

## IPC 1A Practice Exam

The following practice exam will help prepare you for the CBE. The questions are similar to those on the CBE, though not identical, and the format is similar. The practice exam is presented to help you study for the CBE. Work straight through the practice exam as if you were actually taking the proctored test. When you encounter a question you don't know at all or a topic that isn't fresh in your memory, mark that question so that you will know to go back and study the topic more thoroughly.

### Multiple Choice

Circle the letter of the response that *best* answers the question or completes the statement. A periodic table of elements is included for reference at the end of this document.

1. The best type of graph to show parts of a whole would be a
  - A. line graph.
  - B. bar graph.
  - C. pie chart.
  - D. histogram.
2. When trying to decide whether to wear black or white clothing on a winter day, which of the following would be a hypothesis?
  - A. Black clothing should be worn when the temperature dips below 50° Fahrenheit.
  - B. Most people at school wore white yesterday.
  - C. Black clothing is the correct choice for a winter day.
  - D. I think black clothing would be most comfortable to wear on a winter day like today.
3. In a science lab, the mass of a person would probably be measured in
  - A. grams.
  - B. kilograms.
  - C. milligrams.
  - D. pounds.
4. In a science lab, the tool most likely used to measure the mass of a large crystal of copper sulfate would be a
  - A. graduated cylinder.
  - B. ruler.
  - C. balance.
  - D. scale.
5. Before any lab activity is begun, investigators should
  - A. read through all instructions.
  - B. study any applicable safety rules.
  - C. ask any questions about any part of the procedure they don't understand.
  - D. All of the above.

6. A light bulb is an example of
- A. a dependent variable.
  - B. an independent variable.
  - C. pure science.
  - D. technology.
7. A scientific theory that has been tested many times and is generally accepted as true is called a
- A. law.
  - B. hypothesis.
  - C. fact.
  - D. prediction.
8. If the mass of an object is 300 g and its volume is 150 mL, its density is
- A. 0.5 g/mL.
  - B. 2.0 g/mL.
  - C. 5 g/mL.
  - D. 0.2 g/mL.
9. How many degrees are between the freezing point and the boiling point on the Celsius temperature scale?
- A. 10
  - B. 100
  - C. 180
  - D. 273
10. A meter is slightly larger than a(n)
- A. foot.
  - B. inch.
  - C. yard.
  - D. mile.
11. Which of the following is a physical property of matter?
- A. density
  - B. flammability
  - C. reactivity
  - D. beauty
12. Viscosity describes substances in the \_\_\_\_\_ state of matter.
- A. solid
  - B. liquid
  - C. gas
  - D. plasma

13. The mathematical formula for density is
- A.  $D = m \times v$
  - B.  $D = m / v$
  - C.  $D = v / m$
  - D.  $D = m + v$
14. Of the following items, the one with the **most** thermal energy would be
- A. a glass of ice water.
  - B. a glass of tap water.
  - C. a large glacier.
  - D. a cubic meter of steam.
15. Burning a piece of paper is an example of a
- A. phase change.
  - B. physical change.
  - C. chemical change.
  - D. mass change.
16. When two or more substances are mixed together but not chemically combined, the resulting combination is called a(n)
- A. element.
  - B. mixture.
  - C. compound.
  - D. phase change.
17. Which of the following is **not** a mixture?
- A. colloid
  - B. compound
  - C. suspension
  - D. solution
18. A property or properties that might be used to separate substances in a mixture could include which of the following?
- A. magnetism
  - B. melting point
  - C. solubility
  - D. All of the above.
19. A substance that cannot be changed into simpler substances by a chemical change is called a(n)
- A. element.
  - B. liquid.
  - C. solid.
  - D. mixture.

20. Which of the following has a definite volume and shape?
- A. solid
  - B. liquid
  - C. gas
  - D. plasma
21. As a result of his experiment, Rutherford proposed that an atom has a
- A. dense, positively charged nucleus.
  - B. dense, negatively charged nucleus.
  - C. neutral nucleus surrounded by negatively charged electrons.
  - D. neutral nucleus surrounded by positively charged particles.
22. Mendeleev arranged an early “periodic table” in order by
- A. increasing atomic number.
  - B. increasing atomic mass.
  - C. increasing electron orbitals.
  - D. decreasing atomic number.
23. In the chemical equation  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ ,
- A. water combines with oxygen.
  - B. water is produced.
  - C. hydrogen and oxygen are produced.
  - D. a compound is changed into the elements of which it is made.
24. Hydrogen is grouped with alkali metals because it
- A. is a gas.
  - B. has one electron in its outer energy level.
  - C. does not readily form compounds.
  - D. is a metal.
25. An element with an atomic number of 6 and a mass number of 14 contains \_\_\_\_\_ neutrons in its nucleus.
- A. 20
  - B. 12
  - C. 8
  - D. 6
26. A family of elements with two electrons in its outer energy level is the
- A. actinides.
  - B. alkali metals.
  - C. alkaline earth metals.
  - D. halogens.

27. When the temperature of a solution of a solid in a liquid is raised, the solubility usually
- A. increases.
  - B. decreases.
  - C. remains the same.
  - D. cannot be determined.
28. In the early 1900s, experimentation done in Rutherford's lab
- A. resulted in the proposal that most mass and all positive charges are concentrated in the nucleus of the atom.
  - B. explained the presence of small, negatively charged particles in atoms.
  - C. explained the orbital paths of electrons around the nucleus.
  - D. determined that paths of electrons cannot be precisely predicted.
29. The radioactive isotope nickel-63 has a half-life of 100 years. How much of a 10.0-g sample of nickel-63 is left after 300 years?
- A. 10 g.
  - B. 5 g
  - C. 2.5 g
  - D. 1.25 g
  - E. 0.625 g
30. The modern periodic law states that the physical and chemical properties of elements are periodic functions of their
- A. atomic mass.
  - B. atomic number.
  - C. phase.
  - D. energy content.
31. Which of the following describes an isotope's half-life?
- A. a constant time interval
  - B. a varied time interval
  - C. an increasing time interval
  - D. a decreasing time interval
32. For which of the following could carbon-14 dating be used?
- A. a bone fragment
  - B. a marble column
  - C. dinosaur fossils
  - D. rocks

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33. Elements that have 5, 6, 7, or 8 electrons in their outermost energy level are
- A. metals.
  - B. nonmetals.
  - C. metalloids.
  - D. alloys.
34. Which of the following is an atom that has gained an electron?
- A. negative ion
  - B. positive ion
  - C. polar molecule
  - D. nonpolar molecule
35. If heat must be added to a chemical reaction for the reaction to continue to completion, the reaction is
- A. balanced.
  - B. endothermic.
  - C. exothermic.
  - D. reactant.
36. The transfer of electrons occurs during
- A. metallic bonding.
  - B. covalent bonding.
  - C. ionic bonding.
  - D. the formation of molecules.
37. An atom with an oxidation number of 2-
- A. has two valence electrons.
  - B. will form an ion with a charge of 2+.
  - C. will form an ion with a charge of 6-.
  - D. has six valence electrons.
38. The formula for zinc iodide is  $ZnI_2$ . What is the oxidation number of zinc in zinc iodide?
- A. 1-
  - B. 1+
  - C. 2-
  - D. 2+
39. A chemical reaction in which two or more substances combine to form another substance is called a
- A. reactant.
  - B. decomposition reaction.
  - C. synthesis reaction.
  - D. product.

40. According to the law of conservation of mass, if two atoms of hydrogen are used as a reactant, how many atoms of hydrogen must be part of the product?
- A. None would be required.
  - B. 1
  - C. 2
  - D. 4
41. Which of the following represents a correctly balanced double-replacement reaction?
- A.  $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
  - B.  $\text{MgCO}_3 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{CO}_3$
  - C.  $\text{Ba}(\text{NO}_3)_2 + \text{K}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{KNO}_3$
  - D.  $\text{C}_3\text{H}_8 + \text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$
  - E. None of the above.
42. Which of the following is an endothermic reaction?
- A. cooling water nearly to the freezing point
  - B. iron rusting
  - C. burning wood
  - D. exploding dynamite
43. In an exothermic reaction,
- A. some energy is destroyed.
  - B. energy is released.
  - C. energy is taken from the surroundings.
  - D. energy is stored in one or more of the products.
44. What type of reaction is shown in the following chemical equation?  $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
- A. decomposition.
  - B. double-displacement
  - C. single-displacement
  - D. synthesis
45. Which of the following is a property of acids?
- A. Acids have a sour taste.
  - B. Acids affect indicators.
  - C. Acids neutralize bases.
  - D. All of the above.

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46. Solutions can form with
- A. solids in liquids.
  - B. liquids in gases.
  - C. gases in liquids.
  - D. All of the above.
47. An insoluble compound that forms during a chemical reaction is
- A. aqueous.
  - B. a catalyst.
  - C. an inhibitor.
  - D. a precipitate.
48. Acids react with active metals to produce
- A. hydrogen gas.
  - B. oxygen gas.
  - C. either hydrogen or oxygen gas.
  - D. different gases, depending on the acid.
49. Acetic acid is found in
- A. battery acid.
  - B. citric acid.
  - C. stomach acid.
  - D. vinegar.
50. Of the following, the strongest base would have a pH of
- A. 10.
  - B. 3.
  - C. 7.
  - D. 6.
51. A solution that contains a large amount of solute in the solvent could be described as
- A. concentrated.
  - B. diluted.
  - C. polar.
  - D. unsaturated.
52. In a chemical reaction between a strong acid and a strong base, the resulting solution should have a pH of
- A. 2.
  - B. 7.
  - C. 0.
  - D. 12.



53. Fractional distillation is useful for petroleum because
- A. it has a low boiling point.
  - B. it has a high boiling point.
  - C. its fractions boil and condense at different temperatures.
  - D. its fractions have different densities.
54. Which of the following is a chemical property?
- A. density
  - B. solubility
  - C. flammability
  - D. hardness
55. The particles that make up a solid move \_\_\_\_\_ than do the particles that make up a gas.
- A. in the same way
  - B. more quickly
  - C. more quickly and farther
  - D. more slowly

**Read the following information, then answer questions 56-61.**

Students wanted to know about the strength of a balloon under various temperature conditions. Four identical balloons were used for their experiment. Each balloon was filled with helium. One balloon was left in a room at normal room temperature. The second balloon was placed in a room with temperatures ten degrees higher than normal room temperature. The third balloon was placed in a warm oven. The fourth balloon was placed in an automobile in 100° weather.

56. In the experiment above, the balloons were a(n)
- A. independent variable.
  - B. dependent variable.
  - C. constant.
  - D. control.
57. In the experiment, the balloon left at room temperature was a(n)
- A. independent variable.
  - B. dependent variable.
  - C. constant.
  - D. control.
58. In the experiment, the different temperature environments were the
- A. independent variable.
  - B. dependent variable.
  - C. constant.
  - D. control.

59. In the experiment, the helium in each of the balloons was a(n)
- independent variable.
  - dependent variable.
  - constant.
  - control.
60. In the experiment, the time of failure for each balloon was the
- independent variable.
  - dependent variable.
  - constant.
  - control.
61. The idea stating that matter is made of small particles that are in constant motion is
- Boyle's law.
  - Charles's law.
  - the kinetic theory of matter.
  - Archimedes' principle.

### Written Response

The following questions should be answered in complete sentences on your own paper. Writing must be neat and legible. Good writing skills should be used throughout.

62. The solubility of potassium chloride in water is 34 g per 100 g of water at 20°C. A warm solution containing 100 g of potassium chloride in 200 g of water is cooled to 20°C. How many grams of potassium chloride will come out of solution? Show your work and units.
63. Complete the chart below. For each substance, you have been given enough information to determine the values that are missing.

Substance	Symbol	Atomic No.	Mass No.	Protons	Neutrons	Electrons
Helium	He	2	4			
Magnesium	Mg	12			12	
Zinc	Zn	30	65			
Bromine	Br		80			35
Uranium	U				146	92

64. You have an opportunity to go into a science lab to perform flame tests. As part of the lab, you will be dipping a wire into chemical solutions and then holding the tip of the wire in a Bunsen burner flame. Your materials will include five beakers of solution, acid to clean the wire after you burn the chemical off each time, a Bunsen burner, and matches to start the burner. Make a comprehensive **list of safety rules** you should follow during this lab.
65. Think of five different objects in your home that are made entirely or partially from a synthetic polymer. For each one, determine what was used before the synthetic polymer became available.
66. An archaeologist finds some ancient pottery. The pottery has only one-fourth of its original amount of carbon-14. If the half-life of carbon-14 is 5,730 years, how old is the pottery?