

# VALUE BASED QUESTIONS

## ELECTROSTATICS

1. An elderly woman went alone to the Registrar's office to disburse her property. When she enquired in the office she was asked to get a Xerox copy of the document which works under electrostatic induction. The Xerox shop was far away and across the road. She took the help of the passer-by and got her Xerox done.

- What values did the passer-by have?
- How does a neutral body get charged by electrostatic induction?

Ans: a. Helping, sharing, respect for elderly people.

b. For a body to get positively charged, a negatively charged body has to be brought close to the neutral body which after earthing gets charged uniformly.

2. Ram and Shyam went to the trade fair. They were busy in a crowded corner. Balloons were sold. A child was seen troubling his parent and crying for something. On seeing this, Ram went to the child and said that he would perform a trick with balloons. Ram took two balloons and Shyam helped him to inflate and tie. When the balloons were rubbed with the sweater he was wearing, they were attracted. When taken nearer to wall, the balloons got stuck. The child enjoyed and stopped crying.

- Give two values of Ram and Shyam.
- How did the balloons get attracted? Will they repel also?

Ans: a. Presence of mind and knowledge of static electricity.

b. When balloons were rubbed with woollen sweater, it becomes negatively charged. When taken nearer the wall, positive charges are induced by electrostatic induction on that part of the wall, so gets attracted. ie, when the bodies are similar charged they repel.

3. Arun had to repaint his car when he was reminded by the car company for his regular car service. He told them to do spray painting of mountain dew colour. The company also replied that they usually perform spray painting only as wastage is minimized and even painting is achieved.

- What values did the car service company have?
- If spray painting is done by electrostatic induction, how is even painting achieved?

Ans: a. Customer care, commitment, concern and truthfulness

b. Droplets of paint are charged particles which get attracted to any metallic objects by electrostatic forces.

4. In Akash's classroom the fan above the teacher was running very slowly. Due to which his teacher was sweating and was restless and tired. All his classmates wanted to rectify this. They called for an electrician who came and changed the capacitor only after which the fan started running fast.

- What values did Akash and his classmates have?
- What energy is stored in the capacitor and where?

Ans: a. Team work, concern, respect to teacher and responsibility

b. Electrical energy in the dielectric of the capacitor.

5. Aswin asked his Physics teacher why are voltmeter, galvanometer and ammeter kept in a cavity inspite of its outer covering being made of an insulator

- What values did Aswin have?

b. Explain Faraday's cage or electrostatic shielding

Ans: a. inquisitiveness, to improve his knowledge in Physics, willingness to gain knowledge

c. These sensitive instruments should not be disturbed by external electric field.

6. Vijay was preparing an electronic project for science exhibition. He required a capacitance of  $2\mu\text{F}$  having a capacity to operate under 1 kV potential. He went to a shop to purchase it. Shopkeeper was having only  $1\mu\text{F}$  capacitors of 400 V rating. Vijay calculated minimum number of capacitors of  $1\mu\text{F}$  so that he could arrange them to form a capacitor of  $2\mu\text{F}$  value.

(a) What values do you judge in Vijay?

(b) Show the calculations done by Vijay

Ans: a. Scientific attitude and hard working nature

7. During a thunderstorm Rohan and his friends were in the middle of a jungle. His friends were standing under a tree. Rohan advised them not to stand there. Rather he suggested they should move back to the bus. He explained them that they are safe inside the bus due to electrostatic shielding.

(a) What are the values exhibited by Rohan ?

(b) What is electrostatic shielding?

Ans: a. Scientific temper and care and concern

b. explanation of electrostatic shielding.

### CURRENT ELECTRICITY

1. That night Vaikunth was preparing for his physics exam. Suddenly the light in his room went off and he could not continue his studies. His cousin brother Vasu who had come to visit him was quick to react. Vasu using the torch (an android application) installed in his mobile phone found that the fuse had blown out. He checked the wiring and located a short circuit. He rectified it and put a fuse wire. The light came to life again. Vaikunth heaved a sigh of relief, thanked Vasu and continued his studies.

a. What are the values projected by Vaikunth and Vasu? (Any two)

b. What is an electric fuse? What characteristics you would prefer for a fuse wire?

Ans: a. Vaikunth: acknowledging the help from others with gratitude.

Vasu: awareness of the technology, helping tendency, practical knowledge of the subject.

b. An electric fuse is a wire used as a safety device which melts when current exceeds the limit. Low melting point, high resistivity.

2. Kumaran wanted to pay electricity bill that day. He realized that the consumption shown by the meter was unbelievably low. He thought that the meter must have been faulty. He wanted to check the meter. But unfortunately he did not have any idea as to how to do this. There came his friend Subhash to help him. He told Kumaran to run only the electric heater rated 1kW, 220 V in his house for some time keeping other appliances switched off. He also calculated the power consumed in kilowatt hour and compared the value with the meter. Kumaran was happy and thanked Subhash for his timely help and the knowledge.

a. What are the values displayed by the friends?

b. Express kWh in joules. Find the resistance of the heater.

Ans: a. Honesty, sharing of knowledge, willingness to help

b.  $1\text{kWh} = 3.6 \times 10^6 \text{ J}$ ,  $R = V^2 / P = 48.4\Omega$

3. Raghav lives in an area where birds in large groups play around producing pleasing humming sounds. One day he notices that the high power lines soon after a strong wind have come too close which may prove fatal for the birds that would sit on them and flutter their wings for some reason or other. He complained to the authorities and the lines were set at the proper distance once again

a. What are the values possessed by Raghav and the authorities?( any two) b. What is the danger that could happen to the innocent birds in Raghav's view? c. How did distancing the lines solve the problem? Ans: a. Raghav: affection towards birds, taking appropriate action, Authorities: conscious b. The bird may get electrocuted; avoid sparking as shown in the diagrams below.

4. Supraja was doing an experiment (Comparison of emfs ) using potentiometer in Physics lab. She could not take the readings because the galvanometer showed same side deflection. She checked the circuit and the connections were correct. Her friend Manasa who was doing her experiment nearby came to help Supraja. Manasa increased the voltage of the eliminator (by turning the knob) supplying current to the potentiometer. Supraja tried the experiment again and got the readings. She thanked Manasa for her help. a. What are the values displayed by both Supraja and Manasa? b. State any one reason why the galvanometer showed same side deflection.c. Distinguish between emf and terminal pd. Ans: a. Sharing of knowledge, caring for and helping others b. The emf of the driving cell should be greater than the emf of the experimental cells c. The potential difference between the terminals of a cell when the cell is in the open circuit and` the potential difference between the terminals of a cell when the cell is in the closed circuit

5. Ramaniamma was a childless widow. She ran her life only by the pension for the Senior citizens from the Government. When she switches of one bulb in her house all the other appliances get switched off. She could not even spend for an electrician. Sujatha living nearby decided to do something about this. She referred to Physics books and learnt that the series combination for the household connection should be the reason. She called an electrician and had the circuit changed to parallel combination. The problem was solved and Ramaniamma was happy. She thanked Sujatha for her help to solve the problem. a. What are the values possessed by Sujatha? b. Why for household a parallel combination used? What are its advantages. Ans: a. care for elderly people, empathy, willingness to gain knowledge b. same voltage for all appliances, even if one appliance is not working the others can work.

6. Rakesh purchased cells for his transistor. He felt that cells are not working properly. He wanted to check their e.m.f. So, he took the cell to the physics lab and with the help of potentiometer found their e.m.f. To his surprise e.m.f. was less than the value claimed by the manufacturer. He lodged the complaint with consumer forum and received the deserving response. (a) What values are displayed by Rakesh ? (b) What do you think why Rakesh used potentiometer instead of voltmeter to find out e.m.f. of the cell ? For more precise measurement the potential gradient of the potentiometer should be high or low ?Ans: a. Responsibility and timely actionb. Potentiometer draws no current from the cell. Low potential gradient.

7. Laxmi and her mother went to the market to purchase some household articles. Laxmi's mother was going to purchase 100 W electric bulb. Laxmi advised her to purchase CFL. She told her mother that it will consume less amount of power and will save electricity.(a) What qualities do you notice in Laxmi ? (b) A 100 W bulb and a 500 W bulb are joined in parallel to the mains. Which bulb will draw more current ? Ans: a. Energy saving, concern for society

## MAGNETIC EFFECTS OF ELECTRIC CURRENT AND MAGNETISM

1. Mr. Narasimhan, a 65-year-old person, often complained of neck pain. One day his grandson Avinash, suggested that magnetic therapy is very effective in reducing such pains. He said that the permanent magnet/electromagnet, used in the device will help to produce Joule's heating effects in the blood stream, which helps the blood flow better. He immediately contacted his friend in Chennai, who was running Magnetic Therapy Clinic. Mr. Narasimhan felt better.

a. What two values did Avinash exhibit towards his grandfather? Mention any two

Ans. Responsible behavior, concern and awareness

b. What is the SI unit of magnetic induction and define it?

Ans. Tesla (defn)

2. Ms. Udaya joined a PG course in Nanotechnology lab in IIT Chennai. The first day, when she went to the lab, she met Mr. Antonio, the lab assistant. He greeted her and advised her not to touch the wires which were suspended from the roof at every part of the lab as they were from high voltage lines. He also told her not to bring any of the two wires closer to each other during any experimental applications. He helped her in understanding about the precautions that have to be taken in the lab.

a. What value did Mr. Antonio exhibit towards Ms. Udaya? Mention any two

(Responsible behavior, sensitivity, concern for others and alerting the people)

b. Why two high voltage power transmission lines should not be close to each other?

(Hint: like currents attract)

c. Give an expression for the magnetic force that acts between the wires?

3. In the birthday party of Bharat, a class 7 student, his parents gave big slinky to all his friends as return gifts. The next day, during the physics class Mr. Mohan, the teacher explained them about the production of magnetic fields using current-carrying coil and also said that they can make permanent magnets, using such coils by passing high currents through them. That night Sumanth, a friend of Bharat, asked his father about the coils, and their shape. His father asked him to bring the slinky, that his friend gave and explained the uses of toroid and solenoid.

a. What value did Sumanth's father exhibit towards his son?

(Responsibility, makes his child to understand the concepts and to generate interest in the subjects)

b. What is the difference in the fields produced by the solenoid and Toroid?

The magnetic field lines in a toroid are concentric circles whereas in a solenoid it is straight within the turns.

4. Ms. Nita Chander found that her son could not hear properly. Mother took her to the specialist who prescribed hearing aid for her son. Hearing aids consist of electromagnets in the loudspeakers used in the device.

a. What two values does Ms. Nita exhibit towards her son and students? Mention any two

(caring attitude, sensitive towards society, concern for others)

c. What is an electromagnet? In what way its hysteresis curve is different from that used for permanent magnets?

Ans. Electromagnet - temporary magnet. Hysteresis curve has small area, small coercivity, small retentivity.

5. Ms. Sumathy, wife of Mr. Varadan, complained about the non-availability of gas cylinders and explained to him to look out for alternate methods for cooking. Mr. Varadan bought an induction

stove to overcome the fuel problem. The next day Sumathy used her copper bottom cooker and kept it on the induction stove. But even after using it for half an hour she found that the cooker was not hot and food not cooked. As she was not aware of the method to use the induction stove, she asked her elder daughter Dhanya, studying first year engineering about it. She told her, that some vessels cannot be used on this stove. She took the instruction manual and explained to her mother, that the stove works on magnetic induction, and copper being a diamagnetic material, will not respond to it.

a. What values did Mr. Varadan and Dhanya exhibit towards Ms. Sumathy? Mention any two

(Awareness, concern for conservation of energy and fossil fuels, sharing the knowledge)

b. Give few examples of diamagnetic materials and explain how their susceptibility varies with temperature?

Ans. Susceptibility is independent of temperature as they have no permanent dipoles.

6. Bala and Rama class X students were assigned a project based on magnetism. In their project work, they had calculated the value of earth's magnetic field. When they submitted their project for verification. Mr. Santosh, their physics teacher, corrected the mistakes. He also suggested few books which could be of use to them.

a. What values did Mr. Santosh exhibit towards his students? Mention any two

(Honesty, helpfulness, responsible behaviour towards students, concern for the student to create interest in the subject)

b. Mention the three magnetic elements required to calculate the value of earth's magnetic field.

Ans. Magnetic declination, magnetic inclination and horizontal component of earth's magnetic field.

7. Mr. Sairam the chief development officer, in southern railway went on an official tour to attend a seminar on fast moving trains. He met his friend Ontosaki in Tokyo after he finished his seminar there. His friend explained to Sairam, how Japanese people are concentrating on energy conservation and saving of fossil fuels using Maglev trains. Mr. Sairam travelled from Tokyo to Osaka in maglev train and found that sound is less, travelling is smooth and understood in what way we are lagging behind Japanese in mass transporting systems. This works on the principle of Meissner's effect.

a. What values did Mr. Sairam find from Ontosaki? Mention any two.

(Awareness about new technology, concern for energy conservation, decrease of noise pollution and air pollution i.e., concern for environment)

b. What is Meissner's effect?

Ans. When a superconductor is cooled in a magnetic field below its critical temperature the magnetic field lines are expelled showing diamagnetic property. This is called Meissner effect.

8. Ms. Lavanya a house wife aged 42 years complained of stomach ache one day. Her husband Mr. Srinivas took her to a nearby hospital. The doctor observed her and found something wrong near her liver and suspected malignancy. There after checking her MRI scan, a team of doctors advised her to go through Carbon radio therapy which is very safe. They said using cyclotron, high speed ions can be generated that directly attack the cancerous tissues and destroy them.

a. What values did Mr. Srinivas and the doctor have exhibited? Mention any two.

Ans. concern for others, helpfulness, presence of mind, responsible citizen

b. What are the roles played by Electric field and magnetic field in Cyclotron?

Ans. The charged particles are accelerated by the electric field with the magnetic field bringing them again and again to the electric field that is the region between the 'Dees'.

9. Mrs. Gupta family was fast asleep during Night. They had no clue that their living room has caught fire due to a short circuit. Suddenly they heard sound of alarm and woke up. They were surprised to see that the sound was coming from the model of fire alarm prepared by their son. They were all happy that a small science model has saved their life

(i) Give the values displayed by the parents and son.

(ii) Name the device use in the model.

Ans: (i) Knowledge, Scientific thinking

(ii) photo cell

**10.** Mrs Thakur left her car headlights on while parking. The car would not start when she returned. Seeing her struggle, Mohit went to her help. Not knowing much about cars, he ran and brought a mechanic Raju from a garage nearby. Raju realized that the battery had got discharged as the headlight had been left on for a long time. He brought another battery and connected its terminals to the terminals of the car battery to get the engine started. Once the engine was running, he disconnected this second battery. This is known as “JUMP STARTING”. Mrs. Thakur thanked both Mohit and Raju for helping her.

(i)What values did Mohit have?

(ii) A storage battery of emf 8.0 volts and internal resistance 0.5 ohm is being charged by a 120 volt DC supply using a series resistor of 15.5 ohms. What is the terminal voltage of the battery during charging? What is the purpose of having a series resistor in the charging circuit?

Ans: (i)Helpful, aware of his weakness, decision making ability.

### **ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS**

1. Krishnan a retired science teacher was walking with his grandson Munna by the side of a paddy field. Munna noticed power grids carrying thick wires. He was curious to know what the structure was and what the wires were for. So he asked his grandfather about it. He also wanted to know if the tower could be removed so that there would be more space for crops. Krishnan explained in detail about the tower and the need for the wires.

QUESTIONS: a) Why is the voltage stepped up for long distance transmission?

b) What are the values exhibited by Krishnan and Munna?

ANSWERS:

a) Less power loss

b) Concern for saving energy and greenery.

2. Nita switched on the radio set to listen to her favourite music but found the reception was not clear. Also there was overlapping of signals. So she adjusted the tuner in the set till she heard the music clear.

QUESTIONS:

a) What are the components of tuning circuit in a radio?

b) Name the phenomenon involved here?

c) What value can be associated with this?

ANSWERS:

a) By adjusting the tuner, she would have changed the capacitance value and adjusted the frequency.

b) Resonance.

c) Harmony. By being in harmony with nature, life would be beautiful and easy for the future generation.

3. Anand on entering his apartment, switched on the tube light, but it did not work. So he called the electrician. The electrician inspected the tube light and suggested a replacement of the choke. On replacing the choke Anand found the tube light working.

QUESTIONS:

a) What is the function of a choke?

b) Identify the value exhibited here.

ANSWERS:

a) To reduce the current in the circuit without any heat loss.

b) Concern for conserving energy.

4. Monica had come from Singapore on a holiday to her grandmother’s place. She had heard a lot about Tirupathi temple and so she went to Tirupathi with her grandmother. She walked through a metal detector and heard a beep sound as she walked through it. When

she went back to Singapore she asked her father about the metal detector and its working. Her father explained the working in detail and also the need for installing metal detectors in places where people visited in huge numbers.

QUESTIONS:

- Name the components present in the detector .
- What is the phenomenon involved?
- What value can be attached with this?

ANSWERS:

- An inductor and a capacitor.
- Resonance.
- Concern for social security and curiosity.

5. During the Physics period, the teacher had started with alternating current. She recalled the concepts of AC and DC. She also asked the students to draw the graphs of AC/DC in their notebook. Ramaa did the work. But Leena was not able to draw. She struggled but Ramaa helped her in the completion of the graph.

Questions: i. What values were displayed by Ramaa?

Sharing the knowledge, helping nature.

ii. Draw graphically AC & DC

iii. Why do we prefer AC to DC?

Less loss of power in AC.

6. A visit to science exhibition was arranged for class XII. They saw the process of electroplating. The students exhibited the electro plating with the help of DC source. Immediately students raised the doubt, “Why don’t we use AC instead of DC?” The teacher in charge explained and cleared their doubts.

Questions:

i) What values were displayed by these students?

Curiosity, critical thinking and understanding

ii) Why should we use dc instead of ac?

Because in AC, direction of current changes periodically whereas the electrodes are with fixed polarities.

7. Subhash wanted to see the work of a transformer. He bought a transformer from a shop. He connected the primary to an AC supply. At that time an aluminum ring in his hand falls into the core of the transformer. Without noticing that he switched on the power supply. The aluminum ring flew up into the air. He became panic. His father, an electrical engineer in EB explained the reason.

Questions:

i. What value does he exhibit?

Curiosity, awareness.

ii. Bring out the reason for the above activity.

Induced current in the aluminum ring acts in the opposite direction to those in Coil and so magnetic field of the ring repels the magnetic field due to the coil.As a result of it the ring shoots up in air.

8. Raj is in XII standard. His Physics teacher demonstrated an experiment to explain Faraday’s laws of electromagnetic induction. Raj interrupted her lecture and asked “Is there any possibility of induced emf due to earth’s magnetism?” The teacher was stunned for a moment and gave this question for group discussion. Finally the students came out with correct answer.

Questions:

i. Write the values that you learnt from this incident.

Team spirit ,curiosity, scientific aptitude.

ii. What can be reason for Raj’s question?

When the wire in N-S direction is dropped freely, none of the components of earth’s magnetic field is intercepted. So no induced emf is produced. When the Wire is dropped freely in E-W

direction horizontal component of earth's magnetic field is intercepted. So emf is induced in the coil.

9. Lakshika used to go to her school on bicycle. She studied electromagnetic induction in her physics class. An idea occurred to her. She attached a small dynamo and an LED with the axle of the cycle. (2)

This way during the ride she used to enjoy the glowing of LED. (a) What values do you think are inculcated in Lakshika after understanding physics ?

(b) What is the principle on which dynamo is based ? Does this device obey principle of conservation of energy.

Ans. (a) Capability to use the understanding of a concept for innovation, scientific temper, ability to correlate.

(b) Dynamo is based on the principle of electromagnetic induction. It converts mechanical energy into electrical energy. Yes, it obeys the principle of conservation of energy.

10. Mr. Dixit purchased heater marked with 80V – 800 W. He wanted to operate it on 100V – 50Hz a.c.

supply. He calculated inductance of the choke required for operating that heater.

(a) Specify the nature of Mr. Dixit.

(b) How Mr. Dixit could have calculated the value of inductance ? Explain.

Ans. a) He seems to be a techno friendly having confidence and knowledge of electrical gadgets.

### **ELECTROMAGNETIC WAVES**

1. Clinical microscopes are used to diagnose diseases based on blood and urine samples. Mr. Bajaj does not believe in such tests. He prefers to go to doctors who diagnose on the basis of pulse check only. He fell ill and his temperature persisted for more than a month. Anurag a student of class twelfth resides near Mr. Bajaj house, convinced Mr. Bajaj and got his examination conducted. How X ray is produced? What are the values exhibited by Anurag?

Ans. X-rays are produced by accelerated charged particles.

Values; Caring nature, sympathy, general awareness.

2. Sushma's mother suffers from cancer of third stage. She has been advised a therapy in which cancerous growth will be burnt by atomic radiations. She is told that her beautiful hair will fall in this therapy and she is liable to become bald. Sushma's mother refuses the therapy which is otherwise must for her. Sushma talked to her mother explaining the need of the therapy and could convince her. What are the values exhibited by Sushma? Which electromagnetic radiation is used in cancer treatment?

Ans; **Sympathy**, caring nature, ability to react to situations.

Radiation used; Gamma radiation.

3. As water nowadays is more contaminated Ritesh's father decided to install a water purifier. When the technician installed the purifier, Ritesh asked him whether it is capable of killing the bacteria and other germs also apart from suspended particles. The technician replied that they are killed by a radiation which is emitted from one of the compartments and explained the whole process of purification.

a) What kind of quality is shown by Ritesh?

b) What radiation does the technician refer to? Mention two more applications of such a radiation.

Ans: UV Radiation. Also used in crack detection, forensic lab for detection of finger prints, in sterilization of surgical instruments.

4. Pramila was gifted with a box like oven on her birthday and she began to cook food extremely fast. Her son Ramu got surprised by the speed with which the food items getting cooked and he enquired about the working of the device as her mother is an engineer. Then his mother explained the importance of a particular type of radiation employed in the system and the principle behind it.

a) What was the quality exhibited by Ramu.

Ans; Curiosity, Scientific temper

b) What kind of radiation does Pramila refer to and mention one more application of that radiation?

Ans: Microwaves. Also used in radar operations and in Communication.

### OPTICS

1. Ravi is using yellow light in a single slit diffraction experiment with slit width of 0.6 mm. The teacher has replaced yellow light by x-rays. Now he is not able to observe the diffraction pattern. He feels sad. Again the teacher replaces x-rays by yellow light and the diffraction pattern appears again. The teacher now explains the facts about the diffraction and

- Which value is displayed by the teacher?
- Give the necessary condition for the diffraction.

Ans: Inculcating scientific temper and curiosity among students, increasing understanding levels of students.

**Condition:** The wavelength of light must be comparable with the size of the slit

2. Aditya participated in a group discussion in his school on “Human eye and its defects” .In the evening he noticed that his father is reading a book by placing it at a distance of 50 cm or more from his eye. He advised him for his eye check-up.

- Suggest the focal length/power of the reading spectacle for him, so that he may easily read the book placed at 25 cm from eye.
- Name the value displayed by Aditya.

Ans: Determining ‘focal length using lens formula and finding power ‘P’

Ans: caring nature, Sympathy

3. Vinod was watching a program on the topic MOON on the Discovery channel. He came to know from the observations recorded from the surface of Moon that the sky appears dark from there. He got surprised and wanted to know the reason behind it. He discussed it with his friends, and they explained the reason behind it.

a) Name the value that was displayed by Vinod and his friends.

Ans. Vinod : Curiosity, Scientific temper.

Friends: helping nature

b) State the reason why sky appears dark from the moon.

Ans: No atmosphere hence no scattering.

4) Ramesh and Arvind were playing near a river. The river appeared shallow to them .Hence they decided to have fun by playing in the river water. Ramesh’s friend Madan happened to pass through. He noticed the intention of the children .Immediately he instructed them not to indulge in adventure and explained them that the river was much deeper than it appeared. This way he avoided a mishapening.

a) What qualities do Madan displayed.

Ans: Caring nature, Social responsibility.

b) With the help of a ray diagram explain why water appeared less deep?

Ans: Correct diagram showing real depth and apparent depth.

5) Balan was very much fascinated towards astronomy that he decided to make a telescope He carefully studied about the construction of telescope and prepared his own model and presented his ideas in a science seminar and got first prize.

a) What qualities do Balan possess?

Ans: Scientific temper, curiosity, in depth understanding of the concept.

b) What kind of telescope he might have made and draw ray diagram for the same

Ans: Astronomical telescope, Ray diagram.

6) A teacher has given three lenses 0.5D, 4.0D and 10.0D to a student. He is not sure as to which lens would be used for constructing a good astronomical telescope. So he consulted his seniors

and the teacher and construct a telescope. Later he showed the telescope to the junior classes and explained about the choice of lenses.

(a) What value has he shown by doing these?

(b) Which lenses are used as objective and which one is an eye piece?

Ans: a) Curiosity, Scientific temper.

b) Objective-0.5D eyepiece -10D

7) . A child is observing a thin film such as a layer of oil on water show beautiful colours when illuminated by white light. He feels happy and surprised to see this. His teacher explains him the reason behind it. The child then gives an example spreading of kerosene oil on water to prevent malaria and dengue. (a) What value was displayed by his teacher?

(b) Name the phenomenon involved.

Ans: (a) Curiosity, Scientific temper.

(b) Interference of light.

8) Ramu while doing the experiment for determination of focal length of a convex lens ,suddenly dropped the lens and it got broken into to two halves along its axis .Then Ramu asked the teacher whether even the broken piece will form the image, the teacher answered in the affirmative and showed the image also.

a) What qualities are exhibited by Ramu?

Ans: Curiosity, Scientific temper.

b) What will be the nature of the image formed?

Ans: Same size, Less intensity.

9). Suman and Arti are friends, both studying in class 12th .Suman is a science student and Arti is a arts student .both of them go to market to purchase sun glasses. Arti feels that any colored glasses with fancy look are good enough. Suman tells her to look for UV protection glasses, Polaroid glasses and photo-sensitive glasses.

Read the following passage and answer the following questions:

(a) What are UV protection glasses, Polaroid glasses and photo sensitive glasses?

(b) What values are displayed by Suman?

Ans. (a) UV protection glasses are those which filter ultra violet rays they are harmful to our eyes. Polaroid glasses help in reducing the glare. Photo sensitive glasses get darker in strong day light. They protect our eyes from strong sunlight especially at noon.

(b) Suman has displayed concern for her friends. She has put to use the knowledge she acquired in her science. Mugging up things for examination is of no use. What we are taught in the class room must be used in practice.

10) During summer vacation Radha and Rani decided to go for a 3 D FILM. They have heard about this film through their friends. They were asked buy special glasses to view the film. Before they go for a movie, they approached their Physics teacher to know about these glasses. Physics teacher explained when two polarizer's are kept perpendicular to each other(crossed polarizer's) the left eye sees only the image from the left end of the projector and the right eye sees only the image from the right lens. The two images have the approximate perspectives that the left and right eyes would see in reality the brain combine the images to produce a realistic 3-D effect.

a) What qualities do these girls possess?

b) What do you mean by Polarization?

c) Mention the other applications of polarization.

ANS: a) Curiosity to learn, approaching the teacher to learn new things, inquisitiveness

b)Refer NCERT text book) & c) Sun glasses, LCD,CD players.

#### DUAL NATURE OF RADIATION AND MATTER

1. A function was organized in the village hall with 500 sitting arrangement. When people started entering in groups the counting became difficult. The village head asked Rahul and his friends to take the responsibility at the gate. The boys took the responsibility and people started

entering one by one . The disciplined entering of the people helped in easy counting with the help of a scientific device given by the village head to boys.

- (a) What values are shown by the boys?
- (b) Name the scientific device which is based on application of photoelectric effect
- (c) What is the principle of such scientific device?

Sol (a) The values shown by boys are :

- (i) High degree of general awareness
- (ii) Sense of responsibility
- (b) Photocell
- (c) A person approaching a door way may interrupt a light beam which is incident on a photocell. The abrupt change in photocurrent records every interruptions of the light beam caused by a person passing across the beam. In this way it helps count the person entering the hall provided they enter the hall one by one.

2. Rohit one day thought if radiation has a dual (wave particle) nature, might not the particle of nature ( the electrons, protons etc.) exhibit wave like character. So he consulted his physics teacher for its answer, who explained the facts properly.

- (a) What are the values displayed by Rohit?
- (b) According to your point of view how teacher explained such thing properly?
- (c) Why is de – Broglie wave associated with the moving football not visible?

Sol (a) The values displayed by Rohit are :

- (i) Curiosity
- (ii) Creativity
- (b) The moving particles of matter display wave like properties under suitable conditions. Because nature is symmetrical and that the two basic physical entities matter and energy must have symmetrical character. If radiation shows dual aspects so should matter.
- (c) The de-Broglie wave length associated with moving football is of extremely short wavelength. Thus, it cannot be detected.

3. Meena thought that there are materials which absorb photons of shorter wavelength and emit photons of longer wavelength. But can there be stable substances which absorb photons of larger wavelength and emit light of shorter wavelength? She got confused and could not find its answer. Then she requested her friend Seema to explain her. The first case, energy given out is less than the energy supplied. But in the second case the material has to supply the energy as the emitted photons has more energy which cannot happen for stable substances.

- (a) What values do you notice in Meena?
- (b) Consider a metal exposed to light of wavelength 600 nm. The maximum energy of the electrons doubles when light of wave length 400 nm is used. Find the work function in eV

Sol (a) The values noticed in Meena are

- (i) High degree of general awareness
- (ii) Concern for her friend
- (iii) Helping and caring nature

4. It is seen that gases are insulators at ordinary pressures and start conducting at very low pressures. Sunny was interested to know the reason behind it. So he requested his friend Amit to explain the concept behind it properly . Amit explained that at low pressure ions are far away, so they have possibility to reach their respective electrodes and constitute the current, but at ordinary pressure ions collide frequently and recombine with the opposite charged ions.

- (a) What values are displayed by Amit ?

(b) An electron is accelerated through a potential difference of 100 V. What is the de Broglie wavelength associated with it? To which part of the electromagnetic spectrum does this value of wavelength correspond?

Sol (a) The values displayed by Amit are :

- (i) High degree of general awareness
- (ii) Concern for his friend
- (iii) Helping and caring nature.

6. Shyam knows that red light has greater intensity and so it is much bright but in case of photoelectric emission it cannot produce the emission of electrons from a clean zinc surface while even weak ultra violet radiation can do so. He could not know specific cause of such thing. Then he went to his friend Kumar for its specific explanation. Kumar explained him that the photoemission of electron does not depend on the intensity while it depends on the frequency and the energy of photon of incident light. The energy of photon of red light is less than the work function of zinc, so red light cannot emit photoelectrons. Similarly, the energy of photon of ultraviolet light is greater than the work function of zinc, so ultraviolet light can emit photoelectrons.

(a) What values are noticed in Kumar?

(b) The work functions of lithium and copper are 2.3 eV and 4 eV respectively. Which of these metals are useful for the photoelectric cell working with visible light? Explain

Sol (a) The values noticed in Kumar are :

- (i) High degree of general awareness
- (ii) Concern for his friend
- (iii) Helping and caring nature

7. Smitha wanted to give a gift to her cousin a burglar alarm. But she did not know about its working principle and its significance. She discussed it with her friend Shruthi. Shruthi explained her that in burglar alarm, ultraviolet light is continuously made to fall on a photocell installed at the doorway. A person entering the door interrupts the beam falling on the photocell. The abrupt change in photocurrent is used to start an electric bell ringing.

(a) What are the values shown by Shruthi?

(b) An electron and a photon each have a wavelength of 1.00 nm. Find (i) their momenta (ii) the energy of the photon, and (iii) the kinetic energy of electron

Sol (a) The values shown by Shruthi are :

- (i) High order general awareness
- (ii) Able to convince someone
- (iii) Helping and caring nature

### ATOMS AND NUCLEI

1. Kala's uncle who was a kabadiwala was getting weak day by day. His nails were getting blue, he stated losing his hair. This happened immediately after he purchased a big container of heavy mass from Delhi University Chemistry Department. Doctors advised him hospitalization and suspected he has been exposed to radiation. His uncle didn't know much about radiations but Kala immediately convinced her uncle to get admitted and start treatment.

(i) What according to you are the values utilized by Devi to convince her uncle to get admitted in hospital

(ii) Name the radioactive radiations emitted from a radioactive element.

Ans : Caring nature and sympathy

Gamma radiation.

2. Selvi's grandfather was reading article in newspaper. He read that after so many years of atomic bombing in Hiroshima or Nagasaki, Japan National census indicated that children born

even now are genetically deformed. His grandfather was not able to understand the reason behind it. He asked his Granddaughter Selvi who is studying in class XII science. Selvi sat with her grandfather and showed him pictures from some books and explained the harmful effects of radiations.

(i) What are the values/ skills utilized by Selvi to make her grandfather understand the reason for genetical deformity?

(ii) Name the nuclear reactions that occurred in atom bomb.

Ans : Better understanding of the subject and helping nature.

Nuclear fission reaction

3. Kannan a resident of Kundakulam was all set to leave everything and shift to another place in view of the decision of Govt. to start nuclear thermal power plant at Kundakulam. His granddaughter Prachi, a science student, was really upset on the ignorant decision of her grandfather. She could finally convince him not to shift, since adequate safety measures to avoid any nuclear mishap have already been taken by the Govt. before starting nuclear thermal plants.

- What is the value displayed by Prachi in convincing her grandfather
- What is the principle behind working of nuclear reactor
- What are the main components of nuclear reactor
- Why is heavy water used as moderator?

Ans :(i) Awareness, social responsibility

(ii) Controlled chain reaction

(iii) Nuclear Fuel, Moderator, Control rods, Coolant, Shielding

(iv) Neutrons produced during fission get slowed if they collide with a nucleus of same mass. As ordinary water contains hydrogen atoms so it can be used as a moderator. But it absorbs neutron at a fast rate. To overcome this difficulty, Heavy water is used as a moderator which has negligible cross sections for neutron absorption

4. Rahu and Rohan got a golden opportunity to attend a 3 days camp at IGCAR, Kalpakam. Rohan was excited about this camp, but Rohan was little disturbed about the camp. When Rahu asked about Rohan's concern, he expressed his fear about the absorption of harmful radiations emitted from the reactor by them. Immediately Rahu explained about the safety measures taken at the reactor site. Rohan was convinced with his reply and started preparing for his camp.

a) What moral would you derive from Rahu?

b) The fission properties of  $\text{Pu}239$  are very similar to those of  $\text{U}235$ . The average energy released/fission is 180 MeV. How much energy, in MeV, is released if all the atoms in 1Kg of pure Pu undergo fission?

Ans: a) Care for his friend and positive attitude towards technology.

5. A farmer in a village was worried about the poor yield of the soil. Kannan, during his visit to his native place happened to meet this farmer and suggested him to use a phosphate fertilizer incorporated with Radio Phosphorous. He also explained that Phosphorous will be taken by the plant for its growth and radio phosphorous will increase the yield. The farmer thanked him for his valuable suggestion. a) Suggest the moral value that you derive out of Kannan,

b) A radioactive isotope has a half life of T years. How long will it take, the activity to reduce to i) 3.125% ii) 1% of its original value?

Ans: a) Concern for the society/locality., awareness, presence of mind.

6. Raman and Nikhil are arguing about the estimation of age of specimen by any scientific

method. Raman said that there is no way of finding the age of a specimen scientifically. But Nikhil argued that there should be one method to find the age of specimen, but he is not aware of that method. Sekar, who is witnessing this argument, convinced them not to proceed with the argument. He said that the age of the specimen can be estimated by noting the drop in the activity of carbon C14, when the organism is dead. Listening to the explanation given by Sekar, both of them were convinced and also felt happy as they have learnt a new concept.

a) What moral value do you observe in Sekar?

b) Obtain the amount of Co60 necessary to provide a radioactive source of 8mCi strength. The half life of Co60 is 5.3 years.

Ans : a) Readiness to teach his juniors, concern of juniors towards learning.

7. a) Sekar saw his younger brother wondering with a question which deals with emission of light from a vapour lamp. He was anxious to know how different colors were being emitted by different light. He also saw mercury and sodium vapour lamps in the physics lab and was curious to know what is inside the lamps. On seeing his anxiety to know more about it Sekar explained about absorption of energy and reemission of photons in the visible region. He also advised him not to touch or break any items in the lab for the thirst of knowledge.

a) What is the moral you derive from Sekar?

Ans: Concern for his brother/ care about the school property.

b) Which series in the hydrogen spectrum is in the visible region?

Ans. Balmer.

8. Mr. Rana a daily wages worker got affected by cancer. On knowing about it all his coworkers started avoiding him, fearing that it was contagious. Mr.Rana felt very depressed. Mr. Rana a close friend immediately took Mr.Rana to a radiologist who examined him and said it was the beginning stage of cancer and it can be easily cured and he also certified that it is not a communicable disease.

(i) What moral values did Mr. Rana exhibit ?

Ans. Positive attitude, encouraging nature, timely help, creating awareness. (ii) A radioactive substance 'X' has a half life of 140 days. Initially it is 8g. Calculate the time for this substance 'X' when it reduces to 1 g.

Ans.  $N / N_0 = (1/2)^n$

$= (1/8)^n$

$= (1/2)^3$

Therefore  $n= 3$

$T = 3 \times 140$

$= 420$  days

9. Rutherford and his team performed the Gold foil experiment that provided a new insight into the structure of an atom. Their findings were not recognized by the scientific community in that period of time. Still this did not deter them from making further path breaking discoveries in the field of Physics.

(i) What were the qualities that can be imbibed by us from Rutherford and his team?

Ans : Ability to remain undaunted even if others do not recognize the validity of research, to forge ahead with what we believe is the truth inspite of opposition.

(ii) What were the conclusions of the gold foil experiment? Draw the graph showing the relationship between the number of alpha particles scattered and the angle of scattering.

10. Eight year old Johnson and his father were waiting to board a bus at the bus stop on a hot scorching summer day. Johnson was feeling faint with thirst and the heat. His anxious father asked the nearby person for water. On seeing this, a tender coconut vendor gave a tender coconut to Johnson who drank it and felt better. Both father and son thanked the coconut vendor who refused to take money.

(i) What are the qualities that you would associate with coconut vendor?

Ans: warm hearted, caring for fellowmen, resourcefulness.

(ii) Name the nuclear reaction taking place in the sun. (Nuclear fusion reaction)

11. Mohini's mother was gaining weight and her body was becoming bulky. She was also experiencing more than normal hunger. Mohini was worried about this. She talked to her friends who suggested her to take her mother to a doctor. Mohini's mother was not willing to go to doctor. Mohini told her friends about this. One day Mohini's friends came to Mohini's house and persuaded her mother to go to doctor. Doctor administered a radioisotope of Iodine and diagnosed the problem. Mohini's mother was prescribed

appropriate medicines. a) What according to you, are the values displayed by Mohini and her friends? b) Give some information about the radioisotope of iodine?

Ans : Concern sympathy for her brother.

### **SEMI CONDUCTOR DEVICES**

1. Ajay observed that there is fluctuation in D c power supply and he made a circuit by using one special semi conductor and regulated the power supply. What values he has shown and name the semiconductor and draw the circuit diagram for regulating power supply.

Ans: Rising to the occasion, finding solutions to the existing problems.

Zener diode is used to regulate the power supply.

2. when power supply in the home is stopped at night 8 pm Sita immediately switched the light of her mobile phone and could find the sufficient light to see the things. What values that she has shown. What kind of diode is there with the cell phone and what are the advantages of it over incandescent bulb?

Ans: Sita has shown presence of mind, application of knowledge.

Light Emitting Diodes are used

Advantages 1) low operational voltages and less power consumption.

2) Fast action and no warm up time required

3) Long time and rugged life.

3. A physics teacher explained that electronic components work with D C. Albert ,a student of his class observed that cell phone is charged by connecting charger to A C in his home. Next day he asked the teacher about the same.

What values the student has shown?

How the conflict would have been resolved by the teacher.

Ans: Albert has applicative mind, curious to learn, reasoning ability. The cell phone charger has the rectifier which converts A C to DC.

4. Father prepared to purchase a LCD TV but his son after studying the semiconductors, could convince his father to purchase an LED TV?

What values the son has shown? Also write any two points where LED is better than LCD TV?

Ans: Application of learning content in day to day life, convincing skills.

LED TV consumes less power and gives more picture clarity than LCD TV.

5. After reading an article on the generations of computers Abhay asked his teacher how it is possible to reduce the size of the computer so less and much efficient?

What values the student has shown?

What component made the computer size so small and what are its advantages and limitations?

Ans: Connect outer experience with class room learning, eager to find the reasons for things happening around.

Integrated chips could make the size of Computer so small.

6. Teacher said that it is difficult to install the electric polls in the hilly stations as the surface is not flat. Then a student asked the teacher how the people are able to maintain their lives in night. The teacher while explaining took the name of an optoelectronic device.

What values the student has shown?

Name the device that has used to clarify the doubt asked by the student?

Ans: Thinking about other's needs, interested to know the alternate ways and means.

Solar cells

7. Raghu's grand father has shown one radio that he purchased with his first salary in 1960, which is bigger than the present portable T V.

Next day Raghu asked his teacher what made the size of the radio so big and how it is possible to make palm size radios now.

What values that Raghu has shown? Write the correct answer for his doubt.

Ans: Raghu was eager to know and curious to learn.

Transistor and IC have made these changes to enable to make palm size radios.

8. After attending the class of semiconductors especially silicon, Rohit asked the teacher is there any relation between this semiconductor silicon and silicon valley?

What values Rohit has shown and what do you think about the relation between Silicon Valley and silicon.

Ans: Enthusiastic and love for learning knowledge and able to connect the outside knowledge to the class room content.

^ Silicon Valley is famous for producing Silicon chips and large business activities take place due to this production.

9. A gardener wanted an alarm to make sound when the air temperature is less than 00 and more than 300 and he told the same to his son, an electrical engineer. His son prepared as per his father's requirement.

What values the son has shown?

How he could design to meet the required needs and what logic gates he must have used?

Ans: Son is very caring and attends to the needs of old people.

The logic gate was OR gate

10. Grand mother of Harish expressed her worry about the theft of valuable articles in home. Harish mad a burglar's alarm and shown his grand mother and explain the function of it? Grand mother appreciated the efforts of harish.

What value harish has shown?

What logic gate has he used in the device?

Ans: Harish is very caring towards old people and respect and attends the needs of old people.

The logic gate used is AND gate.

11. Ram was excited to know about the function of traffic signals .His father has prepared a board and explained the working of traffic signals?

What values the father has shown?

What components he must have used to show the working of traffic lights?

Ans: Father is very caring and affectionate towards his son.

He must have used LEDs and other simple electronic components.

## COMMUNICATION SYSTEMS

1. During a class discussion regarding the bandwidth of transmission medium, group A was of the opinion that message signals could be transmitted at any bandwidth. They were not aware of the transmission media to be used. Group B gave information about the commonly used transmission media while group C informed about the government procedures to be followed.

(a) What was the information given by group B and group C?

(b) What values do you observe in this class discussion?

Ans: Team Work, Togetherness, Awareness.

2. Two students of class 12 were interested in doing a project on 'transmitting signals of different frequencies'. They completed their project without any help but found that (i) the transmission is attenuated and (ii) the various information signals transmitted at low frequencies got mixed up.

(a) Identify the solution for the problem

(b) What values can we learn from those students?

Ans: Eagerness / Curiosity to learn more and scientific attitude.

3. A TV tower has a height of 70m with an average population density around the tower as 1000 per km<sup>2</sup>. In about 5 years the CITY LIMIT the place doubled and the residents were not able to get the broadcast clearly. Niharika, a student, identified the problem and notified the Government saying that the height of the tower should be increased to double its coverage.

(a) By how much should the height of the tower be increased?

(b) What values would you appreciate in Niharika?

Ans : Awareness, Concern for public and Helping the society / being helpful to the society, initiative.

4. Raman went to the market to purchase a T.V. set. He got confused with so many features and functions of electronic appliances. He took the help of his friend Raman, a science student. Shankar explained him about the communication system, digital and analogue signals. This knowledge proved of great help to Raman in purchasing a colour T.V.

(a) What type of nature Sankar has?

(b) What do you mean by the term communication? Which types of signals are better? Ans : (a) Sandeep is friendly, helping and well aware having a vast knowledge of subject.

(b) Truthful, intact and speedy transfer of knowledge or data from one place to other is called Communication. Digital signals are better. These are disturbance free, clear and sharp.

5. Chitra was watching her favorite TV serial suddenly the picture started shaking on TV screen. She asked her brother to check the dish antenna. Her brother found no problem in dish. Chitra noticed the same problem in TV picture again after some time. At the same time she heard the sound of low flying air craft passing over their house. She asked her brother again. He explained the cause of shaking picture on TV screen when air craft passes over head.

(a) Name the values used by Chitra's brother?

(b) Why the picture on the TV screen was shaking when air craft was passing over head?

Ans : (i) Critical thinking and problem solving

(ii) Low lying air crafts reflect TV signals. Due to interference between direct signal received by antenna and reflected signal the picture on TV shakes

6. One day Ravi has observed that the radio in his uncle's house was tuned. But two programmes were coming at a time. Then he opened the radio set and he adjusted the coil properly again it was closed by Rahul. Mention a) scientific value exhibited by Ravi. B) What is the property which he changed and how was it corrected?

Ans :(a) Critical thinking and awareness of subject

7. One morning during school assembly the S U P W teacher who looks after the microphone arrangement was absent. Principal felt inconvenient without microphone to run assembly program. Then a boy of class XII came up on the assembly and he set right the microphone by rotating the knob of the amplifier. Then it started to function properly and loudly. (a) Mention one problem that might have caused to the amplifier

(b) Write the values of the student shown in the above situation?

Ans : (a) Mismatch of resistance of the amplifier with output

: (b) Critical thinking and problem solving

8. Television is theater at home. A TV is a basically a receiver which can be tuned to transmitter of our choice. Younger generation says that T V has merits for the society but elders do not agree to it.

Assuming yourself to be young and then old list two reasons favouring each concept.

Ans : Young- It is the useful tool to gain knowledge through news media

Old : Children tend to over utilize the entertainment component.

9. Kannan lives in a house which is located just beside of a hill in outskirts of the town. He is very interested to listen the music especially of Ghantasala. Recently he purchased a radio set but unluckily he is not able to listen the music. Then a student named Sushil who resides in the neighborhood adjusted by putting one long wire over a wall could succeed the music to listen.

(a) Explain what may be the reason for not being received the signal initially?

(b) What is the scientific attitude shown by the student in solving the above problem?

Ans: (a) Problem in the receiving part.

(b) Awareness and Curiosity

10. Rekha is a late riser. Her grandfather observes that she remains awake late night listening to radio on mobile is also a receiver. Where you have to listen and not to observe anything. Thus you're capable of doing other things simultaneously. Rekha does not ignore her works. But her grandfather blames the FM radio which has made her late riser. What is FM? Why is her grandfather worried?

Ans: Frequency Modulation

He fears distraction of concentration level.