

# Example of Flipped Education

تقديم الشرح : الطالب مينا سامح ناجي

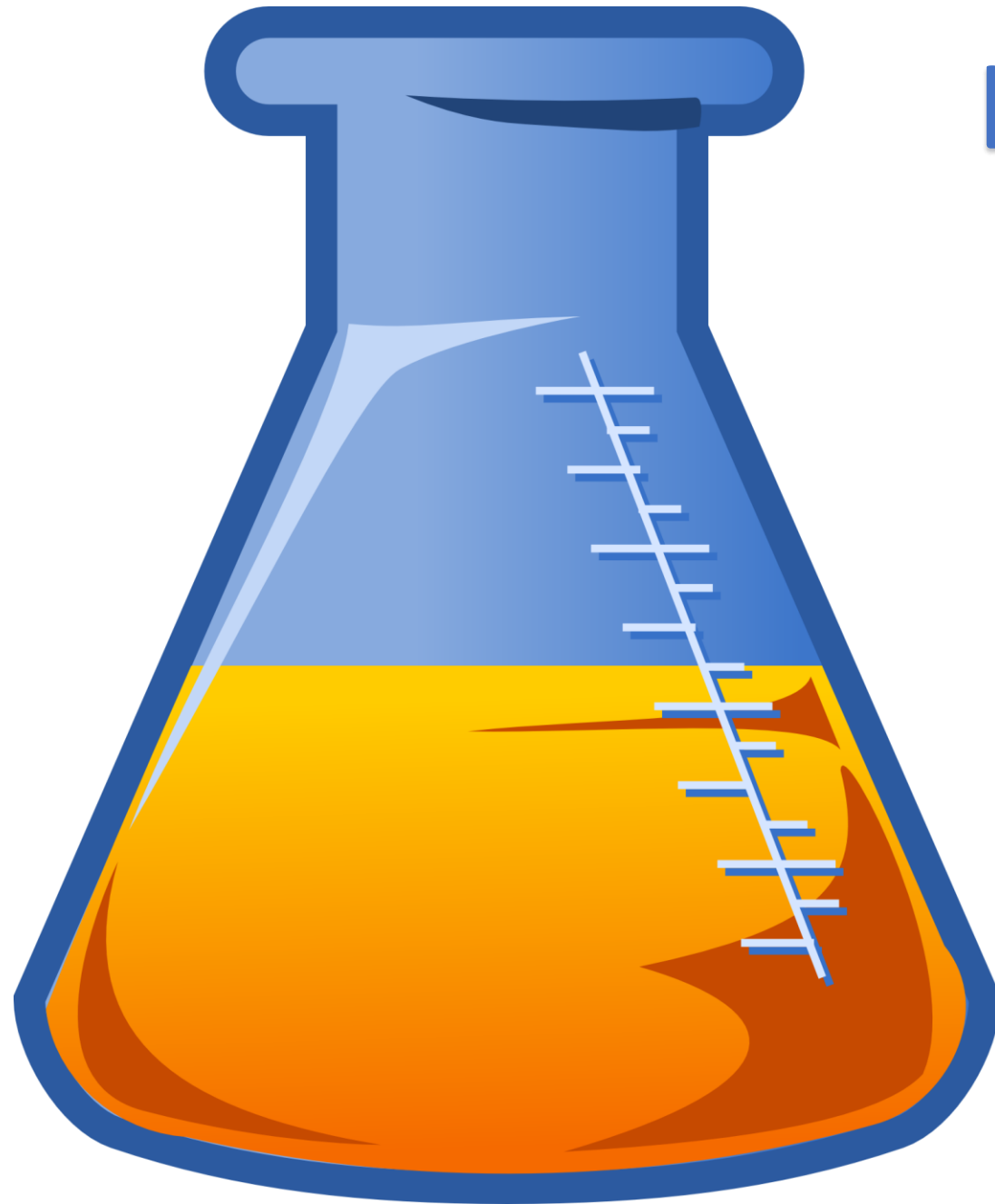
الفرقة الأولى

محاضرة:

**Solubility & Distribution Phenomena**

السبت ٢٣ / ٢٠ / ٢٠٢٣

Solubility



Liquids in  
liquids

# Quick revision

- Cohesive & adhesive forces.
- Kinetic energy and velocity of molecules.
- Internal pressure.
- Polar & Non-polar liquids.
- Boiling point (vaporizing point).
- Critical points of liquids.
- Hydrogen & London bonds.
- Ideal & real solutions.

# Solubility liquid in liquid

## (Miscibility)

Frequently two or more liquids are mixed together in the preparation of pharmaceutical solutions. For example, alcohol is added to water to form hydroalcoholic solutions of various concentrations, volatile oils are mixed with water to form dilute solutions known as aromatic waters, volatile oils are added to alcohol to yield spirits, ether and alcohol are combined in collodions, and various fixed oils are blended into lotions, sprays, and medicated oils.

Alcohols + water = hydroalcoholic solutions

Volatile oils + water = dilute solutions (aromatic waters)



Volatile oils + alcohols = spirits



Ethers + alcohols = collodions



Various of fixed oils are blended into lutions, sprays and medicated oils.



## Liquid-liquid systems may be divided into two categories according to the solubility of the substances in one another:

1. Complete miscibility.
2. Partial miscibility.

## Factors affecting miscibility

1. Nature of solute & solvent. **Like dissolves like**
2. Temperature.
3. Pressure.

# 1. Nature of solute and solvent

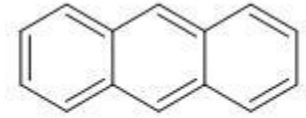
## (LIKE DISSOLVES LIKE)



benzene

Alcohols dissolves in water; both of them are polar.

Benzene dissolves in Anthracene; both of them are non-polar.



anthracene

## 2. Temperature



TEMPERATURE  $\propto$  SOLUBILITY

## 3. Pressure

PRESSURE  $\propto$  SOLUBILITY

(may be neglected)

# Complete miscibility

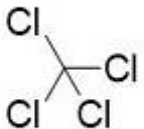
Is the property of two substances to mix in all proportions (that is, to fully dissolve in each other at any concentration) forming a homogenous solution.

For example, water and ethanol are miscible because they mix in all proportions.



benzene

Alcohols or acetones + non-polar solvents such as benzene or carbon tetrachloride = complete miscibility.



tetrachloromethane



By contrast, substances are said to be **immiscible** if there are certain proportions in which the mixture doesn't form a solution.

For example, oil and water are **immiscible**.

## Partial miscibility

- When certain amount of water and ether or water and phenol are mixed, two liquid layers are formed and each of them contains some liquid in the dissolved state.
- Partially miscible liquids are influenced by temperature. In systems such as phenol and water, the solubilities of the two conjugate phases increase with temperature, until at **critical solution temperature**, the compositions are identical. At this temperature a homogenous “single-phase” system is formed.



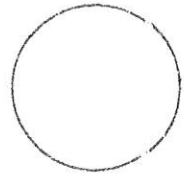
- In some cases, the solubility of some liquid pairs increases as the temperature decreases. The system exhibits a lower critical temperature, below which the two liquids are soluble in all proportions and above which two separate layers formed. Such as [Nicotine and water](#).

**Thanks**

# Formative Questions

## Physical Pharmacy Course

### Lecture ( 3 )



يوسف الحسن  
Student's Name: Yousef Hassan 4/03/2023

Complete:

1- A saturated solution

solution that has dissolved as much solute as it is capable of dissolving

2- The solubility of a drug in polar solvent is due in large measure to

The polarity of the solvent

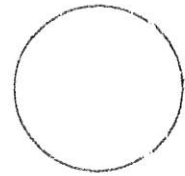
3-dielectric constant of water is ..... 80 ..... and of chloroform is ..... 5 .....

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: celi 8/1/23 4/03/2023

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Complete:

1- A saturated solution

is the solution which enough amount of  
solute that dissolve in the solvents

2- The solubility of a drug in polar solvent is due in large measure to

dipole - dipole interaction (δ+ - δ-)

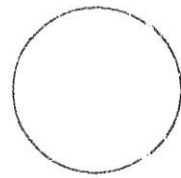
3- dielectric constant of water is ..... 80 ..... and of chloroform is  
..... 5 .....

Tick ✓ of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: مينا محمد ناصح 4/03/2023

Complete:

1- A saturated solution

is the maximum quantity of solute that can completely dissolve in a certain volume of solvent.

2- The solubility of a drug in polar solvent is due in large measure to

large measure of difference between the two positive and negative charge.

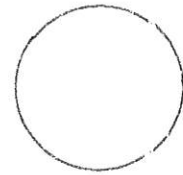
3-dielectric constant of water is 80 and of chloroform is 5

Tick ✓ of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: محمد بن عبد الوهاب 4/03/2023

Complete:

1- A saturated solution

It is a solution has a maximum solute in the solvent

2- The solubility of a drug in polar solvent is due in large measure to

Because the dipole moment

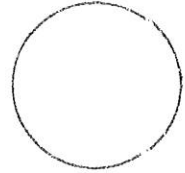
3- dielectric constant of water is ..... 80 ..... and of chloroform is  
..... 9 .....

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect ( X )

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. ( U )

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name أحمد بن محمد بن أحمد بن أسامة 4/03/2023

Complete:

1- A saturated solution

A solution At which we add maximum amount of solute in a solvent at constant temperature.

2- The solubility of a drug in polar solvent is due in large measure to because the drug forms hydrogen bond with polar solvent so the solubility increase «dipole moment forces»

3- dielectric constant of water is ..... 80 ..... and of chloroform is 4

Tick ✓ of X:

1- Branching of the carbon chain increases the nonpolar effect (X).  
due to forming intermolecular forces & the solubility increase ← polar

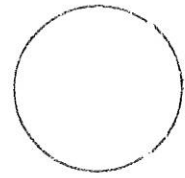
2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve.

→ Standard text books

(4)



Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: فوزان محمد بن محمد الدمشقي 4/03/2023

Complete:

1- A saturated solution

*A solution when all particles of solute dissolved in the solvent, filling all the spaces between them, without any precipitate.*

2- The solubility of a drug in polar solvent is due in large measure to dielectric constant

3- dielectric constant of water is 80 and of chloroform is 5

Tick  $\checkmark$  of X:

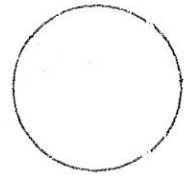
1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve.

*(4)*



Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name zaid b. g. zaid 4/03/2023

Complete:

1- A saturated solution

IS a Chemical Solution containing the maximum conc. of a solute dissolved in the solvent. the additional solute will not dissolve in a saturated solution.

2- The solubility of a drug in polar solvent is due in large measure to

Have large dipole moments and contain bonds between atoms with very different electron negativities

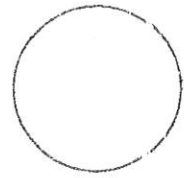
3- dielectric constant of water is 80 and of chloroform is 5

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect ( $\checkmark$ ). X

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. X

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: سولمة عبد الحسین 4/03/2023

Complete:

1- A saturated solution

Solution containing the maximum concentration of a solute dissolved in a solution.

2- The solubility of a drug in polar solvent is due in large measure to

physical and chemical properties of solvent and solute, The Temperature, The Pressure, The pH and state of subdivision of solute.

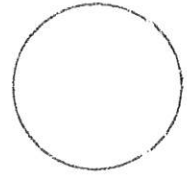
3-dielectric constant of water is ..... 80 ..... and of chloroform is ..... 5 .....

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (X)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: محمد حسن عبدالوارث 4/03/2023

Complete:

1- A saturated solution

is a chemical solution containing the maximum concentration of solute in a solvent. The additional solute will not dissolve in a saturated solution.

2- The solubility of a drug in polar solvent is due in large measure to the solubility hydro bond - dipole moment.

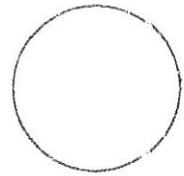
3- dielectric constant of water is 80 and of chloroform is 5

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect ( $\chi$ ).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: Maha Mostafa 4/03/2023

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Complete:

1- A saturated solution  
is a chemical solution containing the maximum concentration of solute dissolved in the solvent.

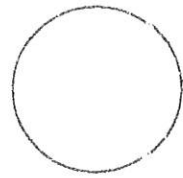
2- The solubility of a drug in polar solvent is due in large measure to  
the solubility of substance also depends on structural features (hydrogen bond - dipole moment)

3- dielectric constant of water is ..... 80 ..... and of chloroform is  
..... 5 .....

Tick  $\checkmark$  of X:

- 1- Branching of the carbon chain increases the nonpolar effect (X).
- 2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (X)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: محمد عبد السلام 4/03/2023

Complete:

1- A saturated solution

A solution that has the ~~most~~ highest degree of <sup>solute</sup> solvent and ~~can't~~ doesn't need more ~~solute~~. If you add more it will make a precipitate as ~~the~~ solution is in equilibrium.

2- The solubility of a drug in polar solvent is due in large measure to

high level of ~~ions~~ Ionization.

3-dielectric constant of water is 80 and of chloroform is 5

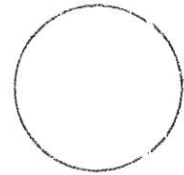
Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (N)



Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name أحمد سليمان 4/03/2023

Complete:

1- A saturated solution

is a chemical solution containing the maximum concentration of solid dissolved in the solvent.

2- The solubility of a drug in polar solvent is due in large measure to

~~high level of~~ hydrogen bond - dipole moment  
- high level of ionization

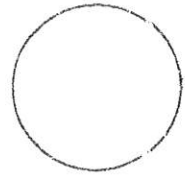
3- dielectric constant of water is ..... 80 ..... and of chloroform is  
..... 5 .....

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (X)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: رنا علاء عبد العليم 4/03/2023

Complete:

1- A saturated solution

solution in which maximum of solvent has been dissolved

2- The solubility of a drug in polar solvent is due in large measure to

because of the polarity of the polar solvent

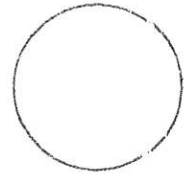
3-dielectric constant of water is .....80..... and of chloroform is  
.....4.....

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: Dr. J. G. Al-Sayid 4/03/2023

Complete:

1- A saturated solution

Complete solubility of solute (maximum solute)

2- The solubility of a drug in polar solvent is due in large measure to

~~pressure & temperature~~  $\Delta H$  to form Hydrogen bond

3- dielectric constant of water is 80 and of chloroform is

4

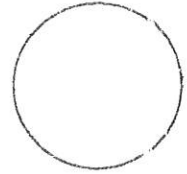
Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. ( $\checkmark$ )



Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: محمد بن عبد الله بن محمد 4/03/2023

Complete:

1- A saturated solution

(whole) certain amount of solute dissolve in whole amount of solvent.

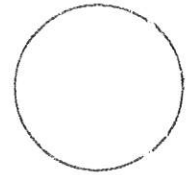
2- The solubility of a drug in polar solvent is due in large measure to dipole moment

3- dielectric constant of water is ..... 80 ..... and of chloroform is ..... 5 .....

Tick ✓ of X:

- 1- Branching of the carbon chain increases the nonpolar effect (✓) ✗
- 2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name مورطان محمد عبد الرحمن 4/03/2023

Complete:

1- A saturated solution

is a solution that have a maximum solute that dissolve in them and if added extra solute that don't dissolve.


2- The solubility of a drug in polar solvent is due in large measure to


.....  
.....

3- dielectric constant of water is ..... 80 ..... and of chloroform is

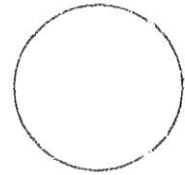
.....

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect ( $\checkmark$ ). 

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. 

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: ياسر كمال أحمد محمد العادل 4/03/2023

Complete:

1- A saturated solution

*A solution that has ~~dissolved~~ dissolved as much solute as it is capable of dissolving. No more solute can be dissolved at a given temperature (contain maximum concentration of solution)*

2- The solubility of a drug in polar solvent is due in large measure to

polarity of the solvent

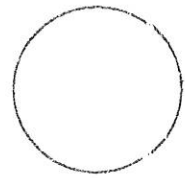
3- dielectric constant of water is ..... 80 ..... and of chloroform is ..... 5 .....

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. ( $\checkmark$ )

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: Nahr Fakhry 4/03/2023  
Etman

Complete:

1- A saturated solution

contain Maximum of concentration of solute

2- The solubility of a drug in polar solvent is due in large measure to

polarity of the solvent

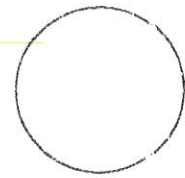
3- dielectric constant of water is ..... 80 ..... and of chloroform is  
..... 5 .....

Tick  $\checkmark$  of X:

1- Branching of the carbon chain increases the nonpolar effect

2- The U.S. Pharmacopeia and National Formulary list the solubility of  
drugs as the number of milliliters of solvent in which 1 gram of solute  
will dissolve.

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: عبدالله بن محمد 4/03/2023

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Complete:

1- A saturated solution

Contain maximum concentration of solute

2- The solubility of a drug in polar solvent is due in large measure to

polarity of the solvent

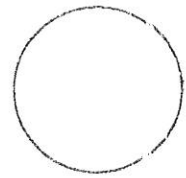
3- dielectric constant of water is ..... 80 ..... and of chloroform is  
..... 5 .....

Tick ✓ of X:

1- Branching of the carbon chain increases the nonpolar effect (X).

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. ✓

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name Nabila Ebrahim Ahmed 4/03/2023

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Complete:

1- A saturated solution

is solution has saturated dissolve complexy  
in solute.

2- The solubility of a drug in polar solvent is due in large measure to

Hydrogen Bonds

3- dielectric constant of water is ..... 80 ..... and of chloroform is  
..... 5 .....

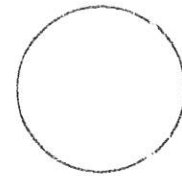
Tick ✓ of X:

1- Branching of the carbon chain increases the nonpolar effect (X).  
*solubility ↑ polar ↑*

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓)



Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: سید آرزو 4/03/2023

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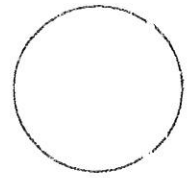
Complete:

- 1- A saturated solution  
A saturated solution that has dissolved as much solute as it is capable of dissolving. In a saturated solution no more solute can be dissolved at a given temperature.
- 2- The solubility of a drug in polar solvent is due in large measure to  
The solubility of a drug is due in large measure to the polarity of the solvent, that is, to its dipole moment. polar solvents dissolve ionic solutes and other polar substances.
- 3- dielectric constant of water is ..... and of chloroform is .....

Tick  $\checkmark$  of X:

- 1- Branching of the carbon chain increases the nonpolar effect (X).
- 2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (4)

Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: Eman Saif ..... 4/03/2023

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Complete:

1- A saturated solution

Solution containing maximum amount of solute and can be dissolved more amount of solvent under conditions ✓

2- The solubility of a drug in polar solvent is due in large measure to

the polarity of solvent ✓

3- dielectric constant of water is ..... 80 ..... and of chloroform is

..... 5 .....

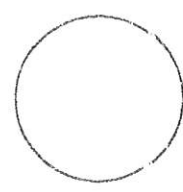
Tick ✓ of X:

1- Branching of the carbon chain increases the nonpolar effect (X). ✓

2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓)



Formative Questions  
Physical Pharmacy Course  
Lecture ( 3 )



Student's Name: Indeer Kamal 4/03/2023

Complete:

- 1- A saturated solution  
A Saturated Solution is a solution that has dissolved as much solute as it is capable of dissolving in a saturated solution no more solute can be dissolved at a given temperature ✓
- 2- The solubility of a drug in polar solvent is due in large measure to  
The solubility of a drug is due in large measure to the polarity of the solvent that is to its dipole moment. Polar solvents dissolve ionic solutes and other polar substance ✓
- 3- dielectric constant of water is .....?..... and of chloroform is Polar substance  
.....?.....

Tick ✓ of X:

- 1- Branching of the carbon chain increases the nonpolar effect (X). ✓
- 2- The U.S. Pharmacopeia and National Formulary list the solubility of drugs as the number of milliliters of solvent in which 1 gram of solute will dissolve. (✓) ✓