Exam

Name________________________________

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

1) What is the physical state in which matter has no specific shape but does have a specific volume? 1) ________
A) salts B) solid C) gas D) liquid E) ice

2) The law of constant composition applies to __________. 2) ________
A) solids
B) solutions
C) homogeneous mixtures
D) heterogeneous mixtures
E) compounds

3) Which one of the following has the element name and symbol correctly matched? 3) ________
A) Sn, silicon
B) P, potassium
C) Mg, manganese
D) C, copper
E) Ag, silver

4) Which one of the following is a pure substance? 4) ________
A) salt water
B) soda drink
C) elemental copper
D) milk
E) wood

5) If matter is uniform throughout and cannot be separated into other substances by physical means, it is __________. 5) ________
A) an element
B) a heterogeneous mixture
C) either an element or a compound
D) a homogeneous mixture
E) a compound

6) Of the following, only __________ is a chemical reaction. 6) ________
A) dropping a penny into a glass of water
B) dissolving sugar in water
C) melting of lead
D) crushing of stone
E) cooking

7) Of the following, __________ is the smallest mass. 7) ________

A) 25 kg

B) 2.5×10^{-2} mg

C) 2.5×10^{10} ng

D) 2.5×10^{15} pg

E) 2.5×10^{9} fg

8) How many liters of wine can be held in a wine barrel whose capacity is 26.0 gal? 8) ________

1 gal = 4 qt = 3.7854 L.

A) 0.146

B) 6.87×10^{3}

C) 98.4

D) 1.46×10^{-4}

E) 6.87

9) How many protons does the Br^- ion possess? 9) ________

A) 35 B) 34 C) 36 D) 8 E) 6

10) Predict the charge of the most stable ion of potassium. 10) ________

A) -1 B) +1 C) -2 D) +3 E) +2

11) What is the volume (in cm^3) of a 63.4 g piece of metal with a density of 12.86 g/cm^3? 11) ________

A) .425

B) 6.65

C) 19.5

D) 4.93

E) none of the above

12) How many significant figures should be retained in the result of the following calculation? 12) ________

$$12.00000 \times 0.9893 + 13.00335 \times 0.0107$$

A) 2 B) 3 C) 4 D) 5 E) 6

13) The number with the most significant zeros is __________. 13) ________

A) 2.501×10^{-7}

B) 0.02500001

C) 0.00002510

D) 2.5100000

E) 250000001

14) Accuracy refers to __________. 14) ________

A) how close a measured number is to zero

B) how close a measured number is to infinity

C) how close a measured number is to the calculated value

D) how close a measured number is to other measured numbers

E) how close a measured number is to the true value

15) Which one of the following is <u>not</u> an intensive property? 15) ______

A) temperature
B) boiling point
C) melting point
D) <u>mass</u>
E) density

16) According to the law of definite proportions, 16) ______

A) **<u>the ratio of the masses of the elements in a compound is always the same.</u>**
B) if the same two elements form two different compounds, they do so in the same ratio.
C) it is not possible for the same two elements to form more than one compoun
D) the total mass after a chemical change is the same as before the change.

17) Which one of the following statements about atomic structure is false? 17) ______

A) **<u>The number of protons and the number of neutrons are always the same in the neutral atom</u>**
B) The protons and neutrons in the nucleus are very tightly packed
C) Almost all of the mass of the atom is concentrated in the nucleus
D) The electrons occupy a very large volume compared to the nucleus.

18) The element rhenium (Re) exists as two stable isotopes and 18 unstable isotopes. Rhenium-185 has in its nucleus 18) ______

A) **<u>75 protons, 110 neutrons</u>**
B) 75 protons, 75 neutrons
C) 75 protons, 130 neutrons.
D) 130 protons, 75 neutrons.

19) An ion is formed 19) ______

I.	by either adding protons to or subtracting protons from the atom.
II.	by either adding electrons to or subtracting electrons from the atom.
III.	by either adding neutrons to or subtracting neutrons from the atom.

A) **<u>Only II is true.</u>**
B) Only I is true.
C) Only I is true.
D) All of the statements are true.

20) The ion $^{14}N^{3-}$ has 20) ______

A) **<u>7 protons, 7 neutrons, 10 electrons</u>**
B) 7 protons, 14 neutrons, 7 electrons
C) 7 protons, 7 neutrons, 7 electrons
D) 7 protons, 7 neutrons, 4 electrons

21) ______ form ions with a 2+ charge when they react with nonmetals. 21) ______

A) **<u>Alkaline earth metals</u>**
B) Alkali metals
C) Halogens
D) Noble gases

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

22) A hollow metal sphere has an outer diameter (o.d.) of 4.366 cm and an inner diameter (i.d.) of 4.338 cm. What is the volume of the metal in the sphere in cm and in inches? Express your answer to the proper number of significant figures. [$V = (4/3)\pi r^3$]

Answer:

$V_{od} = (4/3)(3.14159)(2.183\ cm)^3 = 43.57_{6209} cm^3$

$V_{id} = (4/3)(3.14159)(2.169\ cm)^3 = 42.74_{318} cm^3$

$V_{metal} = V_{od} — V_{id} = 43.57_{620}\ cm^3 — 42.74_{318} cm^3 = 0.83_{3022} cm^3 = 0.83_{3022}\ cm^3 = 0.83\ cm^3$

For conversion to inches:

$0.83_{3022}\ cm^3 \times \left(\frac{1\ in}{2.54\ cm}\right)^3 = 0.051\ in^3$

A hollow metal sphere has an outer diameter (o.d.) of 4.586cm and an inner diameter (i.d.) of 4.502 cm. What is the volume of the metal in the sphere in cm and in inches? Express your answer to the proper number of significant figures. [$V = (4/3)\pi r^3$]

Answer:

$V_{od} = (4/3)(3.14159)(2.293\ \text{cm})^3 = 50.50_{10498}\ \text{cm}^3$

$V_{id} = (4/3)(3.14159)(2.251\ \text{cm})^3 = 47.77_{65436}\ \text{cm}^3$

$V_{metal} = V_{od} — V_{id} = 50.50_{10498}\ \text{cm}^3 — 47.77_{65436}\ \text{cm}^3 = 2.72_{450625}\ \text{cm}^3 = 2.72\ \text{cm}^3$

For conversion to inches:

$2.72_{450625}\ \text{cm}^3 \times \left(\frac{1\ in}{2.54\ cm}\right)^3 = 0.166\ \text{in}^3$

A hollow metal sphere has an outer diameter (o.d.) of 4.617 cm and an inner diameter (i.d.) of 4.588 cm. What is the volume of the metal in the sphere in cm and in inches? Express your answer to the proper number of significant figures. [$V = (4/3)\pi r^3$]

Answer:

$V_{od} = (4/3)(3.14159)(2.308\text{cm})^3 = 51.53_{21045}\ \text{cm}^3$

$V_{id} = (4/3)(3.14159)(2.294\ \text{cm})^3 = 50.56_{71506}\ \text{cm}^3$

$V_{metal} = V_{od} - V_{id} = 51.53_{21045}\text{cm}^3 - 50.56_{71506}\ \text{cm}^3 = 0.96_{49538}\ \text{cm}^3 = 0.96\ \text{cm}^3$

For conversion to inches:

$0.96_{49538}\ \text{cm}^3 \times \left(\frac{1\ in}{2.54\ cm}\right)^3 = 0.059\ \text{in}^3$

A hollow metal sphere has an outer diameter (o.d.) of 4.469 cm and an inner diameter (i.d.) of 4.396 cm. What is the volume of the metal in the sphere in cm and in inches? Express your answer to the proper number of significant figures. [$V = (4/3)\pi r^3$]

Answer:

$V_{od} = (4/3)(3.14159)(2.234_5 \text{ cm})^3 = 46.73_{3608} \text{cm}^3$

$V_{id} = (4/3)(3.14159)(2.198 \text{ cm})^3 = 44.48_{0668} \text{ cm}^3$

$V_{metal} = V_{od} — V_{id} = 46.73_{3608} \text{ cm}^3 — 44.48_{0668} \text{ cm}^3 = 2.25_{2940} \text{ cm}^3 = 2.25 \text{ cm}^3$

For conversion to inches:

$2.25_{2940} \text{ cm}^3 \times \left(\frac{1\ in}{2.54\ cm}\right)^3 = 0.137 \text{ in}^3$

23) **Problem:**

Note that the two multiplications in this calculation limit their results to 4 sig. figs, which have 3 decimal places in both cases. Adding these two together, we retain 3 decimal places. But the sum is greater than 10, so the final answer has 3 decimal places and 5 sig. figs.

Boron consists of 19.78% ^{10}B with atomic mass of 10.013 u and 80.22% ^{11}B with atomic mass 11.009 u. Calculate the atomic weight of naturally occurring Boron.

Answer:

Atomic wt. = (0.1978)(10.013 u) + (0.8022)(11.009 u)

$= 1.980_{55162}$ u $+ 8.431_{4198}$ u

$= 10.811_{96}$ u = 10.812 amu

Problem:

Boron consists of 19.78% ^{10}B with atomic mass of 10.0238 u and 80.22% ^{11}B with atomic mass 11.008 u. Calculate the atomic weight of naturally occurring Boron.

Answer:

Atomic wt. = (0.1978)(10.0238 u) + (0.8022)(11.008 u)

$= 1.982_{7076399999999}$ u $+ 8.830_{6176}$ u

$= 10.813_{325}$u = 10.813 amu

Problem:

Boron consists of 19.78% $_{10}$B with atomic mass of 10.0475 u and 80.22% $_{11}$B with atomic mass 11.004 u. Calculate the atomic weight of naturally occurring Boron.

Answer:

Atomic wt. = (0.1978)(10.0475 u) + (0.8022)(11.004 u)

= $1.987_{3954999999999}$ u + 8.827_{409} = 10.814_{8038}u = 10.815 amu

Problem:

Boron consists of 19.78% $_{10}$B with atomic mass of 10.0381 u and 80.22% $_{11}$B with atomic mass 11.006 u. Calculate the atomic weight of naturally occurring Boron.

Answer:

Atomic wt. = (0.1978)(10.0381 u) + (0.8022)(11.006 u)

= 1.985_{53618} u + 8.829_{0132}u

= 10.814_{5492}u =10.815 amu

24) Make the following conversion. Show the setup with every unit, answer with correct significant gigures.

$$\frac{1.55\,\text{kg}}{\text{m}^3} \times \frac{1000\,\text{g}}{1\,\text{kg}} \times \frac{1\,\text{m}^3}{(10)^3\,\text{dm}^3} \times \frac{1\,\text{dm}^3}{1\,\text{L}} = 1.55\,\text{g/L}$$

$$\frac{2.998\times10^8\,\text{m}}{\text{s}} \times \frac{1\,\text{km}}{1000\,\text{m}} \times \frac{60\,\text{s}}{1\,\text{min}} \times \frac{60\,\text{min}}{1\,\text{hr}} = 1.079 \times 10^9\,\text{km/hr}$$

$$\frac{8.75\,\mu\text{m}}{\text{s}} \times \frac{1\times10^{-6}\,\text{m}}{1\,\mu\text{m}} \times \frac{1\,\text{km}}{1\times10^3\,\text{m}} \times \frac{60\,\text{s}}{1\,\text{min}} \times \frac{60\,\text{min}}{1\,\text{hr}} = 3.15 \times 10^{-5}\,\text{km/hr}$$

$$\frac{254\,\text{mi}}{11.2\,\text{gal}} \times \frac{1.609\,\text{km}}{1\,\text{mi}} \times \frac{1\,\text{gal}}{4\,\text{qt}} \times \frac{1.057\,\text{qt}}{1\,\text{L}} = \frac{9.64\,\text{km}}{\text{L}}$$