

NLSC (Ordinary Level)

490+ Questions and key points to consider in Scenario-Based-Assessment

Author

COLLINS TAREMWA, BSc.Educ (Hons), MUST

+256-784824014/757713819

Proof-Read By

Ngobi Derrick, Banwite Sinani and other senior Physics Trs

- 1. You are to drive 300 km to an interview. The interview is at 11:15 A.M. You plan to drive at 100 km/h, so you leave at 8:00 A.M. to allow some extra time. You drive at that speed for the first 100 km, but then construction work forces you to slow to 40 km/h for 40 km.
- (a) What would be the least speed needed for the rest of the trip to arrive in

time for the interview?

Key points

- -Find remaining time
- -Find the remaining distance.
- -Speed=Distance/time
- (b) And knowing how dangerous over rushing to beat the deadline can be to your life and other road users, explain how best you can overcome these dangers as you drive on your way to the interview?

Key points

- -starting journey early
- 2. During heavy rainstorms, most people seek for shelter under the nearby homestead whereas others may opt for the following risky measures, standing on people's verandas for fear mostly of getting wet. Some people however may find themselves on the BODABODA and they just want to continue with their journey not knowing what risks involved: A few people tend to take shelter under the tall trees. Some school children even dare to continue enjoying their football games in open soccer fields still not worried of the risks involved. Some people take shelter in very tall buildings which does not have a lightening conductor.

As a student of science in the science club of your school, you have been selected to present to the community meeting during the termly community awareness week of your school. Write a clear well explained presentation on the possible reasons why the above the above-mentioned group of people are putting their lives in danger and in each case suggest the possible preventive measures that can be undertaken to address/minimise/overcome the dangers you have stated.

- -Lightening and Thunder
- -Communicable diseases

33. A student read some journal and was surprised on reading this sentence.

"Though the Greek god Atlas spent many years carrying the earth on his shoulders, we say that he did no work since he did not move a single step". He was worried about someone carrying such a heavy thing for many years and doing no work. As a physics student explain to him why the sentence is having no error.

Key points

- -W.D=mgd (d=0)=mg*0=0J
- 34. A paperclip is hanging from a string near a bar magnet. What happens when the magnet is brought closer to the paperclip?

Key Points:

The paperclip is made of a magnetic substance (typically iron or steel) and will be attracted to the magnetic field of the bar magnet. As the magnet is brought closer, the attraction between the magnet and paperclip increases, causing the paperclip to move towards the magnet.

35. A compass needle is placed near a bar magnet. What happens to the needle when the magnet is rotated?

Key Points:

The compass needle aligns itself with the magnetic field produced by the bar magnet. When the magnet is rotated, the magnetic field changes direction, causing the compass needle to follow and align with the new direction of the magnetic field.

36. A magnet is heated to a high temperature. How does this affect its magnetic properties?

Key Points:

- -Heating a magnet to a high temperature can disrupt the alignment of magnetic domains within the magnet, causing it to lose its magnetism. This process is known as demagnetization.
- 37. A magnet is rubbed against a piece of iron repeatedly. What is happening during this process?

Key Points:

-Rubbing a magnet against a piece of iron can induce magnetization in the iron. The iron

233. As you carry out your research using a concave mirrors of focal length 10 cm, the mirror accidentally drops on the floor and gets broken. When you go to collect another concave mirror, you realise that Mr. Ocen, the lab technician is not around. However, there is a box containing several convex and concave mirrors of different focal lengths from which you have to pick a similar concave mirror of focal length 10 cm.

How would you differentiate between a convex and concave mirrors from the box.

Briefly describe a quick method of how you would determine the focal length of the mirror that you want.

Key points:

-View far objects measure the distance between image and mirror it's approximately the focal length.

234. The school Administration is planning to install Ceramic Tiles in a classroom. Each tile measures 0.4m by 0.4m and each costs 4000 shillings. If the dimension of the classroom is 4m by 4m, Find the:

(i) number of tiles needed to cover the classroom.

Key point

n=(4/0.1)*(4/0.1)= 100tiles

(ii) The cost of the tiles needed to cover the classroom.

Key point

P=100*4,000=400,000/=

235. Two brothers were sitting in a house. They noticed that the mother was frying chicken from a kitchen that was 10m away from the house.

As a physics student, explain how the two brothers were able to detect the process that was taking place in the kitchen and why.

Key points:

-Brownian motion and diffusion account for this

236. While traveling with her dad to the village on a hot day, Ritah noticed that there was a pool of water ahead of them. She advised her dad to change route but the dad didn't take up her advise because he was sure it was not a pool of water though didn't know how to explain to her. If you're travelling with them, help Ritah's dad to explain to Ritah what the seemingly pool of water was and how it is formed.

-Formation of mirage.

- 237. A heap of weed of mass 3tonnes is moving towards the turbines at the Jinja power station. A group of engineers needs to use a machine operating at 2kW for five minutes, to remove the weed from the river as shown in Figure and place it at the bank, which is 12m above the river.
- (a). Determine the efficiency of the machine.

Key Points

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- E=(3*1,000*10*12*100)/(2*1000*5*60)[Formula withheld for learners to research] = 360/6 = 60\%
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(b). Comment on the efficiency of the machine.

Key points

- some energy wasted in overcoming friction.

238. As its threatening to rain, your friend notices a beautiful pattern of colours in the sky. She shouts that she has seen a rainbow. However, she does not know how its formed. As a physics student, help explain to your friend how a rainbow is formed.

Key points:

-Dispersion of white light

239. The head teacher instructed the school carpenter to make a notice board of dimensions 1.5 m by 0.5 m. If each notice is written on a piece of paper of dimensions 21 cm by 30 cm, what is the maximum number of notices that can be put on the notice board at any one time? (04 marks)

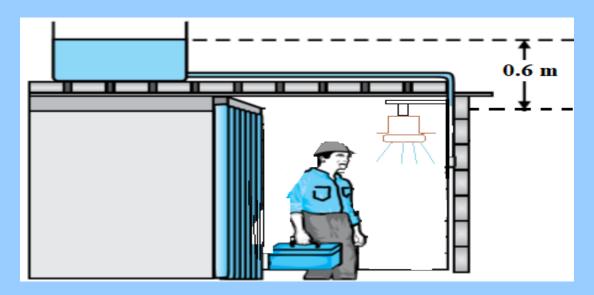
Key points:

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-n= (150/21)*(50/30)
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= 7*1{we truncate}

=7 notices

240. A plumber noticed that the bath in Etomet's home was not functioning satisfactorily because the water pressure at the showerhead shown in Figure 2 was too low.



Taking density of water = 1000 kgm⁻³, g= 10 Nkg⁻¹,

- (a) What is the water pressure at the showerhead?
 - Key points:
- -P=1000*10*0.6=6,000Pa
- (b) What must the plumber do to increase the water pressure at the showerhead to
- 15,000 Pa?

Key points:

- -By increasing height by h. 15,000=1000*10(0.6+h)
- 241. A country is considering building a new nuclear power plant. Discuss the advantages and disadvantages of nuclear energy compared to other forms of energy production.

Key points:

-Low greenhouse gas emissions, high energy density, continuous power generation, nuclear waste disposal challenges, potential for accidents, public perception and safety concerns.

242. A community is concerned about the storage of nuclear waste near their town. Discuss the 52 different methods of nuclear waste disposal and their associated risks.

-Geological disposal, deep underground repositories, reprocessing, interim storage, transportation hazards, long-term containment strategies.

243. A country is debating whether to invest in nuclear weapons development. Discuss the ethical and geopolitical implications of nuclear proliferation.

Key points:

-Deterrence theory, arms race dynamics, nuclear non-proliferation treaties, risk of nuclear conflict, disarmament efforts, humanitarian consequences of nuclear warfare.

244. Ali moved out of the house early in the morning and he saw his picture on the ground moving along with him. He attributed this to witchcraft. As a physics learner explain to him what was the picture.

Key points:

-Formation of shadows

245. Nangulu and Karambazi wanted to visit their friend Natogo in a village, they reached when she was in the swampy garden digging. Nangulu was putting on high healed shoe, and so she was stopped to reach there. Why do you think she was stopped.

Key points

- Due to a small surface area, pressure is high hence her shoes will stick in mud
- 246. Tom shaves his beard at the end of each week. He bought a shaver, brush, Shampoo and mirror.
- (a) By observing the figure which type mirror you think teacher Tom bought. Explain your reasoning.

Key points:

-Concave since it forms a magnified image when object is between F and mirror.



((b) Do you think that teacher Tom's mirror is similar to a car side mirror? Support your answer.

Key points:

-Not similar, cars needs convex mirrors because car drivers need a wide field of view.

246. Abdallah is a business man. He constructed a store yard building of 1 floor to keep his properties. He then installed an overhead tank on the ground level to supply him with water. After two years, He got his savings from the bank and added other 2 floors on his building up to level 3 floor. The people on the 2nd and 3rd level kept on complaining that water cannot reach into their taps. As a S.2 learner, explain what was the cause of the problem how would you solve it.

Key points:

-Increase water pressure by increasing the height of water tank

247. Mikka got a glittering stone and he was very happy that he was going to become rich. He told his family members that it was gold. The family members disagreed with him. As a S1 physics learner, Make a write up to solve the disagreements in the family (Density of pure gold is 1.92g/cm³.

- -Find its density by measuring it's mass and volume. If density is 1.92g/cm³ then it's gold.
- 248. Two students Tronna and Glen were tasked to measure the length of their classroom, Glen used his footsteps and got 20 footsteps while Tronna went to the laboratory and got tape measure, she found out that the length of the class was 5meters.
- (i). Why did the two students get different values of the length.

- -Different instruments and units one is using feet and the other using tape measure in metres. And we can't easily convert footsteps to metres.
- (ii). Who of two students got the collect measurements of the class

Key points:

- -Tronna as Tape measure is more accurate.
- (iii) How can you improve on the accuracy of an estimated value

Key points:

- -Repeating the measurement more times and taking average.
- 249. While in village you went to fetch water however your sister saw an insect walking on water surface and she was surprised and thought it was magic
- (i) Tell your sister which type of force enables insect to float on water

Key points:

- -Surface tension
- (ii) Suppose you are in your school and given the following apparatus; beaker water, needle and filter paper, describe how you can show the existence of this type of force on water surface.

Key points:

- -Experiment to show surface tension
- 250. A solar panel is installed on the roof of a house. Describe how solar energy is converted into electrical energy.

Key points:

-Photovoltaic effect, conversion of sunlight to electricity, energy transformation.

305. A student is curious about the potential risks of nuclear accidents. Describe the major nuclear accidents in history and their consequences.

Key points:

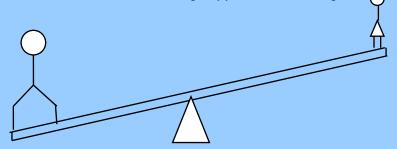
-Major nuclear accidents include the Chernobyl disaster in 1986, the Fukushima Daiichi accident in 2011, and the Three Mile Island accident in 1979. These accidents resulted in significant releases of radioactive materials, causing immediate health impacts, environmental contamination, and long-term effects on local populations.

306. A person is measuring the temperature of a gas in a container. What is the effect of increasing the pressure on the temperature measurement?

Key points:

-Increasing the pressure of a gas generally increases its temperature. Therefore, if the pressure of the gas in the container is increased, the temperature measurement would likely be higher.

307. You meet Joy and her uncle having fun at a recreation place. As they enjoy on a sea saw made of a uniform beam which is 10m long supported on a wedge at its mid point,



Joy weighs 45kg at the extreme right. The uncle is 30kg heavier than Joy and is at the extreme left. How far should the uncle be from the support for the beam to balance horizontally?

- -Principle of moments
- 45*(10-d)=30*d
- -1.5(10-d)=d
- -15=2.5d
- -d=6m

308. You met your friend attempting to steal a sharp pointed metal rod mounted at the top of their house so as to sell it as scrap. Advise your friend on the relevance of such a device on the house.

Key points:

- -Controlling lightening by conducting charge.
- 309. You are seated in a car and you observe the speedometer and clock as the driver gradually increases speed as follows;

Clock	Speedometer
9:25a.m	36km/hr
9:30a.m	144km/hr

Obtain the acceleration and distance travelled during this time interval

Key points:

- -a=(v-u)/t
- u=36km/hr=10m/s
- v=144km/hr=40m/s
- -t=5min=5*60=300s
- Insert in formula.
- 310. Two labourers A and B are hired to carry 500 bricks each from a heap 100m from the building under construction. A opts to use a wheel barrow that carries 30 bricks at once while B decides to carry them physically, 8 bricks at a time. Identify any two problems each labourer is likely to face.

Key points:

-Wheel barrow eases work.

315. Establish how fast the sound was moving based on the measurements given.

Key points:

- Distance is too and fro (d = 2*640=1280m)

Speed=d/t=1280/4=320m/s

- 316. Your class monitor always encourages you to sweep the classroom very early in the morning claiming that at early morning, the dust in the does not spread in the classroom, he complains whenever you sweep the classroom at lunch time and in the evening saying that the dust is too much at that time
- (a) Why do you think the dust spreads too much at lunch than evening and the morning time
- (b) Which process so you think is occurring when the dust spreads as you are sweeping the classroom.
- (c) State the factors that affect the process.
- (d) If you are in your school science laboratory how can you demonstrate the process above (B) using relevant apparatus.

Key points:

- -Brownian motion, use kinetic theory of matter to explain more.
- 317. During a thunderstorm, a certain farmer's cow that was sheltering under a tall tree was struck by lightning and it fell dead. His village mates attributed this incidence to witchcraft. As a Physics student, explain to the villagers that the incident was not induced by witchcraft.

Key points:

- Lightning occurs due to the buildup and discharge of electrical energy within a thundercloud.
- 318. A metal rod, when heated, appears to increase in length. Explain the phenomenon of expansion occurring in this situation.

- -The metal rod expands when heated due to the increase in kinetic energy of its particles. This increased kinetic energy causes the particles to vibrate more vigorously, leading to an increase in the average separation between particles and therefore an increase in length.
- 319. A glass bottle filled with water cracks when placed in the freezer. Explain the phenomenon

occurring in this situation.

Key points:

- -The glass bottle cracks because of the anomalous expansion of water. Water expands when it freezes, and in this case, the expansion of water inside the bottle exerts pressure on the glass, causing it to crack.
- 320. A glass jar with a metal lid is difficult to open after being placed in boiling water. Explain the phenomenon of expansion occurring in this situation.

Key points:

- -When the glass jar is placed in boiling water, both the glass and the metal lid expand due to the increase in temperature. As a result, the metal lid becomes tightly fitted to the glass jar, making it difficult to open.
- 321. A metal railway track is provided with expansion gaps. Explain the purpose of these gaps.

Key points:

- The expansion gaps in the metal railway track allow for the expansion of the metal due to temperature variations. Without these gaps, the railway track would buckle or deform under the stress caused by thermal expansion.
- 322. A gas-filled balloon expands when left in direct sunlight. Explain the principle of expansion responsible for the balloon's enlargement.

Key points:

- -When the gas inside the balloon is heated by sunlight, it expands. The increased temperature leads to an increase in the kinetic energy of the gas molecules, causing them to move more vigorously and occupy a larger volume, thereby expanding the balloon.
- 323. A metal bridge has gaps between its sections. Explain the purpose of these gaps.

Key points:

- -The gaps in the metal bridge allow for the expansion and contraction of the metal due to temperature changes. Without these gaps, the bridge sections would not have room to expand, which could lead to structural damage or collapse.
- 324. A glass jar cracks when boiling water is poured into it. Explain the phenomenon of expansion and contraction occurring in this situation.

Key points:

-The glass jar cracks due to the difference in expansion rates between the glass and the boiling

water. The boiling water causes the glass to expand rapidly, while the outer surface of the glass remains cooler and contracts. This difference in expansion and contraction rates leads to stress and eventually results in the cracking of the jar.

325. Explain the phenomenon of lightning in terms of electrostatics and the buildup of electric charges in the atmosphere.

Key points:

- -Lightning is a natural discharge of static electricity that occurs during thunderstorms. It is caused by the buildup of electric charges in the atmosphere, where negatively charged particles accumulate at the bottom of clouds and induce a positive charge on the ground, resulting in a discharge of electricity.
- 326. A metal train track buckles under the scorching heat of the sun. Explain the phenomenon occurring in this situation.

Key points:

- -The metal train track expands under the scorching heat of the sun due to the increase in temperature. As the metal absorbs heat, the kinetic energy of its particles increases, causing them to vibrate more vigorously and resulting in an increase in length.
- 327. A glass bottle filled with water bursts when placed in a campfire. Explain the phenomenon occurring in this situation.

Key points:

- -The glass bottle bursts due to the anomalous expansion of water. As the water inside the bottle heats up, it undergoes expansion. However, the glass bottle cannot expand at the same rate, leading to stress and eventually causing it to burst.
- 328. A metal pipe bursts when hot steam passes through it. Explain the phenomenon of expansion and contraction occurring in this situation.

Key points:

- -The metal pipe bursts due to the difference in expansion rates between the metal and the hot steam. The hot steam causes the metal pipe to expand rapidly, while the outer surface of the pipe remains cooler and contracts. This difference in expansion and contraction rates leads to stress and eventually results in the bursting of the pipe.
- 329. Muganga was puzzled that the shallow end of the swimming pool at his school appeared to be about 1.5 m deep when in the actual sense it was 2.0 m.

Use a ray diagram to illustrate and explain Kalindi's puzzle, hence determine the refractive index of the water in the swimming pool at Muganga's school

- -Refraction
- ñ=Real Depth/Apparent depth=2÷1.5=1.3333
- 330. Recently the bridge connecting different villages were destroyed by the floods and the community members have organized a meeting to solve this problem of the weak bridge which cannot withstand extreme weather conditions. Will they be able to solve this problem permanently?
- (a) You are one of the people who has attended this meeting, what materials will you advise them to use for constructing a long-lasting bridge for this community which can withstand all weather changes.

Key points

- Low expansion materials, may even use alloys
- Non rusting metals or solve it by painting
- (b) Explain to the community members how the bridge needs to be built so that it can last for generations by (include sketch of how the bridge will look when it is finished)

Key point

- Using Rollers
- 331. Explain the difference between fixed and variable resistors.

Key points:

- -Fixed resistors have a predetermined and unchanging resistance value. Variable resistors, also known as potentiometers or rheostats, allow for the adjustment of resistance in a circuit. They have a movable contact that can change the length of the resistor's resistive material.
- 332. What is the internal resistance of a cell and how does it affect the circuit?

Key points:

- -The internal resistance of a cell is the resistance offered by the electrolyte and other internal components. It affects the overall output voltage of the cell when a current is drawn from it. The internal resistance causes a drop in the cell's voltage as the current increases.
- 333. Explain the water pipe analogy for Ohm's Law.

Key points:

-The water pipe analogy compares the flow of water in pipes to the flow of current in an electrical circuit. Voltage is equivalent to water pressure, current is equivalent to water flow rate,

340. How does the resistance of a wire change when its length is doubled, keeping other factors constant?

Key points:

- -When the length of a wire is doubled, its resistance also doubles, assuming all other factors such as material and cross-sectional area remain constant. Resistance and length are directly proportional.
- 341. A person wearing high heels exerts more pressure on the ground compared to a person wearing flat shoes. Discuss why this happens.

Key Points:

- -The pressure exerted by the person's weight is concentrated over a smaller area with high heels, resulting in greater pressure on the ground. Am
- 342. Explain how pressure increases with depth in a fluid.

Key Points:

- -Pressure in a fluid increases with depth due to the weight of the fluid above, resulting in greater pressure at greater depths.
- 343. Describe the process of determining the focal length of a convex lens experimentally.

Key Points:

- -The focal length of a convex lens can be determined experimentally by placing an object at a known distance from the lens and measuring the distance at which a sharp image is formed on a screen. The distance between the lens and the screen is the focal length.
- 344. The headteacher of your school wishes to buy two batteries each of emf 6V and internal resistance 2Ω each to be used on the school lighting system. The lighting system can use a maximum voltage of 6 V. The head teacher would also wish to buy the connecting wires. wire A has a diameter of 0.1 mm and costs 1000 shillings per metre and the wire B has a diameter of 0.15 mm and costs 2500 shillings per metre. He is not sure which wire to buy.

More support information.

 \cdot The batteries are to be connected to a bulb of resistance 4 Ω .

The bulb may blow up if the current exceeds 3A.

(a) Advise the headteacher on how best he can arrange the batteries and the type of the wire to be used. Conclude by commenting on the advantage(s) of the arrangement chosen and the wire used.

Key points:

-He should connect the two batteries in parallel to maintain a total emf of 6V and increase the available current. Wire B with a diameter of 0.15mm should be chosen as it has a lower

resistance compared to wire A

(b)Prove mathematically if the current produced by the arrangement designed in task(a)above is safe for the bulb.

Key points.

- Total resistance=(2*2)/(2+2)+4=5ohms
- -Current=6/5=1.2A<3A hence current produced is safe.

345. A newly recruited dentist was supposed to examine the tooth of the patient. The dentist used a mirror whose focal length is 10cm. The dentist is not so sure of the right position of the patient's tooth from the mirror. The possible positions of the tooth from the mirror are position A,B,C,D and E.

Support information .

Position	А	В	С	D	Е	F	G
Object Distance (cm)	4	8	12	16	20	24	28

Where object Distance is the distance of the tooth of the patient from the mirror

Using physics knowledge,explain how you will help the dentist to select the best position of the patients'tooth from the mirror and give reasons why you did not select each of the other remaining positions.

Key points:

-A and B are better since the give upright and magnified images though B gives a more magnified image hence better. Other points give inverted images.

346. If one has ever been to the beach for long enough,one may have noticed a change in the ocean's water level. In one of the ports, a large ship failed to land on shore due to low water levels at that shore at that time of the day. One of the tourists wondered why it happens like this at times. He was confused on why the water level was too low at that time of the day. If you were the tour guide at that port, with the aid of a well labelled illustration, write down a possible explanation that you will provide to this tourist in order to promote understanding of earth and space physics. Conclude by suggesting the positive and negative effects of such a situation.

- -The fluctuation in ocean water levels is primarily caused by the gravitational pull of the Moon and the Sun, known as tides. During certain phases of the lunar cycle, such as low tide, the gravitational forces are aligned in a way that results in lower water levels.
- 347. How does overexposure to ultraviolet and other high-frequency radiations affect living organisms?

433. How does evaporation contribute to the efficiency of sweating as a cooling mechanism in the human body?

Key Points:

-When sweat evaporates from the skin, it takes heat energy from the body, resulting in a cooling effect. This cooling effect helps regulate body temperature and contributes to the efficiency of sweating as a cooling mechanism. As the sweat evaporates, it cools the skin and helps dissipate excess heat.

434. Explain the relationship between boiling point and external pressure.

Key Points:

-The boiling point of a liquid is determined by the balance between its vapor pressure and the external pressure applied to it. When the external pressure is equal to the vapor pressure, the liquid boils. Decreasing the external pressure lowers the boiling point, while increasing the external pressure raises the boiling point.

435. Give the difference between boiling and evaporation.

Key Points:

-Boiling occurs at the boiling point of a substance throughout the entire volume, whereas evaporation occurs at the surface of a liquid below its boiling point.

436. Describe the energy production process in the Sun.

Key Points:

-The Sun produces energy through the process of nuclear fusion. In its core, hydrogen nuclei combine to form helium, releasing a tremendous amount of energy in the form of light and heat. This process is sustained by the Sun's immense gravitational pressure.

437. What causes variation in the color and brightness of stars?

Key Points:

-The color and brightness of stars are determined by their temperature and size. Hotter stars appear bluish-white, while cooler stars appear reddish. The brightness of a star depends on its intrinsic luminosity, distance from Earth, and any intervening dust or gas that might absorb or scatter light.

Author's Academic Autobiography

I was born from a below average family. After hearing from many media outlets that working hard will make me successful, I gave it a try - who wouldn't wish to be successful?.

Well by bad luck I didn't attend P.7 and what I missed most was that P.7 farewell party but anyway I did P.L.E in P.6 and managed to get 3 Distinctions and one C3 in Social studies, maybe because of Nyangire rebellion.

In S.1 I saw some student who got 9 aggregates in 8 from a certain school in Bushenyi and he was in new vision newspaper. He became my role model I tried my best so that one day I would appear in a news paper to satisfy my own pride and ego, good enough I got 12 at S.4 and I appeared in New Vision.

At U.C.E I did my best and got 12 in eight with 5 D1's, I then embarked on PCM though I preferred reading Functional Approach and Biological science to Nelkon and Parker in my free time like the adage has it "Health is wealth".

In U.A.C.E I managed to get a B in Physics, well I passed all other subjects though am interested in Physics. I was offered Bachelor of Science with Education Physical from Mbarara university on Government sponsorship.

I understand many people don't like being teachers though me I enjoy it and it was my first choice in PUJAB.

So in short am currently a Physics Teacher though am not disclosing the big schools am working with currently as some of you may view it as a marketing point, I do believe in quality products rather than too much advertising.

As I conclude my autobiography, I wish all of you success in your endeavours.

Author's Quote

"Work hard as success is not guaranteed though inaction will guaranty failure"

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