

## 991\_1st\_Exam\_991013

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

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

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

Answer: D

2) A block of wood has dimensions of  $1.2\text{ m} \times 5.0\text{ cm} \times 7.0\text{ cm}$  and has a mass of  $3.0\text{ kg}$ . What is the density of the wood?

- A)  $1400\text{ g/mL}$
- B)  $0.71\text{ g/mL}$
- C)  $1.4\text{ g/mL}$
- D)  $0.071\text{ g/mL}$
- E)  $140\text{ g/mL}$

Answer: B

3) A  $16.0\text{ g}$  sample of iron has a volume of  $2.035\text{ cm}^3$ . What is its density expressed to the correct number of significant figures?

- A)  $7.86\text{ g/cm}^3$
- B)  $7.862\text{ g/cm}^3$
- C)  $32.6\text{ g/cm}^3$
- D)  $7.9\text{ g/cm}^3$
- E)  $0.127\text{ g/cm}^3$

Answer: A

4) Convert  $82^\circ\text{F}$  to the Kelvin scale.

- A)  $195\text{ K}$
- B)  $373\text{ K}$
- C)  $301\text{ K}$
- D)  $245\text{ K}$
- E)  $452\text{ K}$

Answer: C

5) Which of the following is a compound?

- A) oxygen
- B) water
- C) heat
- D) nitrogen
- E) salad dressing

Answer: B

6) What mass of sugar, in grams, would be obtained from the evaporation of water from  $1.5\text{ kg}$  of a sugar solution which is  $10.5\%$  sugar by mass?

- A)  $0.158\text{ g}$
- B)  $157.5\text{ g}$
- C)  $0.1575\text{ g}$
- D)  $15.8\text{ g}$
- E)  $160\text{ g}$

Answer: E

7) Saltwater is:

- A) a mixture
- B) an atom
- C) an element
- D) only one compound
- E) a molecule

Answer: A

8) A solution of  $34.5\%$  sulfuric acid by weight in water has a density of  $1.26\text{ g/mL}$ . How many grams of sulfuric acid are needed to make  $3.22\text{ L}$  of this solution?

- A)  $1.40 \times 10^3\text{ g}$
- B)  $1.40 \times 10^5\text{ g}$
- C)  $882\text{ g}$
- D)  $1.20 \times 10^5\text{ g}$
- E)  $135\text{ g}$

Answer: A

9) 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) 36.1%                      B) 45%                      C) 63.3%                      D) 36%                      E) 63%

Answer: D

10) Using the proper number of significant figures, how should the answer to the multiplication of the measurements  $200.1 \times 8.550 \times 0.04899$  be written?

- A) 83.815                      B) 83.8                      C) 83.81                      D) 83.8148                      E) 83.82

Answer: C

11) Which of the following is a chemical change?

- A) the freezing of water to form ice  
B) the reaction of chlorine gas and sodium to form salt  
C) hammering zinc into a thin film  
D) the inability of gold to react with water  
E) the boiling of water to form steam

Answer: B

12) A cation has 28 neutrons and 21 electrons. If it has a +3 charge, what is its correct symbol?

- A)  ${}_{21}^{28}\text{Sc}^{3+}$                       B)  ${}_{21}^{49}\text{Sc}^{3+}$                       C)  ${}_{28}^{24}\text{Ni}^{3+}$                       D)  ${}_{24}^{52}\text{Cr}^{3+}$                       E)  ${}_{24}^{28}\text{Cr}^{3+}$

Answer: D

13) What is the density ( $\text{g/cm}^3$ ) of tin if  $4.56 \times 10^{20}$  atoms make a cube 2.31 mm on each side?

- A) 7.29                      B) 0.00729                      C) 0.0142                      D) 3.28                      E) 169

Answer: A

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

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

Answer: B

15) The following ratios of masses were obtained with a mass spectrometer:

$$\frac{{}^{35}_{17}\text{Cl}}{{}^{19}_9\text{F}} = 1.8406, \quad \frac{{}^{19}_9\text{F}}{{}^{12}_6\text{C}} = 1.5832$$

What is the mass of a  ${}^{35}_{17}\text{Cl}$  atom in atomic mass units?

- A) 36.36 u                      B) 35.45 u                      C) 35.00 u                      D) 13.95 u                      E) 34.97 u

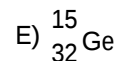
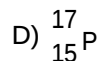
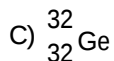
Answer: E

16) A cation has 13 neutrons and 10 electrons. If it has a charge of +1, what is its correct symbol?

- A)  ${}_{11}^{13}\text{Na}^+$                       B)  ${}_{13}^{26}\text{Al}^+$                       C)  ${}_{11}^{13}\text{Na}^+$                       D)  ${}_{11}^{24}\text{Na}^+$                       E)  ${}_{10}^{23}\text{Ne}^+$

Answer: D

17) Write the symbol for the radioactive isotope phosphorus-32.



Answer: A

18) 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) 1.280 g

C) 7.136 g

D) 9.696 g

E) 3.268 g

Answer: D

19) Choose the INCORRECT statement.

A) Protons and neutrons are close to the same mass.

B) Gamma rays are bent by magnetic fields as a ray of positive charges.

C) Protons and neutrons are found in the nucleus.

D) The mass number is the number of protons plus neutrons.

E) The atomic number is the proton number.

Answer: B

20) The total numbers of neutrons, protons, and electrons in  $^{35}\text{Cl}^-$  are \_\_\_\_\_.

A) 17 neutrons, 35 protons, 36 electrons

B) 18 neutrons, 17 protons, 18 electrons

C) 35 neutrons, 17 protons, 18 electrons

D) 17 neutrons, 17 protons, 17 electrons

E) 18 neutrons, 17 protons, 16 electrons

Answer: B

21) Which of the following are isomers?

A)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_3$

B)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{OH}$

C)  $\text{CH}_3\text{CH}(\text{CH}_2\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_3$

D)  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}(\text{OH})\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_3$

E)  $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

Answer: B

22) Choose the INCORRECT name formula combination.

A)  $\text{HNO}_2$  nitrous acid

B)  $\text{LiCN}$  lithium cyanide

C)  $\text{Fe}_2(\text{SO}_4)_3$  iron(III) sulfite

D)  $\text{Ba}(\text{OH})_2$  barium hydroxide

E)  $\text{Na}_2\text{CO}_3$  sodium carbonate

Answer: C

23) The oxidation state of oxygen in oxygen difluoride,  $\text{OF}_2$ , is \_\_\_\_\_.

A) -1

B) -2

C) +2

D) +1

E)  $-\frac{1}{2}$

Answer: C

24) Which of the following could be an empirical formula?

A)  $C_8H_{10}N_4O_2$  (caffeine)

B)  $C_6H_8O_6$  (vitamin C)

C)  $C_9H_8O_4$  (aspirin)

D)  $C_{10}H_{14}N_2$  (nicotine)

Answer: C

25) The correct chemical name for the compound  $KNO_2$  is \_\_\_\_\_.

A) potassium nitrate

B) potassium nitrous oxide

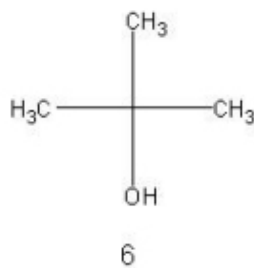
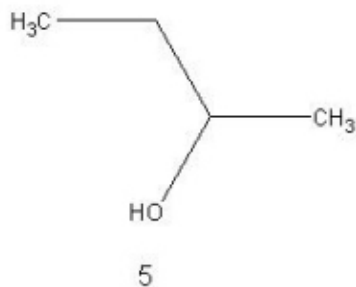
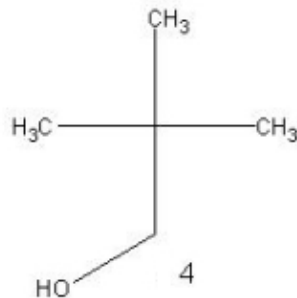
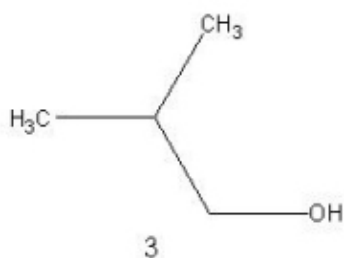
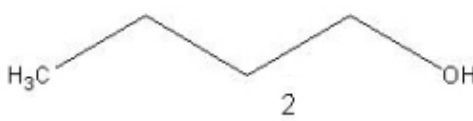
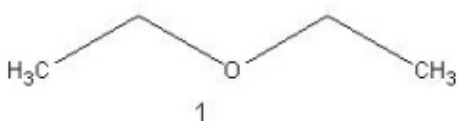
C) potassium hyponitrite

D) potassium nitrite

E) potassium nitrogen dioxide

Answer: D

26) Which of the following is(are) isomer(s) of organic compound with formula  $C_5H_{12}O$ ?



A) 1 and 2

B) 1 and 3

C) 4

D) 6

E) 5 and 4

Answer: C

27) Choose the INCORRECT oxidation state.

A) Cl is +5 in  $HClO_3$

B) S is +6 in  $H_2SO_3$

C) Br is +3 in  $BrF_3$

D) C is -2 in  $CH_3OH$

E) C is +4 in  $CS_2$

Answer: B

28) A sample contains 43.7% phosphorus and 56.3% oxygen. The molar mass is 284 u. What is the molecular formula of the compound?

- A)  $\text{P}_5\text{O}_8$                       B)  $\text{P}_4\text{O}_5$                       C)  $\text{P}_2\text{O}_5$                       D)  $\text{P}_4\text{O}_{10}$                       E)  $\text{PO}_3$

Answer: D

29) Elemental analysis of 50.0000 g of a compound showed that it contained 12.7520 g C, 3.2105 g H, and the rest was S. The empirical formula of this compound is \_\_\_\_\_.

- A)  $\text{C}_2\text{H}_3\text{S}_2$                       B)  $\text{CH}_2\text{S}$                       C)  $\text{CHS}$                       D)  $\text{C}_2\text{H}_2\text{S}$                       E)  $\text{CH}_3\text{S}$

Answer: E

30) What is the oxidation state of chlorine in sodium hypochlorite?

- A) -1                      B) +5                      C) +2                      D) +1                      E) +3

Answer: D

31) The correct chemical name for the substance  $\text{Al}(\text{OH})_3$  is \_\_\_\_\_.

- A) aluminum oxytrihydrate  
B) aluminum trihydroxide  
C) aluminum hydroxide  
D) aluminum(III) hydroxide  
E) aluminum trihydrogenoxide

Answer: C

32) How many grams of Cr are found in  $1.00 \times 10^2$  g of  $\text{K}_2\text{Cr}_2\text{O}_7$ ?

- A) 35.4 g                      B) 24.3 g                      C) 12.2 g                      D) 33.8 g                      E) 48.6 g

Answer: A

33) A 2.000 g sample of water contains 11.19% H by mass and 88.81% O by mass. What percent of H by mass will be found in a 6.00 g sample of water?

- A) 33.33%                      B) 88.81%                      C) 33.57%                      D) 11.19%                      E) 5.60%

Answer: D

34) Choose the INCORRECT oxidation state.

- A) C is 0 in  $\text{H}_2\text{CO}$   
B) S is +4 in  $\text{H}_2\text{SO}_3$   
C) Fe is +2 in  $\text{Fe}_2\text{O}_3$   
D) Mn is +7 in  $\text{KMnO}_4$   
E) C is +2 in  $\text{HCOOH}$

Answer: C

35) Given the reaction:



How many moles of  $\text{K}_2\text{SO}_4$  are produced by allowing five moles each of  $\text{KMnO}_4$ ,  $\text{KI}$ , and  $\text{H}_2\text{SO}_4$  to react?

- A) 5 mol                      B) 1 mol                      C) 4 mol                      D) 3 mol                      E) 2 mol

Answer: D

- 36) Cryolite is a compound needed for the Hall- Heroult process for producing aluminum. Cryolite is produced by the following reaction:

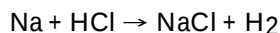


How many grams of cryolite are produced if the reaction has a 94.3% yield and a limiting reagent of 27.8 grams of HF?

- A) 275 g                      B) 15.0 g                      C) 15.9 g                      D) 45.9 g                      E) 48.6 g

Answer: D

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



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

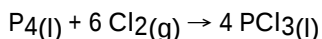
Answer: C

- 38) Write the complete balanced equation for the complete combustion reaction expected to occur between  $\text{C}_3\text{H}_7\text{OH}$  and  $\text{O}_2$ .

- A)  $2 \text{ C}_3\text{H}_7\text{OH} + 6 \text{ CO}_2 \rightarrow \text{CO} + 8 \text{ H}_2\text{O}$   
B)  $2 \text{ C}_3\text{H}_7\text{OH} + 9 \text{ O}_2 \rightarrow 6 \text{ CO}_2 + 8 \text{ H}_2\text{O}$   
C)  $2 \text{ C}_3\text{H}_7\text{OH} + 9 \text{ CO}_2 \rightarrow 6 \text{ CO}_2 + 8 \text{ H}_2\text{O} + 9 \text{ C}$   
D)  $\text{C}_3\text{H}_7\text{OH} + \text{O}_2 \rightarrow 3 \text{ CO}_2 + 4 \text{ H}_2\text{O}$   
E)  $2 \text{ C}_3\text{H}_7\text{OH} + 9 \text{ O}_2 \rightarrow 6 \text{ C} + 8 \text{ H}_2 + 10 \text{ O}_2$

Answer: B

- 39) Given the reaction:



If the percent yield is 82%, what mass of  $\text{P}_4$  is required to obtain 2.30 g  $\text{PCl}_3$  ( $\text{Cl}_2$  in excess)?

- A) 0.95 g                      B) 0.16 g                      C) 0.43 g                      D) 0.63 g                      E) 0.52 g

Answer: D

- 40) How many grams of  $\text{CrSO}_4$  will be made from 25.0 grams each of  $\text{Zn}$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ , and  $\text{H}_2\text{SO}_4$ ?



- A) 10.8 g                      B) 12.6 g                      C) 37.8 g                      D) 25.2 g                      E) 28.3 g

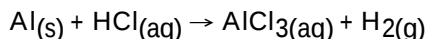
Answer: A

- 41) How many grams of a solid mixture containing strontium chloride would one need to make 558 mL of a 0.100 M strontium chloride solution, if the solid mixture contains 58.6% strontium chloride by weight?

- A) 8.85 g                      B) 15.1 g                      C) 9.52 g                      D) 5.19 g                      E) 6.62 g

Answer: B

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



- A) 21                      B) 13                      C) 19                      D) 11                      E) 18

Answer: B

- 43) In the following reaction:



14.0 g  $\text{KClO}_3$  yielded 1.40 g  $\text{KCl}$ . What is the percent yield?

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

Answer: B

- 44) To measure the volume of an irregularly shaped container filled with water, 1.00 mL of 2.00 M potassium chloride solution is added. After stirring, a 5.00 mL sample was found to contain  $2.54 \times 10^{-2}$  mg of potassium ion. What is the volume of the container?

A)  $3.97 \times 10^{-4}$  L      B) 29.4 L      C)  $2.94 \times 10^4$  L      D) 2.54 L      E) 15.4 L

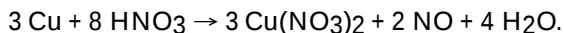
Answer: E

- 45) If 5.97 mL of a solution of NaCl contains 2.54 mg of sodium ion, what is the molarity of the sodium chloride solution?

A) 0.102 M  
B)  $1.85 \times 10^{-5}$  M  
C)  $7.28 \times 10^{-3}$  M  
D)  $1.85 \times 10^{-2}$  M  
E) 0.425 M

Answer: D

- 46) 42.6 g Cu are combined with 84.0 g of HNO<sub>3</sub> according to the reaction:

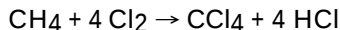


Which reagent is limiting and how many grams of Cu(NO<sub>3</sub>)<sub>2</sub> are produced?

A) Cu(NO<sub>3</sub>)<sub>2</sub>, 125.6 g  
B) Cu, 125.6 g  
C) Cu, 93.8 g  
D) HNO<sub>3</sub>, 93.8 g  
E) HNO<sub>3</sub>, 125.6 g

Answer: D

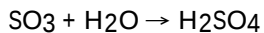
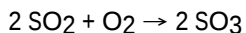
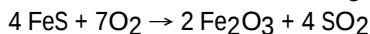
- 47) How much Cl<sub>2</sub>, in g, is required to produce 12.0 g CCl<sub>4</sub> according to the following reaction?



A) 1.38 g      B) 22.1 g      C) 12.0 g      D) 11.0 g      E) 5.52 g

Answer: B

- 48) How many grams of sulfuric acid, H<sub>2</sub>SO<sub>4</sub>, can be obtained from 400 grams of iron ore if the ore is 80.0% by mass FeS? The reactions involved are given below.



A) 287 g      B) 89.3 g      C) 446 g      D) 557 g      E) 357 g

Answer: E

- 49) There are two stable isotopes of supposium (Su).



Compute the atomic mass of supposium.

A) 192.5 u      B) 191.8 u      C) 194.0 u      D) 193.1 u      E) 190.9 u

Answer: D

50) A 1.900 g sample of  $\text{C}_6\text{H}_{12}$  is burned in an excess of oxygen. What mass of  $\text{CO}_2$  and  $\text{H}_2\text{O}$  should be obtained?

A) 0.994 g  $\text{CO}_2$ , 0.407 g  $\text{H}_2\text{O}$

B) 2.98 g  $\text{CO}_2$ , 1.22 g  $\text{H}_2\text{O}$

C) 10.45 g  $\text{CO}_2$ , 4.27 g  $\text{H}_2\text{O}$

D) 5.23 g  $\text{CO}_2$ , 2.38 g  $\text{H}_2\text{O}$

E) 5.96 g  $\text{CO}_2$ , 2.44 g  $\text{H}_2\text{O}$

Answer: E