VIRGINIA STANDARDS OF LEARNING

Spring 2008 Released Test

END OF COURSE CHEMISTRY

Form S0118, CORE 1

This released test contains 1 fewer test item (#1–49 only)
than an original SOL EOC Chemistry test.

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Directions

Read each question and choose the best answer. Then fill in the circle on your answer document for the answer you have chosen.

SAMPLE

Which of the following is a balanced equation?

A $H_2 + Br_2 \rightarrow 2HBr$

B $H_2 + Br_2 \rightarrow HBr$

C $H_2 + 2Br_2 \rightarrow 2HBr$

D $2H_2 + Br_2 \rightarrow HBr$

1

Trial	Concentration
1	0.971 M
2	0.982 M
3	1.02 M
4	0.971 M
5	0.976 M

A student performed a series of titrations to find the concentration of an unknown acid. The results of the titrations are shown in the data table. What is the mean of this set of data?

A 0.971 M
B 0.976 M
C 0.984 M
D 1.00 M

2 Iodine-131 is a radioactive isotope with a half-life of 8 days. How many grams of a 64 g sample of iodine-131 will remain at the end of 24 days?

F 56 g
G 48 g
H 32 g
J 8 g

3 Which of the following is the correct name for the compound MnF_3?

A Manganese fluoride(III)
B Manganese(III) fluoride
C Manganese(I) fluoride(III)
D Manganese(III) fluoride(III)

GO ON

4 The name of the salt formed by the neutralization of hydrochloric acid and sodium hydroxide is —

F sodium chloride
G sodium chlorate
H sodium chlorite
J sodium hypochlorite

5 If the quantity of heat lost or gained is ($\triangle H$) = mass × change in T × specific heat, what is the amount of heat required to raise 200.0 g of water from 22.00°C to 100.0°C? Specific heat of water is $\frac{4.180\ J}{g \cdot °C}$.

A 652.1 joules
B 6,521 joules
C 65,210 joules
D 652,100 joules

6

$$\underline{a}\ Mg(OH)_2 + \underline{b}\ HCl \rightarrow \underline{c}\ MgCl_2 + \underline{d}\ H_2O$$

The coefficients necessary to balance the equation correctly are —

F $a = 2, b = 1, c = 1, d = 2$
G $a = 1, b = 2, c = 1, d = 2$
H $a = 1, b = 1, c = 1, d = 1$
J $a = 2, b = 2, c = 1, d = 1$

7 A balloon is filled with 3.8 L of helium gas at STP. Approximately how many moles of helium are contained in the balloon?

A 0.17 mol
B 0.26 mol
C 72 mol
D 85 mol

8 Which of these elements has the smallest atomic radius?

F Beryllium (Be)
G Oxygen (O)
H Sodium (Na)
J Sulfur (S)

9 If 250.0 mL of a 0.96 M solution of acetic acid ($C_2H_4O_2$) are diluted to 800.0 mL, what will be the approximate molarity of the final solution?

A 0.19 M
B 0.24 M
C 0.30 M
D 0.77 M

10 An atom contains 70 protons, 70 electrons, and 99 neutrons. What is the mass number?

F 239
G 169
H 140
J 70

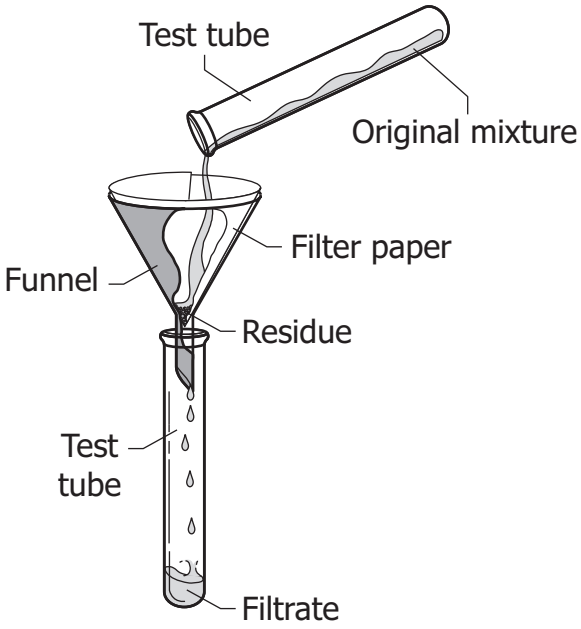
11 Which set of equipment would be *most* useful to determine the density of a liquid?

A Balance and periodic table
B Periodic table and thermometer
C Balance and graduated cylinder
D Graduated cylinder and thermometer

12 Sodium chloride conducts electricity when dissolved in water. What type of bond is present in NaCl?

F Nonpolar covalent
G Polar covalent
H Hydrogen
J Ionic

13

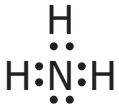


The picture shows a filtration process. Which of these is *least* likely to pass into the test tube?

A Dissolved gases
B Dissolved salts
C Liquid solvents
D Solid particles

14 Which of the following represents the Lewis dot diagram of ammonia (NH_3)?

F



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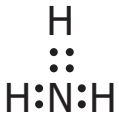

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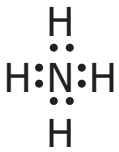

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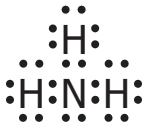


15 After 1911, most scientists accepted the theory that the nucleus of an atom was very dense and very small and had a positive charge. What led scientists to accept this theory?

A Dalton's theory of the atom was over 100 years old.

B Scientists before 1911 used the scientific method of inquiry improperly.

C A new model proved that the quantum theory of the atom was inaccurate.

D Rutherford did an experiment firing alpha particles at a thin piece of gold foil.

16 A sodium atom has an electron configuration of $1s^2 2s^2 2p^6 3s^1$. If the sodium atom becomes ionized, its new electron configuration will be the same as which element?

F Lithium
G Neon
H Magnesium
J Potassium

17 Which reaction is correctly balanced?

A $Fe_4 + CuSO \longrightarrow FeSO_4 + Cu$

B $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$

C $2Fe + CuSO_4 \longrightarrow 2FeSO_4 + Cu$

D $Fe + 2CuSO_4 \longrightarrow 2FeSO_4 + Cu$

18 Which of the following particles has a positive one (+1) charge?

F Alpha
G Electron
H Neutron
J Proton

GO ON

19 What is the mass of one mole of CO_2?

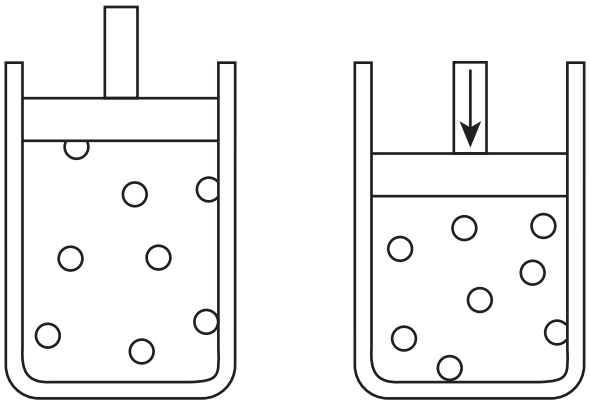
A 24 g
B 28 g
C 44 g
D 56 g

20 According to the periodic table, Mg will *most* likely react with elements in which of these groups?

F 1
G 3
H 17
J 18

GO ON

21



A sample of a gas is in a cylinder as shown. If the temperature is kept constant and the piston moves down to decrease the volume, the pressure increases because the gas particles —

A expand

B lose velocity within the container

C become smaller

D collide more frequently with the container

22 Which of the following shows the correct number of atoms of each element in the formula $Mg(NO_3)_2$?

F 1 magnesium atom, 2 nitrogen atoms, and 6 oxygen atoms

G 1 magnesium atom, 2 nitrogen atoms, and 5 oxygen atoms

H 1 magnesium atom, 1 nitrogen atom, and 6 oxygen atoms

J 1 magnesium atom, 1 nitrogen atom, and 5 oxygen atoms

23 A student is given a container of potassium nitrate crystals. In order to determine the exact mass of the potassium nitrate using a triple beam balance, he must know the —

A mass of the filled container and the chemical formula for potassium nitrate
B mass of the filled container and the density of potassium nitrate
C volume of the filled container and the volume of the potassium nitrate
D mass of the empty container and the mass of the filled container

24 C-12 and C-13 are naturally-occurring isotopes of the element carbon. C-12 occurs 98.89% of the time and C-13 occurs 1.108% of the time. What calculation should be used to determine the atomic mass of this element?

F $\dfrac{(12 \times 0.01108) + (13 \times 0.9889)}{2}$

G $(12 \times 0.9889) - (13 \times 0.01108)$

H $(12 \times 0.9889) + (13 \times 0.01108)$

J (12×0.9889)

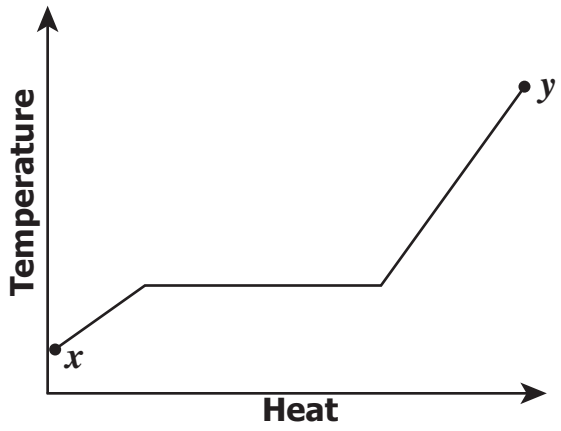
25

$$\mathbf{AB + energy \rightarrow A + B}$$

The general equation shown is a reaction that is an —

A exothermic decomposition
B endothermic decomposition
C endothermic synthesis
D exothermic synthesis

26



Examine the graph of the temperature of a compound versus heat added to the compound. Which of the following *most* likely happens as the compound is heated from point x to point y?

F The phase of the compound changes.

G The mass of the compound is increasing.

H The molecules of the compound lose potential energy.

J The molecules of the compound are breaking apart into atoms.

27 In order to determine the identity of a substance, a student listed the following properties. Which of the following is a chemical property?

A Oxidizes in air

B Conducts an electric current

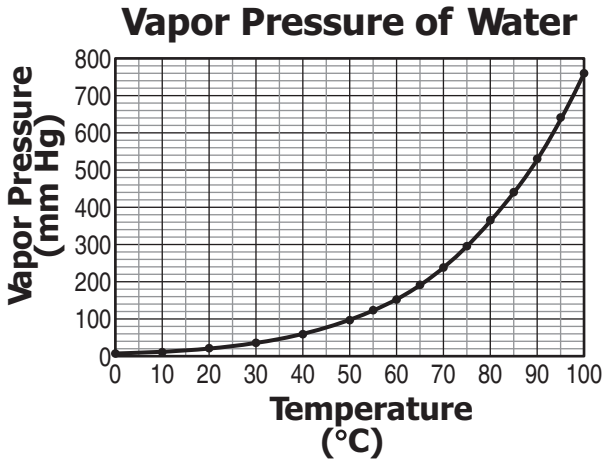
C Attraction to a magnet

D Dissolves in water

28 The following results of a scientific study on water were found in a chemistry handbook.

Properties of Water

Molar Mass: 18.015 g/mole
Melting Point: 0.0°C
Boiling Point: 100.0°C



What is the independent variable in the study?

F Molar mass
G Melting point
H Vapor pressure
J Temperature

29 Which of the following is a solid/solid solution?

A An alloy of gold and copper
B A mixture of argon and krypton
C A strongly electrolytic acid
D A neutralized base

30 Which of these compounds is *most* likely to contain an ionic bond?

F H_2

G SO_2

H CH_4

J $CaCl_2$

31 The composition of dry air is approximately 78% nitrogen, 21% oxygen, and 1% other gases. What is the partial pressure of nitrogen at standard atmospheric pressure (101.3 kPa)?

A 21.0 kPa

B 79.0 kPa

C 101.3 kPa

D 760.0 kPa

32 A gas has a volume of 100.0 mL at a pressure of 600.0 mm Hg. If the temperature is held constant, what is the volume of the gas at a pressure of 800.0 mm Hg?

F 33.33 mL

G 66.67 mL

H 75.00 mL

J 133.0 mL

33 Which of the following solutions will have the greatest concentration?

A 2 moles of solute dissolved in 1 liter of solution
B 0.3 mole of solute dissolved in 0.6 liter of solution
C 2 moles of solute dissolved in 10 liters of solution
D 0.1 mole of solute dissolved in 0.5 liter of solution

34

$$Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$$

The chemical equation shown is an example of a —

F single-replacement reaction
G synthesis reaction
H decomposition reaction
J double-replacement reaction

35 Which element is a noble gas?

A Fluorine (F)
B Hydrogen (H)
C Nitrogen (N)
D Xenon (Xe)

36 To determine if a reaction is exothermic, a student should use a —

F pH probe
G motion sensor
H pressure sensor
J temperature probe

37 What is the name of NH_4OH ?

A Ammonium hydroxide
B Nitrogen oxygen hydride
C Nitrogen hydroxide
D Ammonium oxygen hydride

38 A student hypothesizes that the solubility of a particular solute in water is nearly constant as temperature varies. The student can *best* test the hypothesis by doing which of the following?

F Researching the chemical properties of many different solutes
G Measuring the solubility of the solute at five different temperatures
H Drawing diagrams of the molecular structures of water and of the solute
J Measuring the solubility of several different solutes at a fixed temperature

39

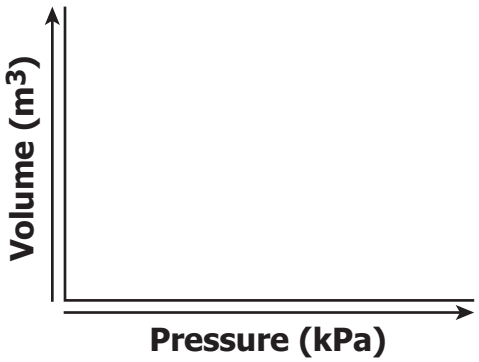
$$\underline{?}\ P + \underline{?}\ Br_2 \rightarrow \underline{?}\ PBr_3$$

Which set of coefficients will balance this equation?

A 3, 1, 1
B 2, 3, 2
C 3, 2, 3
D 2, 6, 2

40

Volume (m^3)	Pressure (kPa)
0.3	498
0.4	409
0.5	247
0.8	203
1.0	150



The table shows the measurements of the volume and the pressure of a portion of a gas at constant temperature. After graphing, the data reveals that the volume is —

F inversely proportional to pressure
G directly proportional to pressure
H inversely proportional to pressure squared
J directly proportional to pressure squared

41 What is the correct name for the compound P_4O_6?

A Phosphoric acid
B Phosphorus oxide
C Phosphorus(IV) oxide
D Tetraphosphorus hexoxide

42

$$2Fe(s) + O_2(g) \rightarrow 2FeO(s)$$

To which category does this reaction belong?

F Synthesis
G Decomposition
H Single replacement
J Double replacement

43 As heat is added to a substance undergoing a phase change, the temperature remains constant because the energy is being used to —

A break covalent bonds
B lower the specific heat capacity
C overcome intermolecular forces
D oppose electron cloud repulsions

44

$$2Na + 2H_2O \rightarrow 2NaOH + H_2$$

How many moles of hydrogen gas are produced when 0.066 mole of sodium is completely reacted?

F 0.022 mol H_2
G 0.033 mol H_2
H 0.066 mol H_2
J 0.099 mol H_2

45 The accepted value for the specific heat of aluminum is 0.897 $\frac{J}{g \cdot °C}$. Which of the following sets of specific heat values for aluminum, calculated from a prior experiment, has the *greatest* accuracy and precision?

A 0.847 $\frac{J}{g \cdot °C}$, 0.847 $\frac{J}{g \cdot °C}$, 0.848 $\frac{J}{g \cdot °C}$

B 0.896 $\frac{J}{g \cdot °C}$, 0.899 $\frac{J}{g \cdot °C}$, 0.896 $\frac{J}{g \cdot °C}$

C 0.897 $\frac{J}{g \cdot °C}$, 1.04 $\frac{J}{g \cdot °C}$, 1.03 $\frac{J}{g \cdot °C}$

D 0.936 $\frac{J}{g \cdot °C}$, 0.876 $\frac{J}{g \cdot °C}$, 0.879 $\frac{J}{g \cdot °C}$

46 A 1.0 M aqueous solution of which substance would have the *lowest* pH?

F NH_3
G HCl
H $Ba(OH)_2$
J NaF

47 What is the chemical formula for iron(II) phosphide?

A Fe_2P
B Fe_2P_3
C FeP_2
D Fe_3P_2

48 **In a mixture of oxygen (O_2) and nitrogen (N_2) gas, 80.0 percent of the total gas pressure is exerted by the nitrogen. If the total pressure is 2.0 atm, what pressure does the oxygen exert?**

F 0.20 atm
G 0.40 atm
H 0.80 atm
J 1.6 atm

49

$$2H_3PO_4 + 3Mg(OH)_2 \rightarrow Mg_3(PO_4)_2 + 6H_2O$$

Phosphoric acid, H_3PO_4, is neutralized by magnesium hydroxide, $Mg(OH)_2$, according to the equation shown. How many moles of water will be produced from the neutralization of 0.24 mole of H_3PO_4?

A 0.24 mol
B 0.48 mol
C 0.72 mol
D 1.44 mol

STOP

Answer Key-EOC015-S0118

Test Sequence Number	Correct Answer	Reporting Category	Reporting Category Description
1	C	001	Scientific Investigation
2	J	002	Atomic Structure and Periodic Relationships
3	B	003	Nomenclature, Chemical Formulas, and Reactions
4	F	004	Molar Relationships
5	C	005	Phases of Matter and Kinetic Molecular Theory
6	G	003	Nomenclature, Chemical Formulas, and Reactions
7	A	004	Molar Relationships
8	G	002	Atomic Structure and Periodic Relationships
9	C	004	Molar Relationships
10	G	002	Atomic Structure and Periodic Relationships
11	C	001	Scientific Investigation
12	J	003	Nomenclature, Chemical Formulas, and Reactions
13	D	001	Scientific Investigation
14	F	003	Nomenclature, Chemical Formulas, and Reactions
15	D	001	Scientific Investigation
16	G	002	Atomic Structure and Periodic Relationships
17	B	003	Nomenclature, Chemical Formulas, and Reactions
18	J	002	Atomic Structure and Periodic Relationships
19	C	004	Molar Relationships
20	H	003	Nomenclature, Chemical Formulas, and Reactions
21	D	005	Phases of Matter and Kinetic Molecular Theory
22	F	003	Nomenclature, Chemical Formulas, and Reactions
23	D	001	Scientific Investigation
24	H	002	Atomic Structure and Periodic Relationships
25	B	003	Nomenclature, Chemical Formulas, and Reactions
26	F	005	Phases of Matter and Kinetic Molecular Theory
27	A	002	Atomic Structure and Periodic Relationships
28	J	001	Scientific Investigation
29	A	005	Phases of Matter and Kinetic Molecular Theory
30	J	003	Nomenclature, Chemical Formulas, and Reactions
31	B	005	Phases of Matter and Kinetic Molecular Theory
32	H	005	Phases of Matter and Kinetic Molecular Theory
33	A	004	Molar Relationships
34	F	003	Nomenclature, Chemical Formulas, and Reactions
35	D	002	Atomic Structure and Periodic Relationships
36	J	001	Scientific Investigation
37	A	003	Nomenclature, Chemical Formulas, and Reactions
38	G	001	Scientific Investigation
39	B	003	Nomenclature, Chemical Formulas, and Reactions
40	F	001	Scientific Investigation
41	D	003	Nomenclature, Chemical Formulas, and Reactions
42	F	003	Nomenclature, Chemical Formulas, and Reactions
43	C	005	Phases of Matter and Kinetic Molecular Theory
44	G	004	Molar Relationships
45	B	001	Scientific Investigation
46	G	004	Molar Relationships
47	D	003	Nomenclature, Chemical Formulas, and Reactions
48	G	005	Phases of Matter and Kinetic Molecular Theory
49	C	004	Molar Relationships

Chemistry, Core 1

If you get this many items correct:		Then your converted scale score is:
0		000
1		201
2		233
3		253
4		267
5		278
6		288
7		297
8		304
9		311
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28		**400**
29		404
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42		473
43		480
44		489
45		499
46		**511**
47		525
48		545
49		578
50		600