

## Example admission test

### Corso di Dottorato in Scienze Molecolari

#### University of Padova

From a database 110 multiple-choice questions (in english) are selected by the computer subdivided in the following topics:

Analytical chemistry	10 questions
Organic chemistry	20 questions
Inorganic chemistry	20 questions
Physical chemistry	20 questions
Pharmaceutical chemistry	20 questions
Pharmaceutical technology	20 questions

The same 110 questions are randomized in a different way for each candidate. Each candidate can freely choose which questions to answer, but should respond to 60 questions in total (no penalty is given for a wrong answer). In case more questions are answered, the first 60 questions will be considered. The correction procedure is computerized and is anonymous. Only after correction the result is associated to the name of the candidate.

On the next pages a representative example of the admission test is given. The correct answers are available in a different file.

Domanda 1 di 110

phch\_12

numero domande con risposta: 0

**Pharmaceutical chemistry**

Which of the following enzymes is responsible for processing HIV proteins during the production of new viruses?

- A Integrase
- B Protease
- C Reverse transcriptase
- D DNA polymerase

Domanda 2 di 110

pht\_13

numero domande con risposta: 0

**Pharmaceutical Technology and Drug Delivery**

Starch is obtained from:

- A. Animal tissues
- B. Crabs
- C. Seaweeds
- D. Corn and other cereals

Domanda 3 di 110

orc\_4

numero domande con risposta: 0

Organic Chemistry - 004

Why is the phenoxy radical (Ph-O<sup>•</sup>) relatively stable?

- A Because there is a large steric hindrance to dimerization
- B Because the spin is delocalized into the aromatic ring
- C Because the oxygen atom is very electronegative
- D Because the O-H bond is very strong

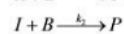
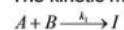
Domanda 4 di 110

phc\_11

numero domande con risposta: 0

**Physical chemistry**

The kinetic mechanism of a chemical reaction is:



Which of the following expression for the rate of the product  $P$  is correct?

- A  $\frac{d[P]}{dt} = -k_1[A][B] + k_2[I][B]$
- B  $\frac{d[P]}{dt} = k_2[I][B]$
- C  $\frac{d[P]}{dt} = -k_2[I][B]$
- D  $\frac{d[P]}{dt} = k_1[A][B] - k_2[I][B]$

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Domanda 5 di 110

inc\_5

numero domande con risposta: 0

**Inorganic Chemistry**

Which of the experiments listed below did *not* provide the information stated about the nature of the atom?

- A) The Rutherford experiment proved that the Thomson "plum pudding" model of the atom was essentially correct.
- B) The Rutherford experiment determined the charge on the nucleus.
- C) Millikan's oil-drop experiment showed that the charge on any particle was a simple multiple of the charge on the electron.
- D) The cathode-ray tube proved that electrons have a negative charge.

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Domanda 6 di 110

pht\_1

numero domande con risposta: 0

**Pharmaceutical Technology and Drug Delivery**

Cyclodextrins are obtained from:

- A. Cellulose
- B. Starch
- C. Hyaluronic acid
- D. Pullulan

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Domanda 7 di 110

phc\_2

numero domande con risposta: 0

**Physical chemistry**

In a closed system, the heat absorbed is equal to the enthalpy variation

- A if pressure is constant
- B in the absence of electrical work
- C at constant pressure and with only work due to volume changes
- D always

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Domanda 8 di 110

inc\_8

numero domande con risposta: 0

**Inorganic Chemistry**

How many protons, neutrons, and electrons does the atom  $^{39}\text{K}$  have?

- A) 19 protons, 19 neutrons, 39 electrons
  - B) 20 protons, 20 neutrons, 19 electrons
  - C) 19 protons, 19 neutrons, 19 electrons
  - D) 19 protons, 20 neutrons, 19 electrons
-

Domanda 9 di 110

phc\_18

numero domande con risposta: 0

**Physical chemistry**

Which of the following statements is untrue? A bimolecular reaction

- A is an elementary reaction, which has two molecules reacting
- B is a second order reaction
- C has a half-life time depending on the initial concentration of the reagents
- D is a reaction mechanism made of two unimolecular reactions

Domanda 10 di 110

anc\_4

numero domande con risposta: 0

**Analytical Chemistry**

A diprotic acid  $H_2A$  having  $pK_1 = 4$ ,  $pK_2 = 8$  is extracted from an aqueous solution with an organic solvent with a partition coefficient  $P=2$ . The distribution coefficient,  $D$ , at  $pH = 6$  is equal to

- A 1/51
- B 1/102
- C 1
- D 2

Domanda 11 di 110

phc\_6

numero domande con risposta: 0

**Physical chemistry**

Which of the following expressions is the isothermal compressibility coefficient?

- A  $-\left(\frac{\partial V}{\partial p}\right)_T$
- B  $-\left(\frac{\partial V}{\partial T}\right)_p$
- C  $-\frac{1}{V}\left(\frac{\partial V}{\partial p}\right)_T$
- D  $-\frac{1}{V}\left(\frac{\partial V}{\partial T}\right)_p$

Domanda 12 di 110

pht\_14

numero domande con risposta: 0

**Pharmaceutical Technology and Drug Delivery**

Starch is formed by units of:

- A. Amino acids
- B. Nucleotides
- C. Sugars
- D. Glycerol

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Domanda 12 di 110

pht\_14

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

Starch is formed by units of:

- A. Amino acids
- B. Nucleotides
- C. Sugars
- D. Glycerol

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Domanda 13 di 110

pht\_6

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

Systemic cyclodextrin toxicity is due to:

- A. High accumulation in the heart
- B. High accumulation in the spleen
- C. Interaction with blood cells and haemolysis
- D. High accumulation in lungs

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Domanda 14 di 110

orc\_9

numero domande con risposta: 0

Two protons have a coupling constant  $J = 6.0$  Hz, measured with a 300-MHz instrument. What would the coupling constant be, if measured with a 600-MHz instrument?

Organic Chemistry - 009

- A 12.0 Hz
  - B Depends on the applied field
  - C The same
  - D 3.0 Hz
-

Domanda 15 di 110

pht\_9

numero domande con risposta: 0

**Pharmaceutical Technology and Drug Delivery**

Cyclodextrins are formed by units of:

- A. Mannitol
- B. Fructose
- C. Galactose
- D. Glucose

Domanda 16 di 110

inc\_17

numero domande con risposta: 0

**Inorganic Chemistry**

What volume of 12.0 M HCl is required to prepare 16.0 L of 0.250 M hydrochloric acid?

A) 130 mL

B) 333 mL

C) 585 mL

D) 768 mL

Domanda 17 di 110

phch\_19

numero domande con risposta: 0

**Pharmaceutical chemistry**

Steroid hormones act:

- A on specific membrane receptors
- B on specific cytoplasmatic receptors
- C by means of non receptor mechanism
- D inhibiting specific enzymes

Domanda 18 di 110

anc\_8

numero domande con risposta: 0

**Analytical Chemistry**

Given a magnetic sector mass analyzer having a radius of curvature,  $r$ , an applied magnetic field,  $B$ , and an acceleration voltage,  $V$ , the  $m/z$  ratio is given by:

A  $\frac{m}{z \cdot e} = \frac{r^2 \cdot B^2}{2 \cdot V}$

B  $\frac{m}{z \cdot e} = \sqrt{\frac{r^2 \cdot B^2}{2 \cdot V}}$

C  $\frac{m}{z \cdot e} = \frac{2 \cdot V}{r^2 \cdot B^2}$

D  $\frac{m}{z \cdot e} = \sqrt{\frac{2 \cdot V}{r^2 \cdot B^2}}$

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Domanda 19 di 110

pht\_12

numero domande con risposta: 0

Starch is a:

- A [Polyaminoacid](#)
- B [Polyvinyl](#)
- C [Polysaccharide](#)
- D [Polyacryl](#)

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Domanda 20 di 110

pht\_7

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

Semisynthetic cyclodextrins are obtained by:

- A. Cleavage of the thoroid ring
- B. Chemical modification of hydroxyl groups
- C. Opening of the glucose units
- D. Polymerization

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Domanda 21 di 110

phc\_1

numero domande con risposta: 0

**Physical chemistry**

Carbon dioxide belongs to the symmetry group

- A  $C_{2v}$
- B  $C_i$
- C  $D_{\infty h}$
- D  $C_{\infty v}$

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Domanda 22 di 110

phc\_13

numero domande con risposta: 0

**Physical chemistry**

The chemical potential of the  $i$ -th component a multicomponent system is equal to

- A  $\left(\frac{\partial U}{\partial n_i}\right)_{S, V, n_{j \neq i}}$
  - B  $\left(\frac{\partial G}{\partial n_i}\right)_{S, V, n_{j \neq i}}$
  - C  $\left(\frac{\partial H}{\partial n_i}\right)_{T, p, n_{j \neq i}}$
  - D  $\left(\frac{\partial U}{\partial n_i}\right)_{T, p, n_{j \neq i}}$
-

Domanda 23 di 110

anc\_3

numero domande con risposta: 0

### Analytical Chemistry

In the time of flight mass analyzer (ToF) the ToF is given by

A  $t = \frac{2 \cdot V \cdot m \cdot L^2}{z \cdot e}$

B  $t = \sqrt{\frac{2 \cdot V \cdot m \cdot L^2}{z \cdot e}}$

C  $t = \sqrt{\frac{m \cdot L^2}{2 \cdot V \cdot z \cdot e}}$

D  $t = \frac{m \cdot L^2}{2 \cdot V \cdot z \cdot e}$

Domanda 24 di 110

phch\_4

numero domande con risposta: 0

### Pharmaceutical chemistry

Choose the histamine precursor:

- A glutamic acid
- B choline
- C tyrosine
- D histidine

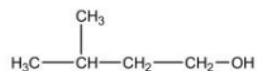
Domanda 25 di 110

orc\_13

numero domande con risposta: 0

Organic Chemistry - 013

How many non-equivalent signals will be observed in the  $^1\text{H}$  NMR spectrum of the following compound?



- A Five
- B Six
- C Four
- D Eight

Domanda 26 di 110

orc\_19

numero domande con risposta: 0

Organic Chemistry - 019

What are the multiplicities of the proton signals in the  $^1\text{H}$  NMR spectrum of *n*-butyl bromide?



(a) (b) (c) (d)

- A (a) triplet; (b) quartet; (c) quartet; (d) triplet
- B (a) triplet; (b) quintet; (c) quintet; (d) doublet
- C (a) triplet; (b) quartet; (c) multiplet; (d) triplet
- D (a) triplet; (b) sextet; (c) quintet; (d) triplet



Domanda 27 di 110

phc\_16

numero domande con risposta: 0

**Physical chemistry**

At a given pressure, the standard entropy of fusion of a substance is related to its fusion temperature according to the expression

- A  $T_{fus} \Delta S_{fus} = \Delta H_{fus}$   
B  $T_{fus} \Delta H_{fus} = \Delta S_{fus}$   
C  $\Delta S_{fus} = \Delta H_{fus}$   
D  $T_{fus} / \Delta H_{fus} = \Delta S_{fus}$

Domanda 28 di 110

anc\_9

numero domande con risposta: 0

**Analytical Chemistry**

What of the following properties is not a requirement of a secondary standard:

- A 100% purity  
B known stoichiometry  
C stability in solution  
D colorless

Domanda 29 di 110

orc\_6

numero domande con risposta: 0

Organic Chemistry - 006

What is the most important reaction pathway followed by free-radical reactions?

- A Electrophilic addition  
B Chain reaction  
C Nucleophilic substitution  
D Electrophilic substitution

Domanda 30 di 110

orc\_10

numero domande con risposta: 0

Organic Chemistry - 010

Two protons resonate at 100 and 500 Hz from TMS, respectively, in a 300-MHz instrument. What would the resonance frequencies be, if measured with a 600-MHz instrument?

- A 50 and 250 Hz  
B 200 and 1000 Hz  
C Depends on the coupling constant  
D The same

Domanda 31 di 110

orc\_2

numero domande con risposta: 0

Organic Chemistry - 002

Arrange the following free radicals: allyl ( $\text{CH}_2=\text{CH}-\text{CH}_2^\cdot$ ), methyl ( $\text{CH}_3^\cdot$ ), *t*-butyl ( $(\text{CH}_3)_3\text{C}^\cdot$ ) and phenyl (Ph $^\cdot$ ) in the order of decreasing stability (first more stable, last less stable).

- A allyl > *t*-butyl > methyl > phenyl  
B allyl > phenyl > *t*-butyl > methyl  
C phenyl > allyl > *t*-butyl > methyl  
D phenyl > *t*-butyl > methyl > allyl

Domanda 32 di 110

phch\_13

numero domande con risposta: 0

### Pharmaceutical chemistry

Prodrugs are:

- A placebo
- B active drugs that are inactivated by biotransformation
- C inactive drugs that are activated by biotransformation
- D homeopathic drugs

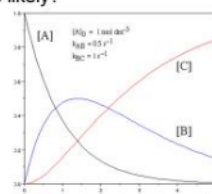
Domanda 33 di 110

phc\_3

numero domande con risposta: 0

### Physical chemistry

Three molecular species A, B and C have concentrations evolving in time in a closed reactor according to the following diagram; which of the following mechanisms A, B, C, or D is more likely?



- A  $A \rightarrow B \rightarrow C$
- B  $A \rightarrow B \rightarrow C$
- C  $A \rightarrow B \rightarrow C$
- D  $A \rightarrow B \rightarrow C$

Domanda 34 di 110

pht\_3

numero domande con risposta: 0

### Pharmaceutical Technology and Drug Delivery

Cyclodextrins core is:

- A. Hydrophobic
- B. Hydrophilic
- C. Amphiphilic (both hydrophobic and hydrophilic)
- D. Neither hydrophobic nor hydrophilic

Domanda 35 di 110

phc\_9

numero domande con risposta: 0

### Physical chemistry

In order for the Clausius-Clapeyron equation to be valid, the following condition must necessarily hold

- A the molar volume of the vapor should be much greater than the molar volume of the liquid
- B condition A and the vapor should behave as a perfect gas
- C conditions A, B and the enthalpy of vaporization should be temperature independent
- D condition A, B, C and thermal capacity at constant pressure of the liquid should be constant

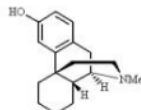
Domanda 36 di 110

phch\_5

numero domande con risposta: 0

**Pharmaceutical chemistry**

Choose the class to which levorphanol belongs:



- A Benzomorphans
- B 4-Phenylpiperidines
- C Morphinans
- D Enkephalins

Domanda 37 di 110

phc\_7

numero domande con risposta: 0

**Physical chemistry**

In ordinary conditions, the diamond, from a thermodynamic point of view, is a metastable phase with respect to graphite, because its chemical potential

- A is greater
- B is smaller
- C has a smaller modulus
- D has a positive sign

Domanda 38 di 110

phch\_2

numero domande con risposta: 0

**Pharmaceutical chemistry**

Cimetidine and ranitidine are used in antiulcer therapy because they:

- A inactivate H<sup>+</sup>, K<sup>+</sup>-ATPase on the wall cells of the gastric mucosa
- B are H<sub>2</sub> histamine antagonists
- C are H<sub>1</sub> histamine antagonists
- D stimulate the secretion of mucus

Domanda 39 di 110

inc\_19

numero domande con risposta: 0

**Inorganic Chemistry**

If a student needs to make a 0.10 M solution of NaHCO<sub>3</sub> how many milliliters of solution can be made using a 0.35 g sample of NaHCO<sub>3</sub>?

A) 3.5 mL

B) 4.20 mL

C) 35 mL

D) 42 mL

Domanda 40 di 110

inc\_9

numero domande con risposta: 0

### Inorganic Chemistry

Which of the following formulas is *not* correct?

- A)  $\text{ZnSO}_3$
- B)  $\text{Ba}(\text{OH})_2$
- C)  $\text{LiO}$
- D)  $\text{KF}$

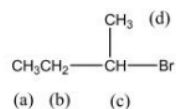
Domanda 41 di 110

orc\_18

numero domande con risposta: 0

Organic Chemistry - 018

What are the multiplicities of the proton signals in the  $^1\text{H}$  NMR spectrum of *sec*-butyl bromide?



- A (a) triplet; (b) quartet; (c) doublet; (d) doublet
- B (a) triplet; (b) quintet; (c) sextet; (d) doublet
- C (a) triplet; (b) quartet; (c) quartet; (d) doublet
- D (a) triplet; (b) quintet; (c) quartet; (d) doublet

Domanda 42 di 110

pht\_15

numero domande con risposta: 0

### Pharmaceutical Technology and Drug Delivery

Starch is used in tablets as:

- A. Diluent
- B. Sweetener
- C. Colouring agent
- D. Flavouring

Domanda 43 di 110

inc\_10

numero domande con risposta: 0

### Inorganic Chemistry

What is the correct formula for calcium phosphate?

- A)  $\text{CaPO}_4$
- B)  $\text{Ca}_3(\text{PO}_4)_2$
- C)  $\text{Ca}_2(\text{PO}_4)_3$
- D)  $\text{Ca}_3\text{PO}_4$

Domanda 44 di 110

pht\_10

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

Cyclodextrins are used in pharmaceutical products as:

- A. Excipients for drug dissolution
- B. Anticancer drugs
- C. Antihypertensive
- D. Detoxifying products

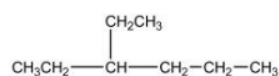
Domanda 45 di 110

orc\_15

numero domande con risposta: 0

Organic Chemistry - 015

How many non-equivalent signals will be observed in the  $^1\text{H}$  NMR spectrum of the following compound?



- A Five
- B Six
- C Twelve
- D Eight

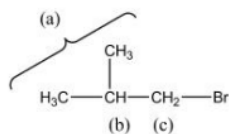
Domanda 46 di 110

orc\_17

numero domande con risposta: 0

Organic Chemistry - 017

What are the multiplicities of the proton signals in the  $^1\text{H}$  NMR spectrum of isobutyl bromide?



- A (a) doublet; (b) septet; (c) triplet
- B (a) singlet; (b) septet; (c) doublet
- C (a) doublet; (b) multiplet; (c) doublet
- D (a) doublet; (b) septet; (c) doublet

Domanda 47 di 110

pht\_4

numero domande con risposta: 0

Physical chemistry

Ideal gases in isothermal processes will not change their

- A molar volume
- B enthalpy
- C entropy
- D chemical potential

Domanda 48 di 110

pht\_5

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

Renal cyclodextrin toxicity is due to:

- A. Poor solubility with precipitation in the kidney
- B. Activation of apoptotic processes
- C. Interfering with ATPase activity
- D. Polymerization in the kidney

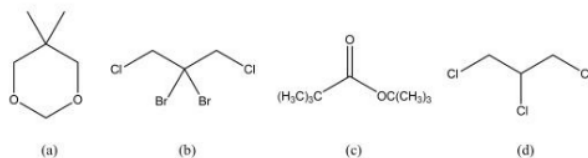
Domanda 49 di 110

orc\_16

numero domande con risposta: 0

Organic Chemistry - 016

Which of the following molecules will exhibit only one signal (a singlet) in its  $^1\text{H}$  NMR spectrum?



- A (a)
- B (b)
- C (c)
- D (d)

Domanda 50 di 110

phc\_19

numero domande con risposta: 0

#### Physical chemistry

For a zero order chemical reaction  $A \rightarrow P$  ongoing in a closed reactor, if  $[A]_0$  is the initial concentration and  $[A]$  is the concentration at time  $t$  of reagent A, the following relation holds

- A  $[A] = kt[A]_0$
- B  $[A] = [A]_0 - kt$
- C  $[A] = [A]_0$
- D  $[A] = 0$

Domanda 51 di 110

anc\_5

numero domande con risposta: 0

#### Analytical Chemistry

A diprotic weak acid  $\text{H}_2\text{A}^*$  has to be extracted from an aqueous solution with an organic solvent. It is better extracted when the pH of the aqueous solution is

- A larger than the  $\text{pK}_2$
- B lower than the  $\text{pK}_1$
- C between the two  $\text{pK}'\text{s}$
- D none of the above

Domanda 52 di 110

anc\_10

numero domande con risposta: 0

#### Analytical Chemistry

In the presence of matrix effect the best calibration procedure is:

- A External calibration
- B Internal calibration
- C Internal standard calibration
- D None of the above reported

Domanda 53 di 110

phc\_17

numero domande con risposta: 0

**Physical chemistry**

For the reaction  $2\text{NOBr(g)} \rightarrow 2\text{NO(g)} + \text{Br}_2\text{(g)}$ , the reaction rate can be defined as

- A  $v = -\frac{d[\text{NOBr}]}{dt}$   
B  $v = -\frac{1}{2} \frac{d[\text{NOBr}]}{dt}$   
C  $v = -2 \frac{d[\text{NOBr}]}{dt}$   
D  $v = -\left(\frac{d[\text{NOBr}]}{dt}\right)^2$

Domanda 54 di 110

phc\_5

numero domande con risposta: 0

**Physical chemistry**

Adding a solute to a solvent will decrease the crioscopic point

- A always  
B never  
C in the absence of solid solutions  
D if the liquid phase is an ideal solution

Domanda 55 di 110

inc\_15

numero domande con risposta: 0

**Inorganic Chemistry**

What volume of 5.45 M potassium hydroxide is required to prepare 61.8 mL of 0.580 M KOH?

- 

Domanda 56 di 110

phc\_10

numero domande con risposta: 0

**Physical chemistry**

The variance of water at the triple point is

- A zero  
B one  
C two  
D three

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Domanda 57 di 110

inc\_18

numero domande con risposta: 0

**Inorganic Chemistry**

What volume of 0.438 M barium nitrate is needed to prepare 251 mL of a solution that is 0.244 M in nitrate?

A)  $1.40 \times 10^2$  mL

B)  $6.99 \times 10^2$  mL

C)  $2.80 \times 10^2$  mL

D)  $4.66 \times 10^2$  mL

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Domanda 58 di 110

phch\_17

numero domande con risposta: 0

**Pharmaceutical chemistry**

Naloxone administered to healthy and non addicted men determines:

- A analgesia
  - B nausea and emesis
  - C generally no effect
  - D insomnia
- 

Domanda 59 di 110

inc\_11

numero domande con risposta: 0

**Inorganic Chemistry**

Which of the following is *not* the correct name for the formula given?

A)  $\text{Cr}_2\text{O}_3$  chromium(III) oxide

B)  $\text{NCl}_3$  nitrogen trichloride

C)  $\text{CuO}$  copper(II) oxide

D)  $\text{CaSO}_4$  calcium sulfite

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Domanda 60 di 110

phc\_15

numero domande con risposta: 0

**Physical chemistry**

The molar heat capacity at constant volume of a chemical compound is defined as the infinitesimal variation of the

- A internal energy for an infinitesimal variation of the temperature, at constant pressure, per mole of substance
- B Gibbs energy for an infinitesimal variation of the temperature, at constant pressure, per mole
- C internal energy for an infinitesimal variation of the temperature, at constant volume, per mole
- D internal energy for an infinitesimal variation of the temperature, at constant pressure, per gram

Domanda 61 di 110

orc\_5

numero domande con risposta: 0

Organic Chemistry - 005

What is the product of the addition of HBr to 1-butene in the presence of peroxides?

- A 1,2-Dibromobutane
- B No reaction
- C 1-Bromobutane
- D 2-Bromobutane

Domanda 62 di 110

pht\_20

numero domande con risposta: 0

**Pharmaceutical Technology and Drug Delivery**

In capsule preparation, which plasticizer is commonly used:

- A. Glycerol
- B. Magnesium stearate
- C. Sodium carbonate
- D. Ethylene glycol

Domanda 63 di 110

phc\_8

numero domande con risposta: 0

**Physical chemistry**

Which of the following parameters does not change during a reversible phase transformation at constant pressure in a one-component system?

- A enthalpy
- B entropy
- C Helmholtz free energy
- D Gibbs free energy

Domanda 64 di 110

phch\_11

numero domande con risposta: 0

**Pharmaceutical chemistry**

Irinotecan is:

- A a prodrug
- B an active metabolite of camptothecin
- C a dual inhibitor of topoisomerase
- D a natural product

Domanda 65 di 110

pht\_18

numero domande con risposta: 0

**Pharmaceutical Technology and Drug Delivery**

Natural cellulose is:

- A. Insoluble
- B. Insoluble
- C. Soluble only in ether
- D. Soluble only at pH 6.5

Domanda 66 di 110

anc\_2

numero domande con risposta: 0

**Analytical Chemistry**

The Van Deemter equation describes

- A The variation of the theoretical equivalent plate height with time
- B The variation of the theoretical equivalent plate height with space
- C The variation of the theoretical equivalent plate height with the eluent linear velocity
- D The variation of the theoretical equivalent plate height with resolution

Domanda 67 di 110

phch\_20

numero domande con risposta: 0

**Pharmaceutical chemistry**

Which of the following antitumor drugs is NOT an alkylating agent?

- A Nitrosoureas
- B Cyclophosphamide
- C Mytomycin C
- D 5-Fluorouracyl

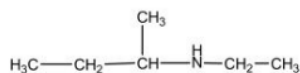
Domanda 68 di 110

orc\_14

numero domande con risposta:

Organic Chemistry - 014

How many non-equivalent signals will be observed in the <sup>1</sup>H NMR spectrum of the following compound?



- A Five
- B Six
- C Four
- D Seven

Domanda 69 di 110

phch\_18

numero domande con risposta: 0

**Pharmaceutical chemistry**

The adrenergic receptors are:

- A porin receptors
- B transmembrane receptors
- C nuclear receptors
- D ion channels

Domanda 70 di 110

phch\_16

numero domande con risposta: 0

**Pharmaceutical chemistry**

Protein kinase involved in signal transduction pathways are:

- A enzymes which catalyse the formation of second messenger cAMP
- B proteins which regulate the action of other proteins by phosphorylation
- C receptors for antiarrhythmic drugs of the quinidine-type
- D enzymes which catalyse the formation of second messenger cGMP

Domanda 71 di 110

anc\_1

numero domande con risposta: 0

**Analytical Chemistry**

The chromatographic resolution is defined as :

- A  $R = \frac{\alpha + 1}{\alpha - 1} \cdot \frac{\bar{k}'}{\bar{k}' + 1} \cdot \frac{\sqrt{N}}{2}$
- B  $R = \frac{\alpha - 1}{\alpha + 1} \cdot \frac{\bar{k}'}{\bar{k}' + 1} \cdot \frac{\sqrt{N}}{2}$
- C  $R = \frac{\alpha - 1}{\alpha + 1} \cdot \frac{\bar{k}'}{\bar{k}' + 1} \cdot \frac{\sqrt{N}}{4}$
- D  $R = \frac{\alpha - 1}{\alpha + 1} \cdot \frac{\bar{k}' + 1}{\bar{k}'} \cdot \frac{\sqrt{N}}{4}$

Domanda 72 di 110

phch\_1

numero domande con risposta: 0

**Pharmaceutical chemistry**

Which kind of bond is less involved in the drug-receptor interaction?

- A covalent
- B ionic
- C hydrogen
- D hydrophobic

Domanda 73 di 110

phch\_15

numero domande con risposta: 0

**Pharmaceutical chemistry**

Sulfonamide action rests on:

- A pKa
- B planarity
- C hydrophobicity
- D chirality

Domanda 74 di 110

phch\_3

numero domande con risposta: 0

**Pharmaceutical chemistry**

Celecoxib is:

- A a monoclonal antibody
- B a steroid anti inflammatory agent
- C a selective cyclooxygenase inhibitor
- D an aryl propionic derivative belonging to NSAID class of drugs

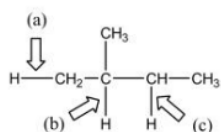
Domanda 75 di 110

orc\_3

numero domande con risposta: 0

Organic Chemistry - 003

Arrange the C–H bonds indicated by arrows in the order of decreasing stability of the alkyl radical formed by hydrogen abstraction (i.e. increasing bond strength).



- A (b) > (a) > (c)
- B (b) > (c) > (a)
- C (a) > (c) > (b)
- D No difference

Domanda 76 di 110

anc\_6

numero domande con risposta: 0

#### Analytical Chemistry

For a size exclusion chromatography column having a pore volume  $V_p$ , the retention volume is given by

- A  $V_r = V_0 + c \cdot V_p$  with  $1 < c < 2$
- B  $V_r = V_0 (1 + c \cdot V_p)$  with  $1 < c < 2$
- C  $V_r = V_p (1 + c \cdot k')$  with  $0 < c < 1$
- D  $V_r = V_0 + c \cdot V_p$  with  $0 < c < 1$

Domanda 77 di 110

inc\_20

numero domande con risposta: 0

#### Inorganic Chemistry

Consider five solutions that all have the same mass of solute in 100.0 mL of solution. Which has the highest concentration as measured in molarity?

A) KCl

B) NaCl

C)  $\text{Na}_2\text{SO}_4$

D) NaF

Domanda 78 di 110

inc\_3

numero domande con risposta: 0

#### Inorganic Chemistry

When 3.0 L of hydrogen gas ( $\text{H}_2$ ) reacts with 1.0 L of nitrogen gas ( $\text{N}_2$ ), 2.0 L of gaseous product is formed. All volumes of gases are measured at the same temperature and pressure. What is the formula of the product?

- A)  $\text{N}_3\text{H}$
- B)  $\text{NH}_3$
- C)  $\text{NH}_4$
- D) NH

---

Domanda 79 di 110

phch\_8

numero domande con risposta: 0

**Pharmaceutical chemistry**

Once activated, the proton pump inhibitors bind to exposed amino acids in the proton pump. Which amino acid is involved?

- A serine
- B cysteine
- C lysine
- D tyrosine

---

Domanda 80 di 110

pht\_4

numero domande con risposta: 0

**Pharmaceutical Technology and Drug Delivery**

Cyclodextrin shape is:

- A. Spherical
- B. Cubic
- C. Square
- D. Toroid (truncated cone)

---

Domanda 81 di 110

inc\_12

numero domande con risposta: 0

**Inorganic Chemistry**

A 14.4-g sample of HF is dissolved in water to give  $3.1 \times 10^2$  mL of solution. The concentration of the solution is

A) 4.6 M

B) 4.5 M

C) 0.22 M

D) 2.3 M

---

Domanda 81 di 110

inc\_12

numero domande con risposta: 0

**Inorganic Chemistry**

A 14.4-g sample of HF is dissolved in water to give  $3.1 \times 10^2$  mL of solution. The concentration of the solution is

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C) 0.22 M

D) 2.3 M

---

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Domanda 82 di 110

pht\_8

numero domande con risposta: 0

**Pharmaceutical Technology and Drug Delivery**

The main biopharmaceutical use of cyclodextrins are used for:

- A. As plasticizers in capsules
- B. As sweeteners
- C. As lubricants in powder manipulation
- D. Enhance the solubility of poorly soluble drugs

---

Domanda 83 di 110

anc\_7

numero domande con risposta: 0

**Analytical Chemistry**

In a flame ionization detector (FID) the flame is produced by the combustion of hydrogen with air because:

- A the flame does not produce charges so that the background current is low
- B the flame is quite cold so that the produced background current is low
- C the flame produces a large amount of electrons so that the current is large
- D the flame is very hot so that analytes are easily decomposed

---

Domanda 84 di 110

inc\_4

numero domande con risposta: 0

**Inorganic Chemistry**

Which one of the following statements about atomic structure is false?

- A) The electrons occupy a very large volume compared to the nucleus.
- B) Almost all of the mass of the atom is concentrated in the nucleus.
- C) The protons and neutrons in the nucleus are very tightly packed.
- D) The number of protons and the number of neutrons are always the same in the neutral atom.

---

Domanda 85 di 110

phc\_12

numero domande con risposta: 0

**Physical chemistry**

The chemical potential of the  $i$ -th component a multicomponent system is

- A the partial molar enthalpy of the component
  - B the molar Gibbs energy of the system
  - C the partial molar internal energy of the component
  - D the partial molar Gibbs energy of the component
-

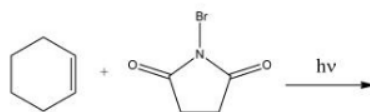
Domanda 86 di 110

orc\_7

numero domande con risposta: 0

What is the product of the following reaction?

Organic Chemistry - 007



Domanda 87 di 110

phch\_14

numero domande con risposta: 0

#### Pharmaceutical chemistry

Choose the WRONG statement regarding the characteristics of a good protein target for antiviral drugs:

- A It should be important to the life cycle of the virus
- B It should bear little resemblance to human proteins
- C It should be common to different types of virus
- D It should be important in the late stages of the virus life cycle

Domanda 88 di 110

phc\_20

numero domande con risposta: 0

#### Physical chemistry

Water decomposes according to the reaction  $\text{H}_2\text{O}(\text{g}) \rightleftharpoons 1/2\text{O}_2(\text{g}) + \text{H}_2(\text{g})$ . At 2300 K and 1 bar the equilibrium constant is  $K=2.08 \times 10^{-3}$ . A system contains initially one mole of water and no oxygen and hydrogen; after decomposition takes place and the system has reached equilibrium, which of the following statements is certainly false?

- A the moles of oxygen and hydrogen are equal
- B there is less than one mole of water left
- C the moles of hydrogen are more than the moles of oxygen
- D the sum of the moles of water plus twice the moles of oxygen is one

Domanda 89 di 110

phch\_9

numero domande con risposta: 0

#### Pharmaceutical chemistry

Which is the main therapeutic use of natural galanthamine?

- A  $\beta$ -antagonist
- B antiemetic
- C anti Alzheimer
- D antidepressant

Domanda 90 di 110

inc\_7

numero domande con risposta: 0

**Inorganic Chemistry**

The element rhenium (Re) exists as two stable isotopes and 18 unstable isotopes. Rhenium-185 has in its nucleus

- A) 75 protons, 75 neutrons.
- B) 75 protons, 130 neutrons.
- C) 130 protons, 75 neutrons.
- D) 75 protons, 110 neutrons.

Domanda 91 di 110

orc\_1

numero domande con risposta: 0

Organic Chemistry - 001

What is the geometry of the methyl radical?

- A) Tetrahedral
- B) Planar trigonal
- C) Pyramidal
- D) Planar T-shaped

Domanda 92 di 110

inc\_2

numero domande con risposta: 0

**Inorganic Chemistry**

Which of the following pairs of compounds can be used to illustrate the law of multiple proportions?

- A)  $\text{NF}_3$  and  $\text{NCl}_3$
- B)  $\text{ZnO}$  and  $\text{ZnCl}_2$
- C)  $\text{H}_2\text{O}$  and  $\text{HCl}$
- D)  $\text{SO}_2$  and  $\text{SO}_3$

Domanda 93 di 110

orc\_20

numero domande con risposta: 0

Organic Chemistry - 020

An unknown compound has raw formula  $\text{C}_2\text{H}_3\text{Cl}_3$ . Its  $^1\text{H}$  NMR spectrum is:  $\delta$  3.91 (doublet, 2H); 5.75 (triplet, 1H). What is its structure?

- A) 1,2-dichloroethane
- B) trichloroethylene
- C) 1,1,1-trichloroethane
- D) 1,1,2-trichloroethane



---

Domanda 94 di 110

pht\_11

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

The most common cyclodextrins and less soluble cyclodextrins are:

- A. Alpha
- B. Beta
- C. Gamma
- D. Delta

---

Domanda 95 di 110

pht\_17

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

Cellulose is formed by glucose units with:

- A. 1-4 alpha bonds
- B. 1-4 beta bonds
- C. 1-6 alpha bonds
- D. 1-6 beta bonds

---

Domanda 96 di 110

pht\_16

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

Starch is:

- A. Hydrophobic
- B. Amphiphilic (both hydrophilic and hydrophobic)
- C. Neither hydrophilic nor hydrophobic
- D. Hydrophilic

---

Domanda 97 di 110

pht\_19

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

The cellulose insolubility is due to:

- A. Presence of Ca<sup>2+</sup> and Mg<sup>2+</sup>
- B. Hydrogen bond formation
- C. Intermolecular covalent bonds
- D. None of these reason

---

Domanda 98 di 110

phc\_14

numero domande con risposta: 0

**Physical chemistry**

In a generic concentration electrochemical cell:  $M | M^+(aq,L) || M^+(aq,R) | M$  (L and R identify solutions at the two electrodes), the standard cell potential is

- A always positive
  - B always negative
  - C always zero
  - D dependent upon the chemical composition of the solutions at the electrodes
-

Domanda 99 di 110

inc\_16

numero domande con risposta: 0

**Inorganic Chemistry**

How much water must be added to 20.0 mL of a 9.50 M sulfuric acid solution to make a 0.480 solution?

A) 81.0 mL

B) 101 mL

C) 376 mL

D) 396 mL

Domanda 100 di 110

inc\_14

numero domande con risposta: 0

**Inorganic Chemistry**

What volume of 2.0 M HCl can be prepared from 2.00 L of 9.00 M HCl?

A) 444 mL

B) 2.25 L

C) 4.50 L

D) 9.00 L

Domanda 101 di 110

phch\_7

numero domande con risposta: 0

**Pharmaceutical chemistry**

Androstane is the reference hydrocarbon for androgens. The number of C atoms of its scaffold is:

A 19

B 27

C 24

D 21

Domanda 102 di 110

orc\_11

numero domande con risposta: 0

Organic Chemistry - 011

A mixture of acetonitrile and chloroform was analyzed by  $^1\text{H}$  NMR. The integrated areas of the signals are in a 1:1 ratio. What is the acetonitrile:chloroform molar ratio?

A 1:1

B 3:1

C 1:3

D 1:2

Domanda 103 di 110

inc\_6

numero domande con risposta: 0

**Inorganic Chemistry**

Which of the following atomic symbols is incorrect?

- A)  $^{20}_{10}\text{Ne}$
- B)  $^{32}_{16}\text{S}$
- C)  $^{28}_{14}\text{Si}$
- D)  $^{13}_8\text{C}$

Domanda 104 di 110

orc\_12

numero domande con risposta: 0

Organic Chemistry - 012

What are the multiplicities of protons in the  $^1\text{H}$  NMR spectrum of  $\text{Cl}-\text{CH}_2-\text{CHBr}_2$  ?

- A Both are triplets
- B A doublet and a triplet
- C Both are doublets
- D A triplet and a quartet

Domanda 105 di 110

phch\_6

numero domande con risposta: 0

**Pharmaceutical chemistry**

Choose the two main targets currently used in anti-HIV therapy:

- A Reverse transcriptase and protease
- B Protease and integrase
- C The viral glycoproteins gp120 and gp41
- D None of the above

Domanda 106 di 110

inc\_13

numero domande con risposta: 0

**Inorganic Chemistry**

The concentration of a 228.0 mL sample of a calcium chloride solution is 0.278 M. What is the mass of solute

- A) 4.79 g
- B) 7.03 g
- C) 135 g
- D) 30.9 g

---

Domanda 107 di 110

orc\_8

numero domande con risposta: 0

Organic Chemistry - 008

Two protons have chemical shifts of  $\delta = 1.0$  and  $5.0$  ppm, respectively, measured with a 300-MHz instrument. What would the chemical shifts be, if measured with a 600-MHz instrument?

- A 2.0 and 10.0 ppm
- B 0.5 and 2.5 ppm
- C Depends on the applied field
- D The same

---

Domanda 108 di 110

inc\_1

numero domande con risposta: 0

**Inorganic Chemistry**

According to the law of definite proportions

- A) if the same two elements form two different compounds, they do so in the same ratio.
- B) it is not possible for the same two elements to form more than one compound.
- C) the ratio of the masses of the elements in a compound is always the same.
- D) the total mass after a chemical change is the same as before the change.

---

Domanda 109 di 110

phch\_10

numero domande con risposta: 0

**Pharmaceutical chemistry**

Immunoglobulins are:

- A macrophages
- B plasma cells
- C lymphocytes
- D antibodies

---

Domanda 110 di 110

pht\_2

numero domande con risposta: 0

Pharmaceutical Technology and Drug Delivery

Starch structure is:

- A. Linear (bonds 1-4 only)
  - B. Branched (bonds 1-6)
  - C. Mixed branched and linear (both bonds 1-4 and 1-6)
  - D. Neither branched nor linear
-