



GRADE 11 CHEMISTRY (30S)

Final Practice Examination

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Instructions

The final examination will be weighted as follows

Modules 1–3	15–20%
Modules 4–6	80–85%

The format of the examination will be as follows:

Part A: Fill-in-the-Blanks	22 x 1 = 22 marks
Part B: Multiple Choice	46 x 1 = 46 marks
Part C: Short Answer	32 marks
Total Marks	100 marks

Include units with all answers as required.

Useful Information

You will need the following in order to complete this examination:

- writing utensils and eraser or correction fluid
- some scrap paper
- a ruler
- a scientific calculator

You will have a maximum of 2.5 hours to complete your final exam.

Part A: Fill-in-the-Blanks (22 Marks)

Use the Word Bank at the end of this exam to help you complete the “Fill in the Blank” questions. As each blank is worth one mark, some questions will have a total value of two marks. Note that there are MORE terms provided than you need, so read over the list carefully and choose the terms you want to use. The same term may be used more than once in this section.

Stoichiometry (4 marks)

1. The calculated amount of product formed during a reaction is called the _____ yield.
2. For a given chemical reaction, the actual yield is always _____ than the theoretical yield.
3. For _____ changes, the release of energy is represented by writing the energy term as a product when writing a chemical equation.
4. Balanced chemical equations contain important information about the amount of reactants required to produce given products. These amounts are represented by _____.

Solutions (10 marks)

5. A _____ is defined as a mixture of two or more substances that are evenly distributed.
6. The shape of the water molecule, combined with the nature of its bonds, makes water a _____ molecule.
7. The total heat change in the dissolving process is called the heat of _____.
8. Non-polar substances, like waxes and oils, are _____ in water.
9. If a solution could dissolve more solute at a particular temperature, the solution is _____.
10. The number of moles of solute dissolved in 1 L of solution is known as _____.
11. The attraction an atom has for the shared electrons in a covalent bond is called _____.
12. When water surrounds individual molecules or ions, the molecules or ions are said to be _____.

13. Polar and charged substances dissolve well in _____ solvents because of the electrostatic attraction between opposite charges.
14. Adding a solute to a solvent lowers the _____ pressure of the solvent.

Organic Chemistry (8 marks)

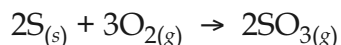
15. Inorganic compounds do NOT tend to contain _____.
16. Decaying animals and vegetation is a major source of _____ compounds.
17. When carbon atoms are bonded together in a tetrahedral lattice arrangement, _____ is created.
18. Any alkane with one or more alkyl groups is automatically a _____ alkane.
19. Ethene, a simple alkene, can be transformed back into ethane by adding _____.
20. All hydrocarbons that do not possess rings are called _____ compounds.
21. The functional group that identifies a compound as an alcohol is called the _____ group.
22. The process of forming an ester from a reaction between an organic acid and an _____ is called esterification.

Part B: Multiple Choice (46 Marks)

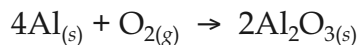
For each Multiple Choice question, shade in the circle that corresponds to your answer on the Bubble Sheet at the end of this exam. DO NOT circle your answers directly on the exam.

Stoichiometry (6 marks)

1. Which of these interpretations of the following balanced equation is TRUE?



- a) 2 atoms of S and 3 atoms of O₂ form 2 atoms of SO₃
 - b) 2 grams of S and 3 grams of O₂ form 2 grams of SO₃
 - c) 2 moles of S and 3 moles of O₂ form 2 moles of SO₃
 - d) 2 L of S and 3 L of O₂ form 2 L of SO₃
2. Which type of stoichiometric calculation does not involve the gram formula mass?
- a) Mass-mass problems
 - b) Mass-particle problems
 - c) Mass-volume problems
 - d) Volume-volume problems
3. The ratio of the actual yield to the theoretical yield is known as the
- a) Excess yield
 - b) Reagent yield
 - c) Percent yield
 - d) Experimental yield
4. In the following balanced equation, how many moles of aluminum are needed to form 3.70 moles of aluminum oxide, Al₂O₃?



- a) 7.40 moles
- b) 3.70 moles
- c) 2.00 moles
- d) 1.85 moles

5. Convert 35.0 L of nitrogen gas to moles of nitrogen gas at STP.
- 1.56 moles
 - 0.640 moles
 - 7.84 moles
 - 22.4 moles
6. Which of the following quantities is conserved in *every* chemical reaction?
- Molecules
 - Mass
 - Formula units
 - Moles

Solutions (20 marks)

7. Which of the following is LESS soluble in hot water than in cold water?
- CO₂
 - NaCl
 - NaNO₃
 - KBr
8. What can be done to crystallize a supersaturated solution?
- Heat the solution.
 - It will crystallize if you leave it alone.
 - Add a crystal of the solute or scratch the glass.
 - Expose the solution to ultraviolet light.
9. In a concentrated solution, there is
- No solvent.
 - A large amount of solute.
 - A small amount of solvent.
 - No solute.

10. In which of the following is concentration expressed in percent by volume?
- a) 10% (v/v)
 - b) 10% (m/v)
 - c) 10% (m/m)
 - d) 10%
11. Which of the following is NOT a colligative property of a solution?
- a) Boiling point elevation
 - b) Freezing point depression
 - c) Vapour pressure lowering
 - d) Solution saturation
12. What is the maximum amount of KCl that can be dissolved into 150.0 g of water? (The solubility of KCl is 34.0 g/100 mL at STP.)
- a) 51.0 g
 - b) 22.7 g
 - c) 34.0 g
 - d) 5.10 g
13. Which of the following pairs of substances are miscible?
- a) Water and gasoline
 - b) Water and salt (NaCl)
 - c) Water and oxygen
 - d) Water and ethanol (alcohol)

14. At STP, the solubility of solute XY is $\frac{10 \text{ g}}{100 \text{ g water}}$. Which of the following solution concentrations could represent an *unsaturated* solution of solute XY?

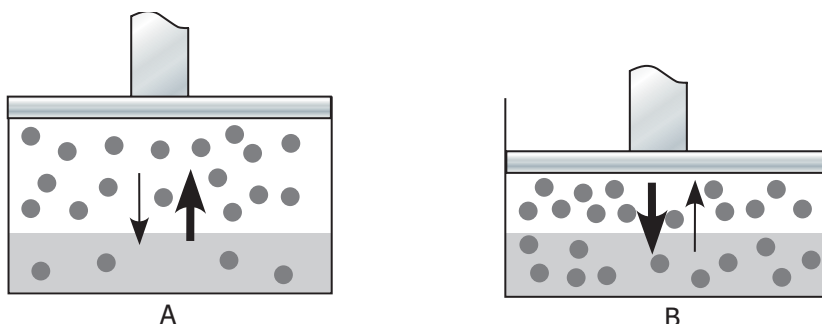
a) $\frac{10 \text{ g}}{100 \text{ g water}}$

b) $\frac{9 \text{ g}}{100 \text{ g water}}$

c) $\frac{5 \text{ g}}{50 \text{ g water}}$

d) $\frac{11 \text{ g}}{100 \text{ g water}}$

15. Use the following two diagrams of a gas-liquid solution to help you determine which statement below is FALSE.



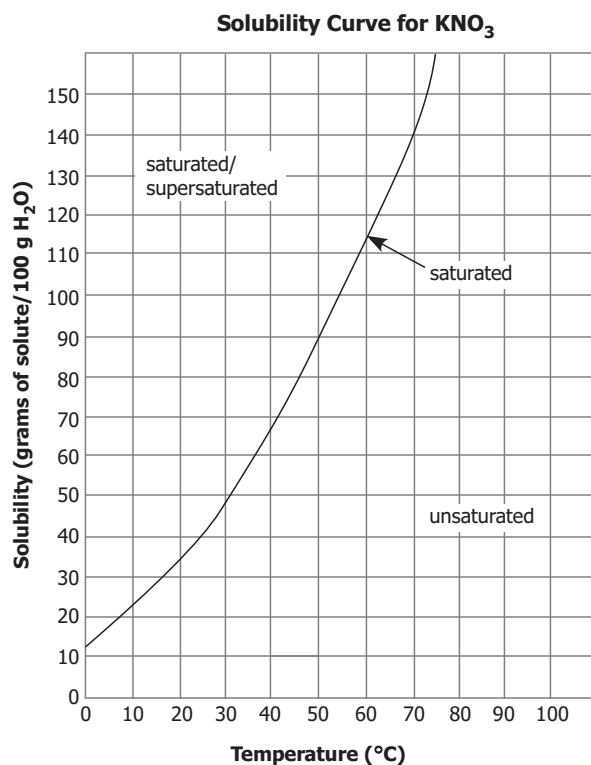
- a) The increased pressure in diagram B illustrates an increased solubility of the gas in the liquid.
- b) The increased pressure shown in diagram B forces the gas into contact with the liquid.
- c) Diagram A shows a greater amount of gas in solution, whereby the liquid holds onto the gas particles.
- d) When the pressure is reduced in diagram A, the solubility of the dissolved gas is reduced.

16. The solubility of a gas in a liquid

- a) Increases as the pressure of the gas above the liquid increases.
- b) Decreases as the pressure of the gas above the liquid increases.
- b) Increases as the pressure of the gas above the liquid decreases.
- d) Is unrelated to the pressure of the gas above the liquid.

17. Which type of mixture could most likely be filtered using filter paper?
- a) A colloid
 - b) A suspension
 - c) A solution
 - d) An emulsion
18. Which of these statements regarding the water molecule is FALSE?
- a) Oxygen is more electronegative than the hydrogen.
 - b) The electrons between the hydrogen and oxygen atoms in each bond lie more towards the oxygen than they do towards the hydrogen.
 - c) The hydrogen atoms are bonded to the oxygen at an angle of 104.5° , which gives the water molecule its characteristic bent shape.
 - d) The water molecule is a non-polar molecule.
19. Which statement below would NOT ensure greater conductivity of an electric current?
- a) There must be charged particles or ions present in the solution.
 - b) Particles must move freely through the solution.
 - c) There must be fewer ions present in solution.
 - d) There must be a lower volume of solvent in which the ions are dissolved.

Use the "Solubility Curve for KNO_3 " below for Questions 20 to 22.



20. Estimate the approximate solubility of KNO_3 at 30°C .
- 16 g/100 g H_2O
 - 33 g/100 g H_2O
 - 48 g/100 g H_2O
 - 60 g/100 g H_2O
21. Estimate the temperature at which the solubility of potassium nitrate is 50 g/100 g.
- About 90°C
 - About 20°C
 - About 30°C
 - About 8°C
22. Indicate which of the following sets of data represents a *saturated* solution of potassium nitrate.
- 25°C : 40 g/100 g H_2O
 - 63°C : 140 g/100 g H_2O
 - 8°C : 10 g/100 g H_2O
 - 74°C : 150 g/100 g H_2O

23. How many moles of NaOH would be needed to make 0.0500 L of a 0.750 mol/L solution?
- 15.0 mol
 - 0.0375 mol
 - 50.0 mol
 - 0.750 mol
24. Identify the FINAL step to follow when preparing a solution.
- Mass out the solute and add it to the flask.
 - Add more solvent until you reach the required amount.
 - Mass out the solvent and add it to the flask.
 - Add about half the required volume of solvent to the flask.
25. You start with a solution that is 0.800 mol/L and exactly 0.0700 L. You need to prepare a 0.300 mol/L solution. What is the final volume of the solution?
- 3.43 L
 - 0.026 L
 - 0.580 L
 - 0.187 L
26. Which method of water treatment is useful for controlling disease-causing organisms such as viruses, bacteria, and parasites?
- Water softening
 - Filtration
 - Chlorination
 - Distillation

Organic Chemistry (20 marks)

27. Which of these statements does NOT accurately describe tar sands?
- Tar sands provide a synthetically produced source of hydrocarbons.
 - Tar sands are a combination of clay, sand, water, and bitumen.
 - Tar sands can be mined and processed to extract the oil-rich bitumen.
 - Bitumen requires no further refining and can be pumped from the ground in its natural state.

28. Which type of bond will carbon commonly form?
- a) Covalent
 - b) Ionic
 - c) Metallic
 - d) None of these
29. All of these hydrocarbons are *unsaturated* except for
- a) Benzene
 - b) Alkenes
 - c) Alkanes
 - d) Alkynes
30. Which of the following is the correct condensed structural formula for *butane*?
- a) $\text{CH}_3(\text{CH}_2)_3\text{CH}_3$
 - b) $\text{CH}_3(\text{CH}_2)_2\text{CH}_3$
 - c) $(\text{CH}_3)_3\text{CH}_3$
 - d) C_4H_{10}
31. Name the following alkane: C_7H_{16}
- a) Heptane
 - b) Hexane
 - c) Decane
 - d) Octane

32. The correct structural formula for *2,2-dimethylhexane* is:

- a)
$$\begin{array}{c} \text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
- b)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
- c)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
- d)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$

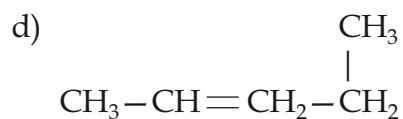
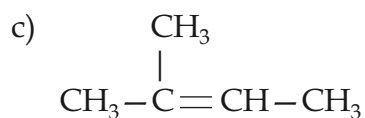
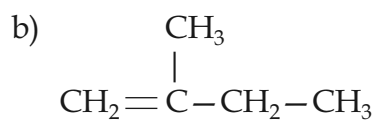
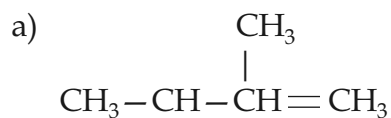
33. Molecules that have the same molecular formula but different structural formulas are called

- a) Allotropes
b) Stereoisomers
c) Structural isomers
d) Isotopes
34. Which straight-chain alkane is a structural isomer of *3-propylheptane*?
- a) 10 carbon atoms = decane
b) 6 carbon atoms = hexane
c) 9 carbon atoms = nonane
d) 5 carbon atoms = pentane

35. The correct name for the alkene $\text{CH}_3\text{CH}=\text{CH}_2$ is

- a) propene
- b) prop-2-ene
- c) 2-propene
- d) prop-3-ene

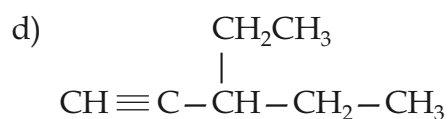
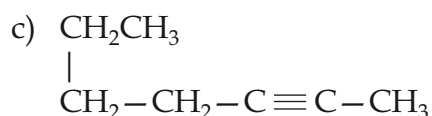
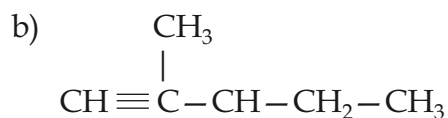
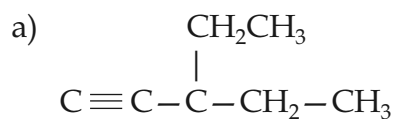
36. The correct structural formula for *2-methylbut-1-ene* is



37. The correct name for the alkyne $\text{CH}\equiv\text{CCH}_2\text{CH}_2\text{CH}_3$ is

- a) pent-1-yne
- b) 1-pentyne
- c) pentyne
- d) pent-4-yne

38. The correct structural formula for 3-ethylpent-1-yne is



39. Give the IUPAC name for the alcohol $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_3$.

- a) 2-methylpentan-4-ol
- b) 2-methyl-4-pentanol
- c) 4-methylpentan-2-ol
- d) 4-methyl-2-pentanol

40. Identify which of the following alcohols is most likely used to make hand soap.

- a) Isopropyl
- b) Glycerol
- c) Ethanol
- d) Methanol

41. Name the following carboxylic acid: $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{COOH}$

- a) 3-methylpentanoic acid
- b) 2-methylbutanoic acid
- c) methyl-3-pentanoic acid
- d) methyl-2-butanoic acid

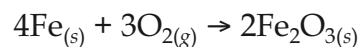
42. Identify which of the following carboxylic acids is responsible for the sting in ant bites.
- Benzoic acid
 - Lactic acid
 - Formic acid
 - Acetic acid
43. Name the ester $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COOCH}_3$.
- methyl butanoate
 - methylpentanoic acid
 - pentyl methanoate
 - methyl pentanoate
44. A very large molecule made of many smaller repeating units is known as
- A monomer
 - A polymer
 - An ester
 - An allotrope
45. Which of these examples of is NOT a polymer formed by an addition reaction?
- Graphite
 - TeflonTM
 - Polypropylene
 - Synthetic rubber
46. Which of these polymers is used for moulded plastics and film?
- Polyethylene
 - Polyvinyl chloride (PVC)
 - TeflonTM
 - Polypropylene

Part C: Short Answer (32 Marks)

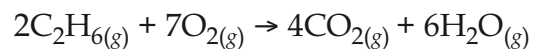
Answer each of the questions below using the space provided. Pay attention to the number of marks that each question is worth, as this may help you decide how much information to provide for full marks. For questions that involve calculations, show your work and check your final answer for the correct number of significant figures and the appropriate unit.

Stoichiometry (15 marks)

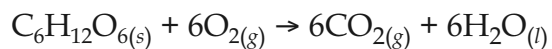
1. How many moles of $O_{2(g)}$ react with 2.4 moles of Fe in the following rusting reaction? (2 marks)



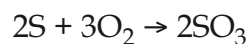
2. What quantity of heat is produced in the complete combustion of 60.2 g of ethane gas (C_2H_6), according to the following balanced chemical reaction? The heat of combustion of ethane is 1560 kJ/mol and its molar mass is 30.0 g/mol. (4 marks)



3. How many grams of CO_2 would be produced if 45 g of $\text{C}_6\text{H}_{12}\text{O}_6$ (glucose) reacted completely with oxygen? Glucose = 180.0 g/mol; CO_2 = 44.0 g/mol. (4 marks)



4. Given 5.0 moles of sulfur and 8.4 moles of oxygen gas, as well as



- a) Identify the limiting factor and the excess reactant. (3 marks)

- b) Calculate the moles of excess reactant that remain. (2 marks)

Solutions (7 marks)

5. Describe any three properties that are true of a solution in terms of the particulate view of matter. (3 marks)

6. Write the equation for dissolving $\text{Ag}_2\text{CrO}_{4(s)}$ in water. (2 marks)

7. What is the number of moles of solute in 0.650 L of a 0.40 mol/L solution? (2 marks)

Organic Chemistry (10 marks)

8. Draw the structural formulas for the following hydrocarbons. (2 marks \times 3 = 6 marks)

a) 2,4-dimethylpentane

b) hex-2-ene

c) 4-ethylhex-2-yne

9. Complete the following table. (4 marks)

	Aliphatic Hydrocarbon	Aromatic Hydrocarbon
Similarities		
Differences		

NOTES

Grade 11 Chemistry Final Practice Examination

Word Bank

Use the following word bank to help you complete the "Fill-in-the-Blank" portion of your Final Examination. Note that there may be MORE terms here than you need, so read over the list carefully before choosing the terms that you want to use. You can also use certain words more than once.

alcohol(s)	dehydrogenation	hydroxyl	ratio(s)
aliphatic	depression	immiscible	R-COOH
alkyl	diamond	increase(s)	reactant
allotrope	dilution	inorganic	saturated
amorphous carbon	electronegativity	insoluble	smaller
aqueous	electrons	isomers	soluble
aromatics	electrostatic	less	solute
benzene	emulsion	limiting	solution
boiling	endothermic	miscible	solvation
branched-chain	equal	molarity	solvent
buckminsterfullerene	esterification	moles	stoichiometry
carbon	excess	more	substituent
carboxyl	exothermic	non-polar	supersaturated
carboxylic	graphite	number	suspensions
coefficients	greater	organic	theoretical
colligative	higher	percent	unsaturated
concentration	hydrogenation	phenyl	vapour
cracking	hydrated	polar	water
crude	hydrocarbon	products	
decrease(s)	hydrogen	proportion(s)	

**Grade 11 Chemistry
Final Practice Examination
Bubble Sheet**

Name: _____

_____ / 46

For each Multiple Choice question, shade in the circle that corresponds to your answer. DO NOT circle your answers directly on the exam.

A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D				
1.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	14.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	27.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	40.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	15.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	28.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	41.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	16.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	29.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	42.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	17.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	30.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	43.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	18.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	31.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	44.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	19.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	32.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	45.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	20.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	33.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	46.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	21.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	34.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
9.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	22.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	35.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
10.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	23.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	36.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
11.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	24.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	37.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
12.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	25.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	38.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					
13.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	26.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	39.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>					

Electronegativities Table

Group 1	1	2	13	14	15	16	17	18	
	1 H 2.20	2 He —	5 B 2.01	6 C 2.50	7 N 3.07	8 O 3.50	9 F 4.10	10 Ne —	11 Ar —
	3	4	11	12	13	14	15	16	
	3 Li 0.97	4 Be 1.47	11 Na 1.01	12 Mg 1.23	13 Al 1.47	14 Si 1.74	15 P 2.06	16 S 2.44	17 Cl 2.83
	19	20	27	28	29	30	31	32	
	19 K 0.91	20 Ca 1.04	27 Co 1.70	28 Ni 1.75	29 Cu 1.75	30 Zn 1.66	31 Ga 1.82	32 Ge 2.02	
	37	38	45	46	47	48	49	50	
	37 Rb 0.89	38 Sr 0.99	45 Rh 1.45	46 Pd 1.35	47 Ag 1.42	48 Cd 1.46	49 In 1.49	50 Sn 1.72	
	55	56	73	74	75	76	77	78	
	55 Cs 0.86	56 Ba 0.97	73 Ta 1.33	74 W 1.40	75 Re 1.46	76 Os 1.52	77 Ir 1.55	78 Pt 1.44	
	87	88	105	106	107	108	109	110	
	87 Fr 0.86	88 Ra 0.97	105 Db —	106 Sg —	107 Bh —	108 Hs —	109 Mt —	110 Uun —	
	57–70 Lanthanide Series		71	72	73	74	75	76	
			71 Lu 1.14	72 Hf 1.23	73 Ta 1.33	74 W 1.40	75 Re 1.46	76 Os 1.52	
	89–102 Actinide Series		103	104	105	106	107	108	
			103 Lr —	104 Rf —	105 Db —	106 Sg —	107 Bh —	108 Hs —	
	118	119	116	117	118	119	120	121	
	118 Uuo —	119 Uuq —	116 Uuh —	117 Uuq —	118 Uuo —	119 Uuq —	120 Uuo —	121 Uuq —	

57 La 1.08	58 Ce —	59 Pr 1.07	60 Nd 1.07	61 Pm 1.07	62 Sm 1.07	63 Eu 1.01	64 Gd 1.11	65 Tb 1.10	66 Dy 1.10	67 Ho 1.10	68 Er 1.11	69 Tm 1.11	70 Yb 1.06
89 Ac 1.00	90 Th —	91 Pa 1.14	92 U 1.30	93 Np 1.29	94 Pu 1.25	95 Am —	96 Cm —	97 Bk —	98 Cf —	99 Es —	100 Fm —	101 Md —	102 No —

Lanthanide Series
 Inner
 Transition
 Elements

 Actinide Series

Alphabetical Listing of the Elements and Their Atomic Masses

Element	Atomic Mass	Element	Atomic Mass	Element	Atomic Mass
Actinium	(227)	Gold	197.0	Praseodymium	140.9
Aluminum	27.0	Hafnium	178.5	Promethium	(145)
Americium	(243)	Hassium	(265)	Protactinium	(231)
Antimony	121.7	Helium	4.0	Radium	(226)
Argon	39.9	Holmium	164.9	Radon	(222)
Arsenic	74.9	Hydrogen	1.0	Rhenium	186.2
Astatine	(210)	Indium	114.8	Rhodium	102.9
Barium	137.3	Iodine	126.9	Rubidium	85.5
Berkelium	(247)	Iridium	192.2	Ruthenium	101.1
Beryllium	9.0	Iron	55.8	Rutherfordium	(261)
Bismuth	209.0	Krypton	83.8	Samarium	150.4
Bohrium	(264)	Lanthanum	138.9	Scandium	45.0
Boron	10.8	Lawrencium	(257)	Seaborgium	(263)
Bromine	79.9	Lead	207.2	Selenium	79.0
Cadmium	112.4	Lithium	6.9	Silicon	28.1
Calcium	40.1	Lutetium	175.0	Silver	107.9
Californium	(251)	Magnesium	24.3	Sodium	23.0
Carbon	12.0	Manganese	54.9	Strontium	87.6
Cerium	140.1	Meitnerium	(266)	Sulfur	32.1
Cesium	132.9	Mendelevium	(256)	Tantalum	180.9
Chlorine	35.5	Mercury	200.6	Technetium	(98)
Chromium	52.0	Molybdenum	95.9	Tellurium	127.6
Cobalt	58.9	Neodymium	144.2	Terbium	158.9
Copernicium	(277)	Neon	20.2	Thallium	204.4
Copper	63.5	Neptunium	(237)	Thorium	232.0
Curium	(247)	Nickel	58.7	Thulium	168.9
Dubnium	(262)	Niobium	92.9	Tin	118.7
Dysprosium	162.5	Nitrogen	14.0	Titanium	47.9
Einsteinium	(254)	Nobelium	(259)	Tungsten	183.8
Erbium	167.3	Osmium	190.2	Uranium	238.0
Europium	152.0	Oxygen	16.0	Vanadium	50.9
Fermium	(257)	Palladium	106.4	Xenon	131.3
Fluorine	19.0	Phosphorus	31.0	Ytterbium	173.0
Francium	(223)	Platinum	195.1	Yttrium	88.9
Gadolinium	157.2	Plutonium	(244)	Zinc	65.4
Gallium	69.7	Polonium	(209)	Zirconium	91.2
Germanium	72.6	Potassium	39.1		

Names, Formulas, and Charges of Common Ions

Positive Ions (Cations)

Name	Symbol	Name	Symbol
aluminum	Al^{3+}	magnesium	Mg^{2+}
ammonium	NH_4^+	manganese(II)	Mn^{2+}
barium	Ba^{2+}	manganese(IV)	Mn^{4+}
cadmium	Cd^{2+}	mercury(I)	Hg_2^{2+}
calcium	Ca^{2+}	mercury(II)	Hg^{2+}
chromium(II)	Cr^{2+}	nickel(II)	Ni^{2+}
chromium(III)	Cr^{3+}	nickel(III)	Ni^{3+}
copper(I)	Cu^+	potassium	K^+
copper(II)	Cu^{2+}	silver	Ag^+
hydrogen	H^+	sodium	Na^+
iron(II)	Fe^{2+}	strontium	Sr^{2+}
iron(III)	Fe^{3+}	tin(II)	Sn^{2+}
lead(II)	Pb^{2+}	tin(IV)	Sn^{4+}
lead(IV)	Pb^{4+}	zinc	Zn^{2+}
lithium	Li^+		

continued

Negative Ions (Anions)

Name	Symbol	Name	Symbol
acetate	$\text{C}_2\text{H}_3\text{O}_2^-$ (CH_3COO^-)	nitrate	NO_3^-
azide	N_3^-	nitride	N^{3-}
bromide	Br^-	nitrite	NO_2^-
bromate	BrO_3^-	oxalate	$\text{C}_2\text{O}_4^{2-}$
carbonate	CO_3^{2-}	hydrogen oxalate	HC_2O_4^-
hydride	H^-	oxide	O^{2-}
hydrogen carbonate or bicarbonate	HCO_3^-	perchlorate	ClO_4^-
chlorate	ClO_3^-	permanganate	MnO_4^-
chloride	Cl^-	phosphate	PO_4^{3-}
chlorite	ClO_2^-	monohydrogen phosphate	HPO_4^{2-}
chromate	CrO_4^{2-}	dihydrogen phosphate	H_2PO_4^-
citrate	$\text{C}_6\text{H}_5\text{O}_7^{3-}$	silicate	SiO_3^{2-}
cyanide	CN^-	sulfate	SO_4^{2-}
dichromate	$\text{Cr}_2\text{O}_7^{2-}$	hydrogen sulfate	HSO_4^-
fluoride	F^-	sulfide	S^{2-}
hydroxide	OH^-	hydrogen sulfide	HS^-
hypochlorite	ClO^-	sulfite	SO_3^{2-}
iodide	I^-	hydrogen sulfite	HSO_3^-
iodate	IO_3^-	thiocyanate	SCN^-

Common Ions

Cations (Positive Ions)

1 ⁺ charge		2 ⁺ charge		3 ⁺ charge	
NH ₄ ⁺	Ammonium	Ba ²⁺	Barium	Al ³⁺	Aluminum
Cs ⁺	Cesium	Be ²⁺	Beryllium	Cr ³⁺	Chromium(III)
Cu ⁺	Copper(I)	Cd ²⁺	Cadmium	Co ³⁺	Cobalt(III)
Au ⁺	Gold(I)	Ca ²⁺	Calcium	Ga ³⁺	Gallium
H ⁺	Hydrogen	Cr ²⁺	Chromium(II)	Au ³⁺	Gold(III)
Li ⁺	Lithium	Co ²⁺	Cobalt(II)	Fe ³⁺	Iron(III)
K ⁺	Potassium	Cu ²⁺	Copper(II)	Mn ³⁺	Manganese
Rb ⁺	Rubidium	Fe ²⁺	Iron(II)	Ni ³⁺	Nickel(III)
Ag ⁺	Silver	Pb ²⁺	Lead(II)		
Na ⁺	Sodium	Mg ²⁺	Magnesium	4⁺ charge	
		Mn ²⁺	Manganese(II)	Pb ⁴⁺	Lead(IV)
		Hg ₂ ²⁺	Mercury(I)	Mn ⁴⁺	Manganese(IV)
		Hg ²⁺	Mercury(II)	Sn ⁴⁺	Tin(IV)
		Ni ²⁺	Nickel(II)		
		Sr ²⁺	Strontium		
		Sn ²⁺	Tin(II)		
		Zn ²⁺	Zinc		

(continued)

Anions (Negative Ions)

1 ⁻ charge		1 ⁻ charge		2 ⁻ charge	
CH ₃ COO ⁻ (C ₂ H ₃ O ₂ ⁻)	Acetate (or ethanoate)	HS ⁻	Hydrogen sulfide	CO ₃ ²⁻	Carbonate
BrO ₃ ⁻	Bromate	OH ⁻	Hydroxide	CrO ₄ ²⁻	Chromate
Br ⁻	Bromide	IO ₃ ⁻	Iodate	Cr ₂ O ₇ ²⁻	Dichromate
ClO ₃ ⁻	Chlorate	I ⁻	Iodide	O ²⁻	Oxide
Cl ⁻	Chloride	NO ₃ ⁻	Nitrate	O ₂ ²⁻	Peroxide
ClO ₂ ⁻	Chlorite	NO ₂ ⁻	Nitrite	SO ₄ ²⁻	Sulfate
CN ⁻	Cyanide	ClO ₄ ⁻	Perchlorate	S ²⁻	Sulfide
F ⁻	Fluoride	IO ₄ ⁻	Periodate	SO ₃ ²⁻	Sulfite
H ⁻	Hydride	MnO ₄ ⁻	Permanganate	S ₂ O ₃ ²⁻	Thiosulfate
HCO ₃ ⁻	Hydrogen carbonate (or bicarbonate)	SCN ⁻	Thiocyanate	3⁻ charge	
ClO ⁻	Hypochlorite			N ³⁻	Nitride
HSO ₄ ⁻	Hydrogen sulfate			PO ₄ ³⁻	Phosphate
				P ³⁻	Phosphide
				PO ₃ ³⁻	Phosphite