Name_____Date_____Block_____

Exam Review

I know It	I need more practice	I don't remember	Objective	Question number for this objective
			Analyze the structure of atoms, isotopes, and ions.	38
			Analyze an atom in terms of the location of electrons	39
			Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model.	40
			Explain the process of radioactive decay by the use of nuclear equations and half-life.	41
			Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds.	42
			Infer the type of bond and chemical formula formed between atoms.	43
			Compare inter- and intra- particle forces	28
			Interpret the name and formula of compounds using IUPAC convention	29, 30
			Compare the properties of ionic, covalent, metallic, and network compounds.	31
			Classify the components of a periodic table (period, group, metal, metalloid, nonmetal, transition).	32
			Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table.	33 - 35
			Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table.	36, 37
			Explain the energetic nature of phase changes	20
			Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point)	18 - 20
			Interpret the data presented in phase diagrams	13, 14
			Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat	11, 12
			Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative	7 - 10

				Explain the energy content of a chemical reaction	15, 16, 17
				Analyze the evidence of chemical change.	1
				Analyze the law of conservation of matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion)	2
				Analyze the stoichiometric relationships inherent in a chemical reaction.	3
				Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates)	4
				Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst)	5
				Explain the conditions of a system at equilibrium	6
				Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle).	24
				Classify substances using the hydronium and hydroxide ion concentrations.	22
				Summarize the properties of acids and bases.	26
				Infer the quantitative nature of a solution (molarity, dilution, and titration with a 1:1 molar ratio)	24
				Summarize the properties of solutions.	21
				Interpret solubility diagrams	27
				Explain the solution process	23

1. Which of the following is an example of a chemical change?
   a. Copper turns green when exposed to the environment.
   b. Bending a piece of copper wire..
   c. A copper wire being used to conduct electricity.
   d. Melting a solid piece of copper to form a liquid.

2. $2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(g)$
   What type of chemical reaction is represented by the equation?
   a.　combustion
   b. decomposition
   c. double replacement
   d. single replacement

3. Considering this balanced chemical equation, how many grams of HgO will be produced when 44 g of Hg react with excess O_2?
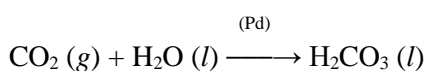
$$2Hg\ (l) + O_2\ (g) \rightarrow 2HgO\ (s)$$
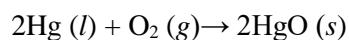
a. 28 g
b. 44 g
c. 48 g
d. 96 g

4. In an experiment, 2.62 g of iron react completely with 1.50 g of sulfur. What is the empirical formula for the compound produced?

a. FeS
b. FeS_2
c. Fe_2S
d. Fe_2S_3

5. This balanced equation represents a chemical reaction using palladium, Pd, as a catalyst.

$$CO_2\ (g) + H_2O\ (l) \xrightarrow{\text{(Pd)}} H_2CO_3\ (l)$$

Without palladium the reaction is slow and produces low concentrations of product. How does the palladium increase the speed of the reaction?

a. The palladium reacts with the water.
b. The palladium lowers the activation energy.
c. The palladium purifies the carbon dioxide.
d. The palladium increases the reaction temperature.

6. What does it mean for a reaction to be at equilibrium?

a. The grams of products is equal to the grams of reactants.
b. The moles of products is equal to the moles of reactants.
c. The reaction is at STP.
d. The rate of the forward reaction is equal to the rate of the reverse reaction.

7. When a miniature marshmallow is placed in a syringe and the end sealed, the marshmallow shrinks in size when the syringe is depressed. This best represents which law?

a. Charles'
b. Gay-Lussac's
c. Boyle's
d. Dalton's

8. A student collected the following data during a lab. Why do the numbers in the P x V column look similar?

Pressure (including air pressure)	Volume (mL)	P x V
2.4 atm	30.0	72
3.4 atm	21.8	74
4.4 atm	16.2	71
5.4 atm	13.2	71

a. Charles' Law states that P and V are directly related
b. Boyle's Law states that P and V are directly related
c. Boyle's Law states that P times V equals a constant
d. Charles' Law states that P times V equals a constant

9. Popcorn contains water vapor, which expands when heated. What gas law does this represent?
   a. Charles
   b. Gay-Lussac
   c. Dalton
   d. Boyle

10. If 434 mL of a gas are in a rigid container at a temperature of 25.5°C and the pressure is measured to be 770. mmHg, what will be the pressure of the gas after the temperature is increased to 40.7°C?
   a. 1230 mmHg
   b. 809 mmHg
   c. 756 mmHg
   d. 471 mmHg

11. A sample of aluminum was heated in boiling water and then placed in a calorimeter containing 120 g of water than had an initial temperature of 20.4°C. After a few minutes the temperature of the water reached a maximum temperature of 24.1°C. Calculate the amount of heat that was released by the metal.
   a. 1.8 kJ
   b. 2.5 kJ
   c. 3.9 kJ
   d. There is not enough information provided to calculate the heat released by the metal

12. To increase the temperature of 100.0 g of H_2O (s) from -50.0°C to -10.0°C, how much energy is required?
   A 1.67×10^4 J
   B 8.20×10^3 J
   C 8.08×10^3 J
   D 1.95×10^3 J

Use the following graph for question 13.

Phase Diagram

Pressure (kPa) vs Temperature (°C)

Points labeled: F, S, H, G, I, E, K
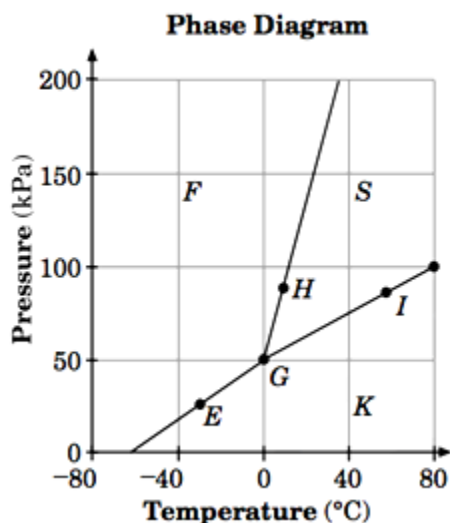
13. What is the state of the substance at point *I*?
   A gas
   B liquid
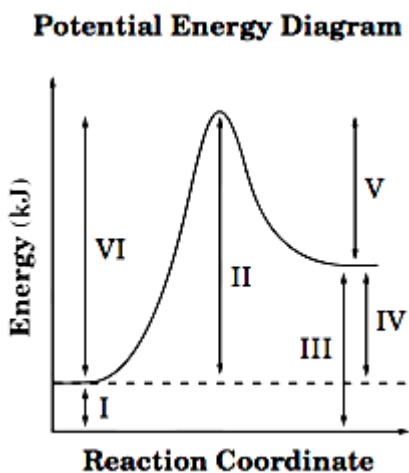   C liquid and gas
   D solid and liquid

Use the following graph for question 14.

Phase Diagram
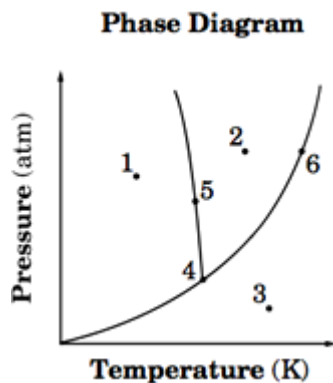
14. At which point do solid, liquid, and gas phases exist in equilibrium?
   A 1
   B 2
   C 3
   D 4

Use the following graph for questions 15 and 16.
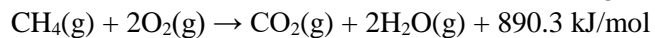
Potential Energy Diagram

15. Which energy measure will change with the addition of a catalyst?
   A I
   B II
   C III
   D IV

16. Which arrow represents the heat of reaction?
   A I
   B II
   C III
   D IV

17. Determine which statement best describes the following reaction:
   $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g) + 890.3$ kJ/mol
   A)   Endothermic and absorbs heat
   B)   Exothermic and absorbs heat
   C)   Endothermic and releases heat
   D)   Exothermic and releases heat

Use the following heating curve to answer #18 - 20.
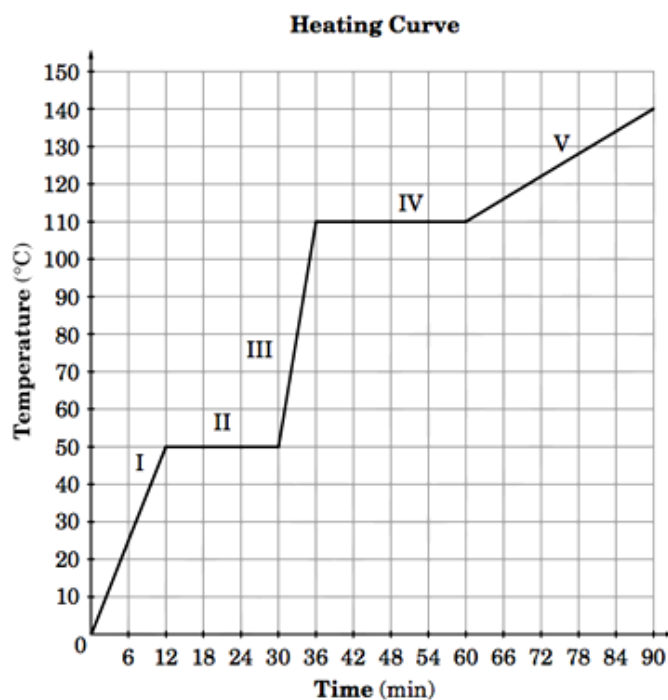
Heating Curve

18. Which region on the graph represents the solid phase?
   A   I
   B   II
   C   III
   D   IV

19. What is the melting point of the substance?
   A) 0°C
   B) 50°C
   C) 110°C
   D) 140°C

20. What happens to kinetic and potential energy in region IV of the heating curve?
   A) They both remain constant
   B) They both increase
   C) Kinetic energy increases and potential energy stays the same
   D) Kinetic energy stays the same and potential energy increases

21. Which compounds will cause the greatest increase in boiling point when a solution is formed with water as the solvent?
   a) $C_{12}H_{22}O_{11}$ (sucrose)
   b) CH_3OH (methanol)
   c) C_6H_{14} (hexane)
   d)   LiBr (lithium bromide)

22. In a water solution, how do acids differ from bases?
   a) Acids form salts, but bases do not.
   b) Acids turn litmus blue, while bases turn litmus red.
   c) Acids form hydrogen ions (H+), while bases form hydroxide ions (OH–).
   d) Acids have a bitter taste while bases have a sour taste.

23. Of the following, which will increase the solubility of a gas in water?
    a) increasing the temperature   b) increasing the volume
    c) increasing the pressure   d) decreasing the pressure

24. During a titration, what volume of 0.500M KOH is necessary to completely neutralize 10.0mL of 2.00M HBr?
    a) 10.0mL
    b) 20.0mL
    c) 25.0mL
    d) 40.0mL

25. If pressure is added to the following reaction: $H_2\text{ (g)} + S\text{ (g)} \leftrightarrow H_2S\text{ (g)}$, what happens to the equilibrium?
    a)   there is no shift in the equilibrium
    b)   the reaction shifts towards the reactants
    c)   the reaction shifts towards the products
    d)   the equilibrium constant

26. Which is a characteristic of an acid?
    a)   It has a pH greater than 7
    b)   It turns blue in the presence of bromothymol blue.
    c)   It contains many hydroxide ions.
    d)   It has a sour taste

Use the graph and data table below to answer question 27.

Solubility Graph
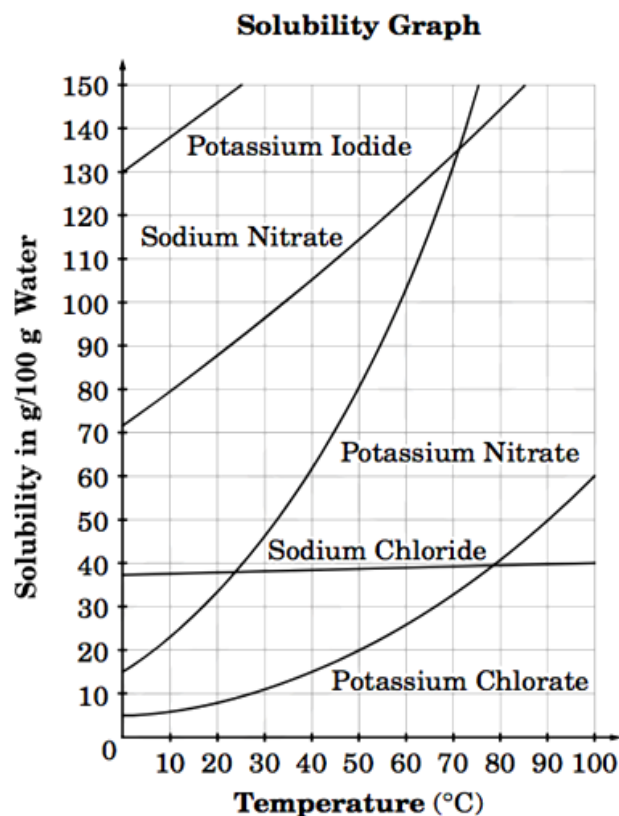
Student Data

Trial	Temperature(°C) of Water	Salt in 100 g of water(g)
1	25	40
2	68	126

27. What is the identity of the substance?
a)   Sodium Nitrate
b)   Potassium Nitrate
c)   Sodium Chloride
d)   Potassium Chlorate

28. Using your knowledge of interparticle forces, how would you expect the boiling point of H_2O to be compared to the boiling point of HCl?
   a. H_2O will have a lower boiling point
   b. H_2O will have a higher boiling point
   c. H_2O will have a similar boiling point
   d. Too little information to determine.

29. What is the name of the compound with the chemical formula $CrCl_3$?
   a. chromium tetrachloride
   b. chromium trichloride
   c. chromium (II) chloride
   d. chromium (III) chloride

30. What is the correct name for the acid whose chemical formula is H_2SO_4?
   a. hydrosulfuric acid
   b. hydrosulfurous acid
   c. sulfurous acid
   d. sulfuric acid

31. Which of the following is NOT a characteristic of most ionic compounds?
a.   They are solids.

b.   They have low melting points.

c.   When melted, they conduct an electric current.

d.   They are composed of metallic and nonmetallic elements.

32. Which of the following elements is a transition metal?
a.   cesium   c.   tellurium

b.   copper   d.   tin

33. To what category of elements does an element belong if it is a poor conductor of electricity?
a.   transition elements   c.   nonmetals

b.   metalloids   d.   metals

34. What element in the second period has the largest atomic radius?
a.   carbon   c.   potassium

b.   lithium   d.   neon

35. The metals in Groups 1A, 2A, and 3A _____.

a.	gain electrons when they form ions	c.	all have ions with a 1 charge
b.	all form ions with a negative charge	d.	lose electrons when they form ions

36. Which of the following has the highest electronegativity?

    a. Nitrogen (N)

    b. Oxygen (O)

    c. Phosphorus (P)

    d. Sulfur (S)

37. Compared with the electronegativities of the elements on the left side of a period, the electronegativities of the elements on the right side of the same period tend to be _____.

a.	lower	c.	the same
b.	higher	d.	unpredictable

38. How many protons and electrons are in a Cu^{2+} ion?
    a. 27 protons, 29 electrons
    b. 27 protons, 31 electrons
    c. 29 protons, 27 electrons
    d. 29 protons, 31 electrons

39. What do the ions K^+, Ca^{2+}, and Cl^- have in common?
    a. They have the same number of protons.
    b. They will form covalent bonds with oxygen.
    c. They have the same electron configuration as argon.
    d. They are larger than their corresponding atoms.

40. Which electron transmission in the hydrogen atom will result in the emission of red light?
    a. $n = 2$ to $n = 3$

    b. $n = 2$ to $n = 4$

    c. $n = 3$ to $n = 2$

    d. $n = 4$ to $n = 2$

41. When K-39 undergoes radioactive decay, the result is two products, one of which is calcium-39. What is the other product?

    a. An alpha particle

    b. A beta particle

    c. A positron

    d. A neutron

42. The reasons salt crystals, such as KCl, hold together so well is because the cations are strongly attracted to

    a. neighboring cations

b. the protons in the neighboring nucleus

c. free electrons in the crystals

d. neighboring anion

43. If two oxygen atoms combine to make a molecule, what type of bond will they form?

a. an ionic bond

b. a hydrogen bond

c. a double covalent bond

d. a single covalent bond