



New for 2016-2017

Clarifications have been made on the conversion chart and list of abbreviations.

Taber's Cyclopedic Medical Dictionary has been deleted as a resource.

Rounding clarification has been added.

Test questions will use standard medical abbreviations from Simmers DHO: Health Science.

Purpose: To encourage HOSA members to improve their ability to identify, solve, and apply mathematical principles involving temperature, weights, and measures used in the health community.

Description This event shall be a written test dealing with selected problems involving conversions between the Fahrenheit and Celsius scales and the metric and household systems of measurement. Competitors will solve complex math problems utilized in health professions, in addition to identifying and interpreting related symbols and abbreviations in a 50 item test plus 10 tie-breaker problems. Written tests will measure knowledge and understanding at the recall, application and analysis levels. Higher-order thinking skills will be incorporated as appropriate.

Dress Code: Competitors must be in official HOSA uniform or in proper business attire. Bonus points will be awarded for proper dress.

- Rules and Procedures**
1. Competitors in this event must be active members of HOSA-Future Health Professionals, in good standing in the division in which they are registered to compete (Secondary or Postsecondary/Collegiate).
 2. Competitors must be familiar with and adhere to the "General Rules and Regulations of the National HOSA Competitive Events Program (GRR)."
 3. The test will consist of fifty (50) test items and ten (10) tiebreaker questions.

Test Plan:

| | |
|--|-----|
| Mathematical essentials..... | 5% |
| Measurement and conversion problems..... | 20% |
| Drug dosages and intravenous solutions | 35% |
| Dilutions, solutions and concentrations | 25% |
| Interpreting medical information | 15% |
| o Charts, graphs, tables | |
| o Basic statistics: mean, median, mode, standard deviation | |
| o Calculating body surface | |

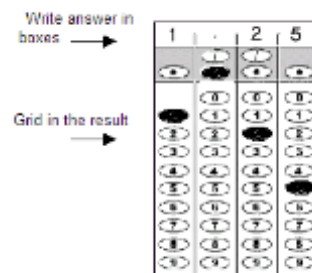
- NOTE:**
1. Abbreviations should be used in written problems.
 2. At least half of the computation and calculation problems will involve conversions.

NOTE: States/regions may use a different process for testing, to include but not limited to pre-conference testing, online testing, and testing at a computer. Check with your Area/Region/State for the process.

4. At the International Leadership Conference, HOSA will provide basic handheld calculators for addition, subtraction, division, multiplication and square root. Check with State Advisor to determine if a calculator will be used at the State level.
5. The conversion chart included in these guidelines will be used as the official reference for the test for uniformity. **Competitors may not use any type of conversion chart or resource during the test.**
6. A series of ten (10) complex, multi-step tie breaking questions will be administered with the original test. In case of a tie, successive tie-breaker questions will be used until a winner is determined. In the tie-breaker, correct spelling is required for an item to be considered correct.
7. The official references for selection of symbols, abbreviations, and problems are:
 - [Simmers, L., Simmers-Nartker, Simmers-Kobelak. DHO: Health Science. Cengage Learning. Latest edition.](#)
 - [Olsen, et al. Medical Dosage Calculations. Pearson Latest edition.](#)
 - [Craig, Gloria P., Clinical Calculations Made Easy. Wolters Kluwer. Latest edition.](#)
 - [Helms, Joel R., Mathematics for Health Sciences: A Comprehensive Approach. Cengage Learning. Latest edition.](#)
8. All competitors shall report to the site of the event at the time designated for the event orientation. The test will immediately follow the orientation. **No proxies will be allowed for the orientation.**

9. **When a Scantron form is used** – the Scantron form for this event will require competitors to grid-in their responses.

At the state-level, when a paper/pencil test is used or the test is administered on a computer, the competitor will write in or key in his/her response to each question.



10. Test Instructions: All competitors will be given a test, a Scantron answer form and two (2) sheets of blank paper. Competitors will be given instructions on the use of the Scantron form. After instructions have been given, the competitors will be notified to start the test. There will be a maximum of **90 minutes** to complete the test. There will be a verbal announcement when there are 15 minutes remaining for the test period. Competitors may be excused from the testing site promptly after completion of the test.
11. Converting between measurement systems will often render a different answer depending upon which systems and conversions are being used. The answer to a calculation problem will ultimately be the same answer after appropriate rounding.

ROUNDING: When rounding decimal numbers to the nearest tenths, hundredths, or thousandths, look to the immediate right of the digit located in the position to be rounded. If the number to the direct right is 5 or larger, round to the position up one

number and drop everything that follows. If the number to the direct right is 4 or smaller, leave the position being rounded as is and drop everything that follows. (Examples: 31.249 (rounded down) = 31 and 23.75 (rounded up) = 24).

In specific situations, answers will be rounded per medical protocol. For example, pediatric dosage is always rounded DOWN to avoid potential overdose. **Unless otherwise indicated, all answers should be rounded to the nearest whole number.**

Competitor Must Provide:

- Event guidelines (orientation)
- Pens and #2 lead pencils with eraser
- Watch with second hand (optional)


Required Personnel (Per Section)

1. One Event Manager (per event)
2. One Section Leader
3. Two-three Proctors
4. One-two event assistants per section
5. One QA to provide quality assurance for the event by ensuring that the guidelines are followed and all event documents are complete.

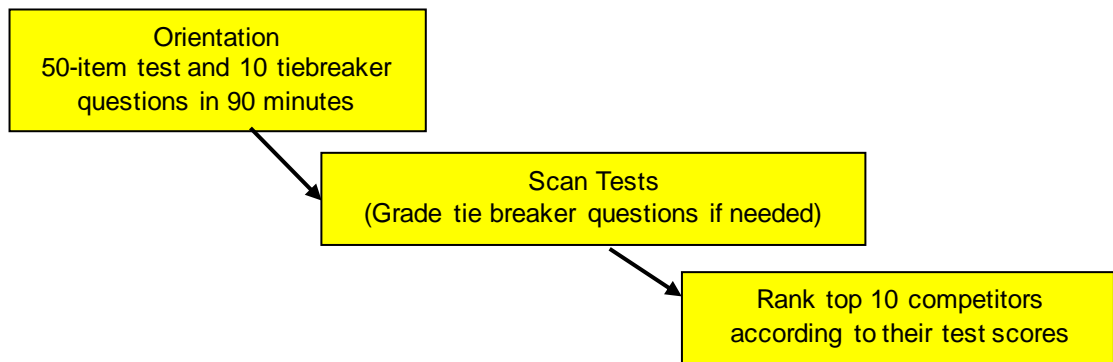
Facilities, Equipment and Materials(Per Section)

- One room to accommodate the total number of competitors
- Tables/chair or schoolroom desks/chairs for total number of competitors
- Table/chairs for event personnel to provide for registration and distribution of materials
- Test packets which are pre-numbered and Scantron / answer forms
- Blank paper (2 sheets per competitor)
- Calculators (1 per competitor)
- Clock or timer
- Evaluation Forms – competitor and personnel

Icon Key

| | |
|---|--|
|  | The orientation includes an event element. Competitors must bring pencils. |
|---|--|

Event Flow Chart



Sample Test Questions

*Competitors will grid-in (or write in) their answers to the test problems.

1. An IV bag of 500 mL solution is started at 1900. The flow rate is 38 gtts per minute, and the drop factor is 10 gtts per mL. At what time (24-hour clock) will this infusion finish?
2. A patient with an eating disorder weighs 95½ lbs. What is the patient's weight in kg?
3. How many grams of sodium chloride are needed to prepare 500 mL of a 5% solution?

HOSA MEDICAL MATH CONVERSION CHART

METRIC EQUIVALENTS

| | |
|--|---|
| Length 1 meter = 100 centimeters = 1000 millimeters 1 centimeters = 10 millimeters | Temperature $^{\circ}\text{C} = (^{\circ}\text{F} - 32) \frac{5}{9}$ $^{\circ}\text{F} = (^{\circ}\text{C}) \frac{9}{5} + 32$ |
| Weight 1 kilogram = 1000 grams 1 gram = 1000 milligrams 1 milligram = 1000 micrograms | Weight Conversion 1 kilogram = 2.2 pounds 1 pound = 16 ounces |
| Volume for Solids 1000 cubic decimeters = 1 cubic meter 1000 cubic centimeters = 1 cubic decimeter 1000 cubic millimeters = 1 cubic centimeter | Volume for Fluids 1 liter = 1000 milliliters 10 centiliters = 1 deciliter 10 deciliters = 1 liter 1 cubic centimeters = 1 milliliter |

APPROXIMATE EQUIVALENTS AMONG SYSTEMS

| Metric | Household/English Liquid |
|--------------------|----------------------------|
| 240 milliliters | 1 cup / 8 ounces / 16 tbsp |
| 30 milliliters | 1 ounce / 2 tbsp / 6 tsp |
| 15 milliliters | 1 tablespoon / 3 teaspoons |
| 5 milliliters | 1 teaspoon |
| 1 milliliter | 15 drops |
| 0.0667 milliliters | 1 drop |
| 1 meter | 39.4 inches |
| 2.5 centimeters | 1 inch |

- Sources: Simmers, L., Simmers-Nartker, Simmers-Kobelak. *DHO: Health Science*. Cengage Learning, Latest edition. and Olsen, et al. *Medical Dosage Calculations*. Pearson. Latest Edition.

MEDICAL MATH ABBREVIATIONS & STANDARDS

The following are the abbreviations and I & O standards that will be used for the Medical Math event. (Official references are identified in the Medical Math Guidelines.)

Any measurement terms not listed in the chart below will be spelled out. (Example: deciliter) In addition, the test will use standard medical abbreviations as designated in the Simmers *DHO Health Science* reference.

| Term | Abbreviation |
|---------------------------------|-----------------------|
| meter | m |
| millimeter | mm |
| centimeter | cm |
| kilogram | kg |
| gram | g |
| milligram | mg |
| microgram | mcg |
| liter | L |
| milliliter | mL |
| cubic centimeter | cc or cm ³ |
| degrees Celsius (Centigrade) | ° C |

| Term | Abbreviation |
|--------------------|--------------|
| foot/feet | ft |
| Inch | in |
| pound | lb |
| ounce | oz |
| quart | qt |
| pint | pt |
| cup | C |
| tablespoon | tbsp or T |
| teaspoon | tsp or t |
| drop or drops | gtt or gtts |
| degrees Fahrenheit | ° F |

I&O Standards

Juice glass = 6 oz
 Coffee cup = 8 oz
 Water glass = 7 oz
 Jello cup = 5 oz
 Ice cream = 4 oz
 Creamer = 1 oz