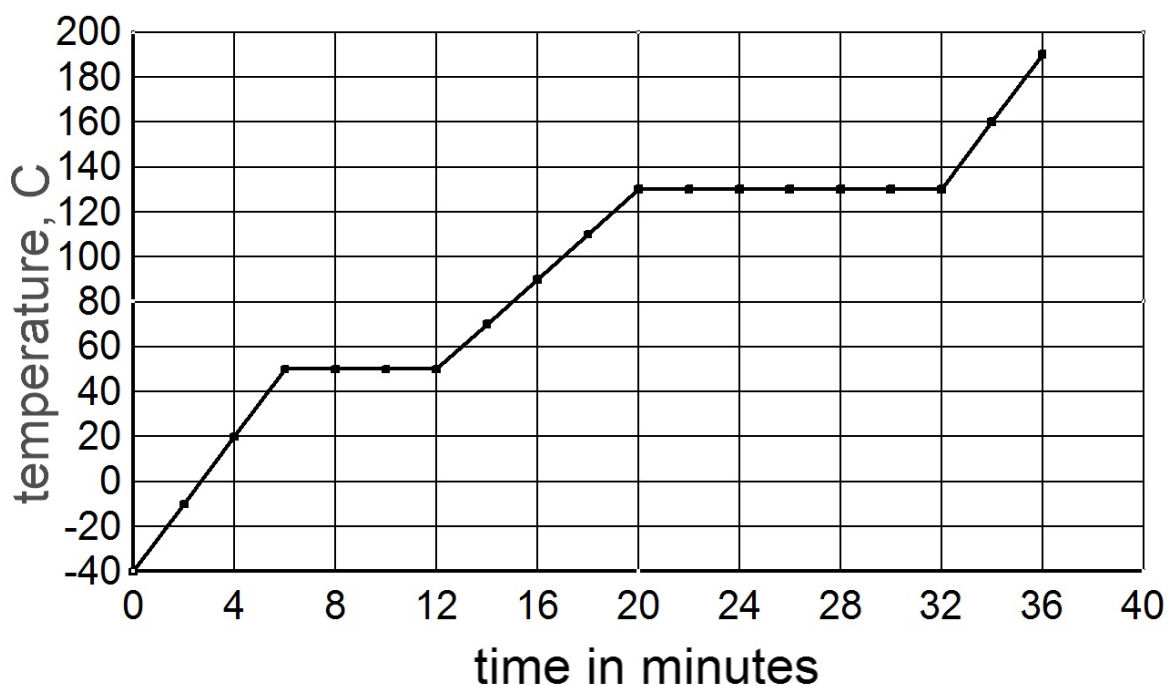


Base your answers to questions 1 to 5 on the heating curve below.

Heating curve of substance X

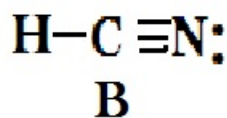
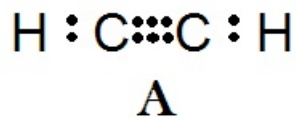
5 grams heated at 5.0 joule/minute



1. What is the freezing temperature of substance X? A) -40°C B) 50°C C) 130°C D) 190°C
2. What is the melting temperature of substance X? A) -40°C B) 50°C C) 130°C D) 190°C
3. At the 24 minute mark, the substance is best described as A) a melting solid B) a liquid below its boiling point C) a boiling liquid D) a gas
4. How long does it take to completely boil the substance once the boiling point has been reached? A) 6 minutes B) 12 minutes C) 8 minutes D) 32 minutes
5. At 100 degrees, substance X must have A) the same vapor pressure as water at that temperature B) a lower vapor pressure than that of water at that temperature C) a higher vapor pressure than that of water at that temperature D) a vapor pressure above 101.3 kilopascals

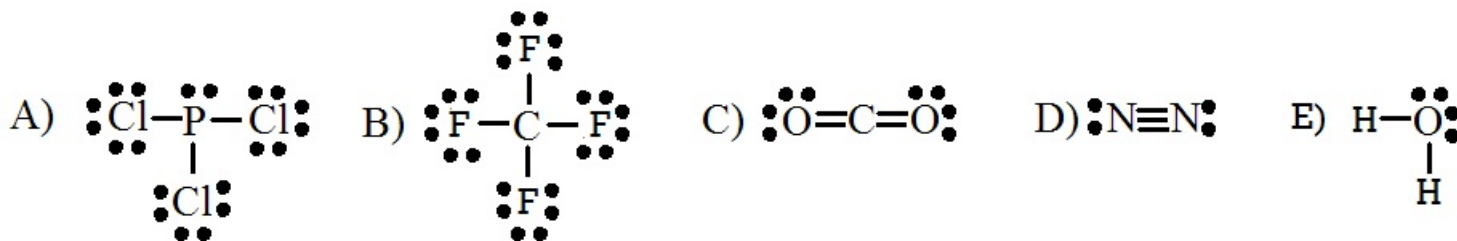
6. Which of the following represents a compound? A) salt water ($\text{NaCl}_{(\text{aq})}$) B) gold ($\text{Au}_{(\text{s})}$)
C) ammonia ($\text{NH}_{3(\text{g})}$) D) chlorine ($\text{Cl}_{2(\text{g})}$)
7. Air is best described as A) a homogenous mixture B) an element
C) a compound D) an alloy
8. How much heat is required to melt 15.0 grams of ice at its melting point?
A) 5010 joules B) 22.3 joules C) 62.7 joules D) 1510 joules
9. A sample of water absorbed 83600 joules, and its temperature changed by 50.0°C .
What was the mass of the water? A) 200.g B) 400. g C. 1670 g D) 4180 g
10. SO_2 molecules have stronger attractions than do N_2 molecules. Which gas sample would probably come closest to ideal gas behavior? A) SO_2 at 25°C and 1.00 atm.
B) SO_2 at 50° and 1.00 atm C) N_2 at 50° and 1.00 atm D) N_2 at 50° and 50.0 atm
11. The pressure exerted by a gas sample will **always** increase when
A) the temperature and volume of the gas are both increased
B) the temperature and volume of the gas are both decreased
C) the temperature of the gas is increased, while the volume is decreased
D) the temperature is decreased, while the volume is increased
12. 30.0 mL of Ne gas is measured at a temperature of 27°C . The temperature is increased, with the pressure constant, until the new volume is 60.0 mL. What is the new temperature?
A) 54°C B) 54 K C) 600°C D) 600 K
13. Based on the vapor pressure curves in table H, which liquid has the **strongest** intermolecular attractions? A) propanone B) ethanol C) water D) ethanoic acid
14. What is the vapor pressure of ethanol at a temperature of $40.^\circ\text{C}$?
A) 13 torr B) 17 torr C) 22 torr D) 58 torr
15. Which of the liquids shown on table H has the **lowest** normal boiling point?
A) propanone B) ethanol C) water D) ethanoic acid
16. A gas at standard pressure has a volume of 24.0 mL. The gas is expanded to a new volume of 96.0 mL with the temperature constant. What is the new pressure of the gas?
A) 0.250 atm. B) 1.00 atm C) 4.00 atm D) 8.00 atm.
17. Which of the following has approximately the same mass as that of a neutron, and has a charge of +1 ? A) a hydrogen atom B) a hydrogen nucleus
C) a hydrogen electron D) a lithium ion
18. Which element has 5 valence electrons? A) boron B) carbon C) nitrogen D) oxygen

Base your answers to questions 19 and 20 on the dot structures “A” and “B” below. Both molecules are linear.



19. Which of these molecules contain(s) a triple bond? A) A only B) B only
C) both A and B D) neither A nor B
20. Which of these is a polar molecule? A) A only B) B only
C) both A and B D) neither A nor B

Base your answers to questions 21 - 24 on the following 5 dot structures:



21. Which molecule has a tetrahedral shape?
22. Which molecule has the same shape as a molecule of ammonia?
23. In which molecule are two atoms sharing electrons **equally**?
24. Looking **only** at molecules B, C, D, and E, how many of these molecules are dipoles?
A) 1 B) 2 C) 3 D) all 4
25. Which is an ionic solid? A) Ag B) S C) C₆H₁₂O₆ D) KBr
26. Which solid is the best conductor of electricity? A) Ag B) S C) C₆H₁₂O₆ D) KBr
27. Which of the following solids has a low melting point, and does not conduct electricity in any of its states? A) I₂ B) Cu C) NaCl D) BaO

28. In general, larger molecules with more electrons have stronger attractions than small molecules with fewer electrons. Nevertheless, HF molecules have stronger attractions than HCl molecules. The best explanation of this exception to the rule is that the HF molecules, but not the HCl molecules form
- A) polar covalent bonds B) nonpolar covalent bonds
C) ionic bonds D) hydrogen bonds
29. How many electrons would be shown in the correct dot structure of a C_2H_4 molecule?
A) 8 B) 12 C) 14 D) 16
30. During the formation of an ionic bond, metal atoms
- A) lose electrons
B) gain electrons C) lose protons D) gain protons
31. When oxygen atoms react with metals, we would expect each oxygen atom to
- A) lose one electron B) lose two electrons C) gain one electron D) gain two electrons
32. Which solid contains positive kernels surrounded by a sea of mobile electrons?
A) K B) I_2 C) H_2O (ice) D) S
33. Given the reaction $F(g) + F(g) \rightarrow F_2(g) + \text{energy}$, which statement best describes this reaction?
A) a bond is formed and energy is released
B) a bond is formed and energy is absorbed
C) a bond is broken and energy is released
D) a bond is broken and energy is absorbed
34. In this expression: $Na(g) + \text{energy} \rightarrow Na^+(g) + e^-$, the energy involved is called
A) electronegativity B) ionization energy C) bond energy D) heat of fusion
35. Which bond has the greatest degree of ionic character?
A) H-Cl B) I-Cl C) K-Cl D) Cl-Cl
36. Which formula represents a molecular substance? A) CaO B) $BrCl$
C) NaCl D) Na_2O
37. Which particles are found in the nucleus of an atom?
A) electrons only B) neutrons only C) electrons and protons
D) protons and neutrons
38. The particle with the symbol 1_1H is a very unusual atom because it contains
- A) no electrons
B) no neutrons C) no protons
D) a negatively charged nucleus

39. Isotopes of an element must have different
 A) atomic numbers B) numbers of electrons
 C) nuclear charge D) numbers of neutrons
40. Which particle has the same number of protons and neutrons?
 A) ^{36}Cl B) ^{39}K C) ^{40}Ca D) ^{52}Cr



41 to 46 are based on the above four atoms.

41. Which of these atoms has the greatest nuclear charge?
42. Which atom has the greatest number of neutrons?
43. Which atom is least likely to bond to other atoms?
44. Which atom has the greatest number of occupied electron shells?
45. Which atom has the smallest atomic radius?
46. Which element is chemically most similar to oxygen?
47. What is the charge of a particle that consists of 16 protons, 17 neutrons and 18 electrons?
 A) +1 B) -1 C) +2 D) -2
48. Which is the most active nonmetal in period 2?
 A) Li B) F C) C D) Ne
49. Which is the most **metallic** element in group 15?
 A) N B) P C) Bi D) As
50. Which element is considered a metalloid?
 A) As B) Cr C) Kr D) U
51. The activities of metals generally **increase** when there is a **decrease** in
 A) atomic radius B) atomic mass C) ionization energy D) number of neutrons
52. When the element with the electron configuration 2-8-6 bonds with the element with the electron configuration 2-6, we would expect the bonds that are formed to be
 A) ionic B) metallic C) polar covalent D) nonpolar covalent

53. What causes the emission of the energy that produces the bright line spectra of the elements?
A) neutrons are absorbed by the nucleus B) protons are absorbed by the nucleus
C) electrons move to higher energy levels D) electrons return to lower energy levels
54. When a certain metal comes in contact with some people's skin, it may produce a blue stain.
This metal is most likely to be A) Sn B) Cu C) Mg D) Ca
55. Which metal explodes when dropped into water? A) Cu B) Fe C) Au D) K
56. What is the symbol for a halogen in period 4? A) I B) Br C) Ca D) As

Note that there are only 3 choices for questions 57 to 60.

57. As ice at 0° turns to water at 0° its average kinetic energy A) decreases B) increases
C) remains the same
58. As the atomic number increases in group 2 of the periodic table, the number of valence electrons in each element A) decreases B) increases C) remains the same
59. As the pressure above a liquid decreases, the boiling temperature of the liquid
A) decreases B) increases C) remains the same
60. When a gas is placed in a container with a constant volume, as the temperature increases, the pressure of the gas A) decreases B) increases C) remains the same

Multiple Choice Questions are 1.2 points each.

Name _____

Essay and long answer pages. Be sure to include units in all of your calculations.

I. When calcium is placed in water, a reaction takes place, producing calcium hydroxide and hydrogen gas.

A. Draw the dot structures of a calcium atom, and of a hydrogen molecule. (4)

B. Write the chemical equation for the reaction,
Calcium + water \rightarrow calcium hydroxide + hydrogen
Be sure to write the *correct formula* for each substance! (2)

C. Balance the equation you wrote in part B. (2)

D. What type of chemical reaction is this? (2)

II. Draw the dot structures of (2 pts each)

A. ammonia

B. carbon disulfide

C. Indicate the shape of each of your molecules (2)

D. Indicate whether each molecule is a dipole. (2)

III. At STP, a sample of Ar gas has a volume of 40.0 mL. The gas is heated to 27° C, and the pressure decreases to 0.400 atm.

A. What is the new volume of the gas? Show the equation that you will use to solve this problem. Then, show how you will substitute numbers for the terms, and solve the equation. (no credit given for an answer without the work) (4)

B. A tank contains Ar at a pressure of 0.400 atm. Ne gas is then added to the tank, with the volume and the temperature constant, until the new **total** pressure = standard pressure.

1. What is the partial pressure of the Ne gas? (2)

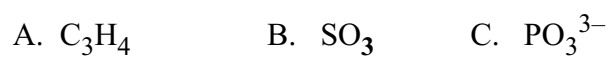
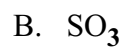
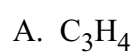
2. Is the number of Ne molecules greater, less than, or the same as the number of Ar molecules? Briefly explain your answer. (2)

IV. An element is found to consist of three different isotopes, with the masses and percentages given in the table below. Use this data to find the average atomic mass of the element. Show work! Express your answer to **three** significant figures. (2 pts)

Mass of isotope →	55.0 amu	56.0 amu	57.0 amu
% of total atoms	20.0	72.0	8.0

Extra Credit:

I. Draw the dot structure of



II. Use the heating curve on page 1 to find A. the heat of vaporization of substance X, and B. the specific heat of substance X in the liquid state.

III. What is the total amount of heat required to convert 25.0 grams of ice, initially at $0^\circ C$, to 25.0 grams of steam, at $100^\circ C$?

have a wonderful vacation!

we look forward to working with you again next term.

