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THE TASKS FOR SELF-CONTROL OF KNOWLEDGE OF STUDENTS ON THE TOPIC «VOLUMETRIC ANALYSIS. TITRATION» ON DISCIPLINE «GENERAL CHEMISTRY» IN MEDICAL UNIVERSITY

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For the organization of independent work of students we prepared methodical instructions on discipline «General chemistry». Methodical instructions to each lesson include: the methodical indicatings and references, which acquaint the students with a theme and purpose of lesson, brief substantiation of the medicobiological importance of a theme for the student, program questions and question for self-preparation with the indicating of the literature. Organization of training of students to practicalclassesin the discipline «General chemistry» includes tasks for self-control of knowledge and skills.

In this article we want to present a tasks for self-control of knowledge of students on the topic «Volumetric analysis. Titration». The volumetric analysis is one of prime and accessible expedients of reception of the chemical information. It is applied in clinical biochemistry to diagnostics of series of pathological states. In biochemical, physiological, sanitary-hygienic and etc. laboratories for definition of chemical composition and quantitative content of separate builders of bodies and tissues, study of a metabolism, metabolism of medicines, the definitions of composition of water, ground, air and etc. will widely be used methods of analytical chemistry. Diagnostics of the majority of diseases includes study of the clinical analyses which are carried out with use of methods quantitative and qualitative analysis.

In medicobiological investigations the methods of acid-base titration will widely be used, they allow to solve many problems incipient at chemical analysis of biological fluids as at statement of the diagnosis, and at treatment of the patients (for definition of an acidity of gastric contents, alkaline reserve of a blood and plasma). In sanitary-hygienic practice the methods of acid-base titration allow to estimate quality of various foodstuffs.

For the lesson «Volumetric analysis. Acid-base titration» wepresented the following tasks for self-control of knowledge:

1. In an acid-base titration, what is the meaning of each of the following words? «Neutralization», «equivalence point», and «endpoint».
2. How many milliliters of 0.200 M sodium hydroxide is required to neutralize 40.0 ml of 0.0500 M HCl solution?
3. How many milliliters of 0.200 M sodium hydroxide is required to completely neutralize:

40.0 ml of 0.0500 M H_2SO_4;

40.0 ml of 0.0500 M H_3PO_4.

4. Write down the mathematical form of equivalence's law.
5. What demands are showed to reactions used in the titrimetric analysis?
6. What titrants apply in an acidimetry and alkalimetry?
7. What molarity and titer of a solution HCl, if on titration 25 ml of it at the presence of phenolphthalein 19.75 ml 0.1 M of a solution NaOH are spent.
8. Calculate molar mass of an equivalent for the following substances: NaOH, H_3PO_4, $CaCl_2$.
9. What the medium and the equivalence point is observed at titration:

a) of weak acids by the strong bases;

b) of weak bases by strong acids?

10. In what case the spring of titration is more – at titration 0.1 M or 0.01 M by a solution HCl?
11. What substances can be determined in a solution by a neutralization method: Na_2SO_4, HCl, $C_6H_{12}O_6$, Na_2CO_3, KNO_3, H_2SO_4?

12. At clinical investigations in particular cases determine gastric acidity-content of a hydrochloric acid and total acid. The curve of titration has 2 springs of titration, at pH – 3–5 and pH – 8–10.

Offer:

a) the plan of performance of the analysis;

b) what indicators will use.

13. On titration 60 ml of a solution of a potassium hydroxide went 30 ml 0,1 M solution of H_2SO_4. How many grams of a potassium hydroxide in 200 ml of such solution?

14. Calculate molarity of a solution (ρ = 1.18 g/sm^3), containing 24.5% of sulfuric acid.

15. Calculate a percent by mass (%) of a hydrochloric acid in a gastric juice (ρ = 1.01 g/cm^3), if 5 ml of juice are spent for titration 3.1 ml 0.098 M solution of sodium hydroxide.

An important part of the section «Volumetric analysis» is the topic «Volumetric analysis. Oxidation-reduction titration».The oxidation-reduction reactions widely wide-spread in a nature. The majority of chemical reactions underlying processes of vital activity, are oxidation-reduction. On the oxidation-reduction mechanism the numerous enzymes-cytochromes, catalase, haemoglobin etc. work.

In the biochemical and clinical analysis, medical and sanitary-hygienic investigations the analytical methods based on oxidation-reduction reactions (for example, definition of an acetone, quinone and hydroquinone, urinary acid in urine, saccharum in a blood, ions of calcium in serum of a blood etc.) are widely applied.

Oxidimetry will use for quality surveillance of pharmaceuticals, in sanitary-hygienic investigations. So, with the help of an oxidimetry determine the content of fissile chlorine in potable water dissolved oxygen and organic impurities in natural water. In medicine and biology widely apply a method of permanganatemetry.

The method of iodinemetry-version of an oxidimetry, is widely applied in medicine and biology. The laboratory part of lesson anchors skills of volumetric-analytical definitions, acquaints with a new method of an oxidimetry-iodinemetry, which will be use in biological and sanitary-hygienic investigations.

For the lesson «Oxidation-reduction titration. Permanganatemetry» wepresented the following tasks for self-control of knowledge:

1. What the oxidation state should have sulfur, nitrogen, chlorine, that they showed properties only: a) of an oxidizing agent; b) of reducer.

2. To calculate molar mass of an equivalent:

а) Fe^{2+}, б) KI in reaction with $KMnO_4$ in acidic medium.

3. How many grams $KMnO_4$ are necessary for preparation 1.5 l of a solution with concentration c (1/5 $KMnO_4$) = 0.2 mol/l?

4. Calculate a shot dry $FeSO_4 \cdot 7H_2O$ for preparation 100 ml of a solution $FeSO_4$ with molarity of an equivalent 0.05 mol/l, which will be used in oxidation-reduction titration.

5. In what the substance of a permanganatemetry consists? For what definition of substances it can be used?

6. 21.6 ml of a solution $KMnO_4$ with concentration c(1/5 $KMnO_4$) = 0.09 mol/l are spent for titration of a solution $FeSO_4$. How many grammes $FeSO_4$ contained in a solution?

7. Spot the content of calcium in mg on 100 ml of serum of a blood, if 0.25 ml of a solution $KMnO_4$ with concentration c (1/5 $KMnO_4$) = 0.1 mol/l. are spent for titration.

8. Make the equations of the given below reactions. Specify an oxidizing agent and reducer.

$HCl + KMnO_4 + H_2SO_4 \rightarrow Cl_2 + ...$

$H_2O_2 + KMnO_4 + H_2SO_4 \rightarrow O_2 + ...$

$K_2SO_3 + KMnO_4 + H_2SO_4 \rightarrow K_2SO_4 + ...$

For the lesson «Oxidation-reduction titration.Iodimetry» wepresented the following tasks for self-control of knowledge:

1. What reactions underlie in a base of iodinemetry? What substances can be determined by this method?

2. How it is possible to fix a point of equivalence in iodinemetry? In what the feature of application of the indicator consists?

3. How many grammes of sodium thiosulfate is required for preparation 1.5 l of a solution $Na_2S_2O_3$ with molarity of an equivalent 0.1 mol/l.

4. At iodinemetric definition of a potassium dichromat in a solution on titration of assay 10 ml of a decomposed solution are spent on the average 2.5 ml of a solution $Na_2S_2O_3$ with molarity of an equivalent 0.1 mol/l. How many grammes of a dichromate contain in 50 ml of a solution?

5. 10.0 ml of a solution $Na_2S_2O_3$ with molarity of an equivalent 0.0192 mol/l spent for titration 10.5 ml of a solution of iodine. Spot molarity of an equivalent of a solution of iodine.

We consider, that the tasks for self-control of knowledge of students will appear to rather useful students and will facilitate by him preparation for lesson, and the performance of the references will serve as a pledge of successful study.

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ПРИМЕНЕНИЕ ИНТЕЛЛЕКТ-КАРТ ДЛЯ СОЗДАНИЯ ИНФОРМАЦИОННЫХ РЕСУРСОВ ПО ТЕМАМ «УГЛЕВОДЫ» И «АМИНОКИСЛОТЫ, ПЕПТИДЫ, БЕЛКИ»

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Обучение студентов ряда специальностей Белорусского государственного технологического университета, таких как «Биотехнология», «Биоэкология», «Охрана окружающей среды и рациональное использование природных ресурсов», «Химическая технология переработки древесины», «Технология лекарственных препаратов» и др., неразрывно связано с необходимостью изучения некоторых специальных разделов органической химии, касающихся особенностей строения, химических свойств, способов получения и использования гетерофункциональных органических веществ, относящихся к группе природных и биологически активных соединений. Эти разделы зачастую не включаются в основные учебники либо представлены в них слишком кратко или упрощенно. Акцент на этих вопросах дисциплины приобретает особую важность в контексте насущной необходимости диверсификации знаний применения современных образовательных технологий, таких как дистанционная форма обучения и др. Внедрение подобной формы в традиционный учебный процесс должно быть основано на системном подходе к организации обучения специалиста, целостности его подготовки, которая достигается посредством взаимосвязей ее основных компонентов.

В ряду основных разделов классической органической химии значительное внимание по праву должно быть уделено химии гетерофункциональных природных соединений, в первую очередь химии углеводов, пептидов и белков, отличающихся огромным многообразием структур, реакционная способность которых обусловлена сложным комплексом взаимосвязанных явлений электронной и конформационной природы, что для исследователей и практиков является значительной преградой на пути изучения и практического использования этих веществ.

Модернизация образования на современном этапе развития предполагает изучение потенциальных возможностей использования дистанционных образовательных технологий применительно к различным видам учебных занятий по органической химии при подготовке инженеров химико-технологического профиля. При этом следует иметь в виду, что в полной мере дистанционная форма получения образования не может обеспечить достаточную глубину понимания материала, способность применения полученных теоретических знаний для формирования требуемого уровня практических экспериментальных навыков и умений при получении образования по химико-технологическому профилю. Вместе с тем использование информационного ресурса для осуществления индивидуального дистанционного взаимодействия обучаемых с тьютором при подготовке к текущим и контрольным точкам траектории учебного процесса вполне уместно. Более