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VALUE BASED QUESTIONS IN CHEMISTRY (2012—13)

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Value Based Questions In Chemistry

1. Manu went with his father to a Shopkeeper who showed them two types of batteries, one with lead plates and the other with cadmium plates. The battery with cadmium plates was more expensive than the lead battery. Manu's father wanted to purchase lead battery as it was cheaper.
   a. As a student of chemistry, why would you suggest to Manu's father to buy the expensive cadmium plate battery. Give two reasons. (2)
   b. What are the values associated with the above decision? (1)

Ans:

a. Cadmium plate battery though expensive is not as strong a pollutant as lead. Lead salts being insoluble in water if ingested into our system cannot be excreted out. Whereas Cd and Ni salts are water soluble, therefore get excreted and hence do not get biomagnified in the body.
b. **Keeping the environment safe from pollution due to lead**.

2. Raju and his father were going in a boat in the river. Raju's father threw away the cell used in watches and hearing aids into the water. Raju prevented him from doing so.
   a. As a student of chemistry, why would you advise Raju's father not to throw the cell in the water body. (2)
   b. What is the value associated with the above decision? (1)

Ans:

a. The watch cells are mercury cells. The mercury will pollute the water. Water contaminated with mercury leads to accumulation of mercury in the body of the fishes and other aquatic life.
b. **Keeping the environment safe from pollution due to mercury**.

3. Kalavati wanted to give her baby a medicine for fever. She added boiled and cooled water as per the instruction, to the contents of the bottle, upto the mark. She shook the bottle. Then gave a spoonful of the medicine to the baby. As a student of chemistry answer the following questions:
    a. Why did she shake up the contents? What is the process called? (2)
    b. What is the value associated with selling medicine in this form?(1)

Ans:

a. She shook the contents of the bottle to bring the contents into the form of a sol. Absorption of medicine are easier in the colloidal form. This process of agitating a precipitate into colloidal sol is called as peptization.
b. When the medicine is sold in anhydrous form it has a higher shelf life and thus can be stored for a longer time. This is a way of **being thrifty** by not wasting the available resources.

4. After entering a closed coal mine area, Ravi found difficulty in breathing, also felt nausea.
    a. What could be the reason for this? (1)
    b. How could Ravi estimate the level of the pollutant? (1)
    c. As a citizen of the country what should be his course of action further? (1)

    Ans:

    a. In coal mines due to lack of oxygen a small percentage of carbon monoxide is formed. This carbon monoxide being poisonous gives the symptoms.
    b. Ravi could estimate the level of CO using I_2O_5.
    c. Ravi should **inform the concerned authority** about the excess of CO in the coal mine.

5. Sudanshu made a model of the unit cell of diamond. It resembled the unit cell of ZnS. If the unit cell of ZnS has 4 units of ZnS per unit cell. It has the same packing efficiency as ZnS. But diamond is the hardest known substance.

   a. What is the number of atoms of carbon per unit cell of diamond? (1)

   b. Why? (1)

   c. What is the value that Sudanshu can derive from these facts?(1)

Ans:

a) The number of atoms of Carbon per unit cell is 8 in diamond.
b) The C—C bond is very strong in diamond (due to small size of Carbon) unlike the Zn—S bond in ZnS.
c) Though from the same background ie with the same structure the property can be different, thus, with a little effort, **we can do same things differently** and bring about major changes.

6. Kartick went to a sugar producing factory. He noticed an alcohol producing unit associated with it. Generally alcohol is prepared industrially in places where sugar is extracted from sugarcane.

   a. As a student of chemistry can you tell Why? (2)

   b. What is the value derived from this fact? (1)

Ans:

a. The molasses that are bi-products of sugar industry can be used in making alcohol.
b. Recycling of industrial waste keeps the environment clean.

7. Large amount of electricity is obtained in our country from burning of coal. The carbon in coal is lost as carbon dioxide, and water as water vapour. The substances left behind are minerals. These are known as fly ash. Fly ash is a major environmental hazard. Faseeh did a project on how to use this fly ash in building

roads and in making roofing tiles. He was appreciated by the judges. What was the value for which he was appreciated?

Ans: Recycling of industrial waste **keeps the environment clean**. (3)

8. Ashraf is 50 years old and has diabetes. He uses saccharine as sweetening agent in tea and coffee and sugar free in sweets. Lakshmi too is diabetic. She controls her sugar level in diet by using less sugar and by exercising.

a. Who is able to handle diabetes more efficiently and why? (1)
b. What value do you derive from this? (1)
c. What are the harmful effects of artificial sweeteners? (1)

Ans:

a. Lakshmi is able to handle diabetes better, because **exercises** activate the pancreases to produce insulin. Exercise keeps one fit and fine.
b. It is necessary to lead a disciplined life.
c. Researches have shown that the artificial sweeteners have harmful effect on the body because they are not excreted easily.

9. Almelu did not like the costlier brand of dish washer because she was not satisfied by using less quantity of the dishwasher, so she bought the cheaper brand of dish washer and used large amounts of it.

a. As a student of chemistry what would you advise Almelu to use? (1)
b. Why? Explain. (1)
c. What value did you impart to Almelu? (1)

Ans:

a. I would advise Almelu to use smaller quantities of the costlier detergent.
b. Almelo was pouring detergents into the drain. These detergents are not biodegradable. Branched detergents are highly non-degradable because the microbes cannot attack it. Straight chain detergents are being prepared these days to reduce the pollution problem. The costlier detergent contains straight chain hydrocarbon.

c. The value imparted was to use **environmentally friendly substances.**

10. Water is a universal solvent. But alcohol also dissolves most of the substances soluble in water. And also many more. Boiling point of water is $100^{o}C$ and that of alcohol is $80^{o}C$. The specific heat of water is much higher than the specific heat of alcohol.

a. List out three possible differences if instead of water as the liquid in our body we had alcohol. (3)

b. What value can you derive from this special property of water and its innumerable uses in sustaining life on earth? (1)

Ans:

a.

I. Even a small raise in temperature in the surroundings will raise the temperature of the body because the specific heat of alcohol is much less than the specific heat of water. In order to cool the body more sweating will take place.

II. As there is less H bonding in alcohol it will get evaporated faster. The alcohol will be evaporated at such a fast rate that the liquid has to be ingested always.

III. Ice which floats on water helps aquatic life to exist even in winter as water insulates the heat from liquid below it to go back to the surroundings. Solid alcohol does not have such special properties.

b. Praise is to the almighty that has so thoughtfully given such special properties to water and made it a liquid that could sustain life.

11. After cleaning the refrigerator thoroughly well, Rohit closed it and kept it switched off for two days. After that on opening it, he got a foul smell. His neighbor advised him to keep a piece of charcoal in the fridge.

a. As a student of chemistry explain why? (2)

b. What value can be drawn from this? (1)

Ans:

a. The charcoal piece adsorbs the foul smelling gases. Eg: in a compost pit too charcoal can be added to remove foul smell.

b. Help your friends and neighbours.

12. A stain of rust is there on your clothe. You are worried how to remove this stain. Shyam tells you to remove this stain using ripened guava.

a. Why? (2)

b. What is the value you are having when doing this? (1)

Ans:

a. The rust is iron oxide. The oxalic acid in guava fruit dissolves iron oxide.
b. **Help your friends and neighbours** when you know some simple home techniques instead of chemicals.

13. You are staying near a fertilizer factory. In the middle of the night there is a leakage of ammonia which is detected by its smell. Within 10 minutes you find the smell is intolerable.

a. What would you do as first aid against this gas spill accident for self and neighbor? (2)

b. What value do you derive from this? (1)

Ans:

a. Ammonia is highly soluble in water. It is detected by its characteristic fishy odor. Hence keep a wet kerchief on your nose to stop inhaling the gas. Then help your neighbours with your suggestion.
b. **Alertness to tackle disasters for society**.

14. Pradeep had very high fever. He was given strong antibiotics. But after recovering from fever he was not able to digest food and was feeling too weak. The grandmother who lived in his neighborhood suggested him to take lots of fruits and vegetables.

a. Why? (1)

b. What is the remedy for this? (1)

c. What was the value that Pradeep had by taking fruits and vegetables? (1)

Ans:

a. Rise in temperature denatures the proteins in our body. The enzymes which are also proteins get denatured. The body has to regenerate these enzymes. Till then Pradeep will continue to feel weak as the enzymes to digest food and for respiration are destroyed due to high temperature and change in pH. Even after the enzymes are regenerated, vitamins which act as prosthetic groups in enzyme action are to be taken from an external source.
b. By taking fruits and vegetables Pradeep is actually taking in vitamins.
c. He obeyed an elderly person's advice.

15. The chairman, Kandla (Gujrat) port due to water scarcity has decided to desalinate sea water to obtain potable water.

a. As a student of chemistry which method will be suitable to use? (1)
b. Discuss the method. (1)
c. What value have you inculcated in using this method? (1)

Ans:

a) Reverse osmosis.
b) Discussed
c) Using less energy ie **energy conservation**

OR

a) Desalination using evaporation using sun's energy
b) Discuss
c) **Using renewable source of energy**.

16. An innovative washer woman while washing a copper miner's clothes found that sand and similar dirt particle fell to the bottom, while the ore particles stuck to the soapsuds and came to the top. The washer woman discussed this matter with a client who was a chemist.

a. What is the reason for this observation? (2)
b. What value do you get from this episode? (1)

Ans:

a. The miner's clothes had particles of CuS / Cu_2S on it. This adhered to the froth and came up.
b. **Keen observation** can lead to great discoveries.

17. A mollusk is a sedentary organism and feeds by filter feeding. In the process it takes in the heavy metals (present in polluted water), which get accumulated in its body. This slows down the metabolism/ activities of the organism. Abhishek used this property of the organism to make it a bio-indicator for pollution. What values did Abhishek show in doing this project?

Ans: He was innovative enough to show the effect of pollution on living things. He was **concerned about the environment**. (3)

18. Bharath went to his grandfather's house in winter this year. As usual he went for fishing. His grandmother told him there will be no fishes in the lake. He noticed that it was more difficult to find fishes in winter. The fishes were deep inside the river. Whereas in summer they were on the surface and hence he was able to catch fishes.
    a) Why are fishes on the surface in water than in the depth in summer? (2)
    b) What value can be derived from this? (1)

Ans:

a) According to Henry's law at low temperature gases are more soluble and hence as more oxygen gets dissolved in water fishes survive better even in depth of the river. In summer as the oxygen is less in water the fishes come to the surface.
c) The value that I derive from this is **wisdom is superior to knowledge**

19. Manoj went to a paper industry. The manager, paper industry H_2O_2 insisted that H_2O_2 be used for bleaching instead of Chlorine in bleaching. Manoj had learnt that Cl_2 is also a bleaching agent
    a. Then why is H_2O_2 used instead of Cl_2 (2)
    a. What value do you derive from this? (1)

Ans:

a) H_2O_2 after bleaching, the product formed is water. While when using chlorine the byproduct is HCl.
b) Seeing the products of the reaction we should select the reagents, so that there is **minimum pollution.**

20. Laboratory alcohol should not be used for sterilization of wounds.
    a. Why? (2)
    b. What values do you derive from this? (1)

Ans:

a. Laboratory alcohol is denatured with methanol. Methanol is extremely poisonous. Hence it should not be used.
b. Laboratory reagents/equipments should not be used for any purpose other than in using for laboratory works.

21. Shubham's father is suffering from high blood pressure. Shubham's mother cooks food with very little salt in it.
    a. Why? (1)
    b. Doctor did not advise him not to consume salt at all. Why? (1)
    c. What value do you get from this? (1)

Ans:

a. As salt ionizes the ionic balance is disturbed and the blood pressure rises.
b. Salt acts as a cofactor in enzyme action. Hence some amount of salt is required in our diet.
c. Caring for your kith and kin.

22. Srisha wanted to keep ice creams without melting. So he had to keep it on ice taken in a container. His grandmother advised him to pour salt on the ice.
    a. Why? (2)
    b. What is the value in this? (1)

Ans:

c. Adding salt to ice decreases the melting point of ice. Hence the decrease in temperature of ice.

d. **Obey your elders**.

23. Sneha's grandmother lives in Simla. In winter there is lot of snow in front of the house. She asked Sneha to clear the snow from the front of the house. Sneha added salt to snow to clear it.

a. Why? (2)

b. What is the value in this? (1)

Ans:

a) Adding salt to ice decreases the melting point of snow. The snow melts. Hence snow can be removed.

b) Keep your surroundings clean

24. Shyam bought a dry cell which was very old. He puts it in the torch. The torch did not glow. He found that the cell was dead. Its potential was zero.

a. Why did this happen?

b. What value did you derive from it?

Ans:

a) As the dry cell (zinc and graphite) contains ions, over a period of time it gets consumed. Hence it gets completely used up even on long standing. (2)

b) **Be thrifty and buy just the required amount of things** **(1)**

25. Swapnesh, living in Ooty, was washing clothes in cold water. He found that the clothes were not getting clean. Geeta , his niece, suggested that he wash the clothes in warm water. Washing of clothes with soaps or detergents is easier in Luke warm water than cold water.

a. Why?

b. What value do you derive from this?

Ans:

a) Action of soaps is due to formation of micelles. But the formation of micelles takes place at a minimum temperature called 'Kraft temperature'. This temperature is reached in lukewarm water. (2)

b) Be humble to accept a scientific fact from a younger person (1)

26. Ruben is a football player. After playing he had sever muscle pain. His brother's friend Suhail asked him to take ENO along with the medicine.

a. Why?

b. What value can you get from this fact?

Ans:

a) Analgesic relieves Pain from muscular cramps. But it causes acidity in the stomach. To relieve from acidity antacid is given. ENO is an antacid.

b) **Be open minded** to accept a suggestion from a friend because friend in need is a friend indeed.

27. Rahul's father recovered from a massive heart attack. As follow up doctor gave him Aspirin.

a. Why? After some time he started to develop some stomach ache. Then his wife gave him some butter milk

b. Why?

c. What value do you get from this?

Ans:

a) Aspirin is a blood thinner. Hence for a patient suffering from heart attack is given Aspirin. Aspirin is acetylated salicylic acid. In the presence of acid in the stomach it undergoes hydrolysis to form two acids salicylic acid and acetic acid. This increases the acidity in the stomach. (1)

b) To neutralize this acidity butter milk is also given. (1)

c) Being dedicated and faithful. (1)

28. Nitrogen combines with hydrogen to form ammonia. $N_2 + 3H_2 \rightarrow 2NH_3$. Ammonia is the basic raw material for preparing fertilizers. Always associated with a refinery/ petrochemical industry we have a fertilizer industry.

a. Why? (2)

b. What is the value you derive from this. (1)

Ans:

a. In the refinery / petrochemical industry hydrogen gas is evolved as a bi-product. Hence to recycle this hydrogen a fertilizer unit is established nearby.

b. Recycling of industrial waste keeps the environment clean.

29. At an exhibition a FORTUNE TELLER predicts your future. Ram and Shyam ran to get their fortune read. The fortune teller asked them to take a paper from the lot. He put the paper into a trough of water. Both the children read what was given in the paper.

a. Give a plausible reason for this. (2)

b. What value do you get from this? (1)

Ans:

a) The writing was done using solution of lead acetate. This had become invisible after drying. The trough contained a solution of H_2S. Reaction of H_2S with water gave a black precipitate of lead sulphide. Hence the writing.

b) Knowledge is the antidote to fear and blind belief.

31. Pavitra was playing a game with her friends. As a part of the game they asked her to express a wish. She said that she wanted to be able to see the atom. Atomic dimensions are from 10^{-12}m and nucleus is 10^{-15}m. Visible range in the electromagnetic spectrum is for wavelengths in the range of 10^{-7}m. As a student of chemistry

a. Describe how the world would look for Pavitra if she is granted her wish. (2)

b. What value can you draw from this? (1)

Ans:

a) Atom is empty space. Being able to see the atom and structure of the atom itself means looking at empty space. Hence all of us will be seen as empty space. The wall will be seen as empty space. You and I will be seen as

empty space. Hence Pavitra will not be able to see anything. In any other words she will be blind. Oh god what a wish!!!

b) Praise be to the almighty who has limited our abilities such that we are able to enjoy this colourful world.