

Honors Chemistry Practice Worksheet

Fifty questions spanning atomic structure, bonding, stoichiometry, and gases, solutions, and equilibrium. Questions 45 to 50 ask for written explanations.

QUESTIONS	50	MULTIPLE CHOICE	17	WRITTEN	33
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Instructions

Show units at every step of a calculation. Balance equations before using them.

- 1** An atom has 8 protons and a mass number of 16. Find the number of neutrons.

- 2** An atom has 20 protons and 20 neutrons. Find its mass number.

- 3** Atomic number equals the number of:
A) Neutrons
B) Protons
C) Electrons in the outer shell
D) Protons + neutrons
- 4** Atomic radius generally:
A) Increases left to right, increases top to bottom
B) Decreases left to right, increases top to bottom
C) Decreases left to right, decreases top to bottom
D) Stays constant across a period
- 5** Electronegativity generally:
A) Increases left to right, decreases top to bottom
B) Decreases left to right, increases top to bottom
C) Increases left to right, increases top to bottom
D) Stays constant down a group
- 6** A bond between sodium and chlorine is best described as:
A) Covalent
B) Ionic
C) Metallic
D) Nonpolar covalent
- 7** A bond between two identical nonmetal atoms is:
A) Ionic
B) Polar covalent
C) Nonpolar covalent
D) Metallic
- 8** Which intermolecular force is strongest?
A) Dispersion forces
B) Dipole-dipole
C) Hydrogen bonding
D) They are all equal
- 9** Find the molar mass of H₂O. (H=1, O=16)

- 10** Find the molar mass of CO₂. (C=12, O=16)

- 11** Find the molar mass of NaCl. (Na=23, Cl=35.5)

- 12** How many moles are in 36 grams of H₂O? (molar mass 18 g/mol)

- 13** How many grams are in 3 moles of CO₂? (molar mass 44 g/mol)

- 14** How many molecules are in 2 moles of a substance? (use 6.022×10^{23} per mole)

- 15** Balance: $__ \text{H}_2 + __ \text{O}_2 \rightarrow __ \text{H}_2\text{O}$.

- 16** Balance: $__ \text{CH}_4 + __ \text{O}_2 \rightarrow __ \text{CO}_2 + __ \text{H}_2\text{O}$.

- 17** Balance: $__ \text{N}_2 + __ \text{H}_2 \rightarrow __ \text{NH}_3$.

- 18** In the reaction $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$, how many moles of H₂O form from 4 moles of H₂?

- 19** In the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, how many moles of NH₃ form from 6 moles of H₂?

- 20** A reaction has a theoretical yield of 50 grams and an actual yield of 42.5 grams. Find the percent yield.

- 21** The limiting reactant is the one that:
- A) Is present in the largest amount
 - B) Runs out first, limiting product formed
 - C) Has the largest molar mass
 - D) Does not react at all

- 22** Find the pressure of a gas using $PV=nRT$ if $n=2$ mol, $R=0.0821$, $T=300\text{K}$, $V=10\text{L}$. (round to two decimals)

- 23** As temperature increases at constant pressure, the volume of a gas:

- A) Increases
- B) Decreases
- C) Stays the same
- D) Becomes zero

- 24** Find the molarity of a solution with 3 moles of solute in 6 liters of solution.

- 25** Find the molarity of a solution with 0.5 moles of solute in 250 mL (0.25 L) of solution.

- 26** Use $M_1V_1=M_2V_2$ to find the final volume when 100 mL of 2M solution is diluted to 0.5M.

- 27** According to Le Chatelier's principle, adding more reactant to an equilibrium system shifts it:

- A) Toward reactants
- B) Toward products
- C) It has no effect
- D) The reaction stops

- 28** According to Le Chatelier's principle, removing product from an equilibrium system shifts it:

- A) Toward reactants
- B) Toward products
- C) It has no effect
- D) The reaction stops

- 29** Find the pH of a solution with $[H^+] = 1 \times 10^{-3}$ M. ($pH = -\log[H^+]$)

- 30** Find the pH of a solution with $[H^+] = 1 \times 10^{-7}$ M.

- 31** A solution with pH 3 is:

- A) Strongly basic
- B) Neutral
- C) Acidic
- D) Cannot be determined

- 32** A solution with pH 10 is:

- A) Acidic
- B) Neutral
- C) Basic
- D) Cannot be determined

- 33** VSEPR theory predicts molecular shape based on:

- A) Atomic mass
- B) Minimizing repulsion between electron pairs
- C) The number of neutrons
- D) Temperature

- 34** A molecule with 4 bonding pairs and 0 lone pairs on the central atom has what shape?

- A) Linear
- B) Trigonal planar
- C) Tetrahedral
- D) Bent

- 35** Water (H_2O) has 2 bonding pairs and 2 lone pairs, giving it what shape?

- A) Linear
- B) Tetrahedral
- C) Trigonal pyramidal
- D) Bent

- 36** How many significant figures are in the measurement 0.00450?

- 37** How many significant figures are in the measurement 1200?

- 38** Which of these is a physical change, not a chemical change?

- A) Rusting iron
- B) Melting ice
- C) Burning wood
- D) Digesting food

- 39** Which observation is the best evidence a chemical reaction has occurred?
- A) A change in shape
 - B) A change in temperature alone
 - C) The formation of a new substance (e.g. a gas or precipitate)
 - D) A change in volume

- 40** Convert 25 degrees Celsius to Kelvin. ($K = C + 273$)

- 41** Explain why a balanced chemical equation must have the same number of each type of atom on both sides.

- 42** Explain why noble gases are chemically unreactive.

- 43** Explain why ionic compounds tend to have high melting points.

- 44** A student mixes two clear solutions and observes bubbles forming immediately. Explain why this indicates a chemical reaction occurred.

- 45** Explain why the limiting reactant determines the maximum amount of product, even if a large excess of the other reactant remains.

- 46** Explain, using Le Chatelier's principle, what happens to an equilibrium system when the temperature is increased for an exothermic reaction.

- 47** Explain why atomic radius decreases across a period from left to right, even though more electrons are being added.

- 48** A gas sample is compressed to half its original volume at constant temperature. Explain what happens to its pressure and why.

- 49** Explain why water is described as a polar molecule.

- 50** Explain the difference between an exothermic and an endothermic reaction, including the direction of heat flow.

Answer key

Direct answers only, in question order. Work the set first, then check.

1. 8	2. 40	3. B) Protons	4. B) Decreases left to right, increases top to bottom	5. A) Increases left to right, decreases top to bottom
6. B) Ionic	7. C) Nonpolar covalent	8. C) Hydrogen bonding	9. 18	10. 44
11. 58.5	12. 2.0	13. 132	14. 1.2044×10^{24}	15. $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
16. $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$	17. $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$	18. 4	19. 4	20. 85%
21. B) Runs out first, limiting product formed	22. 4.93	23. A) Increases	24. 0.5	25. 2.0
26. 400	27. B) Toward products	28. B) Toward products	29. 3	30. 7
31. C) Acidic	32. C) Basic	33. B) Minimizing repulsion between electron pairs	34. C) Tetrahedral	35. D) Bent
36. 3	37. 2	38. B) Melting ice	39. C) The formation of a new substance (e.g. a gas or precipitate)	40. 298

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| 41. The law of conservation of mass requires that matter is neither created nor destroyed in a chemical reaction, so atoms must be conserved from reactants to products | 42. Noble gases have a full outer electron shell, giving them a stable electron configuration with no tendency to gain, lose, or share electrons | 43. Ionic compounds are held together by strong electrostatic attractions between oppositely charged ions throughout a rigid crystal lattice, which requires a large amount of energy to break apart | 44. The formation of a gas (bubbles) indicates a new substance was produced, which is direct evidence that the original substances underwent a chemical change rather than simply mixing | 45. Once the limiting reactant is completely consumed, the reaction cannot continue regardless of how much of the other reactant is left, so it caps the amount of product that can form |
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| 46. Heat acts like a product in an exothermic reaction, so increasing temperature shifts the equilibrium toward the reactants to absorb the added heat | 47. Protons are also being added, increasing the nuclear charge, which pulls the electron cloud in more tightly even though electrons are added to the same energy level | 48. The pressure doubles, because at constant temperature, pressure and volume are inversely related (Boyle's Law): compressing the gas into a smaller space increases the frequency of particle collisions with the container walls | 49. Oxygen is more electronegative than hydrogen, pulling shared electrons closer and creating a partial negative charge near oxygen and partial positive charges near the hydrogens, and the bent shape prevents these charges from canceling out | 50. An exothermic reaction releases heat to the surroundings (products have lower energy than reactants), while an endothermic reaction absorbs heat from the surroundings (products have higher energy than reactants) |
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Error log

Bring this page to your next session so the tutor can start from what actually blocked you.

Questions I answered incorrectly:

Was it a concept, a formula, or a calculation step?

The single topic I want to start the next session with:
