1. Distillation of crude oil from various parts of the world yields different percentages of hydrocarbons. Which statement explains these different percentages?

A) Hydrocarbons are organic compounds
B) Each component in a mixture has a different solubility in water.
C) The carbons in hydrocarbons may be bonded in chains or rings.
D) The proportions of components in a mixture can vary.

2. A mixture consists of sand and an aqueous salt solution. Which procedure can be used to separate the sand, salt, and water from each other?

A) Evaporate the water, then filter out the sand.
B) Evaporate the water, then filter out the salt.
C) Filter out the sand, then evaporate the water.
D) Filter out the salt, then evaporate the water.

3. Compared to a 2.0 M aqueous solution of NaCl at 1 atmosphere, a 3.0 M aqueous solution of NaCl at 1 atmosphere has a

A) higher boiling point and a higher freezing point
B) lower boiling point and a lower freezing point
C) higher boiling point and a lower freezing point
D) lower boiling point and a higher freezing point

4. In an aqueous solution of potassium chloride, the solute is

A) K   B) KCl   C) Cl   D) H_2O

5. When KCl(s) is dissolved in water, the resulting solution is classified as a

A) heterogeneous mixture
B) homogeneous compound
C) heterogeneous compound
D) homogeneous mixture

6. The solubility of $KClO_3$(s) in water increases as the

A) temperature of the solution increases
B) pressure on the solution increases
C) pressure on the solution decreases
D) temperature of the solution decreases

7. At standard pressure, which substance becomes *less* soluble in water as temperature increases from 10.°C to 80.°C?

A) NH_4Cl B) HCl   C) NaCl   D) KCl

8. Which solution has the highest boiling point at standard pressure?

A) 0.10 M KCl(aq)   B) 0.10 M K_2SO_4(aq)
C) 0.10 M K_3PO_4(aq)   D) 0.10 M KNO_3(aq)

9. A bottle of rubbing alcohol contains both 2-propanol and water. These liquids can be separated by the process of distillation because the 2-propanol and water

A) have combined chemically and retain their different boiling points
B) have combined physically and have the same boiling point
C) have combined physically and retain their different boiling points
D) have combined chemically and have the same boiling point

10. Differences in which property allow the separation of a sample of sand and seawater by filtration?

A) particle size   B) concentration of ions
C) volume of sample   D) mass of sample

11. When 5 grams of KCl are dissolved in 50. grams of water at 25°C, the resulting mixture can be described as

A) homogeneous and unsaturated
B) heterogeneous and supersaturated
C) heterogeneous and unsaturated
D) homogeneous and supersaturated

12. Based on Table *F*, which equation represents a saturated solution having the lowest concentration of Cl^- ions?

A) $KCl(s) \rightleftharpoons K^+(aq) + Cl^-(aq)$
B) $NH_4Cl(s) \rightleftharpoons NH_4^+(aq) + Cl^-(aq)$
C) $NaCl(s) \rightleftharpoons Na^+(aq) + Cl^-(aq)$
D) $AgCl(s) \rightleftharpoons Ag^+(aq) + Cl^-(aq)$

13. A 1-gram sample of a compound is added to 100 grams of $H_2O(\ell)$ and the resulting mixture is then thoroughly stirred. Some of the compound is then separated from the mixture by filtration. Based on Table *F*, the compound could be

A) $CaCl_2$ B) $AgCl$ C) $NiCl_2$ D) $NaCl$

14. Paper chromatography can separate the components of a mixture of colored dyes because the components have differences in

A) thermal conductivity   B) decay mode
C) ionization energy   D) molecular polarity

15. According to Table *G*, which substance forms an unsaturated solution when 80. grams of the substance are stirred into 100. grams of H_2O at 10.°C?

A) KNO_3 B) NH_3 C) NaCl   D) KI

16. What is the concentration of a solution, in parts per million, if 0.02 gram of Na_3PO_4 is dissolved in 1000 grams of water?

A) 2 ppm   B) 0.2 ppm
C) 0.02 ppm   D) 20 ppm

17. The solubility of KCl(s) in water depends on the

A) size of the KCl sample
B) temperature of the water
C) pressure on the solution
D) rate of stirring

18. What is the concentration of an aqueous solution that contains 1.5 moles of NaCl in 500 milliliters of this solution?

A) 7.5 M   B) 0.30 M   C) 0.75 M   D) 3.0 M

19. The molarity of an aqueous solution of NaCl is defined as the

A) grams of NaCl per liter of solution
B) moles of NaCl per liter of water
C) grams of NaCl per liter of water
D) moles of NaCl per liter of solution

20. Which substance is most soluble in water?

A) $CaCO_3$ B) $Cu(OH)_2$
C) Ag_2SO_4 D) $(NH_4)_3PO_4$

Base your answers to questions **21** and **22** on the information below and on your knowledge of chemistry.

A student prepares two 141-gram mixtures, *A* and *B*. Each mixture consists of NH₄Cl, sand, and H₂O at 15°C. Both mixtures are thoroughly stirred and allowed to stand. The mass of each component used to make the mixtures is listed in the data table below.

Mass of the Components in Each Mixture

Component	Mixture A (g)	Mixture B (g)
NH_4Cl	40.	10.
sand	1	31
H_2O	100.	100.

21. Describe *one* property of sand that would enable the student to separate the sand from the other components in mixture *B*.

22. Determine the temperature at which all of the NH₄Cl in mixture *A* dissolves to form a saturated solution.

23. Base your answer to the following question on the information below and on your knowledge of chemistry.

Some compounds of silver are listed with their chemical formulas in the table below.

Silver Compounds

Name	Chemical Formula
silver carbonate	Ag_2CO_3
silver chlorate	$AgClO_3$
silver chloride	$AgCl$
silver sulfate	Ag_2SO_4

Identify the silver compound in the table that is most soluble in water.

24. Base your answer to the following question on the information below and on your knowledge of chemistry.

Hydrazine, N_2H_4, is a compound that is very soluble in water and has a boiling point of 113°C at standard pressure. Unlike water, hydrazine is very reactive and is sometimes used as a fuel for small rockets. One hydrazine reaction producing gaseous products is represented by the balanced equation below.

$$N_2H_4(\ell) \rightarrow N_2(g) + 2H_2(g) + heat$$
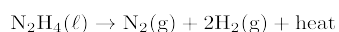
Explain, in terms of molecular polarity, why N_2H_4 is very soluble in water.

25. Base your answer to the following question on the information below.

A total of 1.4 moles of sodium nitrate is dissolved in enough water to make 2.0 liters of an aqueous solution. The gram-formula mass of sodium nitrate is 85 grams per mole.

Determine the molarity of the solution.