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Diabetes Numeracy Test

Last Revised: January 19, 2005 (Answers Revised 3/05, format revised 3/07)

Time Started: _____

Time Completed: _____

Total Time: _____

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The Diabetic Numeracy Test

Description

The Diabetic Numeracy Test (DNT) is an assessment test designed to investigate the numeracy skills in patients with diabetes. Numeracy can be defined as the ability to understand and use numbers and math skills in daily life. Numeracy is particularly important to patients with diabetes because these patients apply math skills to diabetes self-management activities such as, glucose monitoring, carbohydrate counting, and adjustment of insulin. The questions in the DNT were formulated from directions given by health care practitioners to patients with diabetes during a routine clinic visit. In addition, question development was guided by reviewing validated math and literacy tests. Arriving at the answers will require not only the ability to perform a variety of math skills, such as addition, subtraction, and multiplication, but also the application of those skills in the daily setting.

Funding

The development and validation of this scale was funded with support from the American Diabetes Association (Novo Nordisk Clinical Research Award), the Pfizer Clear Health Communication Initiative, the Vanderbilt Diabetes Research and Training Center (NIDDK 5P60DK020593) and a NIDDK Career Development Award (NIDDK 5K23DK065294).

Test Administration

The DNT can be written or orally administered. It consists of 43 questions in five domains: nutrition, exercise, blood glucose monitoring, oral medications and insulin. In addition, the scale consists of eight math problem types: addition, subtraction, multiplication, division, fractions, multi-step mathematics, time, and numeration/counting/number hierarchy. The estimated time for administration of the test is 30 minutes.

General Guidelines

- Introduce yourself to the respondent.
- If the respondent wears glasses, please ask him or her to put them on. If the respondent wears contacts, remind him or her to wear them to the exam.
- Test the patients visual acuity using a Rosenbaum Pocket Vision Screener. Patients with corrected visual Acuity >20/50 should be excluded from test.
- Explain the purpose and time frame of the test.
- Hand the respondent a pencil, paper and calculator before starting the exam.
- Ask the respondent to write any calculations on the scrap sheet.
- Ask the respondent to write his or her final answers on the numeracy test in the spaces provided.
- Explain to the respondent that if he or she is to erase, erase completely without leaving smears or markings.
- Do not look at the answer choices while administering the exam.
- Remind respondents who wear hearing aids to bring them to the test.

For oral administration, the test administrator is to follow these directions:

- Read the questions out loud to the respondent
- Allow the patient to examine any figures associated with the question.
- Repeat the question if asked
- Give the respondent time to answer the question

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- Only read what's printed in the question. Improvising or interpreting a question for a respondent can invalidate the test results and decrease test efficiency.
- Allow time for the respondent to calculate and record his or her answers
- After the respondent has answered a question, immediately proceed to the next item
- There is no time limit on a particular item.
- Remind respondents who wear hearing aids to bring them to the test.

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For respondents who are having difficulty:

- *Repeat any question when asked by the respondent. However, do not repeat the question more than three times.*
- *If the respondent is having difficulty, please encourage the respondent to continue. Appropriate comments are "you're doing fine." However, do not establish a pattern, such as saying "good" only after correct responses.*
- *If the respondent does not want to resume the test, please respond by saying, "I am not trying to embarrass, humiliate, or put your down in anyway. We can stop now, but I would like to pause to let you know that you are very important to this study, and the information you are providing could be used to help patients with diabetes. May I continue…"*
- *Record any information that you think is relevant or important about the respondent's behavior.*

Domains

Domain	**Question number**
Nutrition	1-9
Exercise	10-13
Blood Glucose Monitoring	14-17
Oral Medications	18-22
Insulin	23-43

Math Problem Type	**Question number**
Addition	2,25
Subtraction	8
Multiplication	3,5,16,26,27
Division	11,21,28-31
Fractions/ Decimals	4,6,7,8
Multi-step mathematics	9,12,13,20,35-43
Time	10,17,22
Numeration/Counting/Hierarchy	1,14,15,18,19,23,24,32-34

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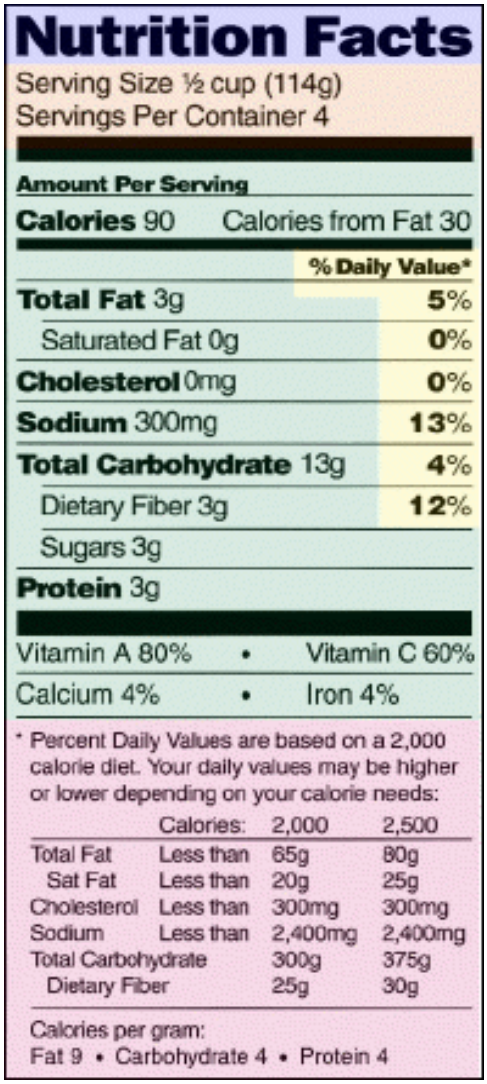
Numeracy Survey Questions

For each question below, follow the directions and read the prompt. Please record your responses on the blank provided for each question.

Nutrition

1. According to the nutrition label, how many grams of total carbohydrate are in 1/2 cup?



Nutrition Facts

Serving Size ½ cup (114g)
Servings Per Container 4

Amount Per Serving

Calories 90	Calories from Fat 30
	% Daily Value*
Total Fat 3g	**5%**
Saturated Fat 0g	**0%**
Cholesterol 0mg	**0%**
Sodium 300mg	**13%**
Total Carbohydrate 13g	**4%**
Dietary Fiber 3g	**12%**
Sugars 3g	
Protein 3g	

Vitamin A 80%	•	Vitamin C 60%
Calcium 4%	•	Iron 4%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

1. ANSWER _____ grams.

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Questions 2-3

2. What is the total amount of carbohydrate eaten if 1 cup of pasta and 1 cup of carrots are eaten together?

Pasta

Nutrition Facts

Serving Size 1 cup (228g)
Serving Per Container 2

Amount Per Serving

Calories 250 Calories from Fat 110

	% Daily Value*
Total Fat 12g	**18%**
Saturated Fat 3g	**15%**
Cholesterol 30mg	**10%**
Sodium 470mg	**20%**
Total Carbohydrate 31g	**10%**

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Carrots

Nutrition Facts

Serving Size 1 cup (85g) (3 oz.)

Servings per container 2.5

Amount per serving

Calories 45 Calories from Fat 0

	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 55 mg	2%
Total Carbohydrate 10g	3%
Dietary Fiber 3g	12%
Sugars 5g	
Protein 1g	

Vitamin A 360% • Vitamin C 8% • Calcium 2% • Iron 0%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat. Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate	Less than	300mg	375mg
Dietary Fiber	Less than	25g	30g

Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4

Ingredients: Carrots.

2. ANSWER _____ total grams

3. If you ate the entire container of pasta, how many calories would you be eating?

3. ANSWER _____ calories

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4. If you ate the entire bag of chips, how many total grams of carbohydrate would you eat?

4. ANSWER _____ total grams

5. 1 gram of carbohydrate elevates your blood sugar level 3 points. How much will 20 grams of carbohydrate elevate your blood sugar?

5. ANSWER _____ points

6. 1/2 cup of potatoes counts as 1 carbohydrate choice. How many choices does 2 cups of potatoes count as?

6. ANSWER _____ choices

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7. You ate 1 and 1/2 cups from the food labeled below. How many grams of carbohydrate did you eat?

Nutrition Facts
Serving size: ¾ cup Servings per container 10
Amount per Serving **Calories** 150 Calories
Total Fat 7g **Total Carbohydrates** 18 grams Dietary Fiber 3g Sugars 3g **Protein** 3g

7. ANSWER _____ grams

8. Your dietitian recommends you eat **5 servings** of fruits and vegetables each day. You already ate ½ cup of canned pineapples, 1 orange and 1 cup of *uncooked* vegetables. To have **5 servings** of fruits and vegetables, how many cups of cooked vegetables should you eat?

Fruits *One serving equals:*	***Vegetables*** *One serving equals:*
1 orange, or 1 apple, or ½ cup of canned pineapples	1 cup of uncooked vegetables, or ½ cup of cooked vegetables, or ¾ cup of tomato juice

8. ANSWER _____ cups

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9. You ate half the container of carrots. How many carbohydrates did you eat?

Carrots

Nutrition Facts

Serving Size 1 cup (85g) (3 oz.)

Servings per container 2.5

Amount per serving

Calories 45 Calories from Fat 0

	% Daily Value*
Total Fat 0g	0%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 55 mg	2%
Total Carbohydrate 10g	3%
Dietary Fiber 3g	12%
Sugars 5g	
Protein 1g	

Vitamin A 360% • Vitamin C 8% • Calcium 2% • Iron 0%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat. Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate	Less than	300mg	375mg
Dietary Fiber	Less than	25g	30g

Calories per gram: Fat 9 • Carbohydrate 4 • Protein 4

Ingredients: Carrots.

9. ANSWER_____ carbohydrates

Questions 10-11

10. When you lift weights, you need to eat 20 grams of carbohydrate within 15 minutes after you finish. If you finish weight training at 2:00 PM, by when should you eat the carbohydrates?

10. ANSWER _____ PM

11. Each cracker has 2 grams of carbohydrate. How many crackers should you eat to get 20 grams?

11. ANSWER _____ crackers

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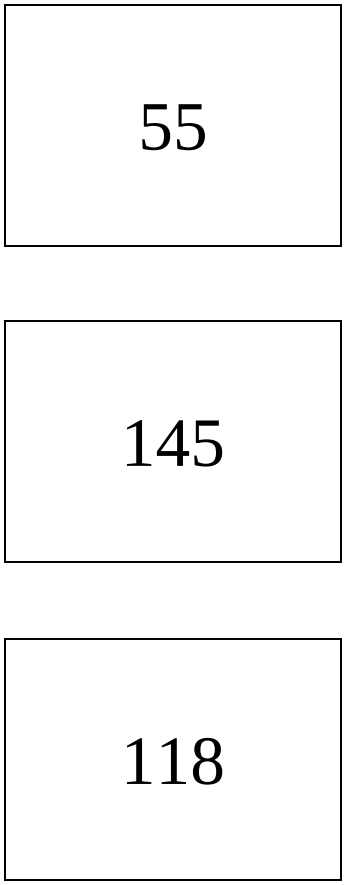
12. Before working in the yard you are to decrease your meal insulin by half, if the meal and yard work are two hours or less apart. You usually take 8 units for lunch. If you eat lunch at 12:30 and are going to cut the grass at 2:00 PM, how much insulin should you take?

12. ANSWER _____ units

13. You have to eat 6 grams of carbohydrate for each 30 minutes you plan to walk. You are planning to walk for one hour. You have a bag with 12 crackers. Each cracker contains 10 grams of carbohydrate. How many crackers do you need to eat before your walk?

13. ANSWER _____ Crackers

14. Your target blood sugar is between 60 and 120. Please circle the values below that are in the target range (circle all that apply):



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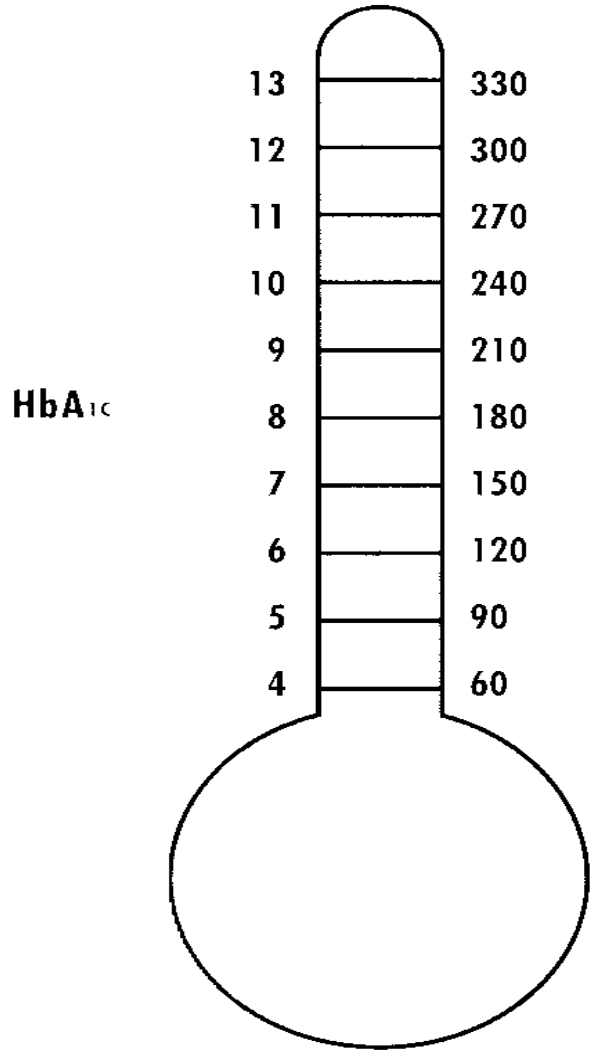
15. The hemoglobin A1c (HbA1c) test measures average blood sugar levels for the 2-3 month period before blood is drawn. A HbA1c of 6% is equal to an average blood sugar of about 120. If your average blood sugar in the past 3 months is 240, approximately what is your HbA1c?



15. _____%

16. You test your blood sugar 4 times a day. How many strips do you need to take with you on a 2-week vacation?

16. ANSWER _____ strips

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17. You test your blood sugar 3 times a day. You purchase a prescription of 50 strips on March 5th. Of the dates below, by when will you need to buy new strips?

March 21st
April 21st
May 21st
June 21st

18. You have a prescription for repaglinide 1 mg pills. The label says, "Take 2 mg of repaglinide with breakfast, 1 mg with lunch and 3 mg with supper." How many pills should you take with supper?

18. ANSWER _____ pills

19. You have a prescription for metformin extended release 500 mg tablets. The label says, "Take 1 tablet with supper each night for the first week. Then, increase by 1 tablet each week for a total of 4 tablets daily with supper."

How many tablets should you take with supper each night the **second** week?

19. ANSWER _____ tablets

20. You have only a few pills left in your pill bottle. Your doctor's office needs 3 days to process a new prescription and your pharmacy needs 2 days to fill it. You take 2 pills a day. What is the **least** amount of pills that should be in your prescription bottle when you call for a renewal?

20. ANSWER _____ pills

21. For your diabetes, you take 1 pill two times per day. When you get your refill, the bottle has 60 pills. How many days supply do you have?

21. ANSWER _____ days

22. You fill your prescription on July 15th. You get a 90 day supply. You must mail in a renewal 10 days before your supply runs out. When do you need to mail in a renewal?

22. ANSWER _____

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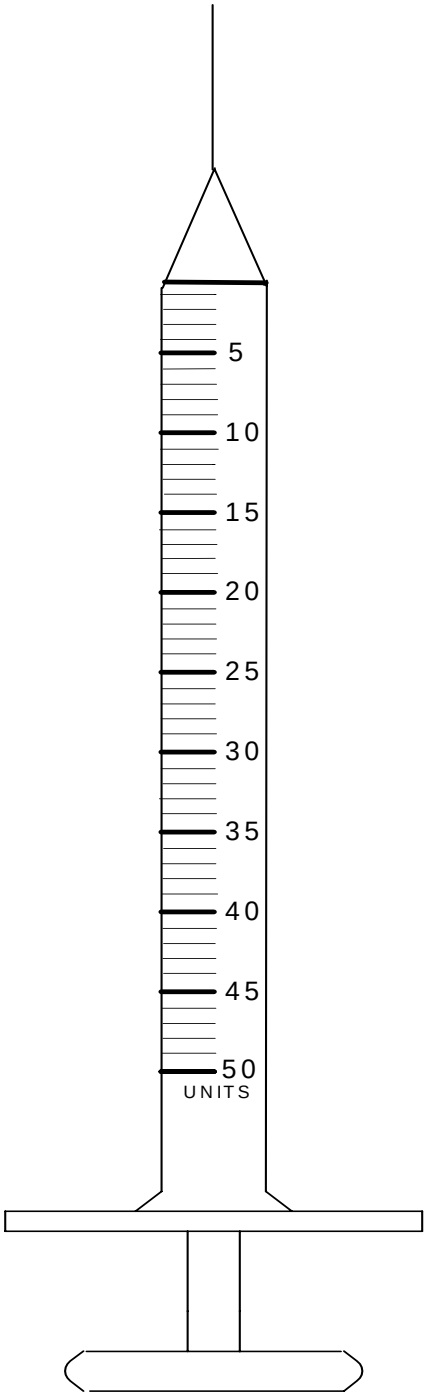
23. You take 46 units of insulin at bedtime. On the syringe below, circle the line/marking that shows you have drawn 46 units.



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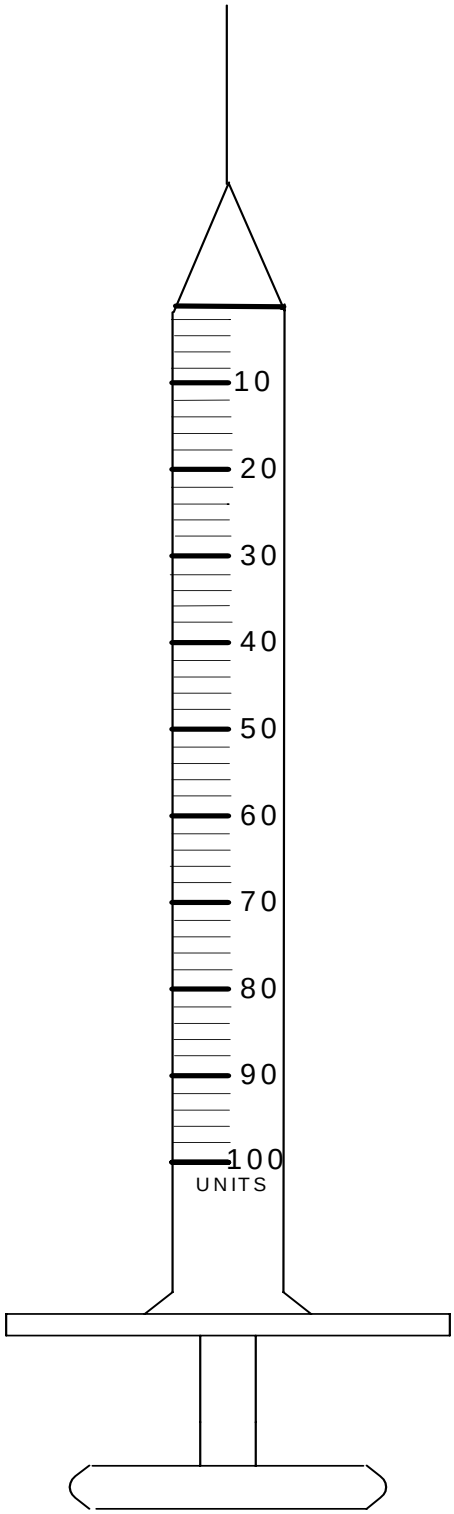
24. Your insulin dose is increased to 54 units and you begin using a larger syringe that holds 100 units. On the syringe below, circle the line/marking that shows you have drawn 54 units.



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25. You take 10 units of insulin lispro and 16 units of insulin glargine before breakfast. What is the total number of units of insulin you take before breakfast?

25. ANSWER _____ total units

26. The doctor tells you to take 2 units of insulin for every 1 serving of carbohydrate you eat. How many units of insulin do you take for 6 servings of carbohydrate?

26. ANSWER _____ units

27. 1 unit of insulin lowered your blood sugar by 30 points. How much does 4 units of insulin lower your blood sugar?

27. ANSWER _____ points

Use the following information for questions 28, 29, 30.

Please round down to the nearest whole number.

You are given the following instructions: "Take 1 unit of insulin for every 7 grams of carbohydrate you eat." How much insulin do you take:

28. When you eat 49 grams at Breakfast?

49g

28. ANSWER _____ units

29. When you eat 60 grams at Lunch?

60g

29. ANSWER _____ units

30. When you eat 98 grams at Supper?

98g

30. ANSWER _____ units

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31. You have been told to cut your insulin in half for a colon test.
Your usual dose is 41 units. What amount should you take for the colon test?

31. ANSWER _____ units

Use the following information for question 32, 33, 34;

You are told to follow the sliding scale shown here. The sliding scale indicates the amount of insulin you take based upon your blood sugar levels.

If Blood sugar is:	**Units of Insulin**
130-180	0
181-230	1
231-280	2
281-330	3
331-380	4

32. How much insulin would you take for a blood sugar of 191?

32. ANSWER _____ units

33. How much insulin would you take for a blood sugar of 134?

33. ANSWER _____ units

34. How much insulin would you take for a blood sugar of 295?

34. ANSWER _____ units

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Use the following information for questions 35, 36 and 37

You check your blood sugar just before eating. You take 1 unit of insulin for every 10 grams of carbohydrates you eat. You are also given the sliding scale shown below. The sliding scale indicates the amount of insulin you should add to your usual dose based upon your blood sugar levels:

If your blood sugar is greater than 120 points at breakfast, lunch or supper, add 2 units of insulin.

If your blood sugar is greater than 150 points at breakfast, lunch or supper, add 4 units of insulin.

If your blood sugar is greater than 180 points at breakfast, lunch or supper, add 6 units of insulin.

Insulin Dose Schedule

1 unit of Insulin /10 grams carbohydrate at meals

If Blood sugar is:	Breakfast	Lunch	Supper
> 120	+ 2	+ 2	+ 2
> 150	+ 4	+ 4	+ 4
> 180	+ 6	+ 6	+ 6

35. Your blood sugar is 284 and you ate 40 grams of carbohydrate at breakfast. How much total insulin do you need to take?

284 mg/dl		40 grams

35. ANSWER _____ units

36. Your blood sugar is 140 and you will eat 50 grams of carbohydrate at lunch. How much total insulin do you need to take?

140 mg/dl		50 grams

36. ANSWER _____ units

37. Your blood sugar is 380 and you will eat 60 grams of carbohydrate at supper. How much total insulin do you need to take?

380 mg/dl		60 grams

37. ANSWER _____ units

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Questions 38-42

You have been asked to start taking 32 units of NPH insulin tonight at bedtime. This insulin will work during the night and will lower your blood sugar first thing in the morning. You were given the following instructions:

- Your goal is to have the morning (fasting) blood sugar below 120.
- Check your blood sugar every morning before breakfast.
- Start with 32 units of NPH tonight. Increase the dose by 2 units **every other** day until your blood sugar is at or below 120.
- Your fasting blood sugar **must** be above 120 for 2 mornings in a row in order for you to increase the insulin dose by 2 units.
- Once your blood sugar is staying below 120, stop increasing the nighttime insulin.

You begin with 32 units of NPH insulin last night. How much NPH insulin will you take on each of the following nights?

38. Morning of day 1, your blood sugar is 164. How much insulin will you take that night?

38. ANSWER _____ units

39. Morning of day 2, your blood sugar is 136. How much insulin will you take that night?

39. ANSWER _____ units

40. Morning of day 3, your blood sugar is 102. How much insulin will you take that night?

40. ANSWER _____ units

41. Morning of day 4, your blood sugar is 140. How much insulin will you take that night?

41. ANSWER _____ units

42. Morning of day 5, your blood sugar is 132. How much insulin will you take that night?

42. ANSWER _____ units

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43. After seeing the Doctor, you are given the following instruction to lower a high blood sugar level before a meal:

" Starting with a blood sugar of 120, take 1 unit of insulin lispro for each 50 points of blood sugar."

How much insulin should you take for a blood sugar of 375?

43. ANSWER _____ units

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Answer Key

Question #	***Answer***
1	13 grams
2	41 grams
3	500 calories
4	63 grams
5	60 points
6	4 choices
7	36 grams
8	1 cup
9	12.5 grams
10	2:00 - 2:15pm
11	10 crackers
12	4 units
13	1-2 crackers
14	Circled 118 only
15	10
16	56
17	March 21
18	3 pills
19	2 tablets
20	10 pills
21	30 days
22	Accept Oct 3-6
23	See Question sheet
24	See Question sheet
25	26 units
26	12 units
27	120 points
28	7 units
29	8 units
30	14 units
31	20 or 20.5 units

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32	1 unit
33	0 units
34	3 units
35	10 units
36	7 units
37	12 units
38	32 units
39	34 units
40	34 units
41	34 units
42	36 units
43	Accept 5-6 units