

Chemistry Final Exam Sample Items

- Which best describes the current atomic theory?
 - Atoms consist of electrons circling in definite orbits around a positive nucleus.
 - Atoms are composed of electrons in a cloud around a positive nucleus.
 - Atoms can easily be split, at which time they become radioactive.
 - An atom's mass is determined by the mass of its neutrons.
- What is the nuclear composition of uranium-235?
 - 92 electrons and 143 protons
 - 92 protons and 143 electrons
 - 143 protons and 92 neutrons
 - 92 protons and 143 neutrons
- Which best describes the relationship between subatomic particles in any neutral atom?
 - The number of protons equals the number of electrons.
 - The number of protons equals the number of neutrons.
 - The number of neutrons equals the number of electrons.
 - The number of neutrons is greater than the number of protons.
- What is the name of the compound PbO_2 ?
 - Lead oxide
 - Lead (II) oxide
 - Lead oxide (II)
 - Lead (IV) oxide
- What is the name of HCl (aq) ?
 - Chloric acid
 - Hydrochloric acid
 - Hydrogen chloride
 - Perchloric acid
- What is the chemical formula for calcium nitrate?
 - CaNO_3
 - $\text{Ca(NO}_2)_2$
 - $\text{Ca(NO}_3)_2$
 - Ca_3N_2
- What is the correct formula for dinitrogen pentoxide?
 - N_4O
 - NO_2
 - N_2O_5
 - NO_4

8. If the volume of an 18.5 g piece of metal is 2.35 cm^3 , what is the identity of the metal?
- Iron
 - Lead
 - Nickel
 - Zinc
9. Which substance listed in the table is a liquid at 27°C ?

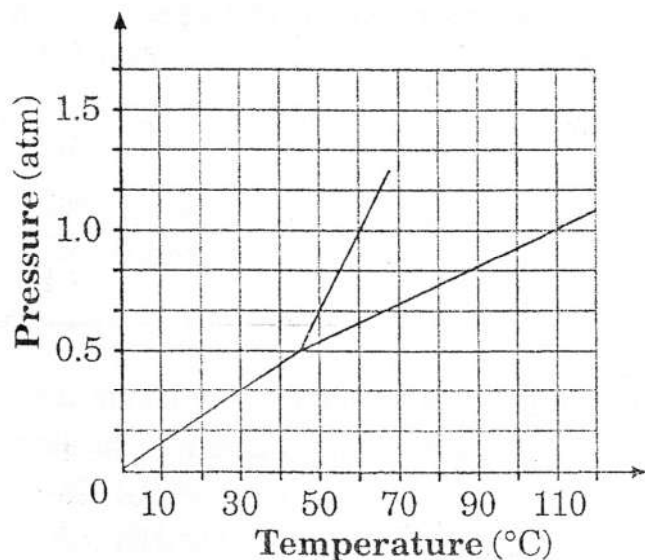
	Melting Point	Boiling Point
I	28°C	140°C
II	-10°C	25°C
III	20°C	140°C
IV	-90°C	14°C

- I
 - II
 - III
 - IV
10. Which will increase the solubility of most solid solutes?
- Decreasing the temperature
 - Decreasing the amount of solvent at constant temperature
 - Increasing the amount of solute at constant temperature
 - Increasing the temperature
11. What happens to the pressure of a constant mass of a gas at constant temperature when the volume is doubled?
- The pressure is doubled
 - The pressure remains the same
 - The pressure is reduced by $\frac{1}{2}$
 - The pressure is reduced by $\frac{1}{4}$
12. What is the pressure, in atmospheres, exerted by a 0.100 mol sample of oxygen in a 2.00 L container at 273°C ?
- $4.48 \times 10^{-1} \text{ atm}$
 - $2.24 \times 10^0 \text{ atm}$
 - $1.12 \times 10^3 \text{ atm}$
 - $2.24 \times 10^3 \text{ atm}$

13. Which pair of elements would most likely bond to form a covalently bonded compound?

- a. Sodium and fluorine
- b. Barium and chlorine
- c. Phosphorus and oxygen
- d. Magnesium and sulfur

14. Consider this phase diagram.



At what temperature does the normal boiling point occur?

- a. 45°C
- b. 60°C
- c. 100°C
- d. 110°C

15. The compound formed between element X and oxygen has the chemical formula X_2O . Which element would X most likely represent?

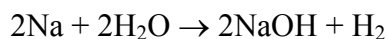
- a. Fe
- b. Zn
- c. Ag
- d. Sn

16. Which electron configuration represents a transition element?

- a. $1s^2 2s^2 2p^3$
- b. $1s^2 2s^2 2p^6 3s^2$
- c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$
- d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$

17. Given the electron configuration of $1s^2 2s^2 2p^4$, how many electrons does this element have in its outer level?
- 2
 - 4
 - 6
 - 8
18. Which correctly lists four atoms from smallest to largest radii?
- I, Br, Cl, F
 - F, I, Br, Cl
 - Si, P, S, Cl
 - Cl, S, P, Si
19. Which have the lowest electronegativities?
- Alkali metals
 - Halogens
 - Rare earth elements
 - Transition metals
20. How many moles are in 59.6 grams of BaSO_4 ?
- 0.256 mole
 - 3.91 moles
 - 13.9 moles
 - 59.6 moles
21. What is the volume of two moles of hydrogen gas at STP?
- 44.8 L
 - 22.4 L
 - 11.2 L
 - 2.00 L
22. How many molecules are contained in 55.0 g of H_2SO_4 ?
- 0.561 molecule
 - 3.93 molecules
 - 3.38×10^{23} molecules
 - 2.37×10^{24} molecules
23. If a sample of magnesium has a mass of 60 g, how many moles of magnesium does the sample contain?
- 1.1 moles
 - 1.2 moles
 - 2.0 moles
 - 2.5 moles

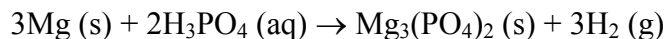
24. Analysis shows a compound to be, by mass, 43.8% N, 6.2% H and 50.0% O. Which is a possible molecular formula for the substance?
- NH_4NO_2
 - NH_4NO_3
 - NH_3OH
 - N_2OH
25. A compound has an empirical formula of CH_2O and a molecular mass of 180 g. What is the compound's molecular formula?
- $\text{C}_3\text{H}_6\text{O}_3$
 - $\text{C}_6\text{H}_{12}\text{O}_6$
 - $\text{C}_6\text{H}_{11}\text{O}_7$
 - $\text{C}_{12}\text{H}_{22}\text{O}_{11}$
26. What is the percent by mass of iron in the compound Fe_2O_3 ?
- 70%
 - 56%
 - 48%
 - 30%
27. Metallic sodium reacts violently with water to form hydrogen and sodium hydroxide according to the balanced equation:



How many moles of hydrogen gas are generated when 4.0 moles of sodium react with excess water?

- 1.0 mole
 - 2.0 moles
 - 3.0 moles
 - 4.0 moles
28. According to the equation $2\text{H}_2\text{O} (\text{l}) \rightarrow 2\text{H}_2 (\text{g}) + \text{O}_2 (\text{g})$, what mass of water is required to yield 22.4 L of oxygen gas at STP?
- 12 g
 - 18 g
 - 24 g
 - 36 g

29. Consider this reaction:



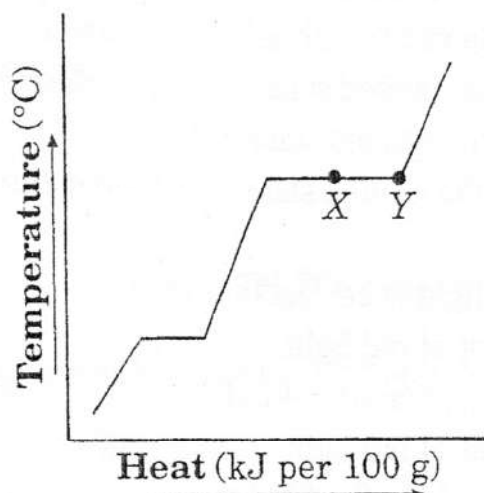
How many grams of magnesium phosphate should be produced if 5.40 g of magnesium react?

- a. 1.8 g
 - b. 19.5 g
 - c. 58.4 g
 - d. 175 g
30. Consider the spectrum for the hydrogen atom. In which situation will light be produced?
- a. Electrons absorb energy as they move to an excited state.
 - b. Electrons release energy as they move to an excited state.
 - c. Electrons absorb energy as they return to the ground state.
 - d. Electrons release energy as they return to the ground state.
31. Which statement regarding red and green visible light is correct?
- a. The speed of green light is greater than that of red light.
 - b. The wavelength of green light is longer than that of red light.
 - c. The energy of green light is lower than that of red light.
 - d. The frequency of green light is higher than that of red light.
32. Which color of light would a hydrogen atom emit when an electron changes from the $n=5$ level to the $n=2$ level?
- a. Red
 - b. Yellow
 - c. Green
 - d. Blue
33. What energy level transition is indicated when the light emitted by a hydrogen atom has a wavelength of 103 nm?
- a. $n=2$ to $n=1$
 - b. $n=3$ to $n=1$
 - c. $n=4$ to $n=2$
 - d. $n=5$ to $n=2$
34. A piece of metal is heated then placed in a beaker of cool water. Which statement best describes the effect of the temperature changes on the kinetic energy of the particles?
- a. Kinetic energy of metal atoms decreases when it was heated.
 - b. Kinetic energy of water molecules increases when the hot metal is placed in it.
 - c. Kinetic energy of water molecules decreases when the hot metal is placed in it.
 - d. Kinetic energy of metal atoms increases when placed in the cool water.

35. The gases helium, neon, and argon are in separate containers at 55°C . Which is true about the kinetic energy of the gases?

- a. Helium has the lowest mass and therefore greatest kinetic energy.
- b. They each have a different kinetic energy.
- c. Argon has the greatest mass and therefore the greatest kinetic energy.
- d. They all have the same average kinetic energy.

36. This is a heating curve for a substance.



Between points X and Y, which would be observed?

- a. Solid and liquid will be present.
- b. Only vapor will be present.
- c. Liquid and vapor will be present.
- d. Only liquid will be present.

37. An open container of water is brought to a boil and heated until all of the water is converted to water vapor. Which describes the changes in the water molecules?

- a. The molecules speed up and move farther apart.
- b. The molecules speed up and move closer together.
- c. The molecules slow down and move farther apart.
- d. The molecules slow down and move closer together.

38. Six grams of gold was heated from 20°C to 22°C . How much heat was applied to the gold?

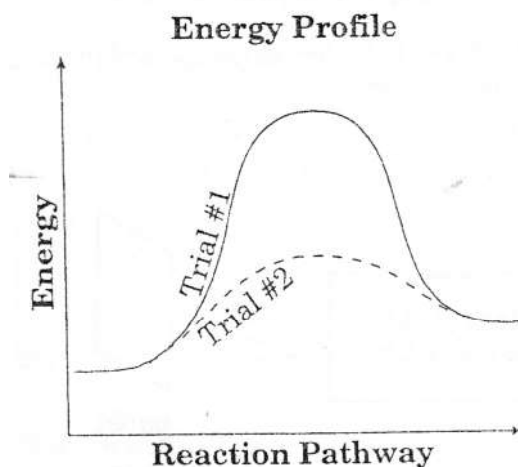
- a. 1.55 J
- b. 15.5 J
- c. 17.0 J
- d. 32.5 J

39. An 18.0 g piece of unidentified metal was heated from 21.5°C to 89.0°C . If 292 J of heat energy was absorbed by the metal in the heating process, what was the identity of the metal?

Specific Heat Table

Substance	Specific Heat
Aluminum	$0.90 \text{ J/g}^{\circ}\text{C}$
Calcium	$0.65 \text{ J/g}^{\circ}\text{C}$
Copper	$0.39 \text{ J/g}^{\circ}\text{C}$
Gold	$0.13 \text{ J/g}^{\circ}\text{C}$
Iron	$0.46 \text{ J/g}^{\circ}\text{C}$
Mercury	$0.14 \text{ J/g}^{\circ}\text{C}$
Silver	$0.24 \text{ J/g}^{\circ}\text{C}$

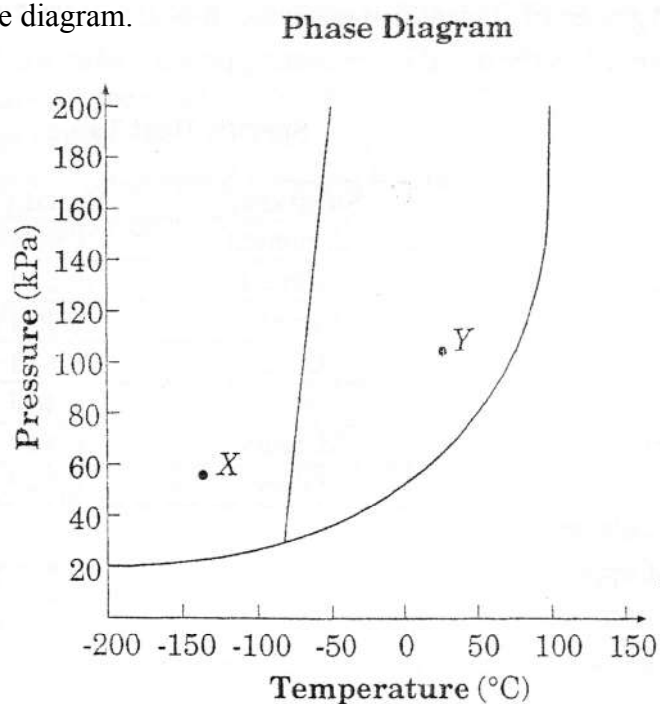
- a. Calcium
 - b. Copper
 - c. Iron
 - d. Silver
40. This graph represents the change in energy for two laboratory trials of the same reaction.



Which factor could explain the energy difference between the trials?

- a. Heat was added to trial #2.
 - b. A catalyst was added to trial #2.
 - c. Trial #1 was stirred.
 - d. Trial #1 was cooled.
41. When a chemical cold pack is activated, it becomes cool to the touch. What is happening in terms of energy?
- a. An exothermic reaction is occurring, absorbing cold from its surroundings.
 - b. An exothermic reaction is occurring, releasing heat to its surroundings.
 - c. An endothermic reaction is occurring, releasing cold to its surroundings.
 - d. An endothermic reaction is occurring, absorbing heat from its surroundings.

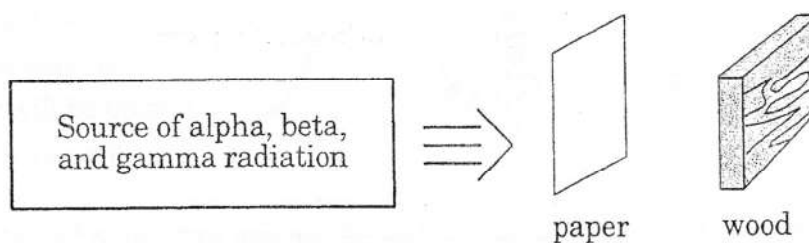
42. Consider this phase diagram.



What process is occurring when a substance changes from point X to point Y?

- a. Boiling
- b. Freezing
- c. Melting
- d. Sublimation

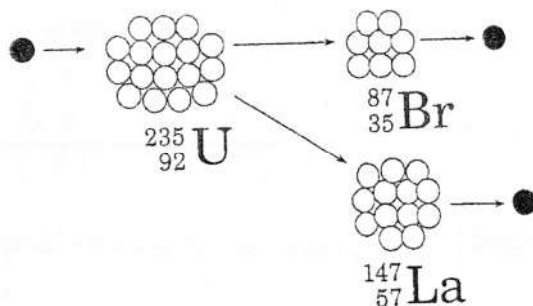
43. Consider this diagram:



Which of the three types of radiation will penetrate the paper and wood?

- a. Alpha, beta and gamma
- b. Alpha and beta only
- c. Gamma only
- d. Beta only

44. In the figure below, what type of nuclear activity is represented?



- a. Fission
- b. Fusion
- c. Alpha emission
- d. Beta emission

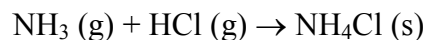
45. Which particle will complete this reaction? $^{59}_{27}\text{Co} + \underline{\quad} \rightarrow ^{60}_{27}\text{Co}$

- a. Electron
- b. Neutron
- c. Nucleus
- d. Proton

46. Which will complete this equation? $^{238}_{92}\text{U} \rightarrow ^{234}_{90}\text{Th} + \underline{\quad}$

- a. $^0_{-1}\text{e}$
- b. $^0_0\gamma$
- c. ^1_1H
- d. ^4_2He

47. Consider this reaction:



Which type of reaction does this equation represent?

- a. Combustion
- b. Decomposition
- c. Single replacement
- d. Synthesis

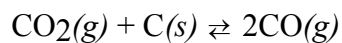
48. Which equation represents a single replacement reaction that can occur?

- a. $\text{F}_2 + 2\text{NaCl} \rightarrow 2\text{NaF} + \text{Cl}_2$
- b. $\text{Cl}_2 + 2\text{NaF} \rightarrow 2\text{NaCl} + \text{F}_2$
- c. $\text{Cu} + 2\text{NaCl} \rightarrow \text{CuCl}_2 + 2\text{Na}$
- d. $\text{Zn} + 2\text{NaF} \rightarrow \text{ZnF}_2 + 2\text{Na}$

49. What products are formed when the metal potassium is added to water?
- K and H_2O
 - KOH and H_2O
 - K_2O and H_2
 - KOH and H_2
50. When Na_2O reacts with water, what is produced?
- HNaO_2
 - $\text{Na} + \text{H}_2\text{O}$
 - $\text{NaO} + \text{H}_2$
 - NaOH
51. Which equation is correctly balanced?
- $\text{Cu} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O} + \text{SO}_2$
 - $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$
 - $2\text{Fe} + 3\text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$
 - $4\text{Cu} + \text{S}_8 \rightarrow 8\text{Cu}_2\text{S}$
52. What coefficients are required to balance this equation?
- $$__\text{Fe}_2\text{O}_3 + __\text{CO} \rightarrow __\text{Fe} + __\text{CO}_2$$
- 2, 6, 3, 6
 - 1, 3, 2, 3
 - 1, 1, 2, 2
 - 1, 1, 2, 1
53. Which example indicates that a chemical change has occurred?
- When two aqueous solutions are mixed, a precipitate is formed.
 - As ammonium nitrate dissolves in water, it causes the temperature of the water to decrease.
 - Alcohol evaporates when left in an open container.
 - Water is added to blue copper (II) chloride solution. The resulting mixture is lighter blue in color.
54. Phenolphthalein is an indicator that turns pink when added to a basic solution. In which solution would phenolphthalein turn pink?
- NaOH
 - HCl
 - H_2O
 - NaCl

55. A water sample was found to have a pH of 6 at 25°C. What is the hydroxide concentration in the water sample?
- $1 \times 10^{-8} \text{ M}$
 - $6 \times 10^{-8} \text{ M}$
 - $1 \times 10^{-6} \text{ M}$
 - $6 \times 10^{-6} \text{ M}$
56. What is the pH of a solution of KOH with a hydroxide concentration of $[\text{OH}^{-1}] = 1 \times 10^{-4} \text{ M}$?
- 10
 - 4
 - 4
 - 10
57. Consider this balanced chemical equation: $2\text{H}_2\text{O}_2 (\text{aq}) \rightarrow 2\text{H}_2\text{O} (\text{l}) + \text{O}_2$
Which of the following will increase the rate of the reaction?
- Increasing pressure on the reaction
 - Decreasing concentration of the reactants
 - Adding a catalyst to the reaction
 - Decreasing the temperature of the reaction
58. For a reaction, increasing the temperature increases the rate of reaction. Which is the best explanation for this happening?
- The pressure increases, which in turn increases the production of products.
 - The concentration of reactants increases with an increase in temperature.
 - The average kinetic energy increases, so the likelihood of more effective collisions between ions increases.
 - Systems are more stable at high temperatures.
59. Which statement explains why the speed of some reactions is increased when the surface area of one or all of the reactants is increased?
- Increasing surface area changes the electronegativity of the reactant particles
 - Increasing surface area changes the concentration of the reactant particles
 - Increasing surface area changes the conductivity of reactant particles
 - Increasing surface area enables more reactant particles to collide
60. The shape of the CH_4 molecule is most similar to the shape of a molecule of
- H_2O
 - N_2H_4
 - SiH_4
 - C_2H_4
61. Which molecule is nonpolar?
- H_2O
 - HF
 - NF_3
 - CF_4

62. The arrangement of atoms in a water molecule, H_2O , is best described as
a. ring b. bent c. linear d. spherical
63. In which pair do *both* compounds exhibit ionic bonding?
a. SO_2 , HCl
b. KNO_3 , CH_4
c. NaF , KBr
d. KCl , CO_2
e. NaCl , H_2O
64. Covalent bonds are most likely to be found in the compound represented by the formula
a. NaCl b. KBr c. CH_4 d. HI e. CaF_2
65. Which molecule is essentially nonpolar?
a. CH_4 b. HCl c. HBr d. H_2O e. NH_3
66. Identify the equilibrium constant expression for the reaction



- | | |
|---|--|
| a. $K_{\text{eq}} = \frac{[\text{CO}]^2}{[\text{CO}_2] [\text{C}]}$ | c. $K_{\text{eq}} = \frac{[\text{CO}]^2}{[\text{CO}_2]}$ |
| b. $K_{\text{eq}} = \frac{[\text{CO}_2] [\text{C}]}{[\text{CO}]^2}$ | d. $K_{\text{eq}} = \frac{1}{[\text{C}]}$ |