

1011_1st Exam_1011017

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

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

- A) -COOH B) -COOCH_3 C) -C(O)H D) $\text{-CH}_2\text{OH}$ E) -OH

Answer: A

2) Dalton's atomic theory is based on several assumptions, which are listed below. Which of these assumptions is strictly correct?

- I) All atoms of the same element are identical.
II) Atoms are indivisible and unchangeable.
III) Chemical changes are the result of the combination, separation, and rearrangement of atoms.
A) II and III are correct.
B) I and II are correct.
C) III is correct.
D) I and III are correct.
E) I, II, and III are correct.

Answer: C

3) A 1.500 g sample of compound containing only C, H, and O was burned completely. The only combustion products were 1.738 g CO_2 and 0.711 g H_2O . What is the empirical formula of the compound?

- A) $\text{C}_2\text{H}_4\text{O}_3$ B) CHO C) CH_2O_2 D) CH_2O E) CH_4O

Answer: A

4) If 85.6 mL of a 6.75 M solution are diluted to 6.20 L with water, what is the concentration of the final solution?

- A) 6.75 (6.20/85.6) M
B) 6.75 (8.56/6.20) M
C) 6.75 (85.6/6200) M
D) 8.56 (6.20/6.75) M
E) 6.75 (6200/85.6) M

Answer: C

5) Aspartame, $\text{C}_{14}\text{H}_{18}\text{N}_2\text{O}_5$, a low-calorie sweetener, is about 200 times sweeter than sugar. How many molecules of aspartame are there in a one-gram packet of sweetener containing 36 mg aspartame?

- A) 7.2×10^{25} molecules of aspartame
B) 2.0×10^{18} molecules of aspartame
C) 1.4×10^{22} molecules of aspartame
D) 4.0×10^{20} molecules of aspartame
E) 7.4×10^{19} molecules of aspartame

Answer: E

6) A species that differs in charge from another atom of the same element:

- I) is called an isotope
II) has more or less neutrons
III) has lost or gained electrons
IV) is called an ion
V) has the same number of protons
A) I and II B) I and III C) II and IV D) III and IV E) III, IV, V

Answer: E

7) 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) 80.0 g glucose per 500 mL water
- C) 4.5 g glucose per 4.5 g water
- D) 0.180 g glucose per mL solution
- E) 0.100 g glucose per mL solution

Answer: D

8) A model that explains and makes predictions about natural phenomena is referred to as a:

- A) hypothesis
- B) deduction
- C) generalization
- D) natural law
- E) theory

Answer: E

9) Choose the INCORRECT statement.

- A) The empirical formula is the simplest formula of the ratio of atoms.
- B) A molecule is a group of bonded atoms that exist as an entity.
- C) An anion is a positive ion.
- D) Ionic compounds result from combinations of metals and nonmetals.
- E) The molecular formula is the listing of the atoms in an actual molecule.

Answer: C

10) 24.0 g of ethane (C₂H₆) are burned to form CO₂ and H₂O. How many grams of CO₂ are produced?

- A) 14.4 g
- B) 32.8 g
- C) 70.3 g
- D) 35.1 g
- E) 43.2 g

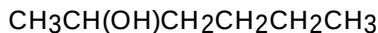
Answer: C

11) Choose the correct statement.

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

Answer: E

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



- A) pentyl alcohol
- B) 1-methylpentanol
- C) 5-hexanol
- D) 2-methylpentanol
- E) 2-hexanol

Answer: E

13) A hypothetical element, E, has two stable isotopes:



What is the average atom weight of the element?

- A) 48.50 u
- B) 47.76 u
- C) 48.44 u
- D) 47.44 u
- E) 49.11 u

Answer: B

14) What is the correct number of significant figures in the answer to the following multiplication: 1.022×0.0011 .

- A) one
- B) two
- C) four
- D) three
- E) cannot be determined

Answer: B

15) Which of the following contains the greatest number of atoms?

- A) 1 mole of S₈ molecules
- B) 2 moles of P₄ molecules
- C) 4 moles of chlorine molecules
- D) 8 moles of H atoms
- E) 3 moles of ozone, O₃

Answer: E

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

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

Answer: C

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

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

Answer: B

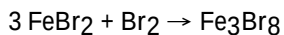
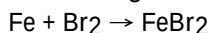
18) Ernest Rutherford is credited with:

- I) the nuclear model of the atom
- II) the identification of alpha and beta particles
- III) the discovery of protons
- IV) the prediction of a third, neutral, subatomic particle

- A) I and II
- B) I and III
- C) I, II, III
- D) II, III, IV
- E) I, II, III, IV

Answer: E

19) Given the following reactions:



If each reaction is 82.0% efficient, what mass of Fe₃Br₈ is produced from 1.00 g Fe?

- A) 3.94 g
- B) 2.65 g
- C) 2.57 g
- D) 3.24 g
- E) 4.81 g

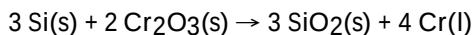
Answer: D

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

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

Answer: C

21) 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) 142%
- B) 105%
- C) 56%
- D) 70%
- E) 95%

Answer: E

22) Ethylene glycol has a density of 1.11 g/mL. What is the volume occupied by 30.0 g of ethylene glycol?

- A) 0.037 mL
- B) 33.3 mL
- C) 31.1 mL
- D) 27.0 mL
- E) 30.0 mL

Answer: D

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

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

Answer: C

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

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

Answer: E

25) Oxygen is:

- A) a solution
- B) a mixture
- C) a compound
- D) an element
- E) always combined with hydrogen

Answer: D

26) A mole of the substance water, H_2O , refers to:

- A) 6.02×10^{23} atoms of H and O
- B) 12.0000 g H_2O
- C) 6.02×10^{23} g H_2O
- D) one H_2O molecule
- E) 6.02×10^{23} H_2O molecules

Answer: E

27) Choose the INCORRECT statement.

- A) Alpha particles are the same mass as a helium nucleus.
- B) Gamma rays are the same as electrons.
- C) The Law of Constant Composition is the Law of Definite Proportions.
- D) Electrons were once known as cathode rays.
- E) Objects of like charge repel each other.

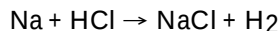
Answer: B

28) Which of the following is a correct feature of the nuclear atom proposed by Rutherford?

- A) All atoms of an element have the same mass.
- B) The majority of alpha particles to strike the foil "bounced back."
- C) The atom is mostly empty space.
- D) The number of neutrons and electrons in the atom are equal.
- E) It is like the "plum pudding" model.

Answer: C

29) What is the sum of the coefficients when the following is balanced with the smallest integer coefficients?



- A) 9
- B) 10
- C) 7
- D) 4
- E) 2

Answer: C

30) Groups, or families, on the periodic table are:

- A) named for the first elements in the series; such as "actinides"
- B) vertical columns of elements with similar properties
- C) extremely reactive with each other
- D) elements that all occur naturally in the same state
- E) horizontal rows of elements with increasing atomic numbers

Answer: B

31) Which of the following are forms of matter?

- I) hydrogen gas
 - II) sunlight
 - III) ice
 - IV) wind
 - V) iron
- A) II and IV
 - B) III and V
 - C) I and V
 - D) I, III and V
 - E) all of the above

Answer: D

32) Choose the INCORRECT statement.

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

Answer: D

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

- A) $^{28}_{14}\text{Si}$
- B) $^{57}_{27}\text{Co}$
- C) $^{55}_{26}\text{Fe}$
- D) $^{56}_{25}\text{Mn}$
- E) $^{56}_{28}\text{Ni}$

Answer: D

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

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

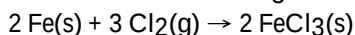
Answer: B

35) Beta particles:

- A) have the same mass as a neutron
- B) are repelled by a positively charged plate
- C) are electrons
- D) are like X-rays
- E) have a mass of 4 and a charge of +2

Answer: C

36) Iron metal reacts with chlorine gas as follows:

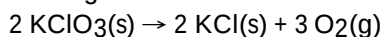


How many moles of FeCl_3 are obtained when 4.6 mol of Cl_2 reacts with excess Fe?

- A) 2.3 mol
- B) 4.6 mol
- C) 3.1 mol
- D) 1.5 mol
- E) 6.9 mol

Answer: C

37) In the following reaction:



14.0 g KClO_3 yielded 1.40 g KCl . What is the percent yield?

- A) 16.4%
- B) 32.9%
- C) 6.08%
- D) 10.0%
- E) 11.0%

Answer: A

38) The number of atoms in 10.0 g of CaCO_3 (100.0 g/mol) is:

- A) 12.1×10^{23} atoms
- B) 12.1×10^{22} atoms
- C) 6.02×10^{22} atoms
- D) 18.1×10^{22} atoms
- E) 30.1×10^{22} atoms

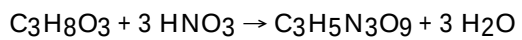
Answer: E

39) How many moles of Fe is present in 1.2 grams of Fe?

- A) 0.215 mol
- B) 0.430 mol
- C) 4.30×10^{-2} mol
- D) 2.15×10^{-2} mol
- E) 2.15×10^{-1} mol

Answer: D

40) Nitroglycerin, used both in medicine and as an explosive, can be prepared by the carefully controlled reaction of glycerol ($\text{C}_3\text{H}_8\text{O}_3$) with nitric acid, as symbolized by:



What mass of nitric acid is required for the production of 2.8 g of nitroglycerin by a process having a 67% yield?

A) 1.2 g

B) 2.3 g

C) 0.39 g

D) 3.5 g

E) 1.6 g

Answer: D