

1001_1st_Exam_1001012

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Choose the INCORRECT statement.

- A) A hypothesis is a conclusion that must follow logically from observations of nature.
- B) A natural law is a generalization of natural phenomena.
- C) An experiment is a test of conclusions about natural law.
- D) The scientific method is the combination of observations, experimentation, and the formulation of laws, hypothesis, and theories.
- E) A theory is a model of nature that can be used to describe natural phenomena.

Answer: A

2) Which of the following is a chemical property of gold?

- A) is a good conductor of heat
- B) does not react with hydrochloric acid
- C) is malleable
- D) is a good conductor of electricity

Answer: B

3) Sulfur dioxide gas is:

- A) a homogeneous mixture
- B) a compound
- C) an element
- D) a solid at room temperature
- E) a heterogeneous mixture

Answer: B

4) Which one of the following would be classified as a heterogeneous mixture?

- A) mix of table salt and black pepper
- B) salt water
- C) copper nitrate solution
- D) brass
- E) a sugar solution

Answer: A

5) The quantity of matter in an object is the object's _____ and is measured on a _____.

- A) mass, balance
- B) mass, scale
- C) weight, scale
- D) weight, balance
- E) Any of the above since the terms are interchangeable.

Answer: A

6) The prefix "milli" and the prefix "micro" correspond, respectively, to the factors:

- A) 10^{-3} and 10^{-6}
- B) 10^{-6} and 10^{-9}
- C) 10^3 and 10^6
- D) 10^{-1} and 10^{-6}
- E) 10^{-3} and 10^{-12}

Answer: A

7) Which of the following is longest?

- A) 3.00×10^{-9} km
- B) 3.0×10^{-4} m
- C) 300 pm
- D) 3.0×10^{-10} cm
- E) 3.0 nm

Answer: B

8) _____ are an indication of the capability of the measuring device and how precise can the measurement can possibly be.

- A) Significant figures
- B) SI base units
- C) Natural law
- D) Exponential notation
- E) Physical changes

Answer: A

9) Which of the following is an exact number?

- A) the volume of a can of fruit juice
- B) the volume of milk in a liter bottle
- C) the distance between earth and the sun
- D) the area of a city lot
- E) the number of days in the month of January

Answer: E

10) A 15.0 g sample of hydrated copper sulfate was heated to dryness and the new mass measured to be 9.59 g. Calculate the percentage of water in the hydrated crystal. Express your answer to the correct number of significant digits.

- A) 45%
- B) 63%
- C) 63.3%
- D) 36.1%
- E) 36%

Answer: E

11) Which of the following would be unaffected by an electric field?

- A) gamma rays
- B) alpha particles
- C) electrons
- D) protons
- E) beta particles

Answer: A

12) Choose the correct statement.

- A) Neutrons have no charge and no mass.
- B) Electrons and protons have about the same mass.
- C) The atomic number is the total number of protons and neutrons in the nucleus.
- D) The charge of a proton is 1837 times the charge of an electron.
- E) An electron has 1/1837 the mass of a proton.

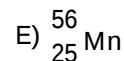
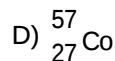
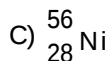
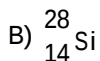
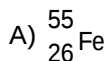
Answer: E

13) What is the mass number of the most abundant form of oxygen atom?

- A) 15.9994
- B) 32
- C) 8
- D) 16
- E) 24

Answer: D

14) Which of these atoms has the greatest number of neutrons in its nucleus?



Answer: E

15) For the ion $^{228}\text{Ra}^{2+}$ with a mass of 228.030 u, determine the numbers of electrons in the ion.

A) 88

B) 86

C) 138.030

D) 226.30

E) 228

Answer: B

16) Which of the following statements is true concerning the masses of individual Cl atoms?

A) None of the atoms have a mass of 35.45 u.

B) Most of the atoms have a mass of 35.45 u.

C) All atoms have a mass of 35.45 u.

D) All atoms have a mass of 17 u.

E) Some of the atoms have a mass of 35.45 u.

Answer: A

17) An element has 5 stable isotopes. The mass and percentage of each are:

89.9043 51.46%

90.9053 11.23%

91.9046 17.11%

93.9061 17.40%

95.9082 2.80%

The element is which of the following?

A) Y

B) Zr

C) Sr

D) Nb

E) Rb

Answer: B

18) Which of the following is a metalloid?

A) bismuth

B) radium

C) selenium

D) calcium

E) mercury

Answer: C

19) A graduated cylinder contains 33.8 mL of water. A stone with a mass of 28.4 g is placed in the cylinder and the water level rises to 44.1 mL. What is the density of the stone?

A) 0.840 g/cm³

B) 0.644 g/cm³

C) 2.76 g/cm³

D) 0.365 g/cm³

E) 5.52 g/cm³

Answer: C

20) Common rubbing alcohol is a solution of 70.0% isopropyl alcohol by mass in water. If a 25.0 mL sample of rubbing alcohol contains 15.0 g of isopropyl alcohol, what is the density of the rubbing alcohol?

A) 0.600 g/mL

B) 0.857 g/mL

C) 0.420 g/mL

D) 2.14 g/mL

E) 3.52 g/mL

Answer: B

21) What is the mass in grams of 1 atom of sulfur (atomic mass = 32.066)?

A) 5.179×10^{-26} g

B) 1.661×10^{-24} g

C) 5.325×10^{-23} g

D) 5.989×10^{-23} g

E) 1.931×10^{-25} g

Answer: C

- 22) A particular sample of seawater has a density of 1.027 g/cm^3 at 10°C and is 2.67% sodium chloride by mass. Given that sodium chloride is 39.34% sodium by mass and that the mass of a single sodium atom is $3.817 \times 10^{-26} \text{ kg}$. Calculate the maximum number of sodium atoms that can be extracted from a 1.5 L sample of this seawater.
- A) 16.18 Na atoms
 - B) 2.212×10^{18} Na atoms
 - C) 1.661×10^{-24} Na atoms
 - D) 4.239×10^{23} Na atoms
 - E) 6.02×10^{20} Na atoms

Answer: D

- 23) The volume of seawater on Earth is about $330,000,000 \text{ mi}^3$. If seawater is 3.5% sodium chloride by mass and has a density of 1.03 g/cm^3 , what is the approximate mass of sodium chloride, in tons, dissolved in the seawater on Earth? (1 mi = 160,934.4 cm, 1 ton = 2000 lb)
- A) 2.1×10^{12} tons
 - B) 2.7×10^8 tons
 - C) 5.5×10^{16} tons
 - D) 3.5×10^{21} tons
 - E) 7.8×10^{25} tons

Answer: C

- 24) A 3.214 g sample of magnesium reacts with 8.416 g of bromine. The only product is magnesium bromide. If 1.934 g of magnesium is left unreacted, how much magnesium bromide is formed?
- A) 5.202 g
 - B) 3.268 g
 - C) 7.136 g
 - D) 1.280 g
 - E) 9.696 g

Answer: E

- 25) Choose the INCORRECT statement.
- A) Formula mass is the mass of a formula unit.
 - B) The molecular formula is the same as, or a multiple of, the empirical formula.
 - C) Molecular mass is the mass of a molecular compound.
 - D) The molecular mass of hydrogen is 1.008 u.
 - E) A structural formula shows which atoms are bonded together and by what type of bond.

Answer: D

- 26) In the following group, the compound with the greatest percentage of oxygen by mass is:
- A) Na_2CO_3
 - B) As_2O_3
 - C) P_4O_6
 - D) ClO_2
 - E) SO_2

Answer: E

- 27) Bromine has two naturally occurring isotopes. One of them, bromine-79, has a mass of 78.9183 u and an abundance of 50.69%. What must be the mass of the other, bromine-81?
- A) 81 u
 - B) 80.92 u
 - C) 81.52 u
 - D) 80.01 u
 - E) 81.33 u

Answer: B

- 28) In which compound does carbon have an oxidation state of zero?
- A) C_2H_2
 - B) CH_2O
 - C) CO_2
 - D) Na_2CO_3
 - E) CH_3OH

Answer: B

- 29) The name of which compound ends in -ite?
- A) H_2SO_3
 - B) Na_2CO_3
 - C) Na_2SO_3
 - D) CaH_2
 - E) HIO_3

Answer: C

30) The name of the compound $\text{Cr}(\text{ClO}_4)_3 \cdot 6\text{H}_2\text{O}$ is _____.

- A) chromium(II) perchlorate hexahydrate B) chromate perchlorate hydrate
C) chromate(III) perchlorate hexahydrate D) chromium(III) perchlorate hexahydrate

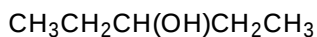
Answer: D

31) The suffix *-ol* designates the presence of which functional group?

- A) $-\text{CH}_3$ B) $-\text{COOCH}_3$ C) $-\text{OH}$ D) $-\text{COOH}$ E) $-\text{C}(\text{O})\text{H}$

Answer: C

32) What is the correct name for the following organic structure?



- A) 3-pentanoic acid
B) 3-pentanol
C) 3-pentane
D) 3-propanol
E) 3-hexanol

Answer: B

33) Which of the following functional groups gives acidic properties to organic molecules?

- A) $-\text{CH}_2\text{OH}$ B) $-\text{COOCH}_3$ C) $-\text{OH}$ D) $-\text{COOH}$ E) $-\text{C}(\text{O})\text{H}$

Answer: D

34) Which of the following is the correct definition of an isomer?

- A) Isomers are molecules that have the same molecular formula but different arrangements of atoms in space.
B) Isomers are molecules that have the same empirical formula but different arrangements of atoms in space.
C) Isomers are molecules that have the same arrangements of atoms in space but different empirical and molecular formulas.
D) Isomers are molecules with the same empirical formula but have different isotopes.
E) Isomers are molecules that have the same molecular formula but contain different isotopes.

Answer: A

35) An unknown organic compound contains carbon, hydrogen, and bromine only. The mass percentages of C and H are 12.77% C and 1.60% H. Bromine from 1.88 g of this compound has been completely converted into 3.70 g of AgBr. The molar mass of unknown organic compound is 188 u. Determine the molecular formula of the unknown.

- A) $\text{C}_2\text{H}_2\text{Br}_2$ B) CH_3Br C) $\text{C}_4\text{H}_6\text{Br}_4$ D) $\text{C}_2\text{H}_3\text{Br}_2$ E) $\text{C}_2\text{H}_2\text{Br}_4$

Answer: D

36) A 2.4917 g sample of an unknown solid hydrate was heated to drive off all the water of hydration. The remaining solid, which weighed 1.8558 g, was analyzed and found to be 27.74% Mg, 23.57% P, and 48.69% O, by mass. What is the formula of the unknown solid hydrate?

- A) $\text{Mg}_2(\text{PO}_4)_3 \cdot 2\text{H}_2\text{O}$
B) $\text{Mg}(\text{PO}_3)_2 \cdot \text{H}_2\text{O}$
C) $\text{Mg}(\text{PO}_4) \cdot 7\text{H}_2\text{O}$
D) $\text{Mg}_3(\text{PO}_4)_2 \cdot 5\text{H}_2\text{O}$
E) $\text{Mg}_3(\text{PO}_4)_2 \cdot 12\text{H}_2\text{O}$

Answer: D

37) Complete combustion of a 0.500 g sample of a pure hydrocarbon yielded 0.973 g CO₂ and 0.319 g H₂O. The empirical formula of this hydrocarbon is _____.

A) C₂H₃

B) C₄H₆

C) C₅H₈

D) C₃H₅

E) C₆H₉

Answer: C

38) The magnesium in a sample of mineral water weighing 110.520 g is first converted to MgNH₄PO₄ and then to Mg₂P₂O₇. The mass of Mg₂P₂O₇ obtained is 0.0216 g. Express the quantity of magnesium in the mineral water in parts per million (that is in g Mg per 10⁶ g H₂O).

A) 234 ppm

B) 21.4 ppm

C) 42.7 ppm

D) 8.95 ppm

E) 1.95 × 10³ ppm

Answer: C

39) Arrange the following in order of increasing oxidation state of chlorine:

NaClO, NaClO₃, NaClO₂, and NaClO₄.

A) NaClO₃, NaClO₂, NaClO, NaClO₄

B) NaClO, NaClO₂, NaClO₃, NaClO₄

C) NaClO, NaClO₃, NaClO₂, NaClO₄

D) NaClO₄, NaClO, NaClO₃, NaClO₂

E) NaClO₄, NaClO₃, NaClO₂, NaClO

Answer: B

40) What is the sum of the coefficients in the balanced equation that represents the complete combustion of the relatively new gasoline additive "MTBE," for which the molecular formula is C₅H₁₂O?

A) 20

B) 39

C) 37

D) 24

E) 29

Answer: B

41) Which metal will produce the most hydrogen per gram of metal?

A) $2 \text{ Cr} + 6 \text{ HCl} \rightarrow 2 \text{ CrCl}_3 + 3 \text{ H}_2$

B) $2 \text{ Li} + 2 \text{ HCl} \rightarrow 2 \text{ LiCl} + \text{H}_2$

C) $2 \text{ Fe} + 6 \text{ HCl} \rightarrow 2 \text{ FeCl}_3 + 3 \text{ H}_2$

D) $\text{Sn} + 4 \text{ HCl} \rightarrow \text{SnCl}_4 + 2 \text{ H}_2$

E) $\text{Mg} + 2 \text{ HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$

Answer: B

42) Which of the following represents a 1.00 M aqueous solution of glucose (C₆H₁₂O₆)?

A) 10.0 g glucose per 10.0 mL water

B) 0.180 g glucose per mL solution

C) 0.100 g glucose per mL solution

D) 4.5 g glucose per 4.5 g water

E) 90.0 g glucose per 500 mL water

Answer: B

43) For the reaction symbolized as $\text{HCl}_{(\text{aq})} + \text{NaOH}_{(\text{aq})} \rightarrow \text{NaCl}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})}$ water is both:

- A) a reactant and the solute
- B) a liquid and the intermediate
- C) a reactant and the solvent
- D) a product and the solvent
- E) a product and the solute

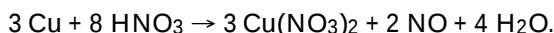
Answer: D

44) What volume of 6.0 M sulfuric acid is required for the preparation of 500.0 mL of 0.30 M solution?

- A) 40 mL
- B) 30 mL
- C) 25 mL
- D) 50 mL
- E) 100 mL

Answer: C

45) 42.6 g Cu are combined with 84.0 g of HNO_3 according to the reaction:

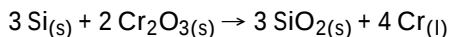


Which reagent is limiting and how many grams of $\text{Cu}(\text{NO}_3)_2$ are produced?

- A) HNO_3 , 93.8 g
- B) $\text{Cu}(\text{NO}_3)_2$, 125.6 g
- C) HNO_3 , 125.6 g
- D) Cu, 93.8 g
- E) Cu, 125.6 g

Answer: A

46) What is the percent yield if 185 grams of SiO_2 are made from 328 g of Cr_2O_3 by the following equation?



- A) 105%
- B) 56%
- C) 70%
- D) 142%
- E) 95%

Answer: E

47) What mass of $\text{Na}_2\text{SO}_4 \cdot 10 \text{H}_2\text{O}$ is needed to prepare 355 mL of 0.445 M Na_2SO_4 ?

- A) 126 g
- B) 0.051 g
- C) 12..7 g
- D) 22.5 g
- E) 50.9 g

Answer: E

48) Given: $\text{CaH}_{2(\text{s})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow \text{Ca}(\text{OH})_{2(\text{s})} + \text{H}_{2(\text{g})}$ (not balanced)

How many grams of $\text{H}_{2(\text{g})}$ result from the reaction of 127 g $\text{CaH}_{2(\text{s})}$ with an excess of water?

- A) 12.2 g
- B) 2.05 g
- C) 18.5 g
- D) 77.8 g
- E) 33.9 g

Answer: A

49) Given: $\text{CaH}_{2(\text{s})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow \text{Ca}(\text{OH})_{2(\text{s})} + \text{H}_{2(\text{g})}$ (not balanced)

How many grams of water are consumed in the reaction of 56.2 g $\text{CaH}_{2(\text{s})}$?

- A) 48.1 g
- B) 22.5 g
- C) 0.58 g
- D) 201 g
- E) 3.55 g

Answer: A

50) Given: $\text{CaH}_{2(\text{s})} + \text{H}_2\text{O}_{(\text{l})} \rightarrow \text{Ca}(\text{OH})_{2(\text{s})} + \text{H}_{2(\text{g})}$ (not balanced)

What mass of $\text{CaH}_{2(\text{s})}$ must react with an excess of water to produce 8.12×10^{24} molecules of $\text{H}_{2(\text{g})}$?

- A) 2.05 g
- B) 956 g
- C) 1.98 g
- D) 0.142 g
- E) 284 g

Answer: E