

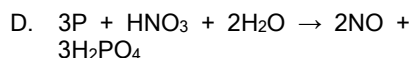
**Past Board Exam Problems
in Chemistry**

- A.
B.
C.
D.
1. EE Board Exam September 2003
What is the mass in grams of 1 liter of carbon monoxide (C) at standard temperature and pressure (STP)? Note: The molecular weight (MW) of CO is 28 g/mole, and at STP, 1 mole of any gas occupies a volume of 22.4 liters.
A. 1.20
B. 1.35
C. 1.45
D. 1.25
2. EE Board Exam April 2003
Two-third of the atom in a molecule of water is hydrogen. What percentage weight of a water molecule if the weight of two hydrogen atoms? The atomic weight of hydrogen is 1.008 g/mol and oxygen is 16.00 g/mole.
A. 19.12
B. 11.19
C. 19.11
D. 12.19
3. EE Board Exam April 2003
How many protons (P) and neutrons are there in the nucleus are present in a Pb nucleus of atomic mass of 206?
A. P = 92, N = 156
B. P = 85, N = 160
C. P = 82, N = 124
D. P = 90, N = 150
4. EE Board Exam April 2003
A 0.064 kg of octane vapor (MW = 114) is mixed with 0.91 kg of air (MW = 29.0) in the manifold of an engine. The total pressure in the manifold is 86.1 kPa, and the temperature is 290 K. Assume octane behaved ideally. What is the partial pressure of the air in the mixture in kPa?
A. 46.8
B. 48.6
C. 84.6
D. 64.8
5. EE Board Exam April 2003
Hydrogen peroxide solution for hair bleeding is usually prepared mixing 5 grams of hydrogen peroxide (H₂O₂).
Molecular weight = 34 g/mole per 100 mL of solution. What is the molarity of the solution?
A. 1.0 M
B. 1.5 M
C. 1.95 M
D. 1.8 M
6. EE Board Exam September 2003
A cylinder contains oxygen at a pressure of 10 atm and a temperature of 300 K. The volume of the cylinder is 10 liters. What is the mass of oxygen in grams? Molecular weight of oxygen is 32 gram/mole.
A. 125.02
B. 130.08
C. 135.05
D. 120.04
7. EE Board Exam April 2003
The molecular diameter of CO is 3.19×10^{-8} at 300 K and pressure of 100 mm Hg. What is the mean free path of the gas in cm?
A. 6.86×10^{-3}
B. 6.86×10^{-5}
C. 2.86×10^{-4}
D. 6.86×10^{-9}
8. EE Board Exam September 2003
How many moles are there in one atom?
A. 3.6×10^{-23}
B. 1.66×10^{-24}
C. 2.0×10^{-24}
D. 2.5×10^{-23}
9. EE Board Exam March 1998
When 0.5 g of liquid is completely evaporated and collected in liter manometer, the pressure is 0.25 atm and the temperature is 27°C. Assume ideal gas behavior, find the molecular weight if the gas constant is 0.0821 L-atm/mole-K.
A. 49.2 g/mole
B. 12.3 g/mole
C. 2.2 g/mole
D. 64.0 g/mole
10. If the atomic weight of magnesium is 24.3 g/mol, calculate how many magnesium atoms does 5 g represent?
A. 1.24×10^{23} atoms
B. 1.76×10^{23} atoms
C. 3.44×10^{23} atoms
D. 2.76×10^{23} atoms
11. How many moles of iron does 25 g of Fe represent? Note: the atomic weight of iron (Fe) is 55.8 g/mol.
A. 0.356 mol
B. 0.564 mol
C. 0.448 mol
D. 0.247 mol
12. How many oxygen atoms are present in 2.00 moles of oxygen molecules considering that it is diatomic?
A. 2.40×10^{24} atoms
B. 3.43×10^{25} atoms
C. 5.67×10^{26} atoms
D. 1.34×10^{24} atoms
13. If the atomic mass of copper (Cu) is 63.5 g/mol, compute how many grams does 0.252 mole of copper (Cu) has?
A. 16 g
B. 18 g
C. 20 g
D. 12 g
14. What is the molecular weight of calcium hydroxide or Ca(OH)₂?
A. 74
B. 67
C. 80
D. 44
15. How many molecules are these in 25 g of hydrogen chloride, HCl?
A. 4.12×10^{23} molecules
B. 4.32×10^{23} molecules
C. 5.34×10^{23} molecules
D. 3.45×10^{23} molecules
16. What is the percentage composition of sodium in the sodium chloride compound?
A. 60.7%
B. 34.6%
C. 39.3%
D. 43.4%
17. What is the composition of oxygen in potassium sulfate, K₂SO₄?
A. 53.2%
B. 36.7%
C. 50.4%
D. 43.4%
18. A 1.63 g of zinc when heated in air combined with 0.40 g of oxygen to form oxide of zinc. What is the percentage composition of Zn in the compound metals?
A. 80.3%
B. 76.5%
C. 19.7%
D. 53.4%
19. Calculate how many moles of ammonia can be produced from 8

- mole of hydrogen reacting with oxygen?
- 4.54 mol of NH_3
 - 7.76 mol of NH_3
 - 5.33 mol of NH_3
 - 4.57 mol of NH_3
- How many molecules of water can be produced by reacting 0.010 mol of oxygen with hydrogen?
 - 1.20×10^{22} molecules
 - 1.32×10^{22} molecules
 - 2.34×10^{22} molecules
 - 4.15×10^{22} molecules
 - If 2 liters of gas measured at STP weigh 3.23 g, what is the molecular weight of the gas?
 - 36.2 g/mol
 - 42.3 g/mol
 - 24.7 g/mol
 - 19.4 g/mol
 - An ethyl ether 691 mL weighs 1.65 g measured at 40°C and 630 torr. Compute the molecular weight of ethyl ether.
 - 34.5 g/mol
 - 43.5 g/mol
 - 73.9 g/mol
 - 67.5 g/mol
 - Calculate the specific gravity of Cl_2 at STP. Note: the molecular weight of Cl_2 is 71 g/mol.
 - 3.45
 - 1.23
 - 2.46
 - 1.76
 - Compute the volume of oxygen at STP that can be formed from a 0.75 mole of potassium chlorate (KClO_3).
 - 18.6 liters
 - 16.8 liters
 - 25.2 liters
 - 23.2 liters
 - What pressure will be exerted by a 0.50 mol of gas in a 7 L container at 23°C ?
 - 1.74 atm
 - 2.05 atm
 - 3.04 atm
 - 1.32 atm
 - Compute how many moles of oxygen has in a 70 L tank at 25°C if the pressure is 2000 psi?
 - 389.3 mol
 - 453.4 mol
 - 145.7 mol
 - 247.4 mol
 - What is the molality of the solution that contains 65 g of sucrose ($\text{C}_{12}\text{H}_{22}\text{O}_{11}$) dissolved in 300 g of water?
 - 0.89 mole/g
 - 0.78 mole/g
 - 0.54 mole/g
 - 0.63 mole/g
 - Calculate the number of moles of an ideal gas sample at 0.6 atmosphere and 87°C which occupies 0.45 liter.
 - 0.0091 mole
 - 0.0087 mole
 - 0.0076 mole
 - 0.0056 mole
 - One gram of hydrogen gas (H_2) is combined with 10 g of Helium (He) gas and confined at 20°C and 5 atm. What is the control volume in liters?
 - 14.4 liters
 - 17.5 liters
 - 16.4 liters
 - 12.7 liters
 - What is the molarity of the solution if 150 g of KCl is dissolved in water to make 800 mL solution?
 - 2.52 moles/liter
 - 2.25 moles/liter
 - 2.87 moles/liter
 - 1.53 moles/liter
 - Compute how many grams of KCl must be dissolved in water so that it can produce a 400 L of 0.6 M (molarity) solution.
 - 17.904 g
 - 14.281 g
 - 11.541 g
 - 12.653 g
 - What is the atomic weight of calcium if 2.25 g of pure calcium metal are converted to 3.13 g of pure CaO ?
 - 49.8 g/mol
 - 54.3 g/mol
 - 23.7 g/mol
 - 40.9 g/mol
 - What is the equivalent weight of sulfuric acid?
 - 49
 - 98
 - 23
 - 100
 - If 60 g of H_2SO_4 is dissolved in water to make a 1.5 L solution, find its normality N?
 - 0.813 equiv/liter
 - 0.576 equiv/liter
 - 0.871 equiv/liter
 - 0.765 equiv/liter
 - What is the equivalent weight of $\text{Mg}(\text{OH})_2$?
 - 23 g/mol
 - 29 g/mol
 - 58 g/mol
 - 20 g/mol
 - How many grams of H_3PO_4 are confined in 700 mL container if its normality is 0.5?
 - 11.45 g
 - 12.34 g
 - 10.56 g
 - 9.35 g
 - Which of the following is the simplest balanced equation of the given reaction?

$$\text{Na}_2\text{CO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$$
 - $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$
 - $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow \text{NaCl} + 2\text{H}_2\text{O} + \text{CO}_2$
 - $2\text{Na}_2\text{CO}_3 + \text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$
 - $2\text{Na}_2\text{CO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + 2\text{CO}_2$
 - If the molecular formula of water is H_2O , then what is its molecular mass?
 - 18 amu
 - 19 amu
 - 20 amu
 - 1 amu
 - What is the molecular weight of barium chloride dehydrate ($\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$)?
 - 234.4 amu
 - 244.3 amu
 - 270.5 amu
 - 298.5 amu
 - Which of the following is the simplest balanced equation of the given oxidation-reduction equation?

$$\text{P} + \text{HNO}_3 + \text{H}_2\text{O} \rightarrow \text{NO} + \text{H}_3\text{PO}_4$$
 - $2\text{P} + \text{HNO}_3 + \text{H}_2\text{O} \rightarrow \text{NO} + 2\text{H}_3\text{PO}_4$
 - $3\text{P} + \text{HNO}_3 + \text{H}_2\text{O} \rightarrow \text{NO} + 3\text{H}_2\text{PO}_4$
 - $3\text{P} + 5\text{HNO}_3 + 2\text{H}_2\text{O} \rightarrow 5\text{NO} + 3\text{H}_2\text{PO}_4$



41. What type of bond results to form sharing of electrons by two atoms?

- A. atomic bond
- B. **covalent bond**
- C. metallic bond
- D. ionic bond

42. Which of the following statements is FALSE?

- A. Organic substances generally dissolve in high concentration acids
- B. All organic matter contains carbon
- C. **Organic matter is generally stable at very high temperatures**
- D. Organic substances generally do not generally dissolve in water

43. Which of the following is most likely to prove that a substance is inorganic?

- A. The substance evaporates in room temperature and pressure
- B. **The substance is heated together with copper oxide and the resulting gases are found to have no effect on limestone**
- C. Analysis shows that the substance contains hydrogen
- D. Analysis shows that the substance contains hydrogen

44. Which of the following elements and compounds is unstable in its pure form?

- A. helium
- B. neon
- C. carbon dioxide
- D. **sodium**

45. What element is known as the lightest metal?

- A. aluminum
- B. manganese
- C. magnesium
- D. **lithium**

46. It is the attraction between like molecules

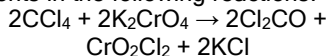
- A. absorption
- B. diffusion
- C. adhesion
- D. **cohesion**

47. Which of the following is the strongest type of bonds?

- A. Van der Waals
- B. **Metallic**

- C. **Covalent**
- D. Ionic

48. Which are oxidizing and reducing agents in the following reactions:



- A. **There are no oxidizing and reducing agents in this reaction**
- B. Oxidizing agent: Chromium; reducing agent, Chlorine
- C. Oxidizing agent, Chlorine; reducing agent, Carbon
- D. Oxidizing agent, Oxygen; reducing agent, Chlorine

49. When all the atoms of a molecule are the same, the substance is called a/an _____.

- A. **compound**
- B. chemical
- C. element
- D. ion

50. Reactions generally produced faster at high temperatures because of which of the following?

- A. The molecules are less energetic
- B. The molecules collide more frequently
- C. The activation energy is less
- D. **The molecules collide more frequently and the activation energy is less**

51. The condition of a liquid electrolyte is measured in terms of its

- A. **specific gravity**
- B. acid content
- C. voltage output
- D. current value

52. An element maybe define as a substance, all atoms of which have the same

- A. number of neutrons
- B. radioactivity
- C. atomic weight
- D. **atomic number**

53. The device which measures the acid content of the cell is called _____.

- A. acid meter
- B. **hydrometer**
- C. hygrometer
- D. pyrometer

54. In a copper atom, the valence ring contains

- A. no electron
- B. **one electron**
- C. two electrons
- D. four electrons

55. A _____ is a cell designed to produce electric current and can be recharged.

- A. **secondary cell**
- B. electrolytic cell
- C. chemical cell
- D. battery

56. Which of the following statements is FALSE?

- A. In general, as reaction products are formed, they react with each other and reform reactants.
- B. At equilibrium, the net reaction is zero.
- C. **The differential rate is the mathematical expression that shows how the rate of a reaction depends on volume**
- D. The net rate at which a reaction proceeds from left to right is equal to the forward rate minus the reserve rate.

57. The opposite of alkali

- A. **acid**
- B. fluid
- C. substance
- D. none of these

58. The amount of electricity a battery can produce is controlled by

- A. the thickness of the plate
- B. the plate surface area
- C. **the strength of the acid**
- D. the discharge load

59. It is the number of protons in the nucleus of an atom.

- A. molecular number
- B. proton number
- C. mass number
- D. **atomic number**

60. When the charge of an atom becomes unbalanced, the charge atom is called _____.

- A. **an ion**
- B. a neutron
- C. a proton
- D. an electron

61. The electrolyte is a solution of water and _____.

- A. **sulfuric acid**
- B. uric acid
- C. nitric acid
- D. formic acid

62. A deuteron is

- A. a neutron plus two protons

- B. **a nucleus containing a neutron and a proton**
- C. an electron with a positive charge 70. A.
- D. a helium nucleus B.
63. Which of the following elements is NOT radioactive? C.
- A. Plutonium 71. A.
- B. Californium B.
- C. Uranium C.
- D. **Cobalt** D.
64. The smallest whole unit of an element like Uranium is 72. A.
- A. molecule B.
- B. **atom** C.
- C. ion D.
- D. electron
65. Pair of electrical conductors of dissimilar materials are joined as to produce a thermal emf when the junctions are of different temperatures. 73. A.
- A. Potentiometer B.
- B. Piezoelectric C.
- C. **Thermocouple** D.
- D. Solar heating 74.
- 75.
- 76.
- 77.
66. The formula for Dinitrogen Pentoxide is 78.
- A. **N₂O₅** 79.
- B. (NO)₅ 80.
- C. NO 81.
- D. none of these 82.
- 83.
- 84.
67. Dielectric is another name for _____. 85.
- A. a conductor 86.
- B. an element 87.
- C. **an insulator** 88.
- D. a capacitor 89.
- 90.
68. "At the same pressure and temperature, equal volumes of all gases contain equal number of molecules." This is known as 91.
- A. Boyle's law 92.
- B. Faraday's law 93.
- C. **Avogadro's law** 94.
- D. Charles' law 95.
- 96.
97. a
69. One of the following statements is wrong. Which one is it?
- A. Electron is an elementary quantity of negative electricity.
- B. Proton is an elementary quantity of positive electricity
- C. An atom is composed of a central nucleus and orbital electrons.
- D. **The mass of an electron is heavier than that of a proton.**