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Name:_____ Class:_____ Date:_____

IGC Chapter 1 Multiple Choice

1. Select the pure substance.
   a. air (a mixture of nitrogen and oxygen)
   b. seawater (water with dissolved salts)
   c. water (a compound of hydrogen and oxygen)
   d. brass (a mixture of copper and zinc)

ANSWER: c

2. Which are considered pure substances?
   a. elements only
   b. compounds only
   c. elements and compounds
   d. elements, compounds, and homogeneous mixtures
   e. elements, compounds, homogeneous mixtures, and heterogeneous mixtures

ANSWER: c

3. Select the true statement.
   a. All compounds are mixtures.
   b. Only elements are pure substances.
   c. Pure substances cannot consist of more than one type of element.
   d. A compound consists of two or more elements.

ANSWER: d

4. Suppose you have two different brands of baking powder that are each uniform throughout. However, the labels show that one brand has a higher sodium content than the other. Classify baking powder.
   a. element
   b. compound
   c. homogeneous mixture
   d. heterogeneous mixture

ANSWER: c

5. In a cup, there is orange juice containing pulp and a few ice cubes. Which choice best describes the contents of the cup?
   a. element
   b. compound
   c. homogeneous mixture
   d. heterogeneous mixture

ANSWER: d

6. Select the chemical property.
   a. color
   b. melting point

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IGC Chapter 1 Multiple Choice

c. flammability
d. density
e. conductivity

ANSWER: c

7. Select the extensive property.
a. volume
b. density
c. color
d. freezing point

ANSWER: a

8. Select the chemical change.
a. ice melting
b. crushing an aluminum can
c. breaking glass
d. water condensing on a cool glass
e. burning wood

ANSWER: e

9. A sample of potassium explodes when dropped into a swimming pool. This property is
a. extensive and physical.
b. extensive and chemical.
c. intensive and chemical.
d. intensive and physical.

ANSWER: c

10. Select the choice that is *not* an example of energy.
a. a beam of light
b. a loud noise
c. an atom
d. heat from a fire
e. radiation from a microwave oven

ANSWER: c

11. A log burns in a fireplace. Which choice best describes the energy conversion?
a. Potential energy is converted to nuclear energy.
b. Matter is converted to potential energy.
c. Kinetic energy is converted to electrical energy.
d. Nuclear energy is converted to heat energy.
e. Chemical energy is converted to heat energy.

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IGC Chapter 1 Multiple Choice

ANSWER: e

12. Select the correct sequence of events in the scientific method.
    a. hypothesis → observation → experiment → theory → scientific law
    b. theory → observation → scientific law
    c. observation → hypothesis → experiment → theory → scientific law
    d. hypothesis → experiment → theory → scientific law
    e. observation → hypothesis → experiment → theory

ANSWER: e

13. An observation is made and a hypothesis is formed. Select the next step in the scientific method.
    a. The hypothesis is tested with experiments.
    b. The hypothesis becomes a theory.
    c. The hypothesis becomes a scientific law.
    d. The hypothesis becomes a scientific axiom.

ANSWER: a

14. A series of experimental results do not support a hypothesis. Select the next step in the scientific method.
    a. A scientific theory is formulated, based on the experimental results.
    b. A scientific law is formulated, based on the experimental results.
    c. Based on the experimental results, a new hypothesis is formulated and tested experimentally.
    d. More experiments are conducted, until the results support the original hypothesis.
    e. A theory is formulated from the results, which can later become a scientific law.

ANSWER: c

15. Select the true statement.
    a. A scientific law can later be revised.
    b. A scientific theory can become a scientific law.
    c. A theory is first formulated to explain an observation.
    d. After a theory becomes generally accepted, it becomes a hypothesis.

ANSWER: a

16. What is the symbol of the SI base unit for amount of substance?
    a. m
    b. mol
    c. g
    d. A
    e. cd

ANSWER: b

17. Select the choice that is *not* a derived unit.

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IGC Chapter 1 Multiple Choice

a. m/s
b. s^{-1}
c. m
d. m^3
e. $kg \cdot m/s^2$

ANSWER: c

18. Select the choice that is equal to 1 km.
a. 100 m
b. 10^3 m
c. 10^{-3} m
d. 10 m
e. 0.001 m

ANSWER: b

19. Select the choice that is equal to 10^{-3} s.
a. 1 ms
b. 1 ks
c. 1 s
d. 1 μs
e. 1 ds

ANSWER: b

20. Select the choice that is equal to 1 ng.
a. 10^6 g
b. 10^3 g
c. 10^{-9} g
d. 10^{-6} g
e. 10^{-3} g

ANSWER: c

21. Select the largest quantity.
a. 1 ng
b. 1 mg
c. 1 kg
d. 1 μg
e. 1 Mg

ANSWER: e

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IGC Chapter 1 Multiple Choice

22. A scientist studies a 1.0 L water sample from a pond and obtains several results. Select the result that is quantitative.

a. The water sample contains microorganisms.
b. The water sample contains iron.
c. The water sample contains calcium.
d. The water sample contains 0.5 μg of lead.
e. The water sample contains sediment.

ANSWER: d

23. Water boils at 100 °C at sea level. A scientist working at sea level takes three temperature measurements of a boiling water sample and obtains values of 93.0 °C, 92.9 °C, and 93.1 °C. Select the statement that most accurately describes the result of the measurements.

a. The measurements are accurate, but not precise.
b. The measurements are precise, but not accurate.
c. The measurements are both precise and accurate.
d. The measurements are neither precise nor accurate.

ANSWER: d

24. Select the number of significant digits in the following value: 2.006

a. one
b. two
c. three
d. four
e. at least two

ANSWER: d

25. Select the number of significant digits in the following value: 0.0126

a. one
b. two
c. three
d. four
e. at least three

ANSWER: c

26. Select the number of significant digits in the following value: 7900

a. one
b. two
c. three
d. four
e. at least two

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IGC Chapter 1 Multiple Choice

ANSWER: e

27. Solve the following problem and select the answer with the correct number of significant digits: 25.00 cm + 3.2 cm = ?

a. 28 cm
b. 28.2 cm
c. 28.20 cm
d. 28.200 cm

ANSWER: b

28. Solve the following problem and select the answer with the correct number of significant digits: (3.001 g/mL)(1.25 mL) = ?

a. 3.7 g
b. 3.75 g
c. 3.751 g
d. 3.7513 g

ANSWER: b

29. Solve the following problem and select the answer with the correct number of significant digits:

$$\frac{(0.00145\ \text{g} + 0.13\ \text{g})}{(0.50\ \text{cm})(0.50\ \text{cm})(0.50\ \text{cm})} = ?$$

a. 1.1 g/cm^3
b. 1.05 g/cm^3
c. 1.052 g/cm^3
d. 1.0516 g/cm^3
e. 0.263 g/cm^3

ANSWER: a

30. A car driving from Portland, Oregon, to Portland, Maine, travels 3.19×10^3 miles. Given that one mile = 1.61 km, convert this distance to kilometers.

a. 1.98×10^3 km
b. 5.14×10^3 km
c. 5.14 km
d. 3.19×10^3 km

ANSWER: b

31. An employee makes $18.00 per hour. Given that there are 52 weeks in a year and assuming a 40-hour work week, calculate the employee's yearly salary.

a. $720 per year
b. $936 per year

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IGC Chapter 1 Multiple Choice

c. $37,440 per year
d. $11,230 per year
e. $8,640 per year

ANSWER: c

32. K2, located on the China–Pakistan border, is the second-highest mountain in the world, at 8611 m above sea level. Given that there are 39.37 inches in one meter and exactly 12 inches in one foot, calculate the height of K2 above sea level in feet.

a. 20,140 ft
b. 28,250 ft
c. 29,030 ft
d. 103,300 ft
e. 339,000 ft

ANSWER: b

33. A standard soccer field covers an area of 7140 m^2. Given that there are 39.37 inches in a meter and exactly 12 inches in a foot, calculate the area of a soccer field in square feet.

a. 663 ft^2
b. 2.34×10^4 ft^2
c. 7.69×10^4 ft^2
d. 3.37×10^6 ft^2
e. 1.11×10^7 ft^2

ANSWER: c

34. Object A and object B have the same mass, but object B has a greater volume than object A. Select the true statement.

a. Object A is more dense than object B.
b. Object B is more dense than object A.
c. Objects A and B have the same densities.
d. The volume of object B is less than the volume of object A.

ANSWER: a

35. A 151 g sample of lead has a volume of 13.4 mL. Calculate the density of lead.

a. 0.0887 g/mL
b. 2.02×10^3 g/mL
c. 2.02×10^3 g·mL
d. 11.3 g/mL
e. 151 g/mL

ANSWER: d

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IGC Chapter 1 Multiple Choice

36. Calculate the volume of an 8.24 g mass of copper (density = 8.96 g/mL).
    a. 0.920 mL
    b. 1.09 g/mL
    c. 73.8 g/mL
    d. 8.96 g/mL

ANSWER: a

37. The boiling point of oxygen is –182.962 °C. Calculate oxygen's boiling point on the Kelvin scale.
    a. 90.19 K
    b. –24.18 K
    c. 456.11 K
    d. –456.11 K

ANSWER: a

38. Dallol, Ethiopia, is one of the hottest places on Earth. From 1960 to 1966, its average annual temperature was measured and found to be 94.0 °F. Calculate Dallol's annual average temperature during this time period in degrees Celsius.
    a. 62.0 °C
    b. 34.4 °C
    c. 201.2 °C
    d. 179.15 °C

ANSWER: b

39. The cosmic background temperature of outer space is 2.725 K. Calculate the cosmic background temperature in degrees Fahrenheit.
    a. –182.24 °F
    b. –267.70 °F
    c. –270.43 °F
    d. –273.15 °F
    e. –454.77 °F

ANSWER: e

40. Potassium is a shiny, solid compound with a melting point of 64 °C. Chlorine is a pale yellow-green gas with a melting point of –102 °C. These two elements can combine to form a white, crystalline substance with a melting point of 771 °C. Select the false statement.
    a. The white crystalline substance formed is a compound.
    b. The melting point of the white crystalline substance is an intensive property.
    c. The combination of potassium and chlorine to form a white crystalline substance is an example of a chemical reaction.
    d. The melting point of the white crystalline substance is a chemical property.

ANSWER: d

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IGC Chapter 1 Multiple Choice

41. The Dead Sea, which borders Israel, Palestine, and Jordan, is a salt lake. Its water has a density of 1.24 kg/L. Calculate the density of Dead Sea salt water in units of grams per milliliter and determine whether it is more or less dense than ocean salt water (density = 1.027 g/mL).

a. Dead Sea salt water has a density of 0.124 g/mL, and it is less dense than ocean salt water.
b. Dead Sea salt water has a density of 12.4 g/mL, and it is more dense than ocean salt water.
c. Dead Sea salt water has a density of 1.24 g/mL, and it is more dense than ocean salt water.
d. Dead sea salt water has a density of 1.21 g/mL, and it is more dense than ocean salt water.

ANSWER: c

42. Water has a density of 1.000 g/mL at 4 °C and a density of 0.997 g/mL at 25 °C. Given that 1 mL = exactly 1 cm^3, calculate the volume difference between 1.000 kg masses of water at these two different temperatures.

a. 997 cm^3
b. 0.000 cm^3
c. 3 cm^3
d. 0.003 cm^3
e. 0.997 cm^3

ANSWER: c

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Name:_____ Class:_____ Date:_____

IGC Chapter 1 Free Response

1. What is the name and symbol for the SI unit of length?
ANSWER: meter, m

2. Give the symbol and numerical meaning for the prefix *micro-*.
ANSWER: μ, 10^6

3. How many significant digits are in the following value? 156.100
ANSWER: six

4. Solve the following problem and round the answer to the correct number of significant digits.

$$\frac{0.08\ \text{g} + 0.10\ \text{g}}{15\ \text{mL} + 3\ \text{mL}} = ?\ \text{g/mL}$$

ANSWER: 0.010

5. The average life expectancy in the United States is 78.7 years. Given that there are 365.25 days in a year, exactly 24 hours in a day, exactly 60 minutes in an hour, and exactly 60 seconds in a minute, calculate the number of minutes that the average American lives.
ANSWER: 4.14×10^7 min

6. Standard-sized dice that are used in games and gambling are approximately cubic in shape and 16 mm in length on each side. Given that there are exactly 10 mm in 1 cm, calculate the volume of a die in units of cubic centimeters. Assume that the die is completely cubic in shape.



ANSWER: 4.1 cm^3

7. Cooking oil has a density of 0.92 g/mL. Calculate the mass of a teaspoon of cooking oil, which is equivalent to 4.93 mL.
ANSWER: 4.5 g

8. When added to water, octane will form a layer on the surface of the water. Iron will sink when added to water. Rank the densities of these substances from lowest to highest.
ANSWER: octane < water < iron

9. Helium's boiling point is 4.222 K. Calculate helium's boiling point in degrees Fahrenheit.
ANSWER: –452.07 °F

10. The lowest recorded temperature on Earth was –89.2 °C at the Soviet Vostok Station in Antarctica in 1983. Calculate this temperature in degrees Fahrenheit.
ANSWER: –128.6 °F

11. Crater Lake in Oregon is approximately 9.7 km long and 8.0 km wide, and has an average depth of 350 m.

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IGC Chapter 1 Free Response

Assuming that the lake has the three-dimensional shape of a rectangular prism, calculate the volume of Crater Lake and round the answer to the correct number of significant figures.
ANSWER: $27\ km^3$

12. The surface area of the Caspian Sea is approximately 1.4×10^5 square miles. Given that there are 1.609 km in one mile, calculate the surface area of the Caspian Sea in square meters and round the answer to the correct number of significant figures.
ANSWER: $3.6 \times 10^{11}\ m^2$

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