

TNReady High School End-of-Course Science

This document provides information about the design of the TNReady assessment. It is not intended to be used solely as an instructional resource or as pacing guide. Districts should consult the Tennessee academic standards when making all instructional decisions including scope and sequence. The Tennessee academic standards can be found [here](#).

High School EOC Testing Structure in Biology I and Chemistry I

As in the past, each year the state assessment includes both operational and field test items. The below testing structure for science reflects both the number of operational assessment items and the number of field test assessment items.

Test Design	
Biology I	<ul style="list-style-type: none"> 75 minutes 60 items
Chemistry I	<ul style="list-style-type: none"> 75 minutes 60 items

High School EOC Blueprints in Biology I and Chemistry I

The blueprints below reflect *only* operational assessment items. You can find both the Biology I and Chemistry I standards [here](#).

Biology			
	# of Items	# of Score Points	% of Test
Content			
• Inquiry and Technology & Engineering	5-10	5-10	9-18
• Cells	11-13	11-13	20-24
• Interdependence	6-7	6-7	11-13
• Flow of Matter and Energy	9-10	9-10	16-18
• Heredity	11-14	11-14	20-25
• Biodiversity & Change	6-7	6-7	11-13
TOTAL	50	50	100
Chemistry			
	# of Items	# of Score Points	% of Test
Content			
• Inquiry and Technology & Engineering	8-10	8-10	14-18
• Atomic Structure	9-11	9-11	16-20
• Matter and Energy	14-16	14-16	25-29
• Interactions of Matter	20-22	20-22	36-40
TOTAL	50	50	100

Please note: Some resource publishers have created materials that contain “TNReady” in the title or within the contents of their instructional materials. **The department does not endorse any of these materials as official TNReady products.**

Calculator Guidance for Science End-of-Course Assessments

Biology

The TNReady End-of-Course biology assessment does not require the use of a calculator. Tennessee science standards for this course do not have a mathematical component, and therefore students are not permitted to use a calculator. It is unnecessary for IEP teams to recommend the use of calculators for students in this course.

Chemistry

The TNReady End-of-Course chemistry assessment requires the use of a calculator for all students. Tennessee science standards for this course have a very strong mathematical component, and therefore all students will need to have a calculator in order to complete the assessment. Please refer to the TNReady High School Mathematics Calculator Policy for a list of permissible calculators.

Item Types

Multiple choice: These are items with four answer options, only one of which is correct.

Multiple select: These are items with more than four answer choices with multiple correct answers. Sometimes the number of correct responses will be indicated (e.g., “choose the three correct answers”), but sometimes the number of correct responses will not be indicated (e.g., “select all of the correct answers”). These items are dependent and based on the standard. For 2017-18, these items will be field tested only in science.

Chemistry Reference Sheet

Periodic Table of the Elements

		Key													18						
		Atomic Number																			
		Element Symbol																			
		Element Name																			
		Average Atomic Mass *																			
1	1	H Hydrogen 1.008	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
2	2	He Helium 4.003	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
3	3	Li Lithium 6.941	4	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
4	4	Be Beryllium 9.012	5	5	6	7	8	9	10	11	12	13	14	15	16	17	18				
5	5	B Boron 10.811	6	6	7	8	9	10	11	12	13	14	15	16	17	18					
6	6	C Carbon 12.011	7	7	8	9	10	11	12	13	14	15	16	17	18						
7	7	N Nitrogen 14.007	8	8	9	10	11	12	13	14	15	16	17	18							
8	8	O Oxygen 15.999	9	9	10	11	12	13	14	15	16	17	18								
9	9	F Fluorine 18.998	10	10	11	12	13	14	15	16	17	18									
10	10	Ne Neon 20.180	11	11	12	13	14	15	16	17	18										
11	11	Na Sodium 22.990	12	12	13	14	15	16	17	18											
12	12	Mg Magnesium 24.305	13	13	14	15	16	17	18												
13	13	Al Aluminum 26.982	14	14	15	16	17	18													
14	14	Si Silicon 28.086	15	15	16	17	18														
15	15	P Phosphorus 30.974	16	16	17	18															
16	16	S Sulfur 32.066	17	17	18																
17	17	Cl Chlorine 35.453	18	18																	
18	18	Ar Argon 39.948	19	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
19	19	K Potassium 39.098	20	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
20	20	Ca Calcium 40.078	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
21	21	Sc Scandium 44.956	22	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
22	22	Ti Titanium 47.867	23	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
23	23	V Vanadium 50.942	24	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
24	24	Cr Chromium 51.996	25	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
25	25	Mn Manganese 54.938	26	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
26	26	Fe Iron 55.845	27	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
27	27	Co Cobalt 58.933	28	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
28	28	Ni Nickel 58.693	29	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
29	29	Cu Copper 63.546	30	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
30	30	Zn Zinc 65.409	31	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
31	31	Ga Gallium 69.723	32	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
32	32	Ge Germanium 72.610	33	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
33	33	As Arsenic 74.922	34	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
34	34	Se Selenium 78.960	35	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
35	35	Br Bromine 79.904	36	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53
36	36	Kr Krypton 83.800	37	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
37	37	Rb Rubidium 85.468	38	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
38	38	Sr Strontium 87.620	39	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
39	39	Y Yttrium 88.906	40	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
40	40	Zr Zirconium 91.224	41	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
41	41	Nb Niobium 92.906	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
42	42	Mo Molybdenum 95.940	43	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
43	43	Tc Technetium (98)	44	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
44	44	Ru Ruthenium 101.070	45	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
45	45	Rh Rhodium 102.906	46	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
46	46	Pd Palladium 106.420	47	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
47	47	Ag Silver 107.868	48	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
48	48	Cd Cadmium 112.411	49	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
49	49	In Indium 114.818	50	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
50	50	Sn Tin 118.710	51	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
51	51	Sb Antimony 121.760	52	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
52	52	Te Tellurium 127.600	53	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
53	53	I Iodine 126.904	54	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
54	54	Xe Xenon 131.290	55	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
55	55	Ba Barium 137.327	56	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73
56	56	Cs Cesium 132.905	57	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
57	57	La Lanthanum 138.905	58	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
58	58	Ce Cerium 140.120	59	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
59	59	Pr Praseodymium 140.908	60	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77
60	60	Nd Neodymium 144.242	61	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
61	61	Pm Promethium (145)	62	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
62	62	Sm Samarium 150.360	63	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
63	63	Eu Europium 151.964	64	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81
64	64	Gd Gadolinium 157.250	65	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
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Chemistry Reference Page

Formulas, Constants, and Unit Conversions

Formulas	
Change in Enthalpy (Heat): $Q = m(\Delta T)c_p$	Heat of Fusion: $Q = m\Delta H_{fus}$
Ideal Gas Law: $PV = nRT$	Heat of Vaporization: $Q = m\Delta H_{vap}$
Density: $d = \frac{m}{V}$	Molarity (M) = $\frac{\text{mol of solute}}{\text{L of solution}}$
Combined Gas Law: $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	Molality (m) = $\frac{\text{mol of solute}}{\text{kg of solvent}}$
Boiling Point Elevation: $\Delta T_b = k_b \times m$	Freezing Point Depression: $\Delta T_f = k_f \times m$

Constants	
Universal Gas Constant (R): $0.0821 \frac{\text{atm} \times \text{L}}{\text{mol} \times \text{K}}$, or equal to $8.31 \frac{\text{kPa} \times \text{L}}{\text{mol} \times \text{K}}$	
Molar Volume at STP: $22.4 \frac{\text{L}}{\text{mol}}$	Avogadro's Number (1 mole): 6.02×10^{23}
Specific Heat Capacity of Liquid Water: $c_p (\text{H}_2\text{O}) = 1.00 \frac{\text{cal}}{\text{g} \times ^\circ\text{C}} = 4.18 \frac{\text{J}}{\text{g} \times ^\circ\text{C}}$	

Unit Conversions	
1 atm = 760 mm Hg = 760 Torr = 101.3 kPa = $14.7 \frac{\text{lb}}{\text{in}^2} = 29.92 \text{ in. Hg}$	K = °C + 273
1.000 calorie = 4.184 Joules	1 mL = 1 cm ³ 1 L = 1,000 mL = 1,000 cm ³
giga (G) = 10 ⁹ , mega (M) = 10 ⁶ , kilo (k) = 10 ³ , hecto (h) = 10 ² , deka (da) = 10 ¹	
deci (d) = 10 ⁻¹ , centi (c) = 10 ⁻² , milli (m) = 10 ⁻³ , micro (μ) = 10 ⁻⁶ , nano (n) = 10 ⁻⁹	

Common Ions					
Element Name	Charges	Ions	Charges	Ions	Charges
Silver (Ag ⁺)	1+	Ammonium (NH ₄ ⁺)	1+	Oxide (O ²⁻)	2-
Zinc (Zn ²⁺)	2+	Nitrate (NO ₃ ⁻)	1-	Sulfide (S ²⁻)	2-
Scandium (Sc ³⁺)	3+	Nitrite (NO ₂ ⁻)	1-	Sulfate (SO ₄ ²⁻)	2-
Copper (Cu ¹⁺ , Cu ²⁺)	1+, 2+	Hydrogen Carbonate (HCO ₃ ⁻)	1-	Sulfite (SO ₃ ²⁻)	2-
Gold (Au ¹⁺ , Au ³⁺)	1+, 3+	Perchlorate (ClO ₄ ⁻)	1-	Carbonate (CO ₃ ²⁻)	2-
Cobalt (Co ²⁺ , Co ³⁺)	2+, 3+	Chlorate (ClO ₃ ⁻)	1-	Peroxide (O ₂ ²⁻)	2-
Nickel (Ni ²⁺ , Ni ³⁺)	2+, 3+	Chlorite (ClO ₂ ⁻)	1-	Chromate (CrO ₄ ²⁻)	2-
Lead (Pb ²⁺ , Pb ⁴⁺)	2+, 4+	Hypochlorite (ClO ⁻)	1-	Dichromate (Cr ₂ O ₇ ²⁻)	2-
Tin (Sn ²⁺ , Sn ⁴⁺)	2+, 4+			Phosphate (PO ₄ ³⁻)	3-
Mercury (Hg ¹⁺ , Hg ²⁺)	1+, 2+				
Iron (Fe ²⁺ , Fe ³⁺)	2+, 3+				
Titanium (Ti ²⁺ , Ti ³⁺ , Ti ⁴⁺)	2+, 3+, 4+				
Chromium (Cr ²⁺ , Cr ³⁺)	2+, 3+				
Vanadium (V ²⁺ , V ³⁺ , V ⁴⁺)	2+, 3+, 4+				
Manganese (Mn ²⁺ , Mn ³⁺ , Mn ⁴⁺)	2+, 3+, 4+				

Turn over for Periodic Table of the Elements