

CHEM 118-03 Midterm Exam

Fall 2024

Question 1

Which state of matter is characterized by a fixed shape and a fixed volume? (1 point)

- A) Solid
 - B) Liquid
 - C) Gas
 - D) Plasma
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Question 2

Which phase of matter has a definite volume but not a definite shape? (1 point)

- A) Solid
 - B) Liquid
 - C) Gas
 - D) Plasma
-

Question 3

What is the density formula? (1 point)

- A) $D = mV$
 - B) $D = \frac{m}{V}$
 - C) $D = \frac{V}{m}$
 - D) $D = m + V$
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Question 4

Convert 3.6×10^2 to a decimal number. (1 point)

- A) 36
 - B) 3600
 - C) 360
 - D) 3.6
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Question 4

Convert 9.8×10^{-4} to a decimal number. (1 point)

- A) 0.0098
 - B) 0.00098
 - C) 0.098
 - D) 9.8
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Question 5

Convert 0.00056 to scientific notation. (1 point)

- a) 5.6×10^{-4}
 - b) 5.6×10^{-5}
 - c) 6.5×10^{-4}
 - d) 5.6×10^{-3}
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Question 6

How many significant figures does the number 0.04050 have? (1 point)

- A) 2
 - B) 3
 - C) 4
 - D) 5
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Question 7

How many significant figures does the number 3.0890 have? (1 point)

- A) 3
 - B) 4
 - C) 5
 - D) 6
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Question 8

What is the correct result of $8.54 + 2.873$ with the appropriate number of significant figures? (1 point)

- A) 11.413
- B) 11.41
- C) 11.4
- D) 11.4130

Question 9

Calculate 0.00325×1500.00 and express the answer using the correct number of significant figures. (1 point)

- A) 4.875
 - B) 4.88
 - C) 4.87500
 - D) 4.900
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Question 10

Convert 5.5 cubic meters to cubic feet. (1 cubic meter = 35.3147 cubic feet) (1 point)

- A) 193.23 cubic feet
 - B) 200.23 cubic feet
 - C) 194.23 cubic feet
 - D) 199.23 cubic feet
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Question 11

How many liters are in 3.534 gallons? (1 gallon = 3.78541 liters) (1 point)

- A) 12.43 liters
 - B) 13.38 liters
 - C) 14.19 liters
 - D) 13.28 liters
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Question 12

Convert 45.0°C to Fahrenheit. (1 point)

- A) 113°F
 - B) 95°F
 - C) 102°F
 - D) 107°F
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Question 13

Convert 146°F to Celsius. (1 point)

- A) 69.3°C
 - B) 295°C
 - C) 63.3°C
 - D) 120°C
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Question 14

What is pure water (H₂O)? (1 point)

- A) Element
 - B) Compound
 - C) Heterogeneous mixture
 - D) Homogeneous mixture
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Question 15

What is granite rock? (1 point)

- A) Element
 - B) Compound
 - C) Heterogeneous mixture
 - D) Homogeneous mixture
-

Question 16

What is brass (an alloy of copper and zinc)? (1 point)

- A) Element
 - B) Compound
 - C) Heterogeneous mixture
 - D) Homogeneous mixture
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Question 17

Which of the following is an example of a physical change? (1 point)

- A) Iron rusting
 - B) Baking a cake
 - C) Evaporating water
 - D) Burning coal
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Question 18

If wood is burned in a camp fire, what type of change is occurring? (1 point)

- A) Physical change
 - B) Chemical change
 - C) No change
 - D) Reversible change
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Question 19

A 50 g piece of aluminum (specific heat capacity, $c = 0.897 \frac{\text{J}}{\text{g} \cdot ^\circ\text{C}}$) is heated from 20°C to 60°C. How much heat is absorbed by the aluminum? (2 points)

- A. 1794 J
 - B. 3588 J
 - C. 2268 J
 - D. 4485 J
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Question 20

If 1000 J of heat is added to a 20 g sample of aluminum (specific heat capacity ($c = 0.897 \frac{\text{J}}{\text{g} \cdot ^\circ\text{C}}$), by how many degrees Celsius will the temperature increase? (2 points)

- A. 40°C
 - B. 50°C
 - C. 56°C
 - D. 44°C
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Question 21

An element has an atomic number of 6 and a mass number of 12. Identify its atomic symbol. (1 point)

- A) He
 - B) Li
 - C) C
 - D) N
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Question 22

Which atomic symbol represents an element with 11 protons, 12 neutrons, and 11 electrons? (1 point)

- A) Al
 - B) Mg
 - C) Na
 - D) Si
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Question 23

An ion has 27 protons, 25 electrons, and 32 neutrons. Identify its atomic symbol. (1 point)

- A. $^{59}_{25}\text{Co}$
 - B. $^{59}_{27}\text{Co}^{2-}$
 - C. $^{60}_{29}\text{Co}^{2+}$
 - D. $^{59}_{27}\text{Co}^{2+}$
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Question 24

An ion has an atomic number of 11, a charge of 1+, and a mass number of 23. Identify its atomic symbol. (1 point)

- A. $^{23}_{11}\text{Na}^{+}$
 - B. $^{23}_{11}\text{Na}^{-}$
 - C. $^{22}_{11}\text{Na}^{+}$
 - D. $^{24}_{10}\text{Na}^{+}$
-

Question 25

An ion has 13 protons, 10 electrons, and a mass number of 27. Identify the atomic symbol of this ion. (1 point)

- A. $^{27}_{13}\text{Al}^{3+}$
 - B. $^{27}_{13}\text{Al}^{3-}$
 - C. $^{27}_{14}\text{Al}^{3+}$
 - D. $^{27}_{13}\text{Al}$
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Question 26

Chemical Formula: $\text{K}_2\text{Cr}_2\text{O}_7$

How many atoms of each element are present? (1 point)

- A) K: 2, Cr: 1, O: 7
 - B) K: 2, Cr: 2, O: 7
 - C) K: 1, Cr: 2, O: 7
 - D) K: 2, Cr: 7, O: 2
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Question 27

Chemical Formula: $\text{C}_6\text{H}_{12}\text{O}_6$

How many atoms of each element are present? (1 point)

- A) C: 12, H: 12, O: 6
 - B) C: 6, H: 12, O: 6
 - C) C: 6, H: 6, O: 12
 - D) C: 12, H: 6, O: 6
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Question 28

Which ionic compound is formed from the ions Na^+ and SO_4^{2-} ? (1 point)

- A) NaSO_4
 - B) Na_2SO_4
 - C) $\text{Na}_2(\text{SO}_4)_2$
 - D) NaSO_3
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Question 29

Which ionic compound is formed from the ions Al^{3+} and PO_4^{3-} ? (1 point)

- A) $\text{Al}(\text{PO}_4)_3$
 - B) Al_3PO_4
 - C) AlPO_4
 - D) $\text{Al}_2(\text{PO}_4)_2$
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Question 30

Identify the ions that make up the compound FeCl_3 . (1 point)

- A) Fe^{2+} and Cl^-
 - B) Fe^{3+} and Cl^-
 - C) Fe^+ and Cl_3^-
 - D) Fe^{3+} and Cl^{3-}
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Question 31

Identify the ions that make up the compound NH_4Cl . (1 point)

- A) NH_3^+ and Cl^-
 - B) NH_4^+ and Cl^-
 - C) NH_4^+ and Cl^{2-}
 - D) NH_4^+ and Cl^+
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Question 32

Determine the formula mass of ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$. You must use proper mathematical notation and units throughout your calculations. (3 points)

Question 33

Chlorine has two naturally occurring isotopes: $^{35}_{17}\text{Cl}$ with a mass of 34.969 amu (75.78% abundance) and $^{37}_{17}\text{Cl}$ with a mass of 36.965 amu (24.22% abundance). Calculate the average atomic mass of chlorine in amu. You must use proper mathematical notation and units throughout your calculations. (3 points)

Question 34

Answer the following questions in your own words. What subatomic property defines an element's identity? What happens to a neutral atom to yield an ion? What is the *natural abundance* of an isotope? (3 points extra credit)