Chapter 6-I: Chemistry & Chemical Safety

Student Homework | *Esthetics Program*

Name: _____ **Date:** _____ **Score:** _____ / 50 pts

Section A: Matter, Elements, Atoms & Molecules

The building blocks of chemistry | *Questions 1–10*

Part 1 (Q1–6): Use a word from the WORD BANK below to fill in each blank. Each word is used once.

WORD BANK		
atom	electrons	element
energy	matter	solid, liquid, gas

1. Anything that has mass and occupies space is called _____.

2. The simplest form of matter, which cannot be broken down into a simpler substance by ordinary chemical means, is called an _____.

3. The basic structural unit that makes up an element is called an _____.

4. Subatomic particles that carry a negative charge are called _____.

5. _____ does not occupy space and does not have mass — it is the only thing in the physical world that is NOT matter.

6. The three states of matter are _____, _____, and _____.

Part 2 (Q7–10): Open fill-in — no word bank.

7. When two or more atoms join together chemically, they form a _____.

8. When two or more atoms of the SAME element are joined chemically, they form a(n) _____ molecule.

9. When two or more atoms of DIFFERENT elements are joined chemically, they form a(n) _____ molecule.

10. Match each chemical symbol to its element name. Write the letter on the line.

a. carbon	**b.** hydrogen	**c.** nitrogen	**d.** oxygen

1. ____ O
2. ____ C
3. ____ H
4. ____ N

Section B: Physical & Chemical Changes; Oxidation-Reduction

How matter transforms | *Questions 11–17*

Part 1 (Q11–13): Circle T for True or F for False.

#	Statement	TRUE	FALSE
11	Ice melting into water is a physical change because no new substance is formed — only the state changes.	T	F
12	Iron rusting is a physical change.	T	F
13	Antioxidants in skin care work by neutralizing free radicals, which are unstable molecules created during oxidation.	T	F

Part 2 (Q14–17): Fill in the blank or circle the correct answer.

14. The chemical reaction in which one substance loses oxygen (or electrons) while another substance gains it — happening at the same time — is called _____.

15. A substance that releases oxygen and causes another substance to be oxidized is called a(n) _____ agent.

16. _____ _____ is a common cosmetic example of an oxidizing agent. It is used as an antiseptic and to lighten hair.

17. Which of the following is the BEST description of a chemical change?

- **a)** A change in the physical state, such as freezing
- **b)** A change in size or shape, such as cutting paper
- **c)** A change in which a new substance with new properties is formed
- **d)** A change that can always be reversed by adding heat

Section C: Solutions, Suspensions & Emulsions

How substances mix in cosmetic products | Questions 18–25

Part 1 (Q18–21): Use a word from the WORD BANK below to fill in each blank. Each word is used once.

WORD BANK			
solute	solvent	solution	universal

18. A liquid (or other substance) used to dissolve another substance is called a _____.

19. The substance that gets dissolved (a gas, liquid, or solid that goes INTO solution) is called the _____.

20. When a solute is fully dissolved in a liquid solvent, the result is called a _____.

21. Water is known as the _____ solvent because it dissolves more substances than any other liquid.

Part 2 (Q22–25): Open fill-in or circle the correct answer.

#	Statement	TRUE	FALSE
22	Oil and water are miscible — they mix easily without help.	T	F

23. Calamine lotion is an example of a _____: solid particles are spread (dispersed) throughout a liquid but settle to the bottom over time, so the bottle must be shaken before use.

24. A standard hand or face lotion is an example of a(n) _____-in-_____ emulsion, where small droplets of oil are surrounded by water as the continuous phase.

25. An emulsifier (such as the surfactants in a moisturizer) makes oil and water blend together by:

- **a)** evaporating the oil so only water is left
- **b)** reducing the surface tension between oil and water so they can mix into a stable emulsion
- **c)** chemically converting the oil into water
- **d)** raising the pH of the mixture above 14

Section D: pH, Acids & Alkalis

Measuring the chemistry of skin care | *Questions 26–34*

Q26–34: Fill in the blanks, mark T/F, or circle the correct answer.

26. pH is a measure of _____ and _____ in a substance.

27. The pH scale runs from _____ (most acidic) to _____ (most alkaline).

28. The pH of distilled water is _____, which is considered chemically neutral.

#	Statement	TRUE	FALSE
29	Acids have a pH range from 0 to just below 7 (0–6.9).	T	F
30	Alkalis (also called bases) have a pH range from just above 7 to 14 (7.1–14).	T	F

31. Because the pH scale is logarithmic (each step = a 10× change), a substance with a pH of 9 is how many times more alkaline than a substance with a pH of 7?

- **a)** 2 times
- **b)** 10 times
- **c)** 100 times
- **d)** 1,000 times

32. On the logarithmic pH scale, a reading of 14 indicates the substance is _____.

33. Alkalis are also commonly known as _____.

34. Only products that contain _____ can have a pH measurement.

Section E: Acid/Alkali Reactions & Surfactants

Neutralization and the chemistry of cleansing | *Questions 35–42*

Q35–42: Fill in the blanks, mark T/F, or circle the correct answer.

#	Statement	TRUE	FALSE
35	When an acid and an alkali are mixed in equal proportions, they neutralize each other and produce salt and water.	T	F

36. The substance that allows oil and water to mix or emulsify is called a _____.

37. A surfactant molecule has two ends: a _____ head that loves water, and a _____ tail that loves oil.

38. The word hydrophilic literally means _____-loving.

39. The word lipophilic literally means _____-loving.

40. Detergents — including the cleansing agents in face washes and body washes — are a type of:

- **a)** surfactant
- **b)** emollient
- **c)** antioxidant
- **d)** exfoliant

41. Surfactants reduce the _____ between the skin and the product, allowing the product to spread and cleanse more easily.

#	Statement	TRUE	FALSE
42	Soap is an example of a surfactant.	T	F

Section F: Chemistry in Cosmetic Products & Chemical Safety

Applied chemistry in the treatment room (Milady) │ Questions 43–50

Q43–50: Mixed format. Apply chemistry to product safety and skin care practice.

43. A _____ sunscreen ingredient is an organic compound that absorbs UV radiation, converts it to heat, and releases it from the skin.

44. A _____ sunscreen ingredient (also called a mineral sunscreen) is an inorganic compound that physically reflects or scatters UV radiation off the surface of the skin.

#	Statement	TRUE	FALSE
45	Chemical sunscreens work by absorbing UV radiation, while physical (mineral) sunscreens reflect or scatter UV.	T	F

46. Antioxidants are valuable in skin care products because they:

- **a)** increase the rate of cell turnover and exfoliate dead cells
- **b)** neutralize free radicals produced during oxidation
- **c)** emulsify oil and water to form stable lotions
- **d)** lower the pH of products to make them more acidic

47. A _____ test, in which a small amount of product is applied behind the ear or to the inside of the elbow and then observed, is performed to check for allergic or adverse reactions before full use. The reaction is observed for _____ hours.

48. Buffering agents that stabilize a cosmetic product by adjusting and maintaining its pH are called:

- **a)** chelating agents
- **b)** emulsifiers
- **c)** pH adjusters
- **d)** preservatives

49. List the TWO most important U.S. federal laws that govern cosmetics marketed and sold in the United States:

Law 1: _____

Law 2: _____

50. SCENARIO — During a facial treatment, your client's skin becomes excessively red and they tell you it feels burning. List, in the correct order, the THREE immediate steps you should take to manage the adverse reaction.

Step 1: _____

Step 2: _____

Step 3: _____