION II

64. (+)
 65. (+)
 66. (o)
 67. (+)

1. (+)
 2. (+)
 3. (+)
 4. (+)
 5. (+)
 6. (+)
 7. (+)
 8. (+)
 9. (+)
 10. (+)
 11. (+)
 12. (o)
 13. (+)
 14. (o)
 15. (+)
 16. (o)
 17. (o)
 18. (+)
 19. (o)
 20. (+)
 21. (+)

72. KEY

73. SECTION I

74. 22. 1 (+)
 75. 23. 3 (+)
 76. 24. 2 (o)
 77. 25. 2 (+)
 78. 26. 1 (+)
 79. 27. 2 (+)
 80. 28. 2 (+)
 81. 29. 4 (+)
 82. 30. 3 (o)
 83. 31. 1 (+)
 84. 32. 2 (+)
 85. 33. 1 (+)
 86. 34. 2 (+)
 87. 35. 4 (+)
 88. 36. 2 (+)
 89. 37. 2 (+)
 90. 38. 2 (+)
 91. 39. 2 (+)
 92. 40. 1 (+)
 93. 41. 2 (+)
 94. 42. 2 (+)

95. 3
 100. 3

101. 43. (+)
 102. 44. (+)
 103. 45. (o)
 104. 46. (o)
 105. 47. (+)
 106. 48. (+)
 107. 49. (+)
 108. 50. (+)
 109. 51. (+)
 110. 52. (+)
 111. 53. (o)
 112. 54. (o)
 113. 55. (o)
 114. 56. (o)
 115. 57. (o)
 116. 58. (+)
 117. 59. (o)
 118. 60. (o)
 119. 61. (+)
 120. 62. (o)
 121. 63. (o)

SECTION II

64. (+)

65. (+)

66. (o)

67. (+)

68. (+)

69. (o)

70. (+)

71. (o)

72. (+)

73. (+)

74. (+)

75. (o)

76. 277. 178. 179. 380. 381. 282. 283. 384. 285. 486. 387. 388. 389. 190. 291. 492. 393. 394. 295. 296. 197. 398. 299. 3100. 3101. 2102. 1103. 4104. 4105. 1106. 2107. 3108. 2109. 1110. 2111. 1112. 2113. 2114. 1115. 1116. 2117. 3118. 3119. 1120. 1121. 4

SECTION II

| | | | | | |
|------|---|------|---|-----|-------|
| 99. | 3 | 96. | 3 | 64. | (+) |
| 100. | 3 | 97. | 1 | 65. | (+) |
| 101. | 3 | 98. | 1 | 66. | (o) |
| 102. | 1 | 99. | 3 | 67. | (+) |
| 103. | 4 | 100. | 3 | 68. | (+) |
| 104. | 4 | 101. | 3 | 69. | (o) |
| 105. | 1 | 102. | 3 | 70. | (+) |
| 106. | 3 | 103. | 3 | 71. | (o) |
| 107. | 3 | 104. | 3 | 72. | (+) |
| 108. | 3 | 105. | 4 | 73. | (+) |
| 109. | 1 | 106. | 3 | 74. | (+) |
| 110. | 3 | 107. | 3 | 75. | (o) |
| 111. | 1 | 108. | 3 | | |
| 112. | 3 | 109. | 3 | | |
| 113. | 3 | 110. | 3 | | |
| 114. | 1 | 111. | 3 | | |
| 115. | 1 | 112. | 1 | | |
| 116. | 3 | 113. | 3 | | |
| 117. | 3 | 114. | 3 | | |
| 118. | 3 | 115. | 4 | | |
| 119. | 1 | 116. | 3 | | |
| 120. | 1 | 117. | 3 | | |
| 121. | 4 | 118. | 3 | | |
| | | 119. | 1 | | |
| | | 120. | 3 | | |
| | | 121. | 3 | | |

122. 3

123. 3

124. 4

125. 3

126. 3

127. 3

128. 3

129. 3

130. 2

131. 3

132. 1

133. 2

134. 3

135. 3

132. 3
133. 3
134. 3
135. 3
136. 3
137. 3
138. 3
139. 3
140. 3
141. 3
142. 1
143. 3
144. 3
145. 3

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