

VALUE BASED QUESTIONS

PHYSICS (042) Std XII

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.

Qs. a) What values did the passer-by have?

b) 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.

Qs. a) Give two values of Ram and Shyam.

b) 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 woolen 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. Yes, when the bodies are similarly 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 achieved.

Qs. a) What values did the car service company have?

b) 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.

Qs a) What values did Akash and his classmates have?

b) 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..

Qs a) 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.

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

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.

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

(2) Why did Vasu have to check the wiring?

(3) What is an electric fuse? What characteristics you would prefer for a fuse wire?

Ans:

(1) Vaikunth: acknowledging the help from others with gratitude.

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

(3) 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 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.

(1) What are the values displayed by the friends?

(2) Express kWh in joules. Find the resistance of the heater.

Ans:

(1) Honesty, sharing of knowledge, willingness to help

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

3. Raghav is 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.

(1) What are the values possessed by Raghav and the authorities? (any two)

(2) What is the danger that could happen to the innocent birds in Raghav's view?

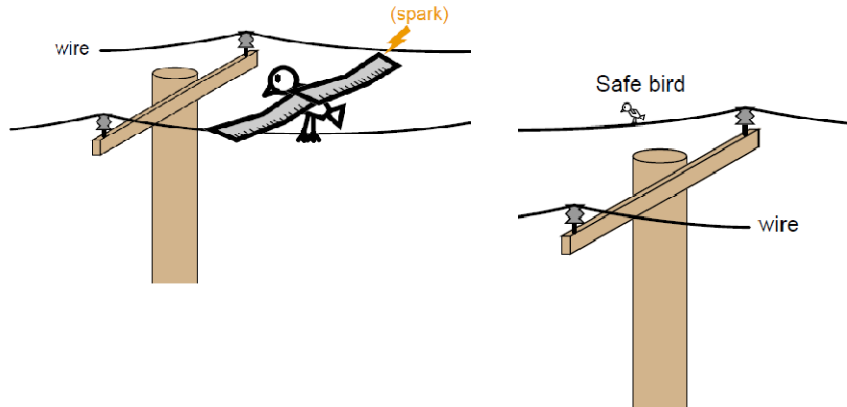
(3) How did distancing the lines solve the problem?

Ans:

(1) Raghav: affection towards birds, taking appropriate action

Authorities: duty conscious

(2) 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 one reason why the galvanometer showed same side deflection.

(c) Distinguish between emf and terminal pd.

Ans:

(1) Sharing of knowledge, caring for and helping others.

(2) 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 Sr.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.

(1) What are the values possessed by Sujatha?

(2) Why for household a parallel combination used? Give two advantages.

Ans:

(1) care for elderly people, empathy, willingness to gain knowledge.

(2) same voltage for all appliances, even if one appliance is not working the others can work.

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 who felt better.

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

Ans.Responsible behaviour, concern and awareness

2. 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 has to be taken in the lab.

1. What value did Mr. Antonio exhibit towards Ms. Udaya? Mention any two
(Responsible behaviour, sensitivity, concern for others and alerting the people)

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

3. 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 slinkys 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.

1. 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)

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

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

4. Ms Nita chander found that her son could not hear properly. The specialist prescribed hearing aid for her son. Hearing aids consist of electromagnets in the loudspeakers used in the device..

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

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

2. 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 can not 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 dia magnetic material, will not respond to it.

1. 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)

2. 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.

1. 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)

2. Mention the three magnetic elements required to calculate the value of earth and draw a neat diagram to explain them.

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

1. 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)

2. What is Meissner's effect? What is the value of χ and μ_r for perfect diamagnetism?

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 housewife 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. Thereafter, 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 attach the cancerous tissues and destroy them.

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

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

2. What are the roles played by electric field and magnetic field in a 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.

ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENT

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 tubelight 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:

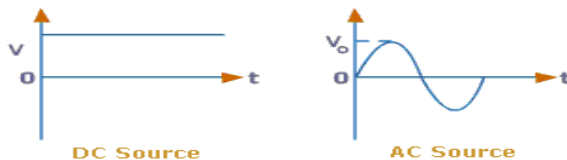
- a) Name the components present in the detector .
- b) What is the phenomenon involved?
- c) What value can be attached with this?

ANSWERS:

- a) An inductor and a capacitor.
 - b) Resonance.
 - c) Concern for social security.
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 value 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,
- 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 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
- 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.

ELECTROMAGNETIC WAVES

Akil was playing cricket with his friends, when a ball hit his friend Bharat on his left leg .Bharat screamed with pain. Akil rushed towards him and comforted him and asked him not to move his leg. He quickly took out his cell phone and called up Bharat's parents and briefed them about the incident. In10 minutes Bharat was taken to the

nearby hospital and was examined by the doctor who advised for an X-rays test which confirmed a hairline fracture.

A) How are X-rays produced?

b) Mention one another application of X rays.

c) Mention two qualities of Akhil which are reflected from the above situation.

Answers

i) x rays are produced by bombarding a metal target by high energy electrons.

ii) To study the atomic structures, treatment for certain forms of cancer

iii) presence of mind, alertness, taking initiative, helpful, caring

2) Chirag was at the restaurant chatting with his cousins. The restaurant was clean and free of flies and insects to his relief. His cousin was curious to know about the uv lamp in the corner and asked Chirag about it. Chirag explained that inside the fluorescent lamp, the electrical energy is converted into uv radiation. The inside of the tube is coated with a fluorescent powder which absorbs the UV and emits violet light in the visible region. These attract the insects which are electrocuted by high-voltage wires near the lamp, so that they don't fall on the food and contaminate them.

i) Name the main source of uv rays?

ii) Why are they considered harmful to us?

iii) What impressed you about chirag?

Answers

i) Sun is the main source of uv rays.

ii) They can cause skin cancer when exposed for a longer time

iii) clarity in explaining, health awareness, knowledge

3) It was Rajat's turn to talk about the great Indian scientist in front of the class and he chose Jagdish Chandra Bose.

Although more famous as a biologist, Jagadish Chandra Bose was a great physicist as well. He can rightly be called the inventor of wireless telegraphy. Though Marconi invented the wireless, Bose had already demonstrated its functioning in public in the year 1895, a year before Marconi's patent for the telegraph. He was the first to fabricate the device that generated radio wave-length (25mm to 5mm). He was a great scientist, who selflessly dedicated his findings to the further development of science. An inventor can make lakhs of rupees by just one or two inventions. Bose has invented many instruments used by many industries. When he was offered money for these, he did not accept it. He felt that knowledge was not anybody's personal property. He permitted anyone and everyone to use the fruits of his work. The whole class including his teacher applauded.

i) Give two properties of the e.m.w produced by Bose.

ii) What values of Bose impressed you from the above passage?

Answers

- i) They are transverse in nature, and travel with the speed of light in vacuum.
- ii) The selfless attitude of the scientist, service mindedness and modesty.

4) A group discussion was in progress...

Speaker 1-Electromagnetic radiations play an important role in maintaining the earth's warmth or average temperature through greenhouse effect. These radiations trap the green house gases such as CO₂ and water vapour thus increasing the temperature.

Speaker 2- We could reduce the emission by using solar operated vehicles or cycles for short distance, use public transport, car pooling.

Speaker 3-The government can impose carbon tax- i.e taxing the individual and industries based on the size of the CO₂ emission.

i)What type of radiation is speaker 1 referring to?

ii) Name one electronic device which emits this radiation.

iii)What values do the speakers exhibit in their discussion?

answers

i) Infra red radiation

ii) Light emitting diodes

iii) concern about the environment, recognising ones duty and taking stock of the situation, open to new ideas, scientific awareness, community service.

RAY OPTICS

1) Rahul was driving a car and suddenly became aware of a loud sound coming from behind. He looked through his rear-view mirror and saw an ambulance. He recalled reading that such emergency vehicles often have their name written in the mirror writing(i.e

He quickly made way for the ambulance, murmuring a quick prayer for the speedy recovery of the patient inside the ambulance.

i)What type of mirror is as a rear view mirror and why?

ii)what values did Rahul exhibit ?

answers

i) Convex mirror ,to get a wide view of traffic behind

ii) Compassion, courtesy, concern for others, knowledgeable

2) Rekha and Preethi were classmates. Preethi was a bright girl and had a quick grasping power. However Rekha noticed that Preethi was not her usual self for the past few days. Rekha found out that Preethi was not able to see the letters on the board properly and also complained of frequent headaches. Rekha suggested to Preethi to get her eye checked .Preethi followed Rekha's suggestion and thanked her saying she felt very comfortable after wearing the spectacles.

- i) What was the eye defect that Preethi had?
- ii) How can it be corrected?
- iii) Rekha was a true friend. Justify.

Answers

- i) *Myopia*
- ii) wearing spectacles made of concave lens
- iii) sympathy, kind, helpful and caring nature, concern

3) Nitin wanted to buy a gift for his sister and so entered a gift shop. The gift shop had many glass items. On looking closely, he found many of the beverage glasses used for cool drinks had big thick glass walls. He decided not to buy these glasses because he knew that this gives a false impression that there is more amount of liquid inside the glass.

- i) As a physics student, *light rays from inside the glass bend away from the normal and appear to diverge*, why are the beverage glasses made with very thick glass walls?

Which physical quantity remains constant when light travels from one medium to another?

- ii) What values can you associate with Nitin decision?

Answers

- ii) *Light rays from inside the glass bend away from the normal and appear to diverge*

- iii) affection, patience, knowledge about refraction,

4) The whole class was excited as they were on their way to Kavalur in TamilNadu, an observatory, housing the largest telescope in India. The teacher was explaining type of telescope, the diameter of the objective (2.34m) and other details. The children were looking forward to see through the telescope.

- i) What type of telescope is the teacher referring to?
- ii) Mention any two advantageous of this telescope
- iii) Why are such a field trips important?

Answers

- i) *Reflecting telescope*

ii) No chromatic aberration, mirrors are relatively lighter and cheaper compared to the lens

iii) Firsthand experience, inculcating a scientific temper, team work, enthusiasm, kindling curiosity

5) Mr. Viswanathan, a retired professor of physics was walking with his grandson. It was last week of December and so it was dark around 5.30pm. The streetlights were on and the yellow light flooded the area around. The boy asked professor why yellow lights were used when white light were brighter. The professor answered that during foggy days the tiny droplets act as prisms splitting white light into its constituent colours and thus reducing the clarity.

- i) What phenomena was the professor referring to? Why does it happen?

- ii) Give one application of prism.
- iii) What values of the boy reflect from the conversation?

Answers

- i) Dispersion, speed of each colour is different when they enter glass.*
- ii) Studying and analysing the spectrum of distant light sources*
- iii) Curiosity, research mindedness, awareness*

6) Satish complained of a severe stomach pain and started crying. His elder brother consoled him and took him to a gastroenterologist. The doctor advised for an endoscopy and asked him to come the next day on an empty stomach. Satish was not for the test as he was afraid. However his elder brother a medical student explained the need for the test and told him it was not a painful experience. He further explained that a tube containing a fine glass fibre would be inserted through the food pipe and light through this pipe would allow the doctor to examine the inside of the stomach. The test was done and satish felt okay after taking medicine for two days.

- i)What is the working principle of the glass fibre in the endoscope?
- II)What are the conditions for the light to travel along the pipe?
- iii)What values of Satish's brother impress you?

Answer

i)Total internal reflection

ii)two conditions

iii)Taking up responsibility, affectionate, timely action, knowledgeable,caring

WAVE OPTICS

1) Two boys, on their way from school were discussing seriously about something. They both were blowing soap bubbles and were thrilled to watch the expanding bubble with spectacular colour rings. Shwetha, a class XII student, was watching them for a long time, walking behind them. Suddenly she realised that the kids did not look at the traffic in that junction area. She rushed to them and instructed them to be cautious while on the road. She also explained the importance of traffic rules and told them that obeying traffic rules not only makes us safe but also others safe.

- a. What are the values highlighted by Shwetha?
- b. Why are colours formed on bubbles?

Ans. a. obeying road rules, alertness,concern in others'slife,clarity of knowledgel

- c. due to superposition of incident and reflected waves of white light by thin film(intereference)

2) Ramu and Somu were going to their friend's house by walk. It was a sunny day in the afternoon. It was very hot. Ramu was finding it very difficult to see around him. He had to strain his eyes to see. Suddenly, Somu took his cooling glasses from his pocket and asked him to wear them and later, Ramu slowly managed to see. Somu advised Ramu on the necessity of wearing sun glasses during summer season.

- a. What are the values shown by Somu?
- b. Name the phenomenon based on which cooling glasses reduce the glare.
- c. What is the resultant intensity of light if both polariser and analyser are rotated through same angle?

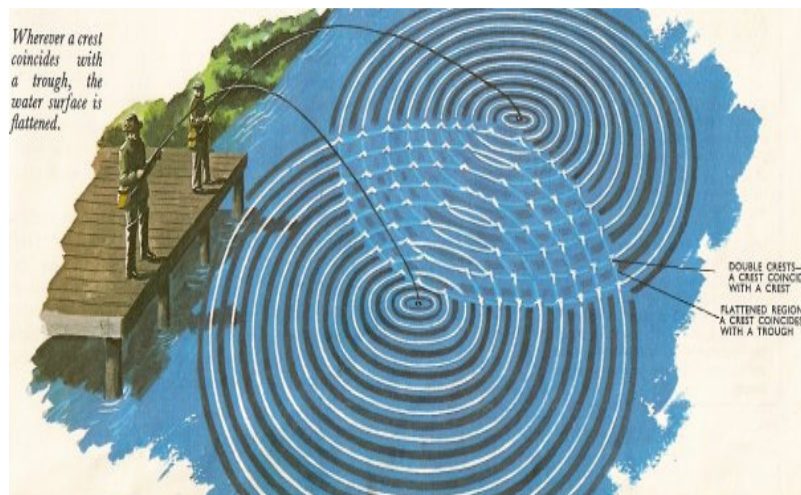
Ans. caring ,sharing,concern

b. polarisation

c. no change in intensity of light

3) Jimmy and Johnny were both creating a series of circular waves by jiggling their legs in water. The waves form a pattern similar to the diagram as shown. Their friend, Anitha , advised Jimmy and Johnny not to play with water for a long time. She then observed beautiful patterns of ripples which became very colourful. When her friend Latha poured an oil drop on it. Latha, a 12th standard girl, had explained the cause for colourful ripple patterns to Anitha earlier.

- a. Identify any 2 values that could be related with Anitha and Latha?
- b. .name the phenomenon involved in the above activity?
- c. define wavefront



5. Ram and Rahim were returning home from the cricket field, On their way they found a new 500 rupee note on the road. Rahim advised Ram to handover the money to the cashier of the charity home They did so and the cashier checked to see whether the currency was genuine or fake. He appreciated the boys and showed them how to check the currency. The number 500 at the centre of the note appears green when looked straight and blue when tilted at an angle. The cashier also explained that the colour shift on tilting is due to constructive interference of blue light produced by the variation of thickness of chemical layers specially added in the printing ink.

a. state one value each that you can identify from Rahim and cashier

b. Draw the intensity distribution pattern of interference.

Ans Ram honesty sincerity and integrity

cashier guiding in the right path readiness to help

DUAL NATURE OF MATTER AND RADIATION

1. In a multistoried building, once a fire broke out at midnight due to electrical short circuit. Ravi along with others rushed to the spot, informed the fire service and put off the fire. But by that time a huge amount of damage had already been done. Ravi being Secretary of the building decided to fix fire alarms (using photo cell) in all the floors

Q - (i) What values were shown by Ravi in this situation?

Ans . Concern for society, social responsibility, application of knowledge.

Q-(ii) A human eye can perceive a minimum light intensity is about 10^{-10} Wm^{-2} . Calculate the number of photons of wavelength $5.6 \times 10^{-7} \text{ m}$ that must enter the pupil of area 10^{-4} m^2 for vision ?

Ans. Energy falling on area per sec $= 10^{-10} \times 10^{-4} = nhc / \lambda$

Therefore $n = \lambda 10^{-10} \times 10^{-4} / hc = 3 \times 10^4 \text{ photons/sec}$

2. Davisson and Germer's actual objective was to study the surface of a piece of nickel by directing a beam of electrons at the surface and observing how many electrons bounced off at various angles. Though the experiment was conducted in a vacuum chamber. air entered the chamber, producing an oxide film on the nickel surface. When they started the experiment again and the electrons hit the surface, they were scattered by atoms which originated from crystal planes inside the nickel crystal. Davisson and Germer's accidental discovery of the diffraction of electrons was the first direct evidence confirming de Broglie's hypothesis that particles can have wave properties as well.

(i) What can we infer about the values shown by Davisson and Germer?

Perseverance, not giving up and patience.

(ii) Write the expression to find the wavelength of an electron when accelerated through a potential difference of V volts.

3. Ravi, while returning home from office late night, saw a person jumping into a house. Suspecting him to be a thief, he slowly followed him. He saw an alarm fixed at the entry of the house. Immediately to alarm the people at the house, he used his laser torch to activate the alarm, as it works with the visible light. The circuit became complete and siren started working and people at the house got up and caught the thief. They thanked Ravi for his action.

a) What moral value can you see in Ravi?

b) The photoelectric cut off voltage in a certain experiment is 1.5V. What is the maximum kinetic energy of the photoelectrons emitted?

Answer: Presence of mind/ Social responsibility/ attitude to help others.

4 A seminar was conducted in an auditorium in Chennai. It was a big auditorium and some seats at the back were vacant. The coordinator had a problem in making the order for lunch, as he was unable to estimate the number of people present in the auditorium. Vikram, associate of the coordinator, saw a digital counter working on the principle of photo electric effect, at every entry and exit gate of the auditorium. The people were allowed to enter through the entry gate and leave the hall by the exit gate. He also noticed that all the counters were in good condition. He immediately noted the display of every counter and gave the coordinator the exact number of people in the auditorium.

a) What moral values can you see in Vikram?

b) What is photo electric effect?

Answer: a) Proper application of knowledge/ concern for his boss/ presence of mind.

ATOMS AND NUCLEI

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1a) Rohit and Mohan got a golden opportunity to attend a 3 days camp at IGCAR, Kalpakam. Rohit was excited about this camp, but Mohan was little disturbed about the camp. When Rohit asked about Mohan's concern, he expressed his fear about the absorption of harmful radiations emitted from the reactor by them. Immediately Rohit explained about the safety

measures taken at the reactor site. Mohan was convinced with his reply and started preparing for his camp.

a) What moral would you derive from Rohit? (1)

b) The fission properties of Pu^{239} are very similar to those of 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?(2)

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

b) NCERT exercise 13.17

2) a) A farmer in a village was worried about the poor yield of the soil. Rohan, 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 Rohan

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.

b) NCERT exercise 13.7

3) a) Akil and Nikhil are arguing about the estimation of age of specimen by any scientific method. Akil 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. Tarun, 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 C^{14} , when the organism is dead. Listening to the explanation given by Tarun, both of them were convinced and also felt happy as they have learnt a new concept.

a) What moral value do you observe in Tarun?

b) Obtain the amount of Co^{60} necessary to provide a radioactive source of 8mCi strength. The half life of Co^{60} is 5.3 years.

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

b) NCERT exercise 13.9

4) a) Shyam 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 Shyam

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 Shyam?

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

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

Ans. Balmer.

5. Mr. Raju a daily wages worker got affected by cancer. On knowing about it all his coworkers started avoiding him, fearing that it was contagious. Mr. Raju felt very depressed. Mr. Rahul a close friend immediately took Mr. Raju 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.

Q- (i) What moral values did Mr. Rahul exhibit ?

Ans. Positive attitude, encouraging nature, timely help, creating awareness.

Q-(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.

$$\begin{aligned}\text{Ans. } N / N_0 &= (1/2)^n \\ &= (1/8)^n \\ &= (1/2)^3\end{aligned}$$

Therefore $n = 3$

$$T = 3 \times 140$$

$$= 420 \text{ days.}$$

6. 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?(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.

7 6 year old Jason and his father were waiting to board a bus at the bus stop on a hot scorching summer day. Jason 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 Jason 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 (warm hearted, caring for fellowmen, resourcefulness)

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

SEMICONDUCTORS

1. Prakash finds his friend Rakesh connecting his new television set directly to switch board. Prakash advises Rakesh not to do so and to connect the television through a voltage stabilizer.

a) Identify the diode used in voltage regulator and give its symbol.

Value Based :

b) What values did Prakash exhibit in the situation described?

- Helpful and concerned
- Practical application of theoretical knowledge.

2. Pradyumna connected a series of solar cells to light up his house which he heated the water.

Contextual :

Briefly describe the typical p-n junction solar cell.

Value Based :

What are the values exhibited by Pradyumna?

- Eco – friendly.
- Less consumption of electricity / saving of electrical energy.

3. Sekhar visited his grandparents who lived in a small village. He found the people of the village uninformed about the internet. So he conducted awareness classes about the advantages and applications of the internet.

Contextual :

Mention the applications of internet.

Value Based :

State the values shown by Shekhar.

- Concern for the villages.
- Helping tendency.
- Contributing to the development of the country.

4. What types of circuits are used to get steady DC output from a pulsating voltage?

Value Based :

How does the working principle of the circuit allow you to overcome hurdles in your life?

- Unwanted habits / thoughts to be eliminated.
- To be steady in life.

5. Ashwin was given 3 semiconductors A, B and C with respective bandgaps of 3eV, 2eV and 1eV for use in a photodetector to detect $\lambda = 1400\text{nm}$. He found that the photodetector was not working with these semiconductors and did not know why. His friend Akash found out the reason for it and explained it to him.

Contextual :

Why did the photodetector not work?

Value Based :

What according to you are the values shown by Akash?

- Helping tendency.
- Presence of mind.
- High degree of awareness.
- Concern for his friend.

6. A student of class 12 was trying to understand the concepts of semiconductors and insulators in terms of energy gaps.

Contextual :

How would you explain these concepts to that student?

Value Based :

What values should we imbibe from this in our daily life?

- Ready to change with a little push.
- Ready / Eager to learn and move to a higher level.

7. Extrinsic semiconductors are preferred over intrinsic semiconductors in most of the important electronic devices.

Contextual :

- Give reason.
- Name the 2 types of extrinsic semiconductors.

Value Based :

Mention some values that can be imbibed into our lives from the properties of extrinsic semiconductor.

- Team work
- Accepting diversity.

COMMUNICATION

1. A TV tower has a height of 70m with an average population density around the tower as 1000 per km⁻². 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.

Contextual :

By how much should the height of the tower be increased?

Value Based :

What values would you appreciate in Niharika?

- Awareness
- Concern for public
- Helping the society / being helpful to the society, initiative

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.

Contextual :

Identify the solution for the problem

Value Based :

What values can we learn from those students?

- Eagerness / Curiosity to learn more.
- Scientific attitude.

3. 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.

Contextual :

What was the information given by group B and group C?

Value Based :

What values do you observe in this class discussion?

- Team Work
- Togetherness
- Awareness

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