

Base your answers to questions 1 to 8 on the heating curve above.

The substance was heated at standard pressure.

1. The normal boiling point of this substance is a) -30°C b) -10°C c) 60°C d) 90°C
2. The freezing point of this substance is a) -30°C b) -10°C c) 60°C d) 90°C
3. The melting point of the substance is a) -30°C b) -10°C c) 60°C d) 90°C
4. At the 2 minute mark, the substance is a) a gas b) a liquid c) a solid
d) both solid and liquid
5. As the substance is heated between the 4 and 8 minute marks, its average kinetic energy a) increases b) decreases c) stays the same
6. Between the 22nd and 26th minute the system undergoes a) an exothermic physical change b) an exothermic chemical change c) an endothermic physical change
d) an endothermic chemical change.
7. Based on the heating curve above, at a temperature of 80°C the substance is a) a solid b) a liquid c) a gas d) changing from solid to liquid.
8. Compared to the heat of fusion of this substance, the heat of vaporization is a) the same b) 2 times greater c) 4 times greater d) 8 times greater
9. What is the normal boiling point of water? a) 100 K b) 273 K c) 373 K d) 474 K

10. How many grams of water will be heated from 30.0° C to 40.0° C by the addition of 836 joules of heat ? a) 10.0g **b) 20.0g** c) 83.6 g d) 8360 g
11. How many grams of water can be boiled at its boiling point by 1130 joules of heat? a) 1.00 gram b) 2.00 grams **c) 0.500 grams** d) 50.0 grams
12. Based on the vapor pressure curves on table H, which liquid has the strongest intermolecular attractions? a) propanone b) ethanol c) water **d) ethanoic acid**
13. How many milliliters are there in 0.250 L ? a) **250. mL** b) 25.0 mL c) 2.50 mL d) 0.00250 mL
14. We often use the heat produced by burning charcoal to cook food. The burning of charcoal is an a) endothermic physical change b) exothermic physical change c) endothermic chemical change **d) exothermic chemical change.**
15. Gases become least ideal under conditions of a) low temperature and low pressure **b) low temperature and high pressure** c) high temperature and low pressure d) high temperature and high pressure
16. Which description of ideal gases is correct?
a) the volume of the gas is the sum of the volumes of all of the particles in the container
b) the pressure exerted by a given number of molecules is proportional to the mass of the molecules
c) the molecules move in random straight line motion, colliding elastically with other molecules
d) there are strong intermolecular attractions.
17. A gas has a volume of 12.00 liters at standard pressure. In order to contract the gas to a new volume of 6.00 liters, at the same temperature, the new pressure must be a) 101.3 kP **b) 202.6 kP** c) 50.65 kP d) 72.0 kP
18. Which is considered a compound? a) **carbon dioxide** b) air c) gold d) hydrogen
19. In which list are the elements arranged in order of increasing atomic mass?
a) Ne, F, Na b) Fe, Co, Ni c) Te, I, Xe **d) Cl, K, Ar**
20. Which statement correctly describes the liquid state?
a) no definite shape, and no definite volume
b) takes shape of container, no definite volume
c) takes shape of container, definite volume d) definite shape, definite volume.
21. The most active nonmetals are generally those that have
a) the smallest atomic radii b) the smallest ionization energies
c) the smallest electronegativities d) the smallest number of valence electrons

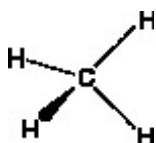
22. How many valence electrons are there in an atom of silicon in the ground state ?
a) 2 b) 4 c) 6 d) 8
23. How many neutrons are there in a particle with the symbol ^{17}N ?
a) 5 b) 7 c) 10 d) 17
24. What is the nuclear charge of an atom with an atomic number of 14 ?
a) + 14 b) +4 c) 28 d) 0
25. How many occupied principal energy levels are there in magnesium atom in the ground state? a) 2 b) 3 c) 4 d) 12
26. What is the total number of protons in the nucleus of an atom of calcium – 42?
a) 20 b) 22 c) 42 d) 62
27. Which species does not have the same electron configuration as a noble gas ?
a) Na^+ b) Mn^{2+} c) Sc^{3+} d) S^{2-}
28. Which electron configuration is correct for a potassium atom ? a) 2-8-8-1
b) 2-8-8 c) 2-8-7 d) 2-8-8-2
29. What is the mass number of a particle that contains 13 protons, 14 neutrons, and 10 electrons? a) 13 b) 14 c) 23 d) 27
30. The nucleus of the atom always has a) more neutrons than protons b) equal numbers of protons and neutrons c) fewer neutrons than protons d) a net positive charge.
- 31-32 The table below shows the normal boiling point of four compounds.

Compound	Normal boiling point. ($^{\circ}\text{C}$)
HF	19.4
CH_3Cl	-24.2
CH_3F	-78.6
HCl	-83.7

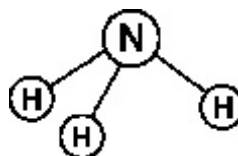
31. Which compound has the weakest intermolecular forces? a) HF b) CH_3Cl
c) CH_3F d) HCl
32. Based on their structures and boiling points, which of the compounds listed above has an intermolecular attraction called hydrogen bonds? a) HF b) CH_3Cl c) CH_3F d) HCl



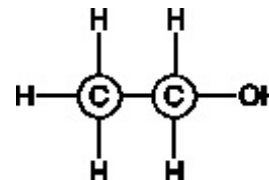
A



B



C



D

Base your answers to questions 33-36 on the four molecular structures above, labeled “a”, “b”, “c” and “d”.

33. Which of these diagrams represents the molecular geometry called “trigonal pyramid”? (also called “pyramidal.”) a)a b)b c)c d)d
34. Hydrogen bonding is NOT a factor in the behavior of molecule a)a b)b c)c d)d
35. The shape represented by diagram “b” is a(n) a) square b) tetrahedron c) equilateral triangle d) rectangular pyramid.
36. Which compound contains a bond that has an electronegativity difference of zero? a)a b)b c) c d) d
37. Compared to nonmetals, metals generally have larger a) ionization energies b) electronegativities c) atomic radii d) ionic radii
38. In a polar covalent bond, there is a slight negative charge on the atom with the a) lower electronegativity b) higher electronegativity c) greater atomic mass d) smaller atomic mass.
39. Which of the following molecules is polar? a) CBr_4 b) H_2 c) CO_2 d) PH_3
40. Which substance is a good conductor of electricity in both the solid state, and the liquid state? a) Ba b) CO_2 c) KCl d) NH_3
41. Which substance forms a solid characterized by a sea of mobile electrons? a) Ni b) CuO c) I_2 d) CO_2
42. Which ion contains exactly the same total number of electrons as an S^{2-} ion? a) O^{2-} b) Ca^{2+} c) Ti^{2+} d) Mg^{2+}
43. Which element generally forms ions that are smaller than its neutral atoms? a) O b) Ca c) Cl d) F
44. Which is the correct formula for an iodine molecule? a) I b) I_2 c) I_3 d) I^-
45. The correct name for the substance with the formula As_2O_5 is a) diarsenic tetraoxide

- b) diarsenic pentoxide C) arsenic (III) oxide D) arsenic (V) oxygen
46. When comparing nonpolar molecules, we generally find that smaller molecules, with fewer electrons, have a) stronger attractions, and higher boiling points b) stronger attractions and lower boiling points c) weaker attractions, and higher boiling points. d) weaker attractions, and lower boiling points.
47. Compared with ionic solids, molecular solids generally have a) stronger attractions, and higher melting points. b) weaker attractions and higher melting points. c) stronger attractions and lower melting points d) weaker attractions and lower melting points.
48. Colored compounds, and multiple positive oxidation states are properties associated with a) sodium b) magnesium c) nickel d) neon
49. When halogen elements react with metals, the halogens generally form ions that have a charge of A) +1 B) + 5 C) +7 D) -1
50. The most reactive metal in period 3 is a) Na b) Ne c) Al d) Cl
51. The most active of the following metals is a) Rb b) Mg c) Na d) Sr
52. In each period, the element with the largest atomic radius is a) a halogen b) a noble gas c) an alkali metal d) a transition metal
53. Which element is most chemically similar to sulfur? a) potassium b) chlorine c) selenium d) phosphorous
54. Which group of elements contains two metalloids? a) B, Si, P, Ar b) Ge, Br, I, Kr c) Se, Te, I, P d) Mn, Fe, Se, Br
55. All of the elements in group 13 have the same a) number of neutrons b) electronegativity c) number of valence electrons d) atomic radius
56. The correct formula for calcium nitrate is a) CaNO b) Ca₂NO c) Ca(NO₂)₂ d) Ca(NO₃)₂
57. Which bond has the greatest degree of ionic character? a) O-Cl b) H-Cl c) H-I d) Br-I
58. An experiment is performed to find the density of an unknown metal. The mass of a piece of that metal is measured, and found to be 26.50 grams. The volume is measured as 3.0 mL. Expressed to the correct number of significant figures, the density of the metal, in grams per liter is A) 9 B) 8.8 C) 8.83 D) 0.113
59. The particle with the symbol P³⁻ contains a) 15 protons, and 12 electrons

- b) 15 protons and 18 electrons c) 18 protons and 15 electrons
d) 12 protons and 15 electrons
60. As the elements in group 2 are considered in order of increasing atomic number, the strength of the elements' attractions for electrons a) **decreases**
b) increases c) remains the same
61. At constant temperature, as the volume of a confined gas is increased, the pressure exerted by that gas a) **decreases** b) increases c) stays the same
62. As the temperature increases, the vapor pressure of a liquid
a) decreases b) **increases** c) stays the same
63. As the pressure on the surface of a liquid decreases, the temperature at which the liquid will boil a) **decreases** b) increases c) stays the same
64. As a liquid is boiled at constant pressure, the temperature of the liquid
a) decreases b) increases c) **stays the same**
65. The dissolving of ammonium nitrate in water is an endothermic process. As ammonium nitrate dissolves in water the temperature of the solution
a) **decreases** b) increases c) stays the same
66. Which element generally reacts by losing 3 electrons from its fifth shell?
a) Tl b) Te c) **In** d) La
67. In an experiment designed to determine the atomic mass of magnesium, a student obtains a value of 25.8 amu. What is the student's % error ?
A) 5.81% B) **6.17 %** C) 94.2 % D) 0.058 %
68. What is the correct name for the compound FeS ?
a) Iron sulfide b) iron (I) sulfide c) **iron (II) sulfide** d) iron (III) sulfide
69. Which of the following properties of elements has no unit? (is unitless)
a) atomic radius b) ionization energy c) **electronegativity** d) atomic mass
70. Which of the following could be an electron configuration of a nitrogen atom in an excited state? A) 2 - 8 - 5 B) **2 - 4 - 1** C) 2 - 5 D) 2-8-3-1
71. Which particle has a far smaller mass than the other three?
a) proton b) neutron c) **electron** d) helium nucleus.
72. A sodium ion, a potassium ion, and a proton all have the same
A) **charge** B) mass C) number of electrons D) radius
73. The least reactive element in period 3 is A) Al B) Cl C) **Ar** D) He

THE CLASSES DIVIDE!! Mr Cohen's students answer the questions in the left column, Mrs.

Goldberg's classes answer the questions in the right column.

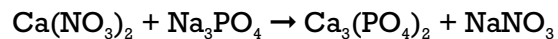
74. A piece of metal is dropped into a battery jar of water and immediately bursts into flame. This metal is most likely to be

- a) Copper
- b) Magnesium
- c) Potassium
- d) Tin

75. What is the oxidation number of the sulfur in the sulfite ion, SO_3^{2-} ?

- a) +3
- b) +4
- c) -2
- d) +6

74 - 75. When calcium nitrate and potassium phosphate solutions are mixed the following reaction occurs:



74. When this equation is balanced with the smallest possible whole numbers, the coefficient in front of the NaNO_3 is

- a) 6
- b) 2
- c) 3
- d) 4

75. This reaction is best described as

- a) synthesis
- b) decomposition
- c) single replacement
- d) double replacement.