



ADAPTIVE TEST

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REQUIREMENTS

SYSTEM OVERVIEW

The system architecture is mainly composed of 3 components:

- MR business rule set
- GA optimizer algorithm
- Intelligent QnA solver

MR business rules are a set of directives that are used to govern the level in the difficulty of questions per topic (easy/ medium / hard) based on the previous performance of the test taker in the same topics.

GA optimizer algorithm uses the previous test scores in individual topics as a benchmark to decide the number of questions for the subsequent test in that particular topic. The GA caters to individual students and delivers an efficient and optimized set of questions in an adaptive manner in order to test the preparedness of the test taker.

Intelligent QnA solver is used for the purpose of self-learning and reasoning. With the help of this tool the future test taker has the access to the study material and at the same time he/she will have the facility to search for a solution in a question answer format.

RECOMMENDED BROWSERS

Adaptive Test System supports the following browsers:

- Internet Explorer 10 and above
- Firefox 52 ESR and 53 and above
- Google Chrome version 59 and above
- Safari version and above

TECHSTACK

Back-end

- Python
- Mongo DB

Front-end

- HTML
- CSS
- JAVASCRIPT

USER INTERFACE

- Our interface consists of an interface for a student and a teacher.
- The teacher has facility to evaluate and update scores of the test taker(student).
- The student has the ability to take a new mock test to assess his/her skills by clicking on the button that generates a new set of questions based on the previous performance. He also has the facility to view his previous test scores along with the solutions where he can assess as to where he was wrong or right.

INSTALLATION GUIDE

Back-end

- Clone the repository <https://github.com/Doraiswamy/Adaptive-Test.git> into a separate directory.
- Choose the editor of your choice. For example, PyCharm, Spyder etc. Note that this is not a compulsory step, it is only if you want to view the code.
- Navigate to the 'backend' folder inside the 'SystemCode' folder.
- An optional step is that you can set up a virtual environment to install your dependencies inside the project folder. This helps in avoiding mixing up of

different environments. Please follow the link given here: <https://uoa-ereseach.github.io/ereseach-cookbook/recipe/2014/11/26/python-virtual-env/>

- Install all the dependencies for the project with the help of the command 'pip install -r requirements.txt'.
- Run the server with the help of the command 'python manage.py runserver 0.0.0.0:8000'.
- Navigate to the browser of your choice and in the search bar paste the following URL: <http://localhost:8000> to check whether the server is running or not.

**** Note:** It is assumed that python 3.0 or above is already installed in your system. If not please install the latest python version from the link given below:

<https://www.python.org/downloads/>

Front-end

Open the browser of your choice. In this case, we are using Mozilla Firefox. Make sure that CORS addon is installed in your browser and is enabled.

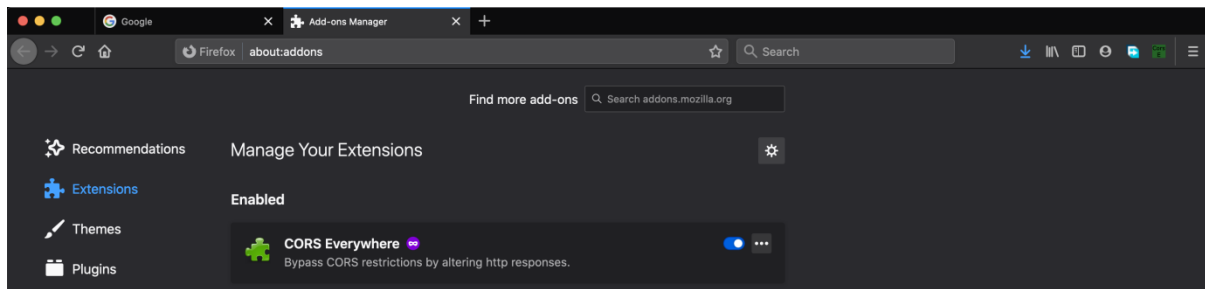
What is CORS and why we need the corresponding addon enabled :

CORS stands for 'Cross Origin Resource Sharing'. If your WebDAV server (WebDAV stands for Web Distributed Authoring and Versioning, which is an extension to HTTP that lets clients edit remote content on the web) is located on a different domain, on a different port or using different protocol (HTTP / HTTPS) such requests are considered to be cross-origin requests and by default are prohibited by most browsers.

In order for the browser to respond to the cross-origin requests we install this addon and enable the same.

For Chrome, the corresponding addon/extension is named as 'Cross Domain - CORS'.

For Firefox, the corresponding addon is named as 'CORS Everywhere'. The following is the screenshot for reference :

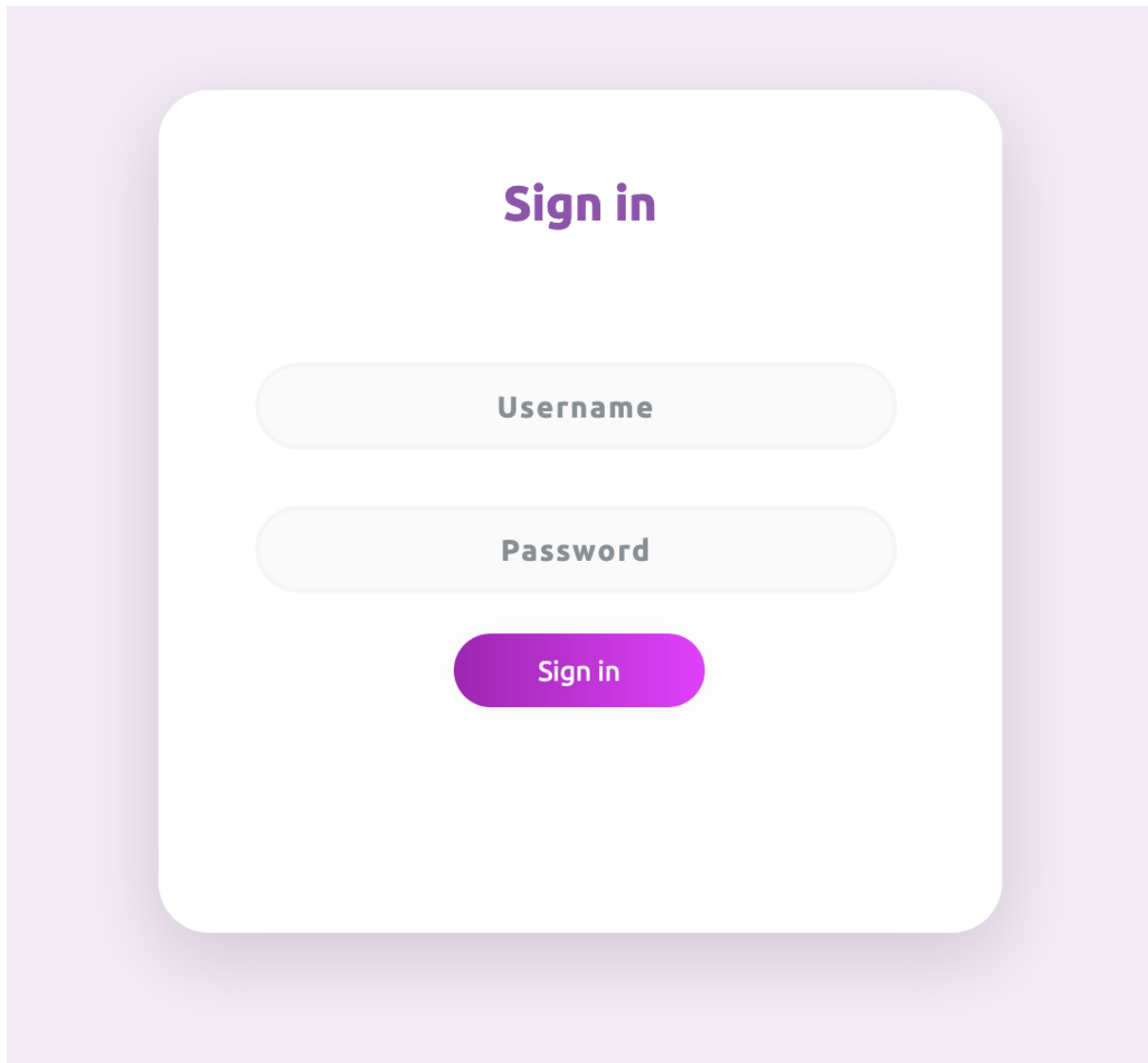


Once the addon is installed and enabled, open the 'login.html' page which is present under the folder Frontend > student adaptive test.

Once the login page is open, please follow the user guide below that showcases the various options available along with corresponding screenshots for both the student and teacher.

USER GUIDE

TEST CASE: STUDENT

A sign-in form with a white background and rounded corners, centered on a light purple background. The form contains the text "Sign in" in bold purple font at the top. Below it are two light gray rounded rectangular input fields, the first labeled "Username" and the second labeled "Password" in bold gray font. At the bottom of the form is a purple rounded rectangular button with the text "Sign in" in white font.

Sign in

Username

Password

Sign in

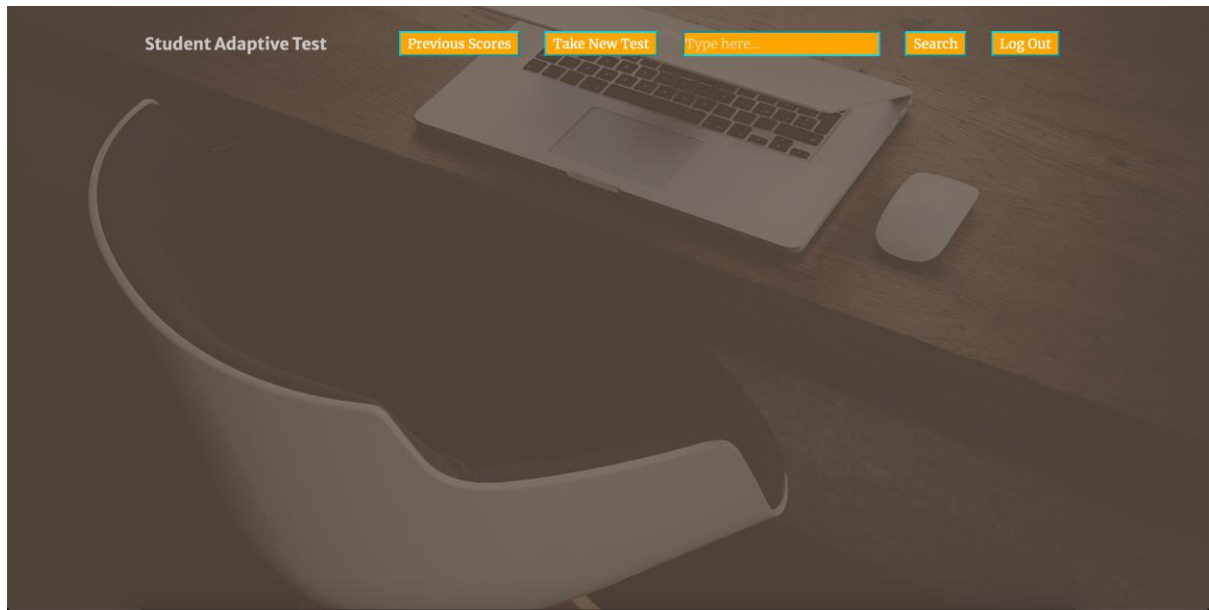
Once on the login page, enter the student credentials to get into the corresponding student page.

In our case the credentials are :

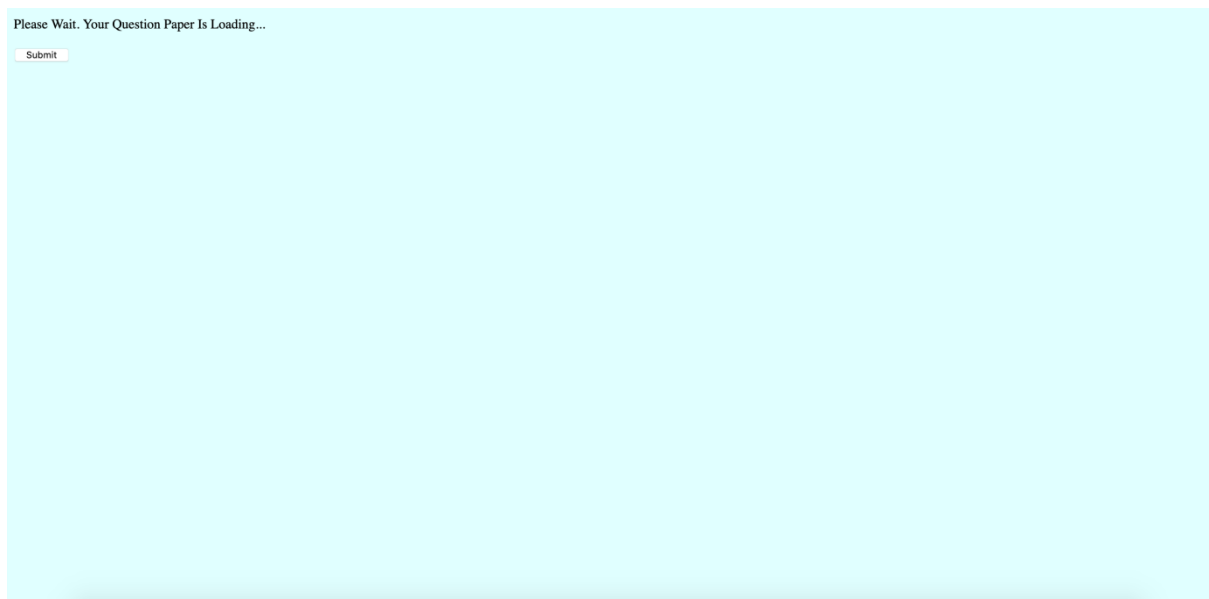
Username : KVTE53627

Password : mahesh

Click on 'Sign in'.



The above screenshot represents the student homepage. The student can click on 'Take New Test' button to take a new assessment based on his previous performance/score.



14. Why do all the elements of the (a) same group have similar properties, (b) same period have different properties? Difficulty level : Medium Topic : Periodic Classification of Elements Marks :2

15. (a) What is meant by corrosion? Name any two methods used for the prevention of corrosion. (b) Suppose you have to extract metal M from its enriched sulphide ore. If M is in the middle of the reactivity series, write various steps used in extracting this metal. Difficulty level : Easy Topic : Metals and Non metals Marks :4

16. Give reasons for the following observations: (i) Ionic compounds in general have high melting and boiling points. (ii) Highly reactive metals cannot be obtained from their oxides by heating them with carbon. (iii) Copper vessels get a green coat when left exposed to air in the rainy season. Difficulty level : Medium Topic : Metals and Non metals Marks :5

17. Hydrogen being a highly inflammable gas and oxygen being a supporter of combustion, yet water which is a compound made up of hydrogen and oxygen is used to extinguish fire. Why? Difficulty level : Easy Topic : Chemical Reactions and Equations Marks :5

18. What is observed when a solution of potassium iodide solution is added to a solution of lead nitrate? Name the type of reaction. Write a balanced chemical equation to represent the above chemical reaction. Difficulty level : Medium Topic : Chemical Reactions and Equations Marks :3

19. The group number and period number respectively of an element with atomic number 8 is. Difficulty level : Easy Topic : Periodic Classification of Elements Marks :3

6,2
16,2
6,8
16,4

20. Give reasons for the following: (i) Silver and copper lose their shine when they are exposed to air. Name the substance formed on their surface in each case. (ii) Tarnished copper vessels are cleaned with tamarind juice. (iii) Aluminium is more reactive than iron yet there is less corrosion of aluminium as compared to iron when both are exposed to air. Difficulty level : Medium Topic : Metals and Non metals Marks :2

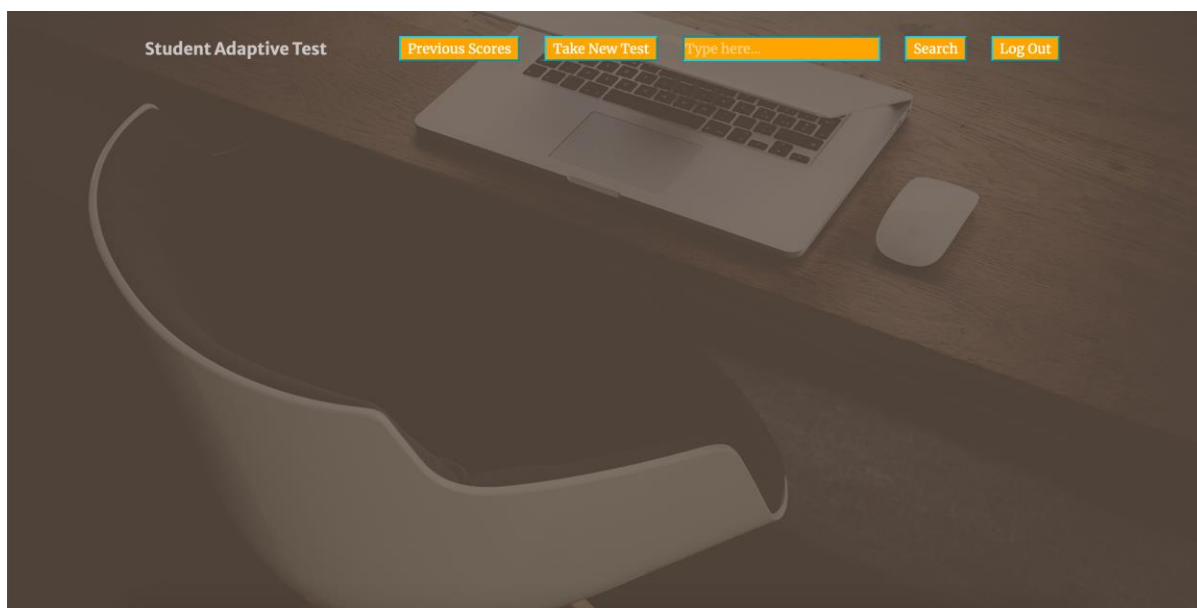
Submit

The above screenshots show the assessment page being loaded and once the page is loaded, the student can fill in the corresponding answers in the text box provided after each question.

Once the student completes the assessment, he/she can click on the 'Submit' button and the corresponding questions and answers would be uploaded into the database and the student would see a response stating 'test details uploaded successfully'.

test details uploaded successfully

Now the assessment details are uploaded successfully to the database and the next step is for the teacher to evaluate these answers and provide a score. Evaluation from the teacher's end is shown under 'TEST CASE : TEACHER' in the next section. Once the teacher completes evaluation and uploads student score, the student can then login back to his account and click on 'Previous Scores' to view the score that they received in the corresponding assessment.

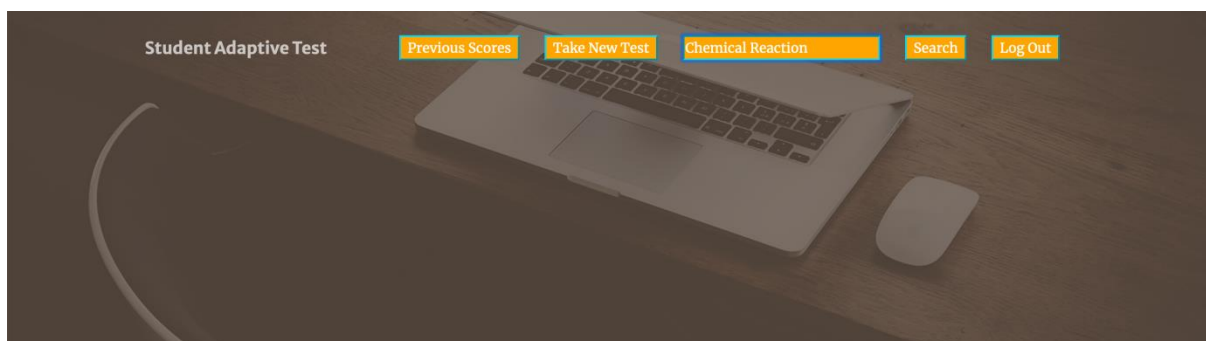
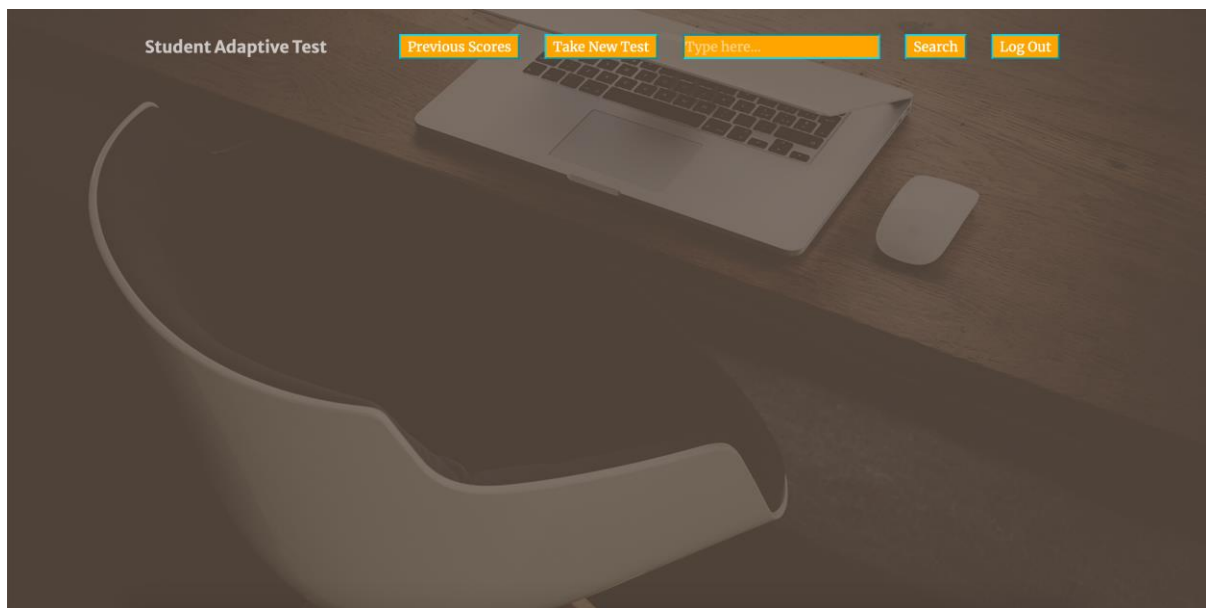


Previous Marks						
Question	Student Answer	Mark	Total Mark	Solution	Keywords	Reference Links
Why does calcium float in water?	Concave mirror	4	7	It is because hydrogen gas is formed which sticks to surface of calcium, therefore it floats. –	Keywords to include [hydrogen gas', 'formed', 'sticks', 'surface', 'calcium']	Reference Link 1 Reference Link 2 Reference Link 3 Reference Link 4
(a) Which two criteria did Mendeleev use to classify the elements in his Periodic Table? (b) State Mendeleev's periodic law. (c) Why could no fixed position be given to hydrogen in Mendeleev's Periodic Table? (i) Sizes of their atoms (ii) Their metallic characters (iii) Their valencies in forming oxides (iv) Molecular formulae of their chlorides (a) The vertical columns in the periodic table are called 'groups'. The horizontal rows in the periodic table are called 'periods'. (b) (i) 'M' and 'N' belong to same period but group I and II. Therefore, 'N' will be smaller than 'M' as atomic size goes on decreasing from left to right. (ii) 'M' is more metallic than 'N'. Metallic character goes on decreasing from left to right as tendency to lose electrons decreases due to decrease in atomic size. (iii) Their valencies are 1 and 2 respectively in forming oxides. Valency goes on increasing first and then decreases. (iv) MCl , NCl_2 are molecular formulae of their chlorides. (d) How and why does the atomic size vary as you go (i) from left to right along a period? (ii) down a group?	The far point is infinity and the near point is 25m	3	5	(a) (i) Increasing order of atomic mass as physical property and similarities in chemical properties of elements. (ii) The formulae and nature of hydrides and oxides formed by elements was treated as basic chemical property for its classification. (b) Properties of elements are the periodic functions of their atomic masses. (c) It is because it resembles both alkali metals as well as halogens. (d) (i) Atomic size goes on decreasing from left to right because one proton and one electron is being added successively therefore, force of attraction between valence electrons and nucleus increases hence, the atomic size decreases. (ii) The atomic size goes on increasing from top to bottom in a group because number of shells keep on increasing therefore, distance between nucleus and valence electrons increases.	Keywords to include ['basic chemical property', 'atomic size decreases', 'valence electrons increases', 'valence electrons', 'atomic size']	Reference Link 1 Reference Link 2 Reference Link 3 Reference Link 4
In electrolysis of water, why is the volume of gas collected over one electrode double that of gas collected over the other electrode?	A person with a myopic eye can use concave lens to restore	1	2	It is because water contains hydrogen and oxygen in the ratio of 2 : 1.	Keywords to include ['water', 'hydrogen', 'oxygen', 'ratio', '2']	Reference Link 1 Reference Link 2 Reference Link 3
(a) Which two criteria did Mendeleev use to classify the elements in his Periodic Table? (b) State Mendeleev's periodic law. (c) Why could no fixed position be given to hydrogen in Mendeleev's Periodic Table? (i) Sizes of their atoms (ii) Their metallic characters (iii) Their valencies in forming oxides (iv) Molecular formulae of their chlorides (a) The vertical columns in the periodic table are called 'groups'. The horizontal rows in the periodic table are called 'periods'. (b) (i) 'M' and 'N' belong to same period but group I and II. Therefore, 'N' will be smaller than 'M' as atomic size goes on decreasing from left to right. (ii) 'M' is more metallic than 'N'. Metallic character goes on decreasing from left to right as tendency to lose electrons decreases due to decrease in atomic size. (iii) Their valencies are 1 and 2 respectively in forming oxides. Valency goes on increasing first and then decreases. (iv) MCl , NCl_2 are molecular formulae of their chlorides. (d) How and why does the atomic size vary as you go (i) from left to right along a period? (ii) down a group?	The far point is infinity and the near point is 25m	3	5	(a) (i) Increasing order of atomic mass as physical property and similarities in chemical properties of elements. (ii) The formulae and nature of hydrides and oxides formed by elements was treated as basic chemical property for its classification. (b) Properties of elements are the periodic functions of their atomic masses. (c) It is because it resembles both alkali metals as well as halogens. (d) (i) Atomic size goes on decreasing from left to right because one proton and one electron is being added successively therefore, force of attraction between valence electrons and nucleus increases hence, the atomic size decreases. (ii) The atomic size goes on increasing from top to bottom in a group because number of shells keep on increasing therefore, distance between nucleus and valence electrons increases.	Keywords to include ['basic chemical property', 'atomic size decreases', 'valence electrons increases', 'valence electrons', 'atomic size']	Reference Link 1 Reference Link 2 Reference Link 3 Reference Link 4
In electrolysis of water, why is the volume of gas collected over one electrode double that of gas collected over the other electrode?	A person with a myopic eye can use concave lens to restore proper vision.	1	2	It is because water contains hydrogen and oxygen in the ratio of 2 : 1.	Keywords to include ['water', 'hydrogen', 'oxygen', 'ratio', '2']	Reference Link 1 Reference Link 2 Reference Link 3 Reference Link 4

Date of Test 5/10/2020

The 'Previous Scores' page would reflect the Question, Student Answer, Mark (given by teacher), Total Mark (for that question), Solution, Keywords that could have been included in the answer and Date of Test.

The student, based on the score awarded, can come back to their homepage and use the search box functionality to learn more on the concepts where they scored less in the assessment.



Chemical Reaction: The transformation of chemical substance into another chemical substance is known as Chemical Reaction. Chemical Reaction: During chemical reactions, the chemical composition of substances changes or new substances are formed. There are some chemical reactions which can show more than one characteristics.

This way, the student can learn more on the concepts that they are weak in and try to score well in the next assessment.

TEST CASE: TEACHER

Once the student completes the assessment, the teacher would then login to their account using the 'login.html' page present under the folder Frontend > student adaptive test.

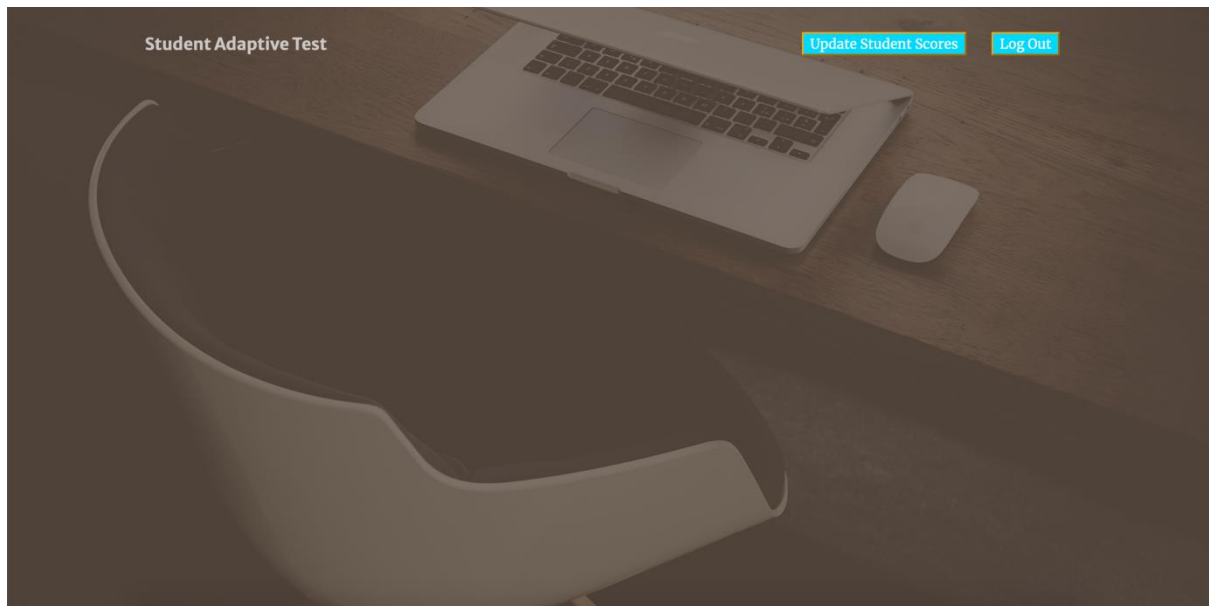
Once on the login page, enter the teacher credentials to get into the corresponding teacher page.

In our case the credentials are:

Username: KV9553870

Password: nachiketh

Click on 'Sign in'.



The above screenshot represents the teacher's homepage. The teacher can click on 'Update Student Scores' button to be able to evaluate the student's previous assessment.

A light blue rectangular form area. At the top left, there is a small input field with the placeholder text "Please enter Student Id". To its right is a small blue button with the text "Submit". The rest of the form area is empty.

The teacher would then be asked to input the student id for which they would like to do the evaluation. Here, the student id can be entered as: KVTE53627. Once the corresponding student id is entered and clicked on Submit button, the page would load student's answers for the respective questions and the teacher can evaluate the same by awarding appropriate marks.

KVTE53627

KVTE53627

Question	Student Answer	Mark	Total Mark
What is the valency of an element with atomic number 35?	gdvkvshkhv	<input type="text"/>	2
Identify the group which is not a Dobereiner triad	lknvlfnv	<input type="text"/>	1
How does the electronic configuration of an atom of an element relate to its position in the modern periodic table? Explain with one example.	slkhjvljv	<input type="text"/>	5
Define the terms: (i) mineral (ii) ore, and (iii) gangue.	hvlshvl	<input type="text"/>	5
What are alloys? How are they made? Name the constituents and uses of brass, bronze and solder.	slvlsfjv	<input type="text"/>	4
Why does the colour of copper sulphate solution change when an iron nail is dipped in it? Write two observations.	slkjslklvs	<input type="text"/>	4
What is meant by a chemical reaction?	shflwv	<input type="text"/>	4
What is observed when a solution of potassium iodide solution is added to a solution of lead nitrate? Name the type of reaction. Write a balanced chemical equation to represent the above chemical reaction.	lksvlksnvl	<input type="text"/>	3
What are amphoteric oxides? Choose the amphoteric oxides from amongst the following oxides: Na ₂ O, ZnO, Al ₂ O ₃ , CO ₂ , H ₂ O	sknvlknvl	<input type="text"/>	3
What is rancidity? Mention any two ways by which rancidity can be prevented.	lkjnlvsnl	<input type="text"/>	4
(a) Why do we classify elements? (b) What were the two criteria used by Mendeleev in creating his Periodic Table? (c) Why did Mendeleev leave some gaps in his Periodic Table? (d) In Mendeleev's Periodic Table, why was there no mention of Noble gases like Helium, Neon and Argon? (e) Would you place the two isotopes of chlorine, Cl-35 and Cl-37 in different slots because of their different atomic masses or in the same slot because their chemical properties are the same? Justify your answer.	s.knmv.snv	<input type="text"/>	5
On the basis of electronic configuration, how will you identify the first and the last element of a period?	kjvljv	<input type="text"/>	5
(a) What is meant by corrosion? Name any two methods used for the prevention of corrosion. (b) Suppose you have to extract metal M from its enriched sulphide ore. If M is in the middle of the reactivity series, write various steps used in extracting this metal.	lkvlwkvnl	<input type="text"/>	4

Once the teacher awards appropriate marks, they can click on 'Update Marks' button to upload the corresponding marks into the database.

What is meant by a chemical reaction?	shflwv	4 <input type="text"/>	4
What is observed when a solution of potassium iodide solution is added to a solution of lead nitrate? Name the type of reaction. Write a balanced chemical equation to represent the above chemical reaction.	lksvlksnvl	3 <input type="text"/>	3
What are amphoteric oxides? Choose the amphoteric oxides from amongst the following oxides: Na ₂ O, ZnO, Al ₂ O ₃ , CO ₂ , H ₂ O	sknvlknvl	3 <input type="text"/>	3
What is rancidity? Mention any two ways by which rancidity can be prevented.	lkjnlvsnl	4 <input type="text"/>	4
(a) Why do we classify elements? (b) What were the two criteria used by Mendeleev in creating his Periodic Table? (c) Why did Mendeleev leave some gaps in his Periodic Table? (d) In Mendeleev's Periodic Table, why was there no mention of Noble gases like Helium, Neon and Argon? (e) Would you place the two isotopes of chlorine, Cl-35 and Cl-37 in different slots because of their different atomic masses or in the same slot because their chemical properties are the same? Justify your answer.	s.knmv.snv	4 <input type="text"/>	5
On the basis of electronic configuration, how will you identify the first and the last element of a period?	kjvljv	3 <input type="text"/>	5
(a) What is meant by corrosion? Name any two methods used for the prevention of corrosion. (b) Suppose you have to extract metal M from its enriched sulphide ore. If M is in the middle of the reactivity series, write various steps used in extracting this metal.	lkvlwkvnl	3 <input type="text"/>	4
Name the reducing agent in the following reaction: 3MnO ₂ + 4Al → 3Mn + 2Al ₂ O ₃ State which is more reactive, Mn or Al and why?	lkjvlkvnl	3 <input type="text"/>	5
Identify the type of reaction(s) in the following equations. (i) CH ₄ + 2O ₂ → CO ₂ + 2 H ₂ O (ii) Pb(NO ₃) ₂ + 2KI → PbI ₂ + 2KNO ₃ (iii) CaO + H ₂ O → Ca(OH) ₂ (iv) CuSO ₄ + Zn → ZnSO ₄ + Cu	lkvnlsvn	4 <input type="text"/>	5
What change in colour is observed when white silver chloride is left exposed to sunlight? State the type of chemical reaction in this change.	;k;wvmvnsn	4 <input type="text"/>	4
The elements of the second period of the Periodic Table are given below: Li Be B C N O F (a) Give reason to explain why atomic radii decrease from Li to F. (b) Identify the most (i) metallic and (ii) non-metallic element.	kjvbskvbksv	3 <input type="text"/>	5
elements after actinium is called	.snv.sdnv	1 <input type="text"/>	1
What is the valency of phosphorus with atomic number 15?	ljshvnb	2 <input type="text"/>	3
Hydrogen being a highly inflammable gas and oxygen being a supporter of combustion, yet water which is a compound made up of hydrogen and oxygen is used to extinguish fire. Why?	snvsn.vn	4 <input type="text"/>	5

KVTE53627

test scores updated successfully

The student can now login to their account and click on 'Previous Scores' to be able to view the score awarded by the teacher in the corresponding assessment.