UNIT 3
ACTIVE AND PASSIVE VOICE

1. Rama *helps* Hari.
2. Hari is *helped* by Rama.

It will be seen that these two sentences express the same meaning.

But in sentence 1, the form of the Verb shows that the person denoted by the subject **does** *something.*

Rama (the person denoted by the subject) does *something.*

The Verb *helps* is said to be in the Active Voice.

In sentence 2, the form of the Verb shows that something **is done to** the person denoted by the Subject.

The Verb *helped* is said to be in the **Passive Voice.**

Def—A verb is in the Active Voice when its form shows (as in sentence 1) that the person or thing denoted by the Subject *does something ;* or, in other words, is the *doer* of the action.

The Active Voice is so called because the person denoted by the Subject *acts.*

Def— A Verb is in the Passive Voice when its form shows (as in sentence 2) that *something is done to* the person or thing denoted by the Subject.

The Passive Voice is so called because the person or thing denoted by the Subject is not active but *passive,* that is, suffers or receives some action.

Def—Voice is that form of a Verb which shows whether what is denoted by the Subject *does something* or *has something done to it.*

Note the change from the Active Voice to the Passive Voice in the following sentences.

Active Voice	*Passive Voice*
1. Sita *loves* Savitri.	1. Savitri *is loved* by Sita.
2. The mason *is building* the wall.	2. The wall *is being built* by the mason.
3. The peon *opened* the gate.	3. The gate *was opened* by the peon.
4. Some boys *were helping* the wounded man.	4. The wounded man was being helped by some boys.
5. He *will finish* the work in a fortnight.	5. The work *will be finished* by him in a fortnight.
6. Who *did* this ?	6. By whom *was* this *done?*
7. Why *did* your brother *write* such a letter ?	7. Why *was* such a letter written by your brother ?

It will be noticed that when the Verb is changed from the Active Voice to the Passive Voice, the *Object* of the Transitive Verb in the *Active* Voice becomes the *Subject* of the Verb in the *Passive* Voice.

[Thus in sentence 1, *Savitri,* which is the object of *loves* in the Active Voice, becomes the Subject of *is loved* in the Passive Voice.]

Since the Object of a verb in the active voice becomes the Subject of the passive form, it follows that *only Transitive Verbs can be used in the Passive Voice,* because an Intransitive Verb has no Object.

196. The passive voice is formed with the suitable tense of the verb *be* followed by the past participle. Study this table.

TENSE (OR MODAL + BASE)	ACTIVE VOICE	PASSIVE VOICE
	take	am taken
Simple present	takes	is taken
	am taking	are taken
		am being taken
Present continuous	is taking	is being taken
	are taking	are being taken
Present perfect	has taken	has been taken
	have taken	have been taken
Simple past	took	was taken
		were taken
Past continuous	was taking	was being taken
	were taking	were being taken
Past perfect	had taken	had been taken
Simple future	will take	will be taken
	shall take	shall be taken
can/may/	can take	can be taken
must, etc. + base	must take	must be taken

Name the Verbs in the following sentences, and tell whether they are in the Active or in the Passive Voice.

1. The cat killed the mouse.
2. We compelled the enemy to surrender.
3. The boy was bitten by a dog.
4. The thief was caught.
5. The boy made a kite.
6. The ship was burned.
7. The young man made a disturbance at the meeting.
8. The captive was bound to a tree.
9. The bird was killed by a cruel boy.
10. The sudden noise frightened the horse.
11. He is loved by all.
12. The exhibition was opened by the Governor.
13. I see a dark cloud.
14. His command was promptly obeyed.
15. Some of the cargo had been damaged by the sea water.
16. Nothing will be gained by hurry.
17. The dog chased the sheep.
18. This letter was posted last night.
19. The field is ploughed.
20. The dog was teased by the boy.
21. The cat drank all the milk.
22. A stone struck me on the head.
23. The old gentleman takes snuff.
24. The money was lost.
25. The letter has just been posted.

Answers: -

ACTIVE: SOMETHING (VERB) DONE BY SUBJECT
PASSIVE: SOMETHING (VERB) DONE TO THE SUBJECT

1. Killed – Active
2. Compelled – Active
3. Bitten – Passive
4. Caught – Passive
5. Made – Active
6. Burned – Passive
7. Made – Active
8. Bound - Passive
9. Killed – Passive
10. Frightened – Active
11. Loved – Passive
12. Opened – Passive
13. See – Active
14. Obeyed – Passive
15. Damaged – Passive
16. Gained – Active
17. Chased – Active
18. Posted – Passive
19. Ploughed – Active
20. Teased – Passive
21. Drank – Active
22. Struck – Active
23. Takes – Active
24. Lost – Passive
25. Posted – Passive

If-conditional clause or If collocation

1. if clause > present simple tense: main clause > future tense (will)
   - If you help me, I will help you.
   - If I win the lottery, I will buy a new car.
   - If it snows tomorrow, we will go skiing.
2. if clause > past simple tense: main clause > would
   - If you knew her, you would agree with me.
   - If I won the lottery, I would buy a new car.
   - If it snowed tomorrow, we would go skiing.
3. if clause > past perfect tense: main clause > would have
   - If you had helped me, I would have helped you.
   - If I had won the lottery, I would have bought a new car.
   - If it had snowed yesterday, we would have gone skiing.
4. if I were a bird, I would fly (will never happen—imagination)

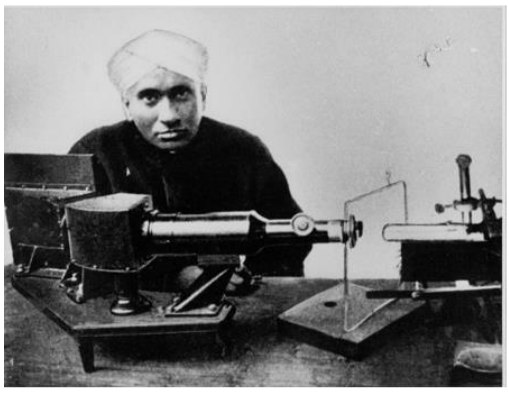
Raman's Equipment and Experimental Setup

Pre-Task: Key Terms

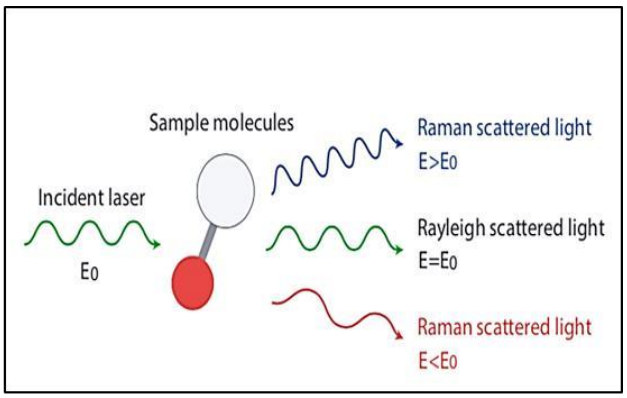
Acoustic	**A branch of physics that deals with the study of mechanical waves in gases, liquids, and solids**
Optics	A branch of physics that studies the behaviour and properties of light
Opalescence	The quality of reflecting light and changing colour with reference to an opal
Polarizing	To make optical waves to oscillate in one particular direction or to make light waves move only in one direction
Surface reflection	The reflection that occurs when light wave bounces off an object
Diffraction grating	An optical element that disperses light composed of lots of different wavelengths (e.g., white light) into light components by wavelength
Molecules	An electrically neutral group of two or more atoms held together by chemical bonds

Molecular diffraction	Various phenomena that occur when a wave encounters an obstacle or a slit, otherwise knowns as the bending of waves around the corners of an obstacle, caused by molecules
Fluorescence	The emission of light by a substance that has absorbed light or other electromagnetic radiation
Acoustic optical effects	The interaction of light (optics) and sound (acoustics).
Infrared spectra	An electromagnetic radiation (EMR) with wavelengths longer than those of visible light.
Heliostat	An apparatus containing a movable mirror, used to reflect sunlight in a fixed direction
Refracting telescope	(also called a refractor) a type of optical telescope that uses a lens as its objective to form an image
Photodetectors	sensors of light or other electromagnetic radiation
Photons	A type of elementary particle representing a quantum of light or other electromagnetic radiation

Raman's Equipment and Experimental Setup



Sir C. V. Raman with his instrument



Scattering of light by molecules

The main challenge Raman faced in his experimental work was posed by the extremely weak

intensity of the scattered light. In his early studies, Raman used a heliostat — a mechanically driven mirror that tracked the motion of the sun to provide a light source. Eventually, however, he came to realize that the sunlight was not sufficiently intense on its own. Thus, in 1927, he acquired a 7-in. refracting telescope, which he used in combination with a short-focus lens to condense the sunlight into a narrow beam. In the following year, he created an even more powerful light source by using highly monochromatic light from a mercury arc lamp together with a large aperture condenser and cobalt- glass filter. Sometimes, he replaced the glass filters with liquid ones. Raman used a violet filter to isolate a band of violet light incident on a sample liquid. At 90 degrees to the incident light, he placed another violet glass filter. This enabled him to observe violet light scattered from the sample, which represented normal Rayleigh scattering.

When he replaced the second filter with a green one, however, the Rayleigh- scattered light was blocked but there was still some green light visible, demonstrating the second form of scattering. Perhaps most interestingly, Raman used his own dark-adapted eyes as photodetectors. Only after he had observed the frequency shift with his eyes and a direct-vision spectroscope did he repeat the observation with a mercury arc lamp and a Hilger baby quartz spectrograph. Surprising as it may seem, the human eye can detect single photons over a high dynamic range. Raman used a small Adam Hilger spectroscope for his initial studies, and he detected the spectrum of the scattered light using photography. Since the intensity of the frequency-shifted

light was extremely weak, long exposure times were required to record the spectra.

Nobel Committee decided to give the Nobel Prize to Raman for his invention. He was awarded the Nobel Prize in Physics on December 11, 1930. He was a great man known for his driving ambition and passion for science. At the age of 60, Raman formed the Raman Research Institute (supported with his own funds and donations that he raised). He also remained a professor, as well as the President of the Indian Academy of Sciences in Bangalore, until his death in 1970. A few days before his death on November 21, 1970, Raman spoke these words, "Science can only flower out when there is an internal urge. It cannot thrive under external pressure." A tree grows where Raman died.

TASK 1: Unscramble the following words

Sl. No.	SCRAMBLED	UNSCRAMBLED
	Naeoelcepsc	OPALESCENCE
1.	Ramanerdeetni	MEDITERRANEAN
2.	Oarcmlule	MOLECULAR
3.	Ecuryfqen	FREQUENCY
4.	Nucsereclfeo	FLOURESCENCE
5.	Mmrocoichtnoa	MONOCHROMATIC
6.	Stenyinti	INTENSITY
7.	Rutpaere	APERATURE

8.	Pcagpsrhoetr	SPECTOGRAPH
9.	Emurcyr	MERCURY
10.	Ottecpsedohtro	PHOTODETECTORS

TASK 2: Locate related words from the passages

	Topic	**Related Words**
	Education	Physics, Universities, Oxford, Research, Institute, professor, Academy
	Places	India, Bangalore
	Nature	Sea, tree, flower, sunlight
	Instruments	Telescope, Photodetectors, Spectrograph, mercury arc lamp, Hilger baby quartz spectrograph, filter, refracting telescope, heliostat
	Action words	Completed, replaced, decided, enabled, used, spoke

	Physics	Science

TASK 3: ~~Create~~ Write a sentence using each of the following words

Sl. No.	Word	Sentence
	Voyage	Sea voyages are interesting.
1.	Urge	Science can only flower out when there is an internal urge
2.	Mystery	It is still a **mystery** why he suddenly left the town
3.	Discovery	Sir C.V. Raman was awarded nobel prize for the discovery of Raman Effect
4.	Congress	The Congress passed the bill
5.	Molecule	Molecule is made up of atoms
6.	Demonstrate	Sir C.V. Raman demonstrated the Raman Effect before the assembled scientists
7.	Phenomenon	Raman effect is a phenomenon of scattering of light by molecules of chemical compounds
8.	Narrow	Heliostat is used to direct the sun's rays in a narrow beam
9.	Condense	Sir C.V Raman used refracting telescope and a short focus lens to Sun's rays into a narrow beam
10.	Dynamic	Human eyes are capable of detecting single photons over a high dynamic range

SOURCE PASSAGE: THE SOAP BUBBLE

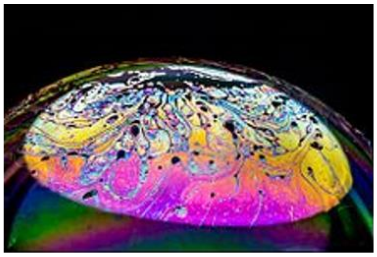
Pre TASK : Key Terms

Iridescent	**Iridescence is the phenomenon of certain surfaces that appear to gradually change colour as the angle of view or the angle of illumination changes**
Refraction	The fact or phenomenon of light, radio waves, etc. being deflected in passing obliquely through the interface between one medium and another or through a medium of varying density
Interference	a phenomenon in which two waves superpose to form a resultant wave of greater, lower, or the same amplitude
Mean curvature	an extrinsic measure of curvature that comes from differential geometry and that locally describes the curvature of an embedded surface in some ambient space such as Euclidean space
Young–Laplace equation	a nonlinear partial differential equation that describes the capillary pressure difference sustained across the interface between two static fluids, such as water and air
Surface tension	the tendency of liquid surfaces to shrink into the minimum surface area possible
Concave surface	a surface that curves inward, or is thinner in the middle than on the edges
Convex surface	a surface that is having an outline or surface curved like the exterior of a circle or sphere or is thinner in the edges than in the middle

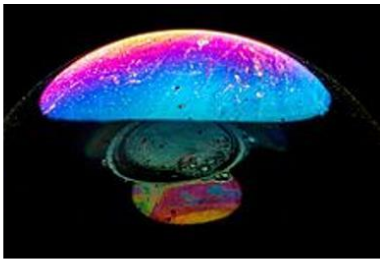
A soap bubble is an extremely thin film of soapy

water enclosing the air that forms a hollow sphere with an iridescent surface. Soap bubbles usually last for only a few seconds before bursting, either on their own or on contact with another object. They are often used for children's enjoyment, but they are also used in artistic performances. Assembling several bubbles results in foam. When light shines onto a bubble it appears to change colour. Unlike those seen in a rainbow, which arise from differential refraction, the colours seen in a soap bubble arise from interference of light reflecting off the front and back surfaces of the thin soap film. Depending on the thickness of the film, different colours interfere constructively and destructively.

A Soap bubble



A single light soap bubble photograph taken under macro photography



A single soap bubble displaying three layers

Mathematics

Soap bubbles are physical examples of the complex mathematical problem of minimal surface. They will assume the shape of least surface area possible containing a given volume. A true minimal surface is more properly illustrated by a soap film, which has equal pressure on inside as outside, hence becoming a surface with zero mean curvature. A soap bubble is a closed soap film: due to the difference in outside and inside pressure, it is a surface of *constant* mean curvature. While it has been known since 1884 that a spherical soap bubble is the least-area way of enclosing a given volume of air (a

theorem of H. A. Schwarz), it was not until 2000 that it was proven that two merged soap bubbles provide the optimum way of enclosing two given volumes of air of different size with the least surface area.

Merging (Physics)

When two bubbles merge, they adopt a shape which makes the sum of their surface areas as small as possible, compatible with the volume of air each bubble encloses. If the bubbles are of equal size, their common wall is flat. If they aren't the same size, their common wall bulges into the larger bubble, since the smaller one has a higher internal pressure than the larger one, as predicted by the Young– Laplace equation. At a point where three or more bubbles meet, they arrange themselves out so that only three bubble walls meet along a line. Since the surface tension is the same in each of the three surfaces, the three angles between them must be equal to 120°. Only four bubble walls can meet at a point, with the lines where triplets of bubble walls meet separated by $\cos^{-1}(-1/3) \approx 109.47°$. All these rules, known as Plateau's laws, determine how a foam is built from bubbles.

Stability

The longevity of a soap bubble is limited by the ease of rupture of the very thin layer of water which constitutes its surface, namely a micrometer-thick soap film. It is thus sensitive to:

- Drainage within the soap film: water falls down due to gravity. This can be slowed by increasing the water viscosity, for instance by adding glycerol. Still, there is an ultimate height limit, which is the capillary

length, very high for soap bubbles: around 13 feet (4 meters). In principle, there is no limit in the length it can reach.

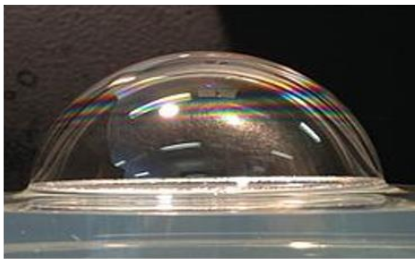
- Evaporation: This can be slowed by blowing bubbles in a wet atmosphere, or by adding some sugar to the water.
- Dirt and fat: When the bubble touches the ground, a wall, or our skin, it usually ruptures the soap film. This can be prevented by wetting these surfaces with water (preferably containing some soap).

Wetting

When a soap bubble is in contact with a solid or a liquid surface wetting is observed. On a solid surface, the contact angle of the bubble depends on the surface energy of the solid. A soap bubble has a larger contact angle on a solid surface displaying ultra-hydrophobicity than on a hydrophilic surface. On a liquid surface, the contact angle of the soap bubble depends on its size - smaller bubbles have lower contact angles.

Soap bubbles can easily merge

A soap bubble wetting an ultra hydrophobic surface



A soap bubble wetting a liquid surface

Medicine – Contact dermatitis

The composition of soap bubbles' liquid has many recipes with slightly different ingredients. The most common one contains 2/3 cup of dishwashing soap, 1 gallon of water, 2/3 tablespoon of glycerin. Because of the presence of dishwasher soap, it's not uncommon for

children to contact dermatitis on face, hands with consequences as rashes, swelling of the eyes, vomiting and dizziness.

Freezing

If soap bubbles are blown into air that is below a temperature of −15 °C (5 °F), they will freeze when they touch a surface. The air inside will gradually diffuse out, causing the bubble to crumble under its own weight. At temperatures below about −25 °C (−13 °F), bubbles will freeze in the air and may shatter when hitting the ground. When a bubble is blown with warm air, the bubble will freeze to an almost perfect sphere at first, but when the warm air cools, and a reduction in volume occurs, there will be a partial collapse of the bubble. A bubble, created successfully at this low temperature, will always be rather small; it will freeze quickly and will shatter if increased further. Freezing of small soap bubbles happens within 2 seconds after setting on snow (at air temperature around −10...−14 °C).

Frozen soap bubble on snow

TASK 1 :Read the text and find out who I am

Sl. No.	Hint	Who am I?
1.	I am an extremely thin film of soapy water.	Soap bubble
2.	I am a curved band of different colours that appears in the sky when the sun shines through rain.	Rainbow
3.	I am a mass of small air bubbles on the surface of a liquid.	foam
4.	I am the process of a liquid changing or being changed into a gas.	Evaporation
5.	I am the feeling that everything is spinning around you and that you are unable to balance.	Faintness or Dizziness

TASK 2: Locate the ANTONYMS of the following words from the text.

WORD	ANTONYM
Displeasure	Enjoyment
unimaginative	Imaginative
constructively	Destructively

Inconstant	Constant
Drying	Wetting
instability	Stability

I. Read to be Ready

Bubbles can be effectively used to teach and explore a wide variety of concepts to even young children. Flexibility, colour formation, reflective or mirrored surfaces, concave and convex surfaces, transparency, a variety of shapes (circle, square, triangle, sphere, cube, tetrahedron, and hexagon), elastic properties, and comparative sizing, as well as the more esoteric properties of bubbles listed on this page. Bubbles are useful in teaching concepts starting from two years old and into college years. A bubble is made of transparent water enclosing transparent air. However, the soap film is as thin as the visible light wavelength, resulting in interferences. This creates iridescence which, together with the bubble's spherical shape and fragility, contributes to its magical effect on children and adults alike. Each colour is the result of varying thicknesses of soap bubble film. Adding coloured dye to bubble mixtures fails to produce coloured bubbles, because the dye attaches to the water molecules as opposed to the surfactant. Therefore, a colourless bubble forms with the dye falling to a point at the base.

	What are the scientific concepts you have learnt through soap bubbles?
	What have you understood of iridescence?
	Can you give examples of transparent elements other than water and air?
	What defines the different colours in the bubble?
	Do you like soap bubbles? If Yes, why? If NO, why not?

II. Frame 'Wh' Questions to the answers given below

	Answer: Foam
	Question: What is produced when assembling several soap bubbles?
1.	Ans: Soap bubbles lasts for a few seconds.
	Que: Do soap bubbles last for an hour?
2.	Ans: Interferences of different colours
	Que: What is the cause for soap bubble
3.	Ans: constant mean curvature
	Que: Tell about the mean curvature of soap bubble
4.	Ans: When two bubbles merge
	Que: When do 2 bubbles achieve minimum surface area?
5.	Ans: Evaporation
	Que: What is the process of a liquid changing or being changed into a gas?

III. Discuss answers for the following in pairs and write it down

1. If you are a soap bubble seller, how will you sell it effectively? Demonstrate.

By showing different colours, I attract kids and sell

2. Share your memorable experiences with soap bubbles from your childhood to the present.

I played by forming soap bubble and foam while my mother was washing clothes

3. Can you connect the characteristics of the soap bubble with any other object? Present it effectively

yes, with rainbow. Rainbow is formed due to differential refraction. But soap bubble is formed due to interference of light

SOURCE PASSAGE :"TOO BAD!":
AN INTRODUCTION TO ROBOTICS AND ARTIFICIAL INTELLIGENCE

Key Terms

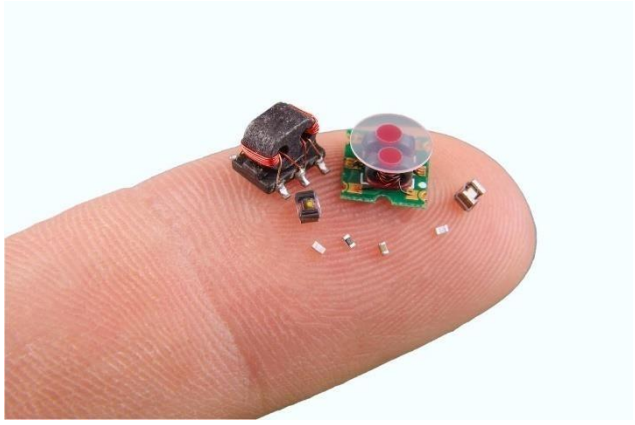
Miniaturization	Size reduction
Radiation therapy	a therapy using ionizing radiation, generally as part of cancer treatment to control or kill malignant cells
Planck's constant	a quantum of electromagnetic action that relates a photon's energy to its frequency
Quantum mechanics	a fundamental theory in physics, which describes the physical properties of nature on an atomic scale
Pinheaded	a form of electrical connector
Anthropomorphism	the attribution of human traits, emotions, or intentions to non- human entities
Quanta	the plural form of quantum. In physics, a quantum is the minimum amount of any physical entity involved in an interaction.
Brownian motion	the random motion of particles suspended in a fluid (a liquid or a gas) resulting from their collision with the fast-moving molecules in the fluid
Electron	a subatomic particle, whose electric charge is negative one elementary charge
Laser beam	a device that emits light through a process of optical amplification based on the stimulated emission of electromagnetic radiation. The term "laser" originated as an acronym for "light amplification by stimulated emission of radiation"
Recoil	the backward movement of a gun when it is discharged (often called knockback, kickback or simply kick)

THE THREE LAWS OF ROBOTICS

1.A robot may not injure a human being or, through inaction, allow a human being to come to harm.

2.A robot must obey the orders given it by human beings except where that would conflict with the First Law.

3.A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.



Dr. Gregory Arnfeld is a robotic scientist, living in the twenty second century. He is an expert in miniaturization. He suffers inoperable cancer and refuses any chemical treatment or radiation therapy. Arnfeld believes that his robotic invention Mike, a microbot, can cure him better than any other treatments. His wife Tertia reminds him that there are a lot of ways to cure cancer in the twenty second century that they live in. But he reassures, "Yes, but Mike is one of them, and I think the best." Tertia retaliates, "how certain are you of miniaturization? That's an even newer technique than robotics." Arnfeld replies, "The miniaturization boys can reduce or restore Planck's constant in a reasonably precise manner, and those controls are built into Mike. He can make himself smaller or larger without affecting his surroundings." Arnfeld is proud of this experiment, as his name will be engraved in the history as the principal designer of Mike. But he says, "My greatest feat will be that of having been successfully treated by a mini-robot—by my own choice, by my own initiative." "It's dangerous," says Tertia, his wife. He responds, "There's danger to everything. Chemicals and radiation have their side effects." He is happy that even if it fails, it will be a glorious experiment.

When Tertia wants to have more clarity on what is to happen, Louis Secundo, of the miniaturization group, says, "We can't guarantee success. Miniaturization is intimately involved with quantum mechanics, and there is a strong element of unpredictability. As MIK-27 reduces his size, there is always the chance that a sudden unplanned re-expansion will take place, naturally killing the patient. The greater the reduction in size and the tinier the robot becomes, the greater the chance of re- expansion. And once he starts expanding again, the chance of a sudden accelerated burst is even higher. The re-expansion is the really dangerous part." When Tertia enquires about the risk level, Secundo says, "The chances are it won't, Mrs. Arnfeld. But the chance is never zero." "What if Mike makes a mistake or reduces himself too far because of a glitch in the mechanism? Then re-expansion would be certain, wouldn't it?" asks Tertia. He replies, "It remains statistical. The chances improve if he gets too small. But then the smaller he gets, the less massive he is, and at some critical point, Mike will become so insignificant and the Programme will send him flying off at nearly the speed of light." Anxious Tertia asks, "Well, won't that kill the doctor?" The scientist assures, "No. By that time, Mike would be so small he would slip between the atoms of the doctor's body without affecting them." Mike would re-expand within seconds, but by the time he re-expanded, he would be a hundred thousand miles away in outer space and the explosion that results would merely produce a small burst of gamma rays for the astronomers to puzzle over. In addition, MIK-27 will have his instructions and he will not reduce himself to smaller than the size needed to carry out his mission.

It is coincidental and surprising that the chief designer of Mike, the Microbot, becomes his first patient. Mrs. Arnfeld discloses to the media that the present condition of Dr. Arnfeld is the result of a predisposition and there have been others in his family who have had it. For this reason, they have no children and Dr. Arnfeld devotes his life to produce a robot that is capable of miniaturization.

Ben Johannes, a co-worker with Dr. Arnfeld for five years, takes Mrs. Arnfeld to the robot's quarters. Mike says, in his curiously neutral voice, which is smoothly average to be quite human, "I am pleased to see you, Mrs. Arnfeld." Mrs. Arnfeld had seen Mike soon after his construction, when he was undergoing the primary tests, and Mike remembered her. He is not a well-shaped robot. He looks pinheaded and very bottom heavy. He was almost conical. Mrs. Arnfeld knows that it is because his miniaturization mechanism is bulky and abdominal and because his brain has to be abdominal as well in order to increase the speed of response. It is an unnecessary anthropomorphism to insist on a brain behind a tall cranium, her husband had explained. Yet it makes Mike seem ridiculous, almost moronic. He represents the psychological advantages to anthropomorphism too. When Mrs. Arnfeld ask whether he has understood the task, he says, "I will see to it that every vestige of cancer is removed." Mike has the ability to recognise a cancer cell when he is at the proper size. He can quickly destroy the nucleus of any cell that is not normal. He further says proudly, "I am laser equipped, Mrs. Arnfeld." Mrs. Arnfeld is still not convinced and she continues to question, "How long will it take to get them one by one?" Johannes intervenes and tells, "Even though the cancer is widespread, it exists in clumps. Mike is equipped to burn off and close capillaries leading to the clump, and a million cells could die at a stroke in that fashion. He will only occasionally have to deal with cells on an individual basis."

Johannes further informs that this process would take hours and every next moment will increase the chance of re-expansion. But Mike confidently guarantees, "Mrs. Arnfeld, I will labor to prevent re-expansion. By monitoring my size and making an effort to keep it constant, I can minimize the random changes that might lead to a re- expansion. Naturally, it is almost impossible to do this when I am actually re-expanding under controlled conditions." Understanding the danger

involved, Mrs. Arnfeld expresses her anxiety regarding the safety of her husband and Mike says solemnly, "The laws of robotics ensure that I will, Mrs. Arnfeld." Johannes further comforts that there is a holosonogram and a detailed cat scan of the area. Mike knows the precise location of every significant cancerous lesion. Most of his time will be spent searching for small lesions undetectable by instruments. Mike is strictly instructed as to how small to get and he will not get smaller beyond that. As a microbot, he obeys orders. Johannes explains the re-expansion process, "Tertia, we're in the lap of the quanta. There is a more reasonable chance that he will get out without trouble. Naturally, we will have him re-expand within Gregory's body as little as possible – just enough to make us reasonably certain we can find and extract him. He will then be rushed to the safe room where the rest of the re-expansion will take place."

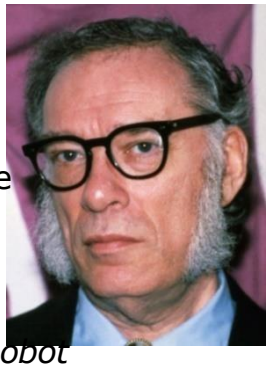
The observation room is underground and half-a-mile away from the viewing room. There are three miniaturists working on this experiment. If anything untoward happens, that will take the lives of the three miniaturists as well. So the miniaturists are very careful in handling this procedure. From the observation room, Mrs. Arnfeld watches the miniaturisation procedure and sees Mike growing smaller and disappear. She sees the procedure of injecting Mike into the body of Dr. Arnfeld and his movement through his tissues by way of his bloodstream. Every move is captured and shown in holosonogram, which is a three-dimensional representation, cloudy and unfocused, made imprecise through a combination of the finite size of the sound waves and the effects of Brownian motion. Mrs. Arnfeld reaches a stage where she could not hold it further. She is sedated and she slept until evening. When she wakes up, Johannes is near her and she reveals the happy news, "Success, Tertia. Complete success. Your husband is cured. We can't stop the cancer from recurring, but for now he is cured."

After two days, she is able to meet and talk to her husband Dr.

Arnfeld. She says happily, "They can't find a trace of cancer in you." But he says, "Well, we can't be too confident about that. There may be a cancerous cell here and there, but perhaps my immune system will handle it, especially with the proper medication, and if it ever builds up again, which might well take years, we'll call on Mike again." On saying this, he wants to see and thank Mike for the wonderful thing that he has done for his life. There Mrs. Arnfeld reveals the news, "Actually, dear, Mike is not available." Shocked Dr. Arnfeld asks, "Not available! Why not?" His wife replies, "He had to make a choice, you see. He had cleaned up your tissues marvellously well; he had done a magnificent job, everyone agrees; and then he had to undergo re- expansion. That was the risky part. Mike decided to minimize the risk. he decided to make himself smaller." Unbelievingly he cries, "What! He couldn't. He was ordered not to." But the wife says, "That was Second Law, Greg. First Law took precedence. He wanted to make certain your life would be saved. He was equipped to control his own size, so he made himself smaller as rapidly as he could, and when he was far less massive than an electron he used his laser beam, which was by then too tiny to hurt anything in your body, and the recoil sent him flying away at nearly the speed of light. He exploded in the outer space. The gamma rays were detected." Dr. Arnfeld stares at her and says, "But I didn't want that. I wanted him safe for further work. My life was less important than his." "Not to me, dear. Not to those who work with you. Not to anyone. Not even to Mike," says his wife putting her hands out to him. Pushing aside her hands, he says, "You don't understand. Oh, too bad. Too bad!"

– Abridged version of the short story "Too Bad" by Isaac Asimov

Isaac Asimov



Isaac Asimov is a remarkable American figure in science fiction. He is a writer and Biochemist. He is a prolific writer of science fiction and science books. He has edited or wrote more than 500 volumes. He is known for his *Foundation* and *Robot* Series.

He became popular with his short story "Nightfall" (1941), which talks of a planet in a multiple-star system which experiences darkness only one night in every 2049 years. This short story brought him to the forefront among the science fiction writers and it is considered as one of the best short stories of this genre. He developed a set of ethics for robots and rejected the idea that robots are marauding metal monsters, which changed the way the subject was treated by other writers. Using the pseudonym Paul French, he wrote science stories for children in the series *Lucky Starr* (1952-58), each volume of this series took place on a different world of the solar system.
Source: https://www.britannica.com/biography/Isaac-Asimov

I. Find the missing letters and write the word

	r	a	d	i	a	t	i	o	n	Radiation
1	q		a	n		u				quantum
2	a			r		n		m		s	astronomers
3		n		h		o		o		o		h		s	anthropomorphism
4		o		o		o		o			a	holosonogram
5	c		a			i	u				cranium

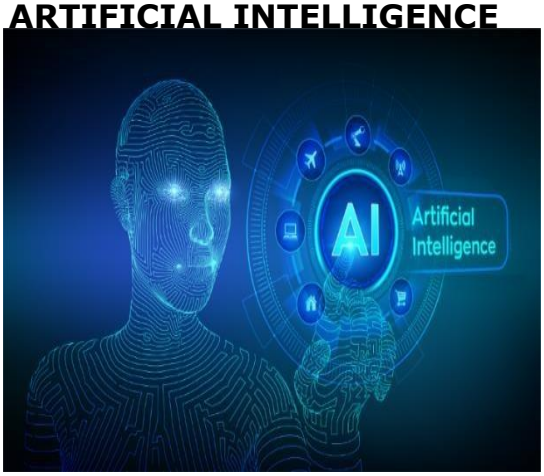
II. Fill the following blanks with suitable words (not from the text)

Dr. Gregory Arnfeld suffers inoperable cancer and refuses any chemical treatment or radiation therapy. Arnfeld believes that his robotic invention Mike can cure him better than any other treatments. His wife Tertia reminds him that there are a lot of ways to treat cancer. But he says, "Yes, but Mike is one of them, and I think the best." Tertia retaliated, "how certain are you of miniaturization? That's an even newer technique than robotics." Arnfeld replies, "The miniaturisation boys can reduce or restore Planck's constant in a reasonably precise manner, and those controls are built into Mike. He can make himself smaller or larger without affecting his surroundings."

Arnfeld is proud of this experiment, as his name will be engraved in the history as the principal designer of Mike. But he says, "My greatest feat will be that of having been successfully treated by a minirobot—by my own choice, by my own initiative." "It's dangerous," says Tertia, his wife.

III. Read to be Ready (Read the passage aloud and take notes)

ARTIFICIAL INTELLIGENCE



Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving. The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal. When most people hear the term artificial intelligence, the first thing they usually think of is robots. That's because big-budget films and novels weave stories about human-like machines that wreak havoc on Earth. Artificial intelligence is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the most simple to those that are even more complex. The goals of artificial intelligence include learning, reasoning, and perception. The applications for artificial intelligence are endless. The technology can be applied to many different sectors and industries. AI is being tested and used in the healthcare industry for dosing drugs and different treatment in patients, and for surgical procedures in the operating room. Other examples of machines with artificial intelligence

include computers that play chess and self-driving cars. Weak AI tends to be simple and single-task oriented, while strong AI carries on tasks that are more complex and human-like.

1. What are the goals of artificial intelligence? learning, reasoning, and perception
2. What is artificial intelligence based on? AI is based on the principle that human intelligence can be defined in a way that a machine can easily mimic it and execute tasks, from the most simple to those that are even more complex
3. Which are the sectors that use AI in the present? AI is being tested and used in the healthcare industry for dosing drugs and different treatment in patients, and for surgical procedures in the operating room. Other examples of machines with artificial intelligence include computers that play chess and self-driving cars.
4. Define weak and strong AI. Weak AI tends to be simple and single-task oriented, while strong AI carries on tasks that are more complex and human-like.
5. Do you think it is a good idea to programme human intelligence in machines? If so, what are the traits that can be programmed? Yes. Reasoning logic along with learning has to be programmed with algorithms and huge training databases Models have to be constructed with required accuracy to solve the problems

Explore the Text

1. Why did Greg refuse chemical and radiation therapy? Arnfeld believes that his robotic invention Mike, a microbot, can cure him better than any other treatments.
2. Why is re-expansion considered dangerous? there is always the chance that a sudden unplanned re-expansion will take place, naturally killing the patient.
3. Why did Mike disobey the instruction programmed in him? To save the life of the Dr. Greg
4. Was Johannes supportive to Mrs. Arnfeld? Yes.
5. What is the safe room used for? The safe room is used for re-expansion

IV. Discuss the following questions and put forth your ideas to the class

1. Are we becoming too dependent on robots? Justify your answer

   yes, wherever complex tasks can be programmed and automated, robots are being commonly used.

   example – right from mechanical applications to surgery

2. Can Artificial Intelligence replace human intelligence? State reasons.

   No. Artificial intelligence can only mimic human intelligence and cannot replace human. because, it does not have thinking power on their own

3. Do you think creating robots with human thinking skills is a good idea?

   Yes, in many applications like healthcare

4. If you get a chance to change the climax of the

story, would you save Mike or Greg or both or

neither?

I would have saved life of both

5. What kind of robot will you create in future if you get a chance? Why?
   humanoid. It would do all works given to me

Biomass and Biofuels

Fuels in use today, like coal and oil, are made from fossils, plants, and animals which died thousands of years ago. Biofuels are fuels made from crops which have just been harvested and from biomass, which contains chemical energy stored from the sun. **Biofuel** (also called agrofuel) is an abbreviation for bio-organic fuel. It describes any plant or animal which can burn and be used for fuel. Trucks, cars, and busses and other vehicles used for transportation need clean-burning fuels. They have internal combustion engines. The fuel in a liquid state is more portable and easily pumped. Petroleum is used today. It is a **fossil fuel**. Coal and wood are also, used for energy but produce much more pollution

in the atmosphere. They are fossil fuels too, made from dead plants and animals of long ago. Wood and its byproducts can now be converted into biofuels such as wood gas, methanol or ethanol fuel.

The goal for all the production of energy is to turn away from the use of fossil fuels. **Biomass** from which biofuel is made includes products like wood, sugar cane, manure and waste from agriculture. Biomass is a storehouse of the sun's energy. If it is handled wisely, more will be produced indefinitely. Fossil fuels may at some point run out. Chlorophyll from plants takes carbon dioxide from the air and combines it with water to form carbohydrates. When these carbohydrates are burned, they release the stored energy.

However, recent discoveries have shown that there is a more efficient way to get energy from biomass rather than burning it. It can be turned into liquid fuels or heated to produce gases which will burn. Willow trees and willow grass are grown specifically to be used to produce energy. Some plants can be grown only for producing energy. Energy can be found also in the by-products or waste products from plants used for other purposes. The products used for energy purposes vary from region to region depending on climate and other conditions.

Power crops which produce energy directly can be grown on large farms. Trees and grasses are the most readily available, although corn is starting to be used. Some trees may grow back very quickly after being cut down to the ground. This process is called **coppicing**. They can

Corn and sorghum are grown mainly for food, but in the United States corn provides most of the liquid biofuel. However, because it must be planted, fertilized and harvested every year, it is not the best source for biofuels. Soybeans and sunflowers produce oil which can be used to make biofuel. However, just like corn, much maintenance is required each year to produce a crop of soybeans and sunflowers. **Microalgae** is another type of crop with oil. This may have the potential for the future of biofuel.

For many years, the way to produce energy from biofuels has been to burn it. However, during this process, energy can be lost or wasted, and some pollution can occur. A new process called **'co-firing'** now is being used. Coal is mixed with up to twenty percent of a biomass product in a boiler in a power plant. Operating costs will be lower, less pollution will occur, and energy will be saved. In Iowa, the Department of Energy and a local energy company have begun using switchgrass to substitute for a certain percentage of the coal. The project has worked well. Biomass can also be used to substitute for petroleum in many other products.

Source : https://www.softschools.com/

Read the above passage and answer the questions given below

State whether the following sentences are TRUE or FALSE

1. Biomass contains solar energy. (True)
2. Grass is not used to make biofuel. (False)
3. Wood is both a fossil fuel and a biofuel (True)

Fill in the blanks with the correct word from the passage

1. Biofuels are converted into energy by the process of__co-firing__.
2. _Biofuel_can be used as an alternative to petroleum in many products.
3. _Grass_is a power crop that is easily available.

Write a sentence describing the given words from the context of the

passage

1. Potential – He has the **POTENTIAL** to explore and discover new things.
2. Accomplishes - No task is so difficult but we can **ACCOMPLISH** it.
3. Substitute – Bio-fuel can be used as a **SUBSTITUTE** for petroleum.
4. Efficient – Bio-fuel is as **EFFICIENT** as petroleum.

Write a short paragraph detailing the similarities and differences between Biomass and biofuels

- Biomass is all non-fossil organic materials that have intrinsic chemical energy content. All energy-containing forms of carbon and all land and water-based vegetation are referred to as biomass. The term biomass refers to organic matter that comes from plants and animals and it is a renewable energy source.
- Biofuels, on the other hand, are energy sources derived from biological materials through contemporary biological processes. Biofuel refers to any fuel derived from biomass, that is, animal wastes or plant or algae. It also refers to liquid fuels such as ethanol and biodiesel that is a fuel made from oils of plants.