GYAN VIGYAN SARITA:शिक्षा

A Non-organizational, Non-remunerative, Non-commercial and Non-political Initiative
To Mentor Unprivileged Children with a Sense of Personal Social Responsibility (PSR)

Monthly e-Bulletin GgyanVigyanSarita:शिक्षा January 01, 2020 (52nd Issue)

Thank You 2019, Happy Dreams.....

We Rise to Receive Blissful Gift - Year 2020, Hearty Welcome .....

CONTENTS: (*Against Each of the Contents Page Number is Indicated for Convenience*)

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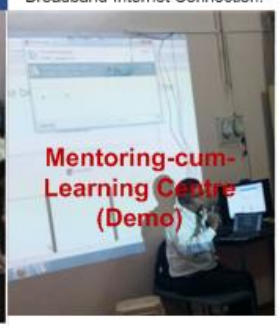
Aim at the Best, but...

Conceptual Representation
of
Online Mentoring
An Initiative To Bridge Gap between
Passionate Teachers
and
Desperate Students
A Selfless Endeavour
to
Democratize Education
with a sense of
Personal Social Responsibility (PSR)

Equipments at Mentoring Center
1.Desk-/Lap-top
2. WebCam
3. Headset with Microphone
4. Digital Pen
AND
Broadband-Internet Connection

Cloud Internet
(Linking platform : cloud based with as low bandwidth as possible for seamless connectivity of audio-video-whiteboard across nodes where internt connectivity is poor- Presently A-VIEW is in use)

Equipments at Learning Center
1.Desk-/Lap-top
2. WebCam
3. A Mixer-cum-amplifier with Speakers
and Wireless Microphone
5. Overhead Projector.
6. UPS (For Continuous Power Supply to computer, internet modem and L&F)
AND
Broadband-Internet Connection:



Important Links
1. Good Internet Connectivity (Wired Broadband Connection)
2. Subject-wise Coordinator for Each Session to Bridge Learning Gaps between Mentor & Students

Special Features
1. Free and Open to all to adopt. Modify, change, correct
2. Welcomes participation, promotion and facilitation on Zero-Fund-Zero-Asset (ZFZA) basis
3. More details on Technological and Operational – please write on **http://www.gyanvigyansarita.in/contact/**

... start, without loosing time, with whatever is available.

Infrastructural requirement for Centres in Interactive Online Mentoring Sessions (IOMS)

Learning Centre (if asked for by Mentor)		Mentoring Centre (if asked for by Mentor)	
Estimated Capital Cost (One Time)			
Particulars	**Cost (in Rs)**	**Particulars**	**Cost (in Rs)**
Desktop (without monitor)	20,000	Laptop	25,000
Projector	9,000	Projector	-
Web camera	2,000	Web camera	-
Mixer cum amplifier with Speaker and Wireless microphones	14,000	Headset with Microphone	3,000
Total	45,000	Total	28,000
Wireless Surface Writing Device (WSWD). It shall be required when Learning Centre is ready for collaborative use of Whiteboard.	15,000	Wireless Surface Writing device	15,000
Total with WSWD	60,000	Total with WSWD	43,000
Estimated Recurring Cost			
a. Internet charges, based on estimated monthly data transfer which depends upon choice of cloud platform, and tariffs of ISP b. Cloud Platform Charges, to be shared across Learning Centres		Internet charges, based on estimated monthly data transfer which depends upon choice of cloud platform, and tariffs of ISP	
Cloud platform : A-VIEW indigenously developed by Amrita University. It is found to be best among available options for use in IOMS. It has been developed for use in imparting Interactive Online Education, with bilateral audio-visual access, in an interactive manner. Cloud platform. a. The IOMS envisages session upto Five Learning Centres. Charges for the platform whenever payable may be shared across in mutual agreement between Learning Centres. b. Benefit of sharing of charges of cloud platform can be optimized with offset of schedule among multiple sessions of IOMS, to the extent Mentor can deliver.		IOMS is since an initiative driven with Personal Social Responsibility (PSR) operating n Zero-Fund-&-Zero-Asset (ZFZA) basis, the Cloud Platform has to provided by Learning Centers for deriving benefit of IOMS. Gyan Vigyan Sarita will be pleased to connect Learning Centres for collectively complementing the cost of Cloud Platform, whenever payable, for arriving at a mutual agreement for cost sharing. So also IT Infrastructure with the Mentors has been in use and is working. But, at any stage if upgradation becomes essential, support of learning centres, beneficiaries of the initiative, is gratefully welcomed on ZFZA basis. Operating cost of Mentor, if required, shall be supported by Learning Centres.	

Specification: These are based on ground level operating experience and need of optimizing the cost on the initiative. This is essential to utilize financial resources, considered scarce, for benefitting more number of students at more number of centres and mentoring centres. These specifications have been updated based on experience of operation of IOMS with available options. MS WhiteBorad a free App of MS office has been tried out in IOMS and is found satisfactory, until a better option is available.

Web Camera: iBall 20.0 HD with a wall mounting

Projector: Portronics POR 624 LED Projector Beam 100 Lumen, Screen Size 130 Inch , 800x480px resolution

Sound System: Ahuja Make PA Mixer Amplifier Model DPA-370, 30 W Max/37W Max, with PA wall speakers PS-300T 10W, and a wireless unit AWM-490V2 Dual Cordless Microphones. This sound input/out when decoupled with USB sound adopter to connect to the computer required echoless environment is achieved in the Classroom and networked mentor and Learning Centres.

Cloud Platform: A-VIEW (Amrita Virtual E-Learning World) developed by Amrita University in association with IIT Bombay, an MHRD, GOI sponsored project.. Problems with Whiteboard functionality of A-VIEW are being circumvented with OneNote app of MS Office for IOMS. This has many features of minimizing bandwidth requirements.

Surface Writing Device: HUION make Model WH1409, or Wacom model Intuos with wireless device makes it suitable for communication with base computer in class in an interactive online environment.

UPS: An additional accessory, for uninterrupted continuity of session, based on power availability to be decided by Learning Centre, **not included in above cost estimates.**

Furniture and Lighting: At Learning Centre, as deemed fit by local administration of Learning Centre, **not included in above cost estimates.**

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संपादकीय

असहमति में सहमति की तलाश: बदलाव की शुरूआत

अभी हाल में हमारे देश में लोकसभा और राज्यसभा की कार्यवाहियां समाप्त हुयी हैं। विधेयकों पर विचार करते हुये बहुत से सदस्यों ने अपने विचार रखे। सामान्यतया, सत्ता पक्ष के सदस्यों के विचार, विपक्ष के सदस्यों के विचारों से अलग रहे।

वास्तव में, यह हमारी प्रकृति है कि जब हम किसी समस्या पर अपने विचार व्यक्त कर रहे होते हैं, तब कभी-कभी ऐसी स्थिति उत्पन्न होती है कि हम दूसरों के विचारों को सही मानने से इंकार कर देते हैं, अथवा उसकी सभी बातों को सही नहीं मानते हैं। यह स्थिति असहमत होना कहलाती है।

दूसरे शब्दों में हम कह सकते हैं कि असहमति वार्त्तालाप के दौरान वह अवस्था होती है, जब हम मान बैठते हैं कि इससे आगे की वार्त्ता का कोई महत्व नहीं होगा और इससे विवाद बढ़ेगा।

अंग्रेजी भाषा में इसे हम "agree to disagree" कहते हैं। यह वाक्य पहली बार सन् 1770 में उस समय प्रकाश में आया, जब जॉर्ज व्हाइटफील्ड (George Whitefield) की मृत्यु हुयी और जॉन वेस्ले (John Wesley) ने एक वक्तव्य लिखकर यह स्वीकार किया कि उन दोनों की विचारधाराओं में भिन्नता थी। जॉर्ज व्हाइटफील्ड ने 18वीं शताब्दी के प्रोटेस्टेंट पुनरुद्धार को प्रेरित किया था। जॉन वेस्ले भी एक अंग्रेज धर्मशास्त्री और प्रचारक थे, जो इंग्लैंड के चर्च के भीतर पुनरुद्धार आंदोलन के नेता थे, जिसे मेथोडिज़्म के रूप में जाना जाता था।

गणित, विज्ञान, साहित्य, तर्कशास्त्र, अर्थशास्त्र आदि में ऐसे तमाम सिद्धांत हैं जिन पर दो अथवा कई विद्वानों की एक राय नहीं है। इन्हीं मत-भिन्नताओं के लिये इस वाक्य का प्रयोग किया जाता है।

जब हम किसी के मत से भिन्न मत रखते हुये उसके मत से कुछ सीमा तक सहमत होते हैं, तब इसका मतलब यह नहीं होता है कि हमने अपना मत हमेशा के लिये छोड़ दिया है या हमने उसकी बात को शत-प्रतिशत स्वीकार कर लिया है।

प्रकृति में मनुष्य पृथ्वी का सबसे अधिक चिंतनशील प्राणी माना गया है। वह हर पल कुछ न कुछ सोचता रहता है। इसी सोच-विचार में वह हमेशा नये-नये सिद्धांतों की खोज भी करता रहता है, लेकिन हर सिद्धांत निरपेक्ष हो, यह जरूरी नहीं है। कुछ सिद्धांत समय के अंतराल में झूठे सिद्ध हो जाते हैं, लेकिन उनको झूठा सिद्ध करना भी नया सिद्धांत बनाना होता है।

हर व्यक्ति के विचार उसकी सोच के अनुसार उसके दिमाग की उपज होते हैं जो उसके विश्वासों, जीवन-मूल्यों, और अनुभवों से प्रेरित रहते हैं। जब तक हम विपरीत विचारों का आदर करते रहते हैं, सभी विचार समाज में प्रभावी बने रहते हैं। एक वृहद् समाज का निर्माण ऐसे ही पृथक विचारों के संयोग से होता है।

इतिहास इस बात का साक्षी है कि असहमति ने विश्व को नयी दिशायें दी है। असहमति ने समाज व देश की कई कुप्रथाओं को नष्ट किया है। अमेरिका में अब्राहम लिंकन ने 1861 में गुलामी प्रथा को खत्म किया। भारत में राजा राममोहन राय ने 1829 में सती प्रथा का विरोध कर उसे खत्म कराया। यह असहमति ही थी कि 1789 में फ्रांसीसी क्रांति ने कुलीनों का विशेषाधिकार खत्म कराया।

जे एस मिल के अनुसार हर व्यक्ति को अपने विचार रखने की छूट होनी चाहिये। इससे एक फायदा यह होता है कि अगर विचार गलत है, तब समाज का विचार और अधिक दृढ़ हो जायेगा और अगर सही है, तब समाज को एक परिष्कृत विचार मिल जायेगा।

यह सच है कि पूर्ण सहमति एक अपवाद है। यह केवल असहमति का आदर होती है। वास्तव में असहमति की स्थिति में हर बुद्धिमान व्यक्ति टकराव से बचता है। ईमानदार सहमति प्रगति की श्रेष्ठ सूचक होती है।

एक दूसरे से अहमत होना मानव की मूलभूत विशेषता है। ऐसा कोई व्यक्ति नहीं है जो किसी न किसी बात पर, किसी न किसी से, असहमत न होता हो। मतभेद होना अस्तित्व का सूचक है। सच तो यह है कि समस्यायें कभी भी असहमति अथवा मतभेद से नहीं उत्पन्न होती हैं। समस्यायें या तो मौन सहमति से उत्पन्न होती हैं अथवा विचार शून्यता से उत्पन्न होती हैं।

परिपक्व मस्तिष्क आपसी मतभेदों को सुलझाने की क्षमता रखता है। किसी के विचारों से मतभेद रखने का मतलब यह नहीं निकालना चाहिए कि हम उसकी आलोचना कर रहे हैं, बल्कि इसे ऊर्जावान और नये विचारों को प्रस्तुत करने की कला के रूप में देखना चाहिए।

आइये, हम अपने समाज के विकास के लिये किसी व्यक्ति के विचारों से सीधे-सीधे असहमत होने के पहले उसमें सहमति के लिये उन तथ्यों को ढूंढें जो सबके लिये हितकारी हों। सच मानिये, यह प्रयास अवश्य सफल होगा। कबीरदास जी का सिद्ध वचन है - जिन खोजा तिन पाइयां, गहरे पानी पैठ।

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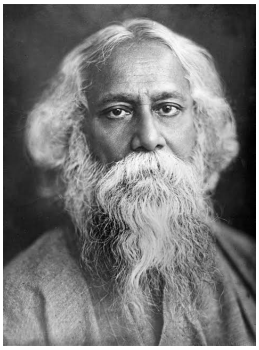
Humanity is acquiring all the right technology for all the wrong reasons.

\- ***R. Buckminster Fuller***

Alo Amar, Alo Ogo… : आलोक तू है, आलोक मेरा...



Gurudev Ravindranath Tagore

(Gurudev, we recall your message on the occasion when we rise to welcome the New Year 2020)

Original in Bengali Script

আলোআমার, আলোওগো আলোভুবন-ভরা।
আলোনয়ন-ধোওয়া আমার, আলোহৃদয়-হরা॥

নাচে আলোনাচে, ওভাই, আমার প্রাণেরকাছে
বাজে আলোবাজে, ওভাই হৃদয়বীণার মাঝে
জাগে আকাশ, ছোটে বাতাস, হাসে সকল ধরা॥

আলোরস্রোতে পালতুলেছে হাজার প্রাণের তরী।
আলোঢেউয়ে উঠল নেচে মল্লিকা মালতী।

মেঘে মেঘে সোনা, ওভাই, যায় না মানিক গোনা
পাতায় পাতায় হাসি, ওভাই, পুলকরাশি রাশি
সুরনদীর কূল ডুবেছে সুধা-নির্ঝর-ঝরা॥

Original in Roman Script

alo amar, alo ogo,
alo bhuwan-bura .

alo nayan-dhowa amar, alo hridaya-hara .
nache alo nache, o bhai, amar praner kache— baje alo baje,
o bhai, hridaybinar majhe— jag akash, chot batus, hase sakal dhara .

alore srote pal tulene hazar prajapati .
alore dheuay uddl neche mallika malati .

meghe meghe sona, o bhai, ya na maanik gona
pata pata hasi,o bhai, pulak raashi raashi
surandir kul dubese sudha-nijhar-jhara .

Translation in Hindi

आलोक तू है आलोक मेरा, आलोक भरे भुवन।
आलोक छाये नैन मेरा करे हृदय हरण॥

नाचे आलोक नाचे ओ-भाइ घेरे प्राण मेरे
गर्जे आलोक बरजे ओ-भाइ मन-वीणा झंकारे
जागे आकाश धाय बातास हँसे धरा जीवन॥

आलोक धारा की पतवार ऐसी हजारों तितलियाँ।
नाचे आलोक लहरों पर मालती-मल्लिका।

मेघ से सोना सोना बरसे रे भाइ मणि अनगिने
पात पात हंसे रे भाइ खुशी अझर झरे
तीर डूबे, सुरसरी के निर्झर हुधातरंग॥

Translation in English

Light of mine, O' my light, light fills the world divine.
Light floods eyes of mine, light fills the heart of mine.

Dances light, it dances brother, near my soul's sphere.
Plays light, it plays brother, striking heart-string's center.
Opens skies, rushes airs, laughter fills the world divine.

In streams of light have raised the sail a thousand moths and mites .
In waves of light have danced Lilies- Jasmines in delights.

Clouds splatter gold my brother, countless are jewels.
Laughter spreads on each leaf my brother, delights endless.
The banks of heaven's river overflowed cascading nectar divine.

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EVOLUTION OF IOMS

- Philosophy of IOMS had its inception in Sarthak Prayash an NGO, in May'2012 in Chalk-N-Talk Mode with stray students.
- Its manifestation in the form of e-Bulletin started in 2016, on 2nd October with its First Issue **Subodh पत्रिका**
- In May' 2017 the initiative was upgraded to IOMS, in its primitive form, with the efforts of its Shri Shailendra Parolkar
- This initiative was reorganized as Gyan Vigyan Sarita in 2017 with its e-Bulletin in the name of **Gyan Vigyan Sarita – शिक्षा**
- With this e-Bulletin as Fourth Annual issue, we are stepping in Fifth year of broadening communication to invoke participation of those who can make a difference, for the larger good.
- Presently it is a satisfactory working model on 'Minimum Need' basis.
- Currently about 75 students in Two rural schools, one is RKM High School in A.P. and other is Army Public School, Dinjan, Assam, are being ng mentored. At Dinjan it is our first step to mentor children of our brave soldiers securing our frontiers
- We continue to look forward…..

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INVITATION FOR CONTRIBUTION OF ARTICLES

Your contribution in the form of an article, story poem or a narration of real life experience is of immense value to our students, the target audience, and elite readers of this Quarterly monthly e-Bulletin ***Gyan-Vigyan Sarita: शिक्षा,*** *and thus create a visibility of the concerns of this initiative. It gives target students a feel that you care for them, and they are anxiously awaiting to get benefitted by your contributions. We request you to please feel free to send your creation, by* ***20th of each month*** *to enable us to incorporate your contribution in next bulletin,* subhashjoshi2107@gmail.com.

We will be pleased to have your association in taking forward path our plans as under-

- ***With the the release of 1st Monthly e-Bulletin in its consecutive Fourth Year, we are gearing up for next Monthly e-Bulletin Gyan-Vigyan Sarita: शिक्षा due on 1st of ensuing month.***
- ***This cycle of monthly supplement e-Bulletin Gyan-Vigyan Sarita: शिक्षा is aimed to continue endlessly, till we get your तन and मन support in this sefless educational initiatice to groom competence to compete among deprived children.***

Formatting Guidelines: (a) Paper Size A4, (b) Fonts: Times Roman (English), Nirmala UI (Hindi), (c) Font Size Title/Author Name/Text: 14pt/12pt/10 pt (d) Margins: top/bottom/left/right – 1"/1"/0.4"/0.4", (e) Photoprofile of author – In 4-5 lines with mail ID and Photo. We will be pleased to provide softcopy of template of an article, in MS Word to the author on advise.

We believe that this e-Bulletins shall make it possible for our esteemed contributors to make its contents rich in value, diversity and based on their ground level work and/or experiences.

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Coordinator's View

Agree to Disagree: A Necessity?

Agreement and disagreement to a proposition are diametrically opposite intellectual posture. It is unlikely that any two persons would agree to a proposition in tandem. Even possibility of a person agreeing to his own proposition, at any earlier occasion, is remote. The reasons behind such contradictions are change of context, roles, responsibilities and realizations of human sensibility and sensitivity. This throws open a few questions – Is disagreement a sign of intellectualism or growing wiser? Is disagreement a way to earn opportunity of counseling? Is a counsel, soon after giving away advice, relieved of his responsibility of its consequences? An effort has been made to evolve answers to these questions for a wider consideration.

With the growth of human civilization perfectionism has grown from personal pursuit to an institutional endeavour. Observation, their repetitions and analyzing their cause have contributed to growth of human intelligence. Accumulation of knowledge by predecessors served as pedestal to their successors to be able to look farther and beyond. Until, Socrates, the pursuit of excellence was either an individual's struggle against his own ignorance and inability to correlate observations; this was called तपस्या (Tapasya) in Indian context. Transmission of knowledge was accomplished individuals was primarily by speech (श्रुति) and actions (कृति) which constricted its spread across. It was Socrates who instilled, among his pupils, process of learning by exploring contradictions to any proposition. His thrust was to explore consideration affecting the proposition which might have remained unthought-of, and thus he lead debate to holistic approach. Gradually, it evolved into dialectical materialism as called by Friedrich Engels and base of Das Kapital by Karl Marx. Further, Marx propounded theory of evolution of thought by identifying three stages of a proposition *Thesis-Antithesis-Synthesis* in a cyclic manner. Upcoming of centers of learning in the form of schools, institutions, universities and research organizations, paradigm of exchange of knowledge has become multi-dimensional.

Taking forward the subject matter, let us analyze why a person agrees or disagrees to other.

Agreement and disagreement are two emotional and intellectual postures and are antonyms to each other. Hence, discussions of them would go together. Act to agree can be classified as **(i)** *Proactive,* **(ii)** *Reactive* and **(iii)** *Passive*.

Proactively Agree: While agreeing to a thought or action one takes pain to analyze, visualize and hypothesize cause of action and its consequence. In this, depth and diversity of considerations addressed depends upon intellectual height and depth of wisdom of the persons. A naïve person has either a limited bandwidth of the scenario or a narrow angle of vision. When a person grows intellectually, angle of vision grows and tends to encompass everything, including human aspects, for the larger good. This is where an intelligent person gets closer to wisdom. Such a person is seldom motivated but more an inspired person. To him, expression is not an end but a means to reach the end, the larger good. Therefore, he would not rest until he convinces, persons disagreeing, to agree; and inspire persons in agreement to pro-act to accomplish the objective in a rational manner. Proactive response is intrinsic and can neither be fabricated nor manufactured or synthesized. This grows into an endless spiral. A person while agreeing or disagree is a state of mind which is purely objective and without animosity to anyone; it is neither an expression of respect or disrespect to person agreed to or disagreed. Proactive agreement leads to a reform which has a long gestation period and hence persons who pursue it are always fewer. It is more about giving away rather than self-gain. This is inspiration derived out of intellect, wisdom, courage and strength to put through self-conviction.

Reactively Agree: Every proposition like a coin has two faces. One of the faces may create an appeal or be considered beneficial by some, while the other face might interest others. This kind of appeal, benefit or interest is purely subjective. Drift of considerations from objectivity to subjectivity causes loss of rationality. It is this irrationality which makes a person to descend from his intellectual plane, and react to any forthcoming proposition. Agreements or disagreements arising out of reactions are reactive in nature and reflect lack of wisdom. Reactive responses can be either intrinsic arising out of vested interests or extrinsically implanted through lucrative means. It is possible to manage extrinsic responses through various motivational techniques. Process of creating reactive disagreement is fast, rather it is rapid. It is like transformation and attracts larger section of society in the hope of some gain.

Passively Agree: This posture is a wait-and-watch proposition where one extends consent to any proposition that comes across. On being confronted for passive agreement, the plea taken is subjective and to keep others pleased. This posture denounces the fact that there is always a thought behind every action, unless it is committed by an idiot. Likewise, there are consequences of actions that follow the passive agreement. Prima facie, passive agreements avoid immediate controversy, but in fact it is averting the crisis of disagreement. *Is there any certainty that passive agreement would not impact someone in an unreasonable, irrational and injudicious manner*? A naïve person may be justified on his passive posture out of ignorance of consequences. But, *an intelligent person taking a naïve posture is blatant intellectual, professional and moral dishonesty*. Every person as an individual, family, society, organization, administration or state is responsible for his thoughts, actions and their consequences and repercussions. Position and power is not a matter of personal prerogative. Therefore, *none has any choice other than to proactively agree or disagree*.

Why to Agree? Next is an effort to analyze origin of thought behind any agreement or disagreement. Primary thoughts are initiated in needs of biological survival. As a child grows, he assimilates responses to different stimulus. Pursuit of responses is different to every individual, and it is based on his context and genetic characteristics. It is seen that certain individuals keep

pursuing certain path despite odds and are categorized as exceptions. Such exceptions were there in every era and would continue to be there in times to come. Yet they do not become a yardstick for measuring, comparing, regulating or judging common men. This is where role of education comes in. Importance of institutionalized education gained momentum in renaissance era in Europe, where paradigm of evolution of thoughts and believes took a route of experimental validation. This continued until late 19th century when Einstein took a path of thought experiment to evolve Theory of Relativity. Yet each of the great thinkers, philosophers and scientist had to defend themselves against the charge of treachery until their proposition was accepted. All this has been a tug of war between agreement and disagreement, knowledge and ignorance, intellect and foolish, wise and stupid.

Education is all about enabling a person to form his beliefs and manifest them in the form of either agreeing or otherwise. Basic requirement of the enablement is **(i)** *ability to observe*; **(ii)** *correlate observations*; **(iii)** *analyze pros-and-cons of each observation*; **(iv)** *explore alternatives of optimizing the effects of observations,* optimization implies maximizing the positivity in observations and minimize its negativity, There are always more than one alternatives to any objective. **(v)** *Making a choice of an alternative that is feasible, viable, economical, and sustainable that supports coexistence both with people and nature;* **(vi)** *implement the selected alternative*; **(vii)** *Last-but-not-the-least preparedness to review the implementation*. This is a cyclic evolution which apart from leading to intellectual upliftment creates sensibility and sensitivity towards men and nature, a reason for our existence and is at the core of wisdom. Enrichment of wisdom of a person is slow and grows exponentially with every cycle of evolution. It leads a person on the path of wisdom and adds to the strength of self-conviction and courage to agree or disagree in a proactive manner. This kind of wisdom has to be evolved and it cannot be imparted, implanted or gifted.

Surge of industrialization in 19th century which continues to grow in 21st century, apart from increase in population to nearly five times, has created requirement of a large human resource with sharp drift in skill sets. Over these two centuries there has been a great departure in socio-political systems from controlled economy to liberal and globally competitive economy. In such a scenario path of automation has become a cost-effective respite. But, this has led the education system into very commercial which is aimed a short-term gains. Result is – **(i)** *a wide gap in demand and supply gap of human resource,* **(ii)** *whatever manpower is becoming available is a result of quick face-lifting and window dressing, but lacking both maturity and wisdom*. **(iii)** *a huge dissatisfied lot so created is more demanding and less performing*, **(iv)** *such youth, who are not industry-ready and are in large number, are under compulsion to passively agree to any reactive proposition*, **(v)** *they are the ready stock for persons with vested interests to propel their intellectualism through reactive agreement/ disagreement.*

In this process the world is increasingly becoming digital with sharp decline in creativity, innovation, ingenuity. This has reduced significance of individuals to nothing more than mere consumers. *It is only a proper education system that can infuse creativity, a necessity for survival and coexistence of human civilization under any circumstances.* Unless education system takes reins of reform in times to come, we shall be left with most of the persons who would be piling stock passive and worthless liability, yet ready to be maneuvered by the promoters of reactive disagreement. It would only serve interests of elitists in their fashion and fascination to reactively disagree; it is safest business and does not involve any responsibility of performance erosion.

In early BC era, *Plutarch* had said, "*I don't need friend who changes when I change, who nod when I nod; my shadow does that best*". Being an illiterate, Saint Kabeer is yet supposed to be a great thinker and relevant. He is one of our role models. He highlighted importance of critiques by advising –

"निंदक नियरे राखिए, ऑगन कुटी छवाय,
बिन पानी, साबुन बिना, निर्मल करे सुभाय।"

Saint Kabeer also stresses upon need of introspection at every stage of agreeing or disagreeing –

"बुरा जो देखन मैं चला, बुरा न मिलिया कोय,
जो दिल खोजा आपना, मुझसे बुरा न कोय।"

But, this can be practiced only by a person who possesses, in his words, wisdom -

"साधु ऐसा चाहिए, जैसा सूप सुभाय,
सार-सार को गहि रहै, थोथा देई उड़ाय।"

Conclusion: These discussions are a clear pointer of necessity to agree and disagree is necessary in light of contexts and prospects, if human civilization has to **(i)** *remain vibrant*, **(ii)** *remain creative*, **(iii)** *grow in harmony and peace,* and **(iii)** *sustain coexistence*. This necessity can be shouldered only by those persons who – **(a)** *have gained wisdom through real education be it in institution or real life*, **(b)** *a strength to implement what they agree*, **(c)** *courage to take it forward their conviction* and **(d)** *a preparedness to face consequences of their actions.*

Kabeer's one more advice which is worth millions of dollars is –

" कबिरा संगत साधु की , ज्यों गंधी का बास ,
जो कुछ गंधी दे नहीं , तो भी बास सुवास। "

All that is expected of us is to take along persons capable to agree or disagree in a proactive manner. It will help rise above self for the cause of the larger good to shed away personal inhibitions. It is in wake of the fact that anything that is absolute and satisfies everyone is impossible. Moreover, urgency of needy cannot wait until satisfaction of intellectual appetite of elites or their convenience to pro-act. Hence, it is essential for elites to resolve their differences and deploy synergy for the larger good on the premise that ***agree to disagree is a necessity****. We are sure that it would be a lifetime satisfaction for elites to leave a legacy of wisdom and courage to pro-act, for our descendents to live in better times of peace and harmony.*

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An Appeal: for Interactive Online Mentoring Session (IOMS) at your establishment

By Gyan Vigyan Sarita – A non-organizational educational initiative

Philosophy: Socio-economic reform through education with **Personal Social Responsibility** (PSR) in a non-organizational, non-remunerative, non-commercial and non-political manner.

Objective: Groom competence to Compete among un-/under-privileged children from 9th-12th in Maths, Physics and Chemistry, leading to IIT-JEE.

Financial Model: ***Zero-&-Fund-Zero-Asset (ZFZA).*** It calls for promoters and facilitators to provide infrastructure for use to the extent they feel it is neither abused nor there is a breach of trust. And, reimbursement of operational expenses, as and when they arise, to the initiative

Operation:

a. **Mode:** Interactive Online Mentoring Sessions (IOMS) since July'16, which has been recently switched over to A-VIEW, web-conferencing S/w, with connectivity upto 5 Learning Centers, with One Mentoring Center.
b. **Participation:** Voluntary and Non-remunerative, Non-Commercial and Non-Political

Involvement:

a. **Promoter** –
   i. Initiate a Learning Center,
   ii. Sponsor a Mentor who is willing to join on certain terms,
   iii. Sponsor cost of operation and up-gradation of infrastructure to voluntary mentors,
b. **Facilitator** –
   i. Provide space and infrastructure for **Interactive Online Mentoring Sessions (IOMS).** Most of it is generally available, and may need marginal add-on,
   ii. Garner support of elite persons to act as coordinators at the Learning Centre.
c. **Participator** –
   i. As a Mentor,
   ii. As a Coordinator,
   iii. Operational support
   iv. E-Bulletin and Website promotion for increasing its depth and width across target students

Background: *The initiative had its offing in May'12, when its coordinator, a non-teacher by profession, soon after submission of Ph.D. Thesis in 2012, at one of the IITs, under taken after retirement got inspired to mentor unprivileged students.*

The endeavour started with Chalk-N-Talk mode of mentoring unprivileged students starting from class 9th upto 12th. Since then it has gone through many ground level experiences and in July'16 it was upgraded to IOMS, a philosophy in action to reachout to more number of deprived students. Currently regular sessions of IOMS are held regularly for students of class 9th and above at few Learning Centeres. Efforts are being made to integerate more learning centers and mentors to diversify its scope and utilize our full capacity.

*It is a small group of Four persons including **Prof. SB Dhar**, Alumnus-IIT Kanpur, **Shri Shailendra Parolkar**, Alumnus-IIT Kharagpur, settled at Texas, US and **Smt. Kumud Bala**, Retd. Principal, Govt. School Haryana. More details of the initiative are available on our website and operational aspects of can be online accessed at IOMS .*

***Actions Requested:** May please like to ponder upon this initiative. **Queries** ,if any, are heartily welcome. We would welcome your collective complementing in any of the areas listed above at **Involvement**, to make the mission more purposeful and reachable to target children.*

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Address: #2487, Mahagun Moderne, Sector-78, NOIDA, UP– 201309, **(M):+91-9711061199,**

e-Mail ID: subhashjoshi2107@gmail.com, **Website: http://www.gyanvigyansarita.in**

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अंदाज ए बयां

जूता विमर्श के बहाने : पुरुष चिन्तन

-समीर लाल 'समीर'

कल कहीं पढ़ता था कि कामकाजी महिलाओं के लिए आरामदायक चप्पल मिलना कितना मुश्किल है. जल्दी मिलती ही नहीं , हर समय तलाश रहती है.

आज बरसों गुजर गये. हजारों बार पत्नी के साथ चप्पलों की दुकान पर सिर्फ इसलिए गया हूँ कि उसे एक कमफर्टेबल चप्पल चाहिये रोजमर्रा के काम पर जाने के लिए और हर बार चप्पल खरीदी भी गई किन्तु उसे याने कमफर्टेबल वाली को छोड़ बाकी कोई सी और क्यूँकि वह कमफर्टेबल वाली मिली ही नहीं.

अब दुकान तक गये थे और दूसरी फेशानेबल वाली दिख गई नीली साड़ी के साथ मैच वाली तो कैसे छोड़ दें ? कितना ढूँढा था इसे और आज जाकर दिखी तो छोड़ने का तो सवाल ही नहीं उठता.

हर बार कोई ऐसी चप्पल उसे जरुर मिल जाती है जिसे उसने कितना ढूंढा था लेकिन अब जाकर मिली.

सब मिली लेकिन एक आरामदायक चप्पल की शाश्वत खोज जारी है. उसे न मिलना था और न मिली. सोचता हूँ अगर उसे कभी वो चप्पल मिल जाये तो एक दर्जन दिलवा दूँगा. जिन्दगी भर का झंझट हटे.

उसकी इसी आदत के चलते चप्पल की दुकान दिखते ही मेरी हृदय की गति बढ़ जाती है. कोशिश करता हूँ कि उसे किसी और बात में फांसे दुकान से आगे निकल जायें और उसे वो दिखाई न दे. लेकिन चप्पल की दुकान तो चप्पल की दुकान न हुई , हलवाई की दुकान हो गई कि तलते पकवान अपने आप आपको मंत्रमुग्ध सा खींच लेते हैं. कितना भी बात में लगाये रहो मगर चप्पल की दुकान मिस नहीं होती.

ऐसी ही किसी चप्पल दुकान यात्रा के दौरान , जब वो कम्फर्टेबल चप्पल की तलाश में थीं, तो एकाएक उनकी नजर कांच जड़ित ऊँची एड़ी, एड़ी तो क्या कहें- डंडी कहना ही उचित होगा, पर पड़ गई.

अरे, यही तो मैं खोज रही थी. वो सफेद सूट के लिए इतने दिनों से खोज रही थी, आज जाकर मिली.

मैने अपनी भरसक समझ से इनको समझाने की कोशिश की कि यह चप्पल पहन कर तो चार कदम भी न चल पाओगी.

बस, कहना काफी था और ऐसी झटकार मिली कि हम तब से चुप ही हैं आज तक.

'आप तो कुछ समझते ही नहीं. यह चप्पल चलने वाली नहीं हैं. यह पार्टी में पहनने के लिए हैं उस सफेद सूट के साथ. एकदम मैचिंग.'

पहली बार जाना कि चलने वाली चप्पल के अलावा भी पार्टी में पहनने वाली चप्पल अलग से आती है.

हमारे पास तो टोटल दो जोड़ी जूते हैं. एक पुराना वाला रोज पहनने का और एक थोड़ा नया, पार्टी में पहनने का. जब पुराना फट जायेगा तो ये थोड़ा नया वाला उसकी जगह ले लेगा और पार्टी के लिए फिर नया आयेगा. बस, इतनी सी जूताई दुनिया से परिचय है.

यही हालात उनके पर्सों के साथ है. सामान रखने वाला अलग और पार्टी वाले मैचिंग के अलग. उसमें सामान नहीं रखा जाता , बस हाथ में पकड़ा जाता है मैचिंग बैठा कर.

सामान वाले दो पर्स और पार्टी में जाने के लिए मैचिंग वाले बीस.

मैं आज तक नहीं समझ पाया कि इनको क्या पहले खरीदना चाहिये- पार्टी ड्रेस फिर मैचिंग चप्पल और फिर पर्स या चप्पल , फिर मैचिंग ड्रेस फिर पर्स या या...लेकिन आजतक एक चप्पल को दो ड्रेस के साथ मैच होते नहीं देखा और नही पर्स को.

गनीमत है कि फैशन अभी वो नहीं आया है जब पार्टी के लिए मैचिंग वाला हसबैण्ड अलग से हो.

तब तो हम घर में बरतन मांजते ही नजर आते.

घर वाला एक आरामदायक हसबैण्ड और पार्टी वाले मैचिंग के बीस.

लोकप्रिय चिट्ठाकार समीर लाल व्यवसाय से चार्टर्ड एकाउंटैंट हैं। आजकल वे कैनैडा में रहते हैं। उन्होंने कहानी लिखना पाँचवीं कक्षा में ही शुरु कर दिया था। आप कविता , गज़ल, व्यंग्य, कहानी, लघु कथा आदि अनेकों विधाओं में दखल रखते हैं| भारत के अलावा कनाडा और अमेरिका में मंच से कई बार अपनी प्रस्तुति कर चुके हैं। आपका ब्लॉग "उड़नतश्तरी" हिन्दी ब्लॉगजगत में एक लोकप्रिय नाम है।

ई-मेल: sameer.lal@gmail.com

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Roots of education are bitter, but the fruit is sweet.

- *Aristotle*

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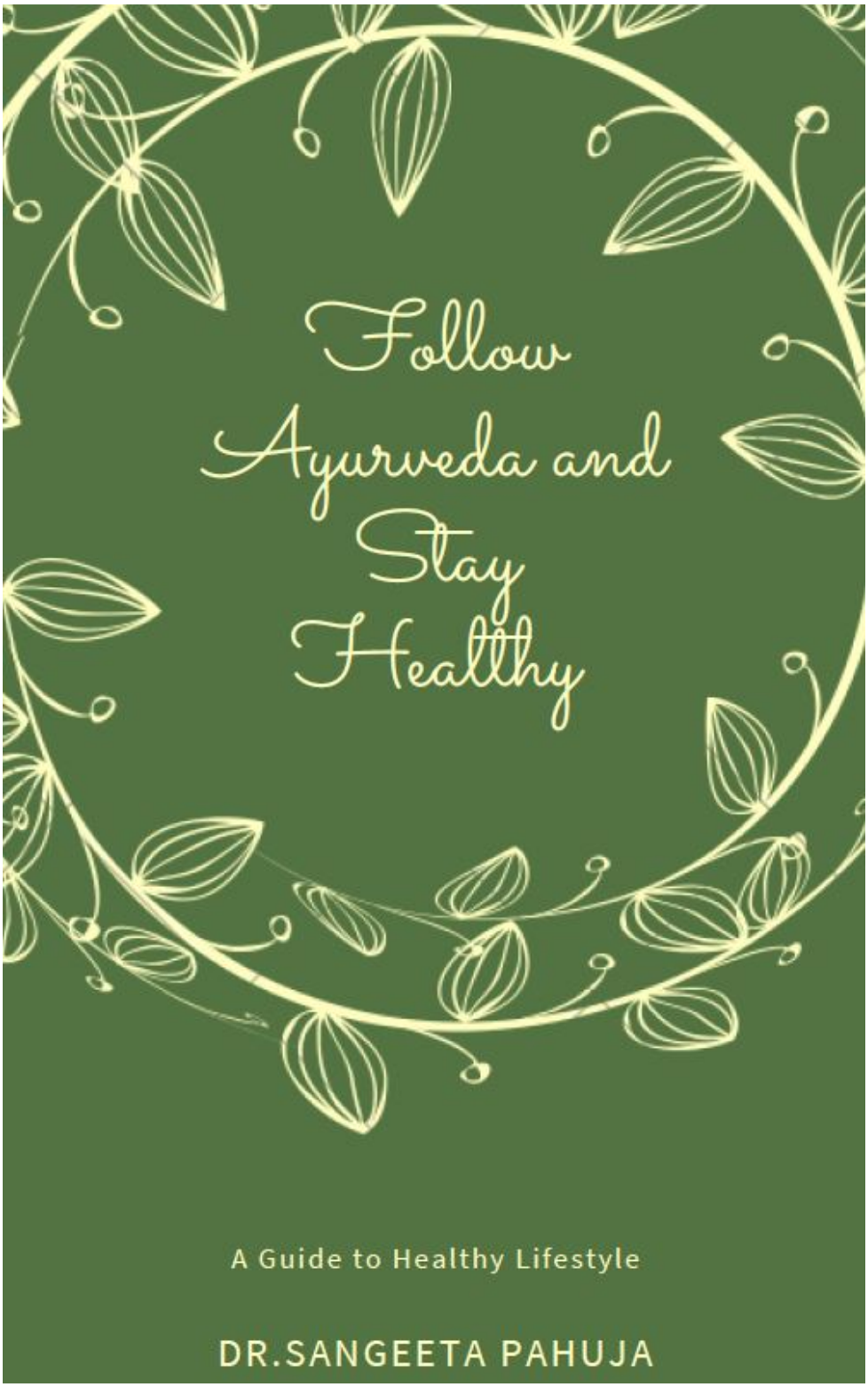
Ayurveda- Health Care

***Dr Sangeeta Pahuja**, regular author of this column has consolidated her articles in the form of a book. Excertps of the book viz. Cover page, Foreword, Preface and Contents are brought out here under. This book will be shortly available as a free web-resource for the larger good on our website. We will notify the link in next e-Bulletin.*



Forward

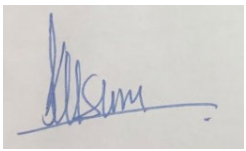
I would like to congratulate my sister as she discovered her 'Soul's purpose" and worked towards Ayurveda, known as the "Sister Science" that is holistic in nature. To me personally, the meaning of Ayurveda has been a way of life.One of the main beliefs is that the food we eat effects our overall wellbeing, and can make us whole or fragmented. Essentially, we can be full of energy and vitality or lethargic and run-down based on what we put into our bodies. This is known as the Sattvik approach.

The book written by Dr. Sangeeta Pahuja emphasizes that we are surrounded by five energy fields and these are also called the "five elements" and they play an important role in all aspects of our life including the way people eat. The five elements that you would be introduced in this book are as follows

- **Space**
- **Air**
- **Water**
- **Fire**
- **Earth**

Would you like to be aware and understand the element you belong to? What is it that you need to do to "Follow Ayurveda and stay Healthy?" The world's best kept secrets are revealed in this book "Follow Ayurveda and Stay Healthy"

With warm regards,



Kusum Gandhi Vig

Founder Director: Mind Matrix Wellness Studio

Counseling Psychologist &NLP Trainer

PREFACE

This is a collection of my articles containing information and suggestions over a way of life one can have with the help of Ayurveda.

A person can stay healthy by following the guidelines about favorable diet and lifestyles through seasons.

In my own life, I have passed through different stages, and God had been kind in all my endeavors.

With a degree in Ayurveda and experience of practicing in the same field for more than 25 years, I had to shoulder the responsibility of bringing up this guide available to almost every individual in the country so that we get back to the basics and nurture the rich lifestyle that we had discovered years ago through Ayurvedic Science.

Dr.Sangeeta Pahuja

Contents

Know Ayurveda : An Introduction

Author is an Ayurvedic Medical Practitioner. She did B.A.M.S. from M.D. University, Rohtak. She has consultation centres at Delhi and Noida. She is keenly interested in spiritual, women and social developmental activities. Contact No.: 9953967901,

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GROWING WITH CONCEPTS

Concepts of an expert are not like a static foundation of a huge structure; rather it is like blood flowing in a vibrant mind.

Growing into an expert, is a process during which each one must have used best of the books available on subject and received guidance of best of the teachers. Authors might have had limitations to take every concept thread bare from first principle and so also must be the constraint of teacher while mentoring a class with a diversity of inquisitiveness and focus. As a result, there are instances when on a certain concept a discomfort remains. The only remedy is to live with the conceptual problem and continue to visualize it thread bare till it goes to bottom of heart and that is an ***ingenious illustration****.*

In this column an effort is being made to take one topic on Mathematics, Physics and Chemistry in each e-Bulletin and provide its illustration from First Principle. We invite all experts in these subjects to please mail us their ingenious illustrations and it would be our pleasure to include it in the column.

We hope this repository of ingenious illustrations, built over a period of time, would be helpful to ignite minds of children, particularly to aspiring unprivileged students, that we target in this initiative, and in general to all, as a free educational web resource.

This e-Bulletin covers – a) Mathematics*, b)* Physics *, and c)* Chemistry*. This is just a beginning in this direction. These articles are not replacement of text books and reference books. These books provide a large number of solved examples, problems and objective questions, necessary to make the concepts intuitive, a journey of educational enlightenment.*

Looking forward, these articles are being integrated into Mentors' Manual. After completion of series of such articles on Physics it is contemplated to come up representative problems from contemporary text books and Question papers from various competitive examinationsand a guide to theirsolutions in a structured manner, as a dynamic exercise to catalyse the conceptual thought process.

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Inetellectualism is not about criticizing or advising without any responsibility of implementation; it is about taking upon responsibility of actions for the larger good.

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Micro and Macro Economics

Prakash Kale

Economics is omnipresent and form an integral part of our lives. Its name is derived from a Greek word 'Oikonomikos'. If we break the word up, 'Oikos', means 'Home', and Nomos', means 'Management'. Individual in home or for that matter whole society and country has unlimited needs and wants which are ever increasing and sources that are available to satisfy them are limited. Hence, economics is the study of how the available resources are managed and organized (by individual, society and country) to deal with the needs and wants. This is the core theme of Economics. Thus we need to have choice or priorities our wants based on resources. Right choices can make us prosper and wrong one can sink us in debt or plight.

As many of us have not studied the economics subject in depth so, for simplicity, article is like understanding basics of Rocket Science in class 10 and terms will also be explained wherever necessary. Further, though theory of economics says that "man behaves ***rationally*** (always looks for profit /loss)", in reality people do have emotions, prejudice, and non-economic reasons to act and behave **irrationally.** Further, focus of article is on two aspects. First like in science, (to maintain nature's equilibrium and continuity, nature's system is such that if we inhale oxygen and exhale carbon-dioxide, plants inhale carbon-dioxide and exhale oxygen) in economics also, two opposite actions must be going on or two opposite groups must exist (sale–purchase, producer-consumer, importer-exporter etc) to balance or to sustain society /country/ world. Also, we all play double role (in pairs) in economic transactions, for example if, as a factory owner we are **producer** of A thing, we are also **consumer** of B thing (produced by someone else). Second is corollary of first, many of virtues like saving (for future) or export (by countries) attributed to single entity if adopted by all individual / countries, they are harmful/ unsustainable in absence of counter action like consumption (against saving) and import (against export) by other group.

To start with, suppose you have 100 rupees with you, the choice of using that money to pay off your bill or spend it on an outing is all an economic decision. Through our choice (of purchasing or not purchasing), we not only influence the prices of the goods and services, but also the goods that will be produced or not produced in society and the income we earn in our business and job. In turn it decides the economic condition of the country, reflected in, interest rates, inflation (price rise over a period), export import performance and unemployment etc., which also directly affects our finances, growth, and many other areas that permit us to be self-sufficient in our lives.

As said above on the one hand individuals take economic decisions under given conditions (at Macro level) and its study is part of Micro Economics. Thus study of Microeconomics is regarding the choice and allocation of resources and prices of goods and services by individuals. Microeconomics focuses on supply and demand and other forces that determine the price levels (need not be of goods only, it is applicable to services, as well price of one currency against another currency in case of forex transactions) in the economy. On the other hand, study of aggregate behavior of individuals or policy changes that need to / are taken to change such behavior (at Micro level) is part of Macro Economics. It studies the behavior of a country (if we are discussing world economy as a whole, decision of individual countries will be studied as part of micro economics) and how its policies affect the economy as a whole. It analyzes entire industries and economies, rather than individuals or specific companies. To give example, government deciding to lower Corporate Tax, is a Macroeconomic decision (affecting all industries) and under it how individual industry redraw their own production, sale, profit plan is Microeconomic decision. This article, (mainly) on Microeconomics (as individual constituent), v/s Macroeconomics (aggregate view or effect) is an attempts to analyze and understand these issues and its effects on us. Object of article is to correct many of misgivings we come across while discussing the topic in our groups and educate young ones about true economic process.

Having explained micro and macro economics separately, let us take a few examples to show how micro and macro economics ***interact, feed on each other and what seems to be good at one level is harmful at the other level.*** We first take **interest rate**. In economics, interest rate (per cent per annum) charged by lender (money giver) or paid by borrower (money taker) is nothing but **time value of money.** It means, if I do have opportunity (if have money) of earning profit but do not have money, I will borrow. For example if I feel having Rs. 100 /- today (not at a later point of time), I can make Rs. 115/- at the end of year, I will be ready to borrow Rs. 100 at 10 % per annum (time value of money), which leaves me Rs. 5 (Rs. 100 plus Rs 10 interest has to be given back to lender) at the end of year. Now for me at **micro level,** it is my decision to borrow or not and for me rate of interest at 10 % per annum seems to be **fixed**. But, if in whole country there are ten people like me making total demand for money at Rs. 1000/- (at 10 % interest) and suppose lender (at its disposal) have only Rs. 800, he will raise (lending) interest rate to 12 % per annum, where in only eight people feel confident to earn more than 12 % per annum and are ready

to borrow. In reverse way if money available is Rs. 1200/- rate of interest will fall to 8 % so as two more people are ready to borrow. ***It must be remembered that at macro level everything (lending- borrowing) balance out and interest rate is not fixed.*** This cascading effect of rate going up/ down is **macroeconomic phenomenon**. It can be induced by micro constituents (as above), or policy maker to induce behavior change in micro constituents. Now a days when we hear that RBI reduces interest rate or should reduce the rate (as part of monitory policy- policy regarding money supply and rate of interest etc decided by the Central Bank of a country), reasoning is same that money available is more and if people take more money economic activity will go up.

But, above reasoning is from producer (borrower) point of view, which does not have money and wants it at the lowest rate. But lender (Bank) too does not have its own money. In fact it borrows from public and name of this borrowing is "taking deposit" from public. Now if on the demand of producer, rate of interest is lowered, say from 10 % to 8 %, bank will have to reduce rate of interest offered to public from 8 % to 6 % (margin of 2 % for self expanses). This will have two effects. First, people will try to shift money from bank to other assets (things having future value, bank deposit is a type of financial asset, that is why to avoid this banks are asking government to reduce rate of interest on Saving Schemes being offered by it i.e. Govt.) and banks capacity to lend money will be reduced (This again will raise rate of interest based on demand for money by producers). Second, for large section particularly senior citizens, income from interest is the source of monthly income and their life becomes miserable with reduced income. **Thus what is good for one section (producer) is not good for another section (depositor). Story does not end here.** Producer will borrow in the hope of selling goods, but lower income in the hands of depositor affect his sales also and his readiness to borrow even at lowered interest rates. So vicious cycle starts and economy enters in down ward cycle and **what started good at micro level becomes evil at macro level.**

Similar is explanation for **Inflation**. In simple terms 4 % inflation, in economy means, on an average there is price rise of 4 % in goods and services over a period of one year. Here, two things must be remembered, first falling inflation does not mean prices are falling; it only means there rate of increase is falling. Second, what we hear is general average inflation, and economies consist of thousands of type of goods and services whose price movement may be different from average inflation. We have just witnessed how prices of Onion have shot to roof by 700 % within a year. What decides the price of a goods and services? **Much like interest rate,** it is equilibrium point between what has been offered for sale by trader/producer and how much money consumer does have/ready to pay for it. Goods/ services available for sale are known as Supply and Goods/ Services likely to be absorbed in economy are known as demand. In economics, Supply and Demand has special meaning. Supply means goods brought in the market at given price and not the stock of goods with the producer/trader. Similarly, for consumer, desire (what he dreams to have) and need (what he supposed to have) are **not demand,** which means consumer have capacity and willingness to part with money at the given price. So, Supply and demand are **function of price.**

Now let us take example of Onion. Suppose market does have 10 kg onion. Now if consumer is ready to pay Rs. 100 for it, rate will be Rs. 10 per kg. So money and Onion is exchanged fully. Now, if market does have only 5 kg. Rate will shoot up to Rs. 20 per kg. To reduce rate, either supply should be improved or consumer should change preference/ habit in such way that only Rs. 50 (society/ home withdraws rupees 50 meant for Onion and spend it on something else, may be a suitable substitute of Onion) is available for Onion, this will reduce price to Rs. 10 per kg. Thus price can go up/ down by way of reduction/increase of goods/ services (supply side) or by way of increase and reduction of money for purchase of goods. That is why when (macro economically) money in circulation increases in the market without actually increase in available physical goods **inflation shoots up.**

This brings us to most debatable question in Economics, does low inflation and consequent low interest rate era is good for economy? Low inflation leads to low interest rates (they are both two side of a same phenomenon, one reflect demand for goods another for money), which adversely affect depositors (a section of society). Now if, inflation is low and interest rate is above it,(at micro level) it affects decision making process of consumer as well as producer. Let us say I have a Rs. 100/-. Inflation is 5 % and interest rate is 7 %. Now unless I need a item of Rs. 100 very urgently (question of life sustainability), I will deposit money in bank for a year, so I will have rupees 107 /- at the end of year and still I can purchase required item in rupees 105/- at the end of year and save rupees 2/-. So under low inflation condition, generally purchases, like Car, Houses etc are put-off. Producer/ trader of goods also will not produce or store anything beyond what is must for operation. Because any unsold stock bears more cost in terms of interest (and storage etc) than profit in terms of price rise. Thus overall economic activity slows down.

Another function of inflation is, (due to changes in prices,) what is in demand (price rise) and what is not (stable or falling price) gets quickly transmitted. It (inflation) also creates imbalances in market, shortage of A (price rise)

stimulates, economic activity for A, surplus of A creates shortage of B and so on, in short what we call progress is nothing but jumping from one problem to another. We may blame, inflation, but it is how country moves up, especially developing country like us. (For example, more cars necessitating wider roads, in turn wider roads pushing more cars on the road). Else we could stagnant at low level of equilibrium, where no one has incentive to produce and consume more.

Next in discussion is export (goods and services going out of country) and import (goods and services coming in the country), which can also be explained like **interest rate and inflation based on demand and supply.** But, here more complication arises due to **different currencies** of exporting- importing country and **power of sovereign countries** to impose various **restrictions** on movement of goods and services in and out of country, distorting the demand supply equation. In export- import business, for import you have to first purchase currency of exporting country (to pay for your import, Rupee has no value there) and on export you have to sale currency (received out of export from importing country). Thus we have a separate market for currency (like goods), and rate of each currency against other currency is determined exactly like goods, based on demand and supply of currencies.

To give one example of each, thus even if exporter of USA is selling item A in one dollar (not changing the price), for Indian importer it cost Rs. 70 (if 1USD=Rs 70) and Rs. 72 (if 1USD=Rs 72). Further, even if New-Zealand producer is ready to sale milk at Rs.25 per litre to Indian Consumer, Government is not allowing import of Milk to protect domestic producer. That is why India withdrew from China led the RCEP (Regional Comprehensive Economic Partnership) stating the deal's potential impact on the livelihoods of its most vulnerable citizens. It was political decision to protect producer as against benefitting consumer. Decision could have been to join group and prepare our producer to compete with exporter by improved efficiencies.

Now, is it possible for "A" country to do only export and not to import anything? Individually possible but for all countries not possible, as mathematically, total export in the world must be equal to total import in the world. Further, world like a society is also run based on "take and give" principal and so, other country "B" can also adopt such policy and affect or paralyze export of country "A" (in to "B"). Economically also, there are two aspects. First, unless A country imports something from country B, country B will not have currency of country A, to pay for imports (A's export to B) and country A will also not have any use of currency of country B. Second, each country has "Natural Advantages", to produce certain type of goods and services at least cost. Producing those goods and services in home country may not be possible at all or possible at higher cost (To give internal example, it is like Tamilnadu state trying to avoid import of Apple from Kashmir and try to produce the same inside the state). Import substitution may be good for self pride or security reason but not always economically profitable.

To conclude, while these two (Micro/ Macro) branches of economics appear to be different, they are actually interdependent and complement one another since there are many overlapping issues between the two fields. Micro and Macro Economics are not contradictory in nature, in fact, they are complementary. As every coin has two aspects- micro and macroeconomics are also the two aspects of the same coin, where one's demerit is others merit and in this way they cover the whole economy. Increased inflation (a macroeconomic effect) would increase the prices of raw materials required by the companies to manufacture products which would in turn also affect the price for the final product charged to the public. Microeconomics and Macroeconomics are both exploring the same things but from different viewpoints. When we talk about macroeconomics while studying the constituents of output in nations economy we also have to understand the demand of single households and firms, which are micro economic concepts. Similarly when we study the investment policies of businesses- a microeconomic concept we cannot do it without learning about the effect of macroeconomic trends in economic growth, taxation policies etc.

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स्कूलों में यौन शिक्षा ... बड़ी कठिन है डगर यौवन की !

निरंजन धुलेकर

विषय ' स्कूलों में यौन शिक्षा ' दशकों से चर्चा का विषय रहा है हमारे देश में । किस कक्षा से शुरू किया जाए , क्या -क्या पढ़ाया जाए , क्या छोड़ा जाए , कैसे पढ़ाया जाए और जो पढ़ाये उसे तैयार कैसे किया जाय ?

और अभिभावक ? धर्म , संस्कार , समाज , राजनीति , कोर्ट , ये रास्ते हैं प्यार के चलना होगा सम्भल के ।

यौन शिक्षा का करिकुलम क्या हो और इसे शुरू कहाँ से किया जाए ? इस शिक्षा के अंग कौन -कौन हों और इन्हें मानसिक रूप से एकरूप कैसे किया जाए ?

इससे पहले कि विषय में हाथ डाला जाए , ज़रा ये पढ़िए ..

... मैं आधुनिक भारत का एक पुरूष अभिभावक हूँ जिसने अभी तक अपनी पुरानी परंपराएं छोड़ने की हिम्मत नहीं की , ख़ास तौर से युवाकाल की तरफ बढ़ती अपनी बेटी को लेकर तो मैं बेहद दकियानूसी हो गया ।

... बेटे की बात कुछ और है ,वो घर से बाहर जाता है दुनिया उसे देखनी समझनी है ।

.... एक माँ होने के नाते मुझे भी चिंता है कि इस शिक्षा में पढ़ाया क्या जाएगा , क्या वो सब मुझे भी मालूम नहीं होना चाहिए ? बच्चों का होमवर्क तो मैं ही लेती हूँ न , पर इस विषय को तो मैंने कभी पढ़ा देखा ही नहीं , मुझे तो शर्म आएगी बच्चों को ये पढ़ाते हुए ..।

... हमारे मज़हब में औरत को ये सब जानना पढ़ाना नामंजूर है .. इसकी इजाज़त नहीं । ये हमारी मजहबी तहज़ीब पर हमला है हम इसे किसी भी कीमत पर लागू होने नही देंगे। हम कोर्ट जाएंगे !

... लो अब यही बचा था पढ़ने -पढ़ाने को , बच्चा- बच्ची साथ में पढ़ते हैं हमाये यहाँ किलास में , कैसी बेसरम टीचर है जे गाँव मे , लाज सरम है कि नहीं ? पहले से ही सनीमा मोबाइल ने दिमाग खराब कर रक्खाअब स्कूल में भी वही सब , घोर कलयुग ।

... सरकारी स्कूलों की मरम्मत तो करवा नहीं पा रही सरकार ,लाखों शिक्षकों के पद ख़ाली पड़े हैं , शिक्षकों से हर वो काम करवाया जाता है जिसके लिए वो नौकरी नहीं करते , फालतू समझ रखा है , सरकार के दिन लद गए ,जनता सब देख रही है , तानाशाही नहीं चलने देंगे मुद्दा बनाएंगे अगले चुनाव में ....

.... आदि इत्यादि !

समझदार माएँ अपने ढंग से शिक्षा बाल्यकाल से देती देखीं गयीं जैसे , सुस्सू की जगह मम्मा पापा के अलावा किसी को मत दिखाना , चड्डी को मम्मा पापा के सामने ही खोलना है , पप्पी सिर्फ घर के लोगों को ही देनी है , गोदमे भी उन्ही के जाना है और बिना हमसे पूछे किसी का दिया हुआ नहीं खाना है , आदि ।

पर यहाँ विषय थोड़े बडे बच्चों का है और मामला उतना आसान नही होता जितना दिखता है ।

ज़माना नेट की वजह से तेज़ी से बदला , इतनी तेजी से कि बॉय और गर्ल फ्रेंड्स अब कक्षा 6 या 7 से ही बनने शुरू हो गए ।

यौन शिक्षा हमारे समाज में आज भी कौतूहल का कम और शर्म का विषय अधिक माना जाता है , जिसे सुनते ही भौंहे तन भी जाती हैं , हमें ये विषय पसंद ही नहीं ।

ये भी सोच है कि हम संस्कारी हैं हमारे बच्चों को ये सब बता कर उनके स्वस्थ मन को दूषित करने की ज़रूरत नहीं ।

प्रश्न ये कि जो बच्चे वीडियोस में जान चुके हैं उन्हें क्लास में पढ़ाया क्या जाए ? बच्चे वो सब देख सुन चुके हो सकते हैं जिसे उनके ही मुंह से सुनने में अभिभावकों को दिक्कत हो ।

मोबाइल्स ने सब बच्चों को सब दिखा दिया है इस परिप्रेक्ष्य में ये विषय और भी चैलेंजिंग हो जाता है ।

इतना ही नहीं कॉन्डोम के विज्ञापन खुलेआम टीवी पर घरों में आते ही पेरेंट्स तो मुँह फेर लेते हैं पर बच्चे मज़े ले कर देखते ही हैं ।

यौन शिक्षा में बच्चो को पढ़ाया क्या जाय और कैसे ?

यौन अंग , संरचना , एनाटॉमी , हार्मोन्स , उत्तेजना , गर्भाधान , विभिन्न प्रकार के यौन संबंध , समलिंगी , विपरीत लिंगी , द्विलिंगी .... ?

आप ये तो उन्हें अब कह नहीं पाएंगे कि इस सब में कोई बुराई है , वो मानेंगे भी नहीं । हो सकता है उन्होंने घर में छुप कर कुछ देख भी लिया हो जो नहीं देखना चाहिए था ।

यौन शिक्षा का प्रथम टारगेट कौन हो ? शिक्षक , छात्र -छात्राएं या कोई और ?

क्या शिक्षक स्वयं असहज नहीं हैं इस विषय को कक्षा में पढ़ाते हुए ? यौन शिक्षा पढ़ाने के लिए क्या वो तैयार हैं ? और उनको ट्रेनिंग देगा कौन ? ये सब उनके लिए भी तो स्वीकार्य होना चाहिए ।

अनेक शिक्षकों ने मुझे बताया कि सबसे कठिन कक्षा नौ और दस के बच्चों को पढ़ाना होता है , शैतान बच्चे !

कोई ताज्जुब नहीं क्यूंकि वो उम्र ही ऐसी होती है , बालक- बालिका से पुरुष और स्त्री बनने का समय , जिसमें हार्मोन्स परिवर्तन चरम पर होते हैं और सेक्स के प्रति झुकाव भी बढ़ता ही जाता है ।

हमारे देश में परिवार , इज़्ज़त , परंपराएं संस्कार और धर्म आदि का बहुत बड़ा प्रभाव बढ़ते बच्चों पर आज भी है ... ऐसा पेरेंट्स समझते हैं ।

उनमें यौन उन्माद को रोकने की ताकत भी माँ- बाप में नहीं है , वो क्या देख रहे या नहीं देख रहे उन्हें पता भी नहीं ।

इस समस्या को क्लास में समझना -समझाना और बच्चो के सीधे प्रश्नों को सुलझाना और उत्तर देना , एक बहुत बड़ी चुनौती है ।

हम बच्चों के साथ अनसेफ सेक्स से होने वाले नुकसान , अपरिपक्व उम्र के यौन संबंधों का उनके आने वाले जीवन पर कुप्रभाव , सामाजिक यौन मनोविज्ञान और खास तौर से बालिकाओं के लिए भावनात्मक उद्वेग में किये गए यौन संबंधों के कु -प्रभावों के बारे में चर्चा कर सकते हैं ।

यौन शिक्षा में यौन- रोगों पर विस्तृत चर्चा और दृश्य- माध्यम से इन रोगों की भयावहता दिखाई जा सकती है ।

यौन बीमारियों का उल्लेख करते समय हम अक्सर पुरुष गर्भ निरोधकों का ज़िक्र कर स्वयं ही रास्ता दिखा देते हैं , यानी सेफ सेक्स ।

छोटे बच्चो को यौन -रोगों के वीभत्स फ़ोटो क्या हम क्लास में दिखा सकते हैं ?

कुँवारी दुल्हन का कॉन्सेप्ट आज भी हमारे पुरूष प्रधान देश में सुप्रीम होता है क्या हम पढ़ा पाएंगे ?

मुझे ऐसा लगता है कि बच्चो को पढ़ाने के पहले , हमारे महानगर ही नहीं ग्रामीण क्षेत्र में स्थित शिक्षकों को तो तैयार करना ही होगा , साथ ही साथ बच्चों के अभिभावकों को भी विश्वास में लेना होगा ।

बच्चे घर पर सवाल पूछेंगे तो कहीं पेरेंट्स बच्चों की पिटाई कर के स्कूलों को कोर्ट में न घसीट लें ।

लीगल आस्पेक्ट्स को भी ध्यान में रखना होगा क्योंकि ऐसे विषयो में जो एक और आयाम जुड़ेगा वो है ... राजनीति ?

राजनीति में आजकल पक्ष राज्य और विपक्ष राज्य का भी बड़ा बोल बाला है ,यानी केंद्रीय सरकार के सापेक्ष ।

प्रश्न ये कि क्या ये नीति केंद्रीय होगी या इन्हें राज्यों पर छोड़ दिया जाएगा , ज़बरदस्ती कुछ चलता नहीं आजकल । राज्य साफ़ बोल देते हैं कि हम इस व्यवस्था या करिकुलम को अपने राज्य में लागू नही करेंगे , या कोर्ट से स्टे भी ला सकते हैं ।

क्या हम यौन शिक्षा पर सामाजिक और राजनीतिक कानूनी लड़ाइयांँ जीत पाएंगे ।

इसका एक और कारण भी है । शिक्षण संस्थानों के मालिक राजनीतिज्ञ भी तो हैं जिन्हें अपने बच्चों के अभिभावक यानी .. वोटर्स को भी संभालना है ।

यौन शिक्षण व्यवस्था किसी आइसोलेशन में चल नहीं पाएगी । समेकित रूप से आने वाली बहुआयामी चुनौतियों के बारे में गंभीरता से सोचना होगा ।

शिक्षकों का प्रशिक्षण इस शिक्षा की धुरी है , अधिकतर शिक्षक महिलाएं भी हैं महानगरों से ले कर गाँव देहात तक ।

क्या वो कक्षा के लड़कों से सीधे नज़रें मिला कर अपनी बात रखने का हौसला रखती हैं ।

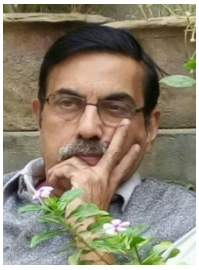
मेरा मानना है कि यौन शिक्षा को क्लास में ले जाने के पूर्व मुख्य टारगेट ग्रुप .. यानी बच्चों के अभिभावक को जागृत करने के साथ- साथ यौन शिक्षा के करिकुलम के बारे में भी पूरी जानकारी दे कर विश्वास में लेना होगा ।

यौन शिक्षा की पुस्तक पहले अभिभावकों को देनी चाहिए ताकि वे स्वयं को मानसिक रूप से तैयार कर सकें और आश्वस्त भी हो सकें ।

उनके प्रश्नों के उत्तर धैर्य से देने होंगे वो उत्तेजित भी हो सकते हैं । रास्ता भी तो वहीं से और शांति से ही खुलेगा ।

ये क़िला अगर जीत लिया तो आगे का यौन शिक्षा का रास्ता आसान हो सकता है ।

ये भी कटु सत्य है कि लगभग ढाई दशक के बाद भी चले अढ़ाई कोस , पर उम्मीद पर ही शिक्षा भी टिकी है ।



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The value of a college education is not the learning of many facts but the training of mind to think.

\- **Albert Einstein**

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"I have been impressed with the urgency of doing. Knowing is not enough; we must apply. Being willing is not enough; we must do."

\- **Leonardo da Vinci**

किताबें बहुत कुछ कहती हैं ...

किताबें बहुत कुछ कहती हैं , इनमें ज्ञान की नदी बहती है
किताबों की दुनिया में जाकर तो देखो , इस ज्ञान गंगा में नहाकर तो देखो
नई-नई बातें, नई जानकारी , किताबें ही देती हैं
हमको ये सारी किताबें, सपनों को सच करती हैं
किताबें बहुत कुछ कहती हैं।

वेदों पुराणों उपनिषद की गाथा, पुस्तकों में मिलेगी ब्रह्माण्ड की कथा
किताबों से बाहर नही ज्ञान कोई, किताबों से अलग न विज्ञान कोई
किताबें सच्ची दोस्त होती हैं, किताबें बहुत कुछ कहती हैं।

इनके लिए तो नही कुछ पहेली, समय की हैं साक्षी सदा की सहेली
हृदय में जगाएं सदा ज्ञान ज्योति, किताबें नई दिशाएं देती हैं
किताबें बहुत कुछ कहती हैं।

परिचय कराती हैं सारे जहां से, नई हर ज़मीं से नये आसमां से
साहित्यिकों का, वैज्ञानिकों का, संसार है ये विद्यार्थियों का
सागर से भी ये अथाह होती हैं, किताबें बहुत कुछ कहती हैं।

समय समय है ....

समय समय है एक चक्र गतिमान, संतत, अविरत
शैशव से यौवन , यौवन से जरा, जरा से मरण और पुनर्जीवन।
समय है रेत, मुट्ठी में न समाए, फिसलती जाए,
लाख जतन करो, हथेलियों में बंद करो, रीत ही जाए।
समय है काल, यह लय है, प्रलय है, भय है और विजय भी है।

समय है सर्वशक्तिमान, लघु क्षण, फिर भी महान
अवसर देता है, आशा भर देता है,सबको कर देता है क्रियावान।

मात्र निमित्त हैं हम....

जन्म पाया इसी धरा पर
ज्ञान पाया इसी धरा से।
बल,बुद्धि,विद्या,पराक्रम,यश, वैभव,
गौरव,समृद्धि,सब कुछ है प्रभु कृपा से।
निमित्त मात्र हैं हम प्राणी, कर्ता है केवल ईश्वर।

ऊंचा औहदा,भव्य मकान,सबकी नींव है यही धरा।
यथार्थ के धरातल से जुड़ा रह प्राणी।
मिथ्या अहंकार में न भटक,
मात्र निमित्त हैं हम प्राणी।।

किस कार्य में कौन निमित्त बनेगा,
सबका कर्ता है विधाता।
सौभाग्यशाली स्वयं को समझ ए प्राणी,
जो अवसर मिले निमित्त बनने का किसी सद्कर्म में।

ना कुछ लाया,ना कुछ किसी को दे सकता है,
ना कुछ ले जा सकता है प्राणी।
स्वयं को कर्ता न समझ,
मात्र निमित्त हैं हम प्राणी।।`

मृणालिनी घुळे

कवियत्री एक सामाजिक चिंतक एवं विचारक हैं | आपकी कविताएँ वर्तमान पर्यवेक्ष्य में बुद्धि-जीवियों को उनके सामाजिक उत्तरदायित्व के प्रति उन्हें चिंतन के लिए प्रेरित करती हैं | आपकी लेखनी प्रादेशिक एवं राष्ट्रीय स्तर पर प्रकाशित है।
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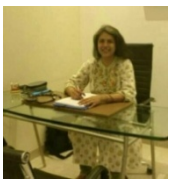
डॉ. संगीता पाहुजा



कवियत्री आयुर्वेदिक चिकित्सक हैं | आपने B.A.M.S. की उपाधि M.D. University, रोहतक से प्राप्त की | आपके दिल्ली एवं नॉएडा में परामर्श केंद्र है | धार्मिक, नारी एवं समाज उत्थान कार्यों में आपकी विशेष रूचि है |
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If you can find a path with no obstacles, it probably doesn't lead anywhere

- Frank A. Clark

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कभी प्रेम हो जाए तो.....

मुकेश आनंद

कभी प्रेम हो जाए तो
सिमट जाना तेजी से अपने अंदर।

ढूँढने की कोशिश मत करना
उसे, जिससे प्रेम हुआ है।

एहसास, सपने और हसरतों को जमा कर,
निचोड़ लेना रस इस खूबसूरत ईंख का,
और बना लेना चीनी, बोतल में रखना बंद।

कभी कड़वाहट हो जिंदगी में तो
मिला देना थोड़ा चीनी और गटक जाना।
थोड़ा आसान रहेगा।

प्रेम कोई देने वाली चीज नहीं,
ये तो तुम्हारे भीतर की उपज है।

बरसते सावन में उपजा एक पुष्प,
सुंदर, सुरभित और अलमस्त।

इसकी तलाश सँभव नहीं;
अगर ज्यादा तलाश में भटके
तो ना तुम रहोगे ना चीनी।

हम दोनों !

निरंजन धुलेकर

जल रहा , सुन शहर अपना,
घर तेरा यहाँ, मेरा भी यहीं !

लगाई आग किसने पता कर,
भीड़ गर तू नहीं, मैं भी नहीं !

मौत पर रोयेगा कौन अपनी,
जो न तो बचेगा, मैं भी नहीं !

जख्म कितने थे, कैसे मिले ,
हकीम तू नहीं, मैं भी नहीं !

कत्ल कैसे करें , एक दूजे का,
जल्लाद तू नही, मैं भी नहीं !

बचाए कौन उस खंजर से,
ख़ुदा तू नही, मैं भी नहीं !

बचा लें मोहल्ला , एक दूजे का
बेघर तु भी नही, मैं भी नहीं !

सियासत खेल हुक्मरानों का ,
खिलाड़ी तू नही, मैं भी नहीं !

मत चल किसी की चालों पर ,
मोहरा तू नही, मैं भी नहीं ।

क्यूँ दे घाव दें , एक दूजे को ,
जो हैवान नही, मैं भी नहीं !

कवि एक अधिवक्ता एवं सामाजिक कार्यकर्ता हैं| सामाजिक विषयों पर पाठन, चिंतन –मनन, लेखन एवं उन पर कार्यान्वन उनकी अभिरुचि है |
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We have learnt that LIFE is neither fast nor sudden leaps;
It grows gradually and sreadily through pits and rises.
We have learnt on every fall, more was needed from us;
Irrespective of how others were.
We have learnt that when tide is against, swim hardest to keep moving ahead;
When in favour swim fastest to create a reserve in case of contingencies.
We have also learnt that reasons are in abundance to justify losses,
But there is only ONE reason to do good beyond self.
LIFE is MUST for sustainable coexistence.

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मँहगाई

भावना मिश्रा

सुधा सुबह-सुबह अपने पति मोहन को कह रहीं थीं, चंदू कि फीस अभी तक जमा नहीं की है । स्कूल से निर्देश आया कि जल्दी फीस जमा कर दें । दिव्या के स्कूल ड्रेस फट गयी, दो साल से एक ही स्कूल ड्रेस पहन रही थी, नई ड्रेस खरीदने के लिए अध्यापिका बोल रहीं थीं । घर में राशन बस एक सप्ताह का ही बचा ।

मोहन मन ही मन सोच रहा था कि एक गार्ड की 15,000 की नौकरी में अब घर चलाना बहुत मुश्किल हो गया हैं।

गाँव से चाचा जी का फोन आया, कि वो अस्पताल में भर्ती है, पैसे भेजने को , इस महीने मोहन ने 10,000 रूपये गाँव भेज दिये थे, और एक ही महीने में पूरा बजट खराब हो गया । दो दिन से तबीयत भी ठीक नहीं, खांसी बहुत बढ़ गयी ,टी. बी. (बीमारी) की दवाई एक सप्ताह से खत्म हो गयी है ।रूपये नहीं होने के कारण अभी तक दवाई नहीं खरीद पाया।

सुधा चिल्लाई कुछ जबाब भी दोगे, इस महीने का वेतन अभी तक क्यों नही आया । मोहन ख्वाब से जागते हुए बोला , हाँ दस दिन में आ जायेगा । सुधा बोली तुम्हारे जूते तो पूरे फटे हैं ।मोहन बोला - वेतन आते ही खरीद लूगाँ ।

सुधा बोली तुम्हें तो बुखार हैं, डाक्टर के पास चलो , मोहन बोला नहीं-नहीं बस हल्का सा बुखार हैं, ड्यूटी जाते वक़्त दवा खरीद लूँगा । बहुत जोर से ख़ाँसी आ रही थी मोहन को , उसने किसी तरह ख़ाँसी को रोका कि कहीं पत्नी डाक्टर को ना बुला ले, बटुवें में केवल २०० रूपये हैं .....

लेखिका कला संकाय से स्नातक तथा एक गृहणी हैं। वे अपने पुत्र मनन्न और पुत्री नव्या के साथ अपने परिवार तथा बुजर्गों की सेवा का आनंद लेती हैं। संगीत (गायन) ,नृत्य एवं भ्रमण इनके शौक हैं।

ई -मेल : bhawna.ragini@gmail.com

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True Leader

D.V.S. Durga Prasad

Great leaders get into the field and lead by example. This story shows how!

According to a popular story, many years ago, a rider on a horseback came across a small group of exhausted soldiers. They were trying to move a heavy log of timber. An officer stood beside them and ordered around rudely - "come on, move the log". The log was too heavy for the soldiers to lift. The stranger turned to the officer and said, "Why don't you step forward and lens a hand?". The officer replied "I am the senior. I only give orders sir. You can help them if you feel strongly about it". Much to his surprise, the rider dismounted and joined the soldiers. "Now, everybody together boys, Heave!" he said. They managed to heave the bulky piece of timber into its place. The stranger mounted his horse and addressed the senior. "The next time you have a piece of timber for your men to heave, officer, send your commander-in-chief."
The horse rider was none other than George Washington, the first President of the United States of America.

What we learn: When leaders demonstrate such integrity, courage and empathy, can Success' be far behind?

Compiler of the story is an English teacher at Ramakrishna Mission in High School, Sitanagram, Vijaywada, A.P. He is a pro-active coordinator of IOMS classes being held at the school, since beginning in 2017.

E-mail ID: prasaddevulapalli2@gmail.com

—00—

Answers: Science Quiz- December'19

Kumud Bala

1 (C)	2 (A)	3 (A)	4 (B)	5 (A)	6 (A)	7 (A)	8 (A)	9 (B)	10 (A)
11 (A)	12 (B)	13 (A)	14 (B)	15 (A)	16 (B)	17 (A)	18 (C)	19 (D)	20 (B)
21 (A)	22 (C)	23 (A)	24 (C)	25 (A)	26 (C)	27 (B)	28 (B)	29 (D)	30 (D)

—00—

ANSWER: CROSSWORD PUZZLE December'19
(Pillution)

Prof. S.B. Dhar

				1A						2I	N	3C	I	N	E	R	A	T	O	R						
				T								A														
				M								R														
				O								B										4A				
				S								O										B				
	5A	I	R	P	O	L	L	U	T	I	O	N										A				
				H								D										T				
6O	Z	O	N	E	L	A	Y	E	R		7B	I	O	D	E	G	R	A	D	A	B	L	E				
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—00—

Compunication (Computer with Communication capability i.e. internet) has forged the world, which is otherwise fragmented into narrow boundaries, into a global village. All that we need to do is to connect the most deprived persons through strings of education. Compunication provides the much needed solution in the form of Virtual Class Rooms.

—00—

It's Not Just A CLOWN
(Episode 7)

Chyanis Tiwari

Uma was exhausted after finishing that boring, tedious, dull, repetitious project.

"Well done, Uma. You don't disappoint me." Mrs. Heather said.

"Well… It wasn't an easy work." Uma said, "I really need a day-off"

"Why? That wasn't a big work. The big project will be held next month." Mrs. Heather said.

"You won't understand. Yesterday was such a mess and confusing day." Uma explained.

"I don't know what you are talking about, but whatever it is, you can't get a day-off." Mrs. Heather said, "You had your day-off on February, remember?"

"Yes ma'am…" Uma said while thinking back to that day when she wasted a day-off just for sleeping lazily like a couch potato.

"Man… I shouldn't waste my day-off that day."

"Yes, you shouldn't have done that." Mrs. Heather said.

Suddenly, another call came in. It was Nina and of course, it could be an urgent call.

"Mrs. Heather, May I go now? I have another call." Uma asked.

"Oh yes, of course. Have a good day." Mrs. Heather said.

"Have a good day." Uma said and quickly, hung up.

"Find anything, Nina?" Uma asked.

"We have to start everything again." Nina said.

"Umm, how?" Uma asked

"Today, 9 am, go to the café and walk back home normally." Nina said.

"Huh, why?" Uma asked again.

"We're going to track that clown, if it follows you." Nina said. "It's 8.48 now. Go get ready." then, she hung up.

What the… Do I have to face that freaking crazy clown again? Uma thought while wearing her normal brown coat, picked up her wallet and rushed out to her common café.

"As always?" Meghan, her best friend asked.

"Yes, hot latte as always." Meghan laugh and started brewing her coffee. Uma was turning right and left, back and front, looking here and there, near and far.

"Is everything okay?" Meghan asked seeing Uma being suspicious.

"Umm… Yes, I am. Don't worry about it." Uma said. "You're *weird*." Meghan said in a funny tone.

"lol no, I'm not." Uma said and turn back and lean at the counter.

"I'm just waiting for someone…" She saw that thing, that clown again. "Shit… don't make an eye contact."

Uma turned back. Meghan looked at the clown in front of the cafe.

"You know, clowns can be very creepy sometimes." Meghan said.

"Especially, that one. He always come and stand there and I don't have enough strength to ask him.

"No one does." Uma said. "I gotta go."

"But, your coffee? Uma?" Meghan asked but, Uma has already gone. "You gotta pay me for this." Then, she take a zip of her own made coffee. "Pretty good."

Uma was rushing back home. When she turned back, she saw that clown following her. She quickly dialled the same number she always called in this situation, Nina Payton.

"Hello?" Nina greeted.

"Nina, that thing is following my piss off. Please come, I'm scared." Uma said while looking back and run.

"Where are you?" Nina asked, but there's no response.

"Where are you?!" She asked again.

"Come at the same street you came yesterday." Then, the line was cut.

"Buds, we gotta go." Nina said and run to her car with Andy.

Uma was running and running, looking back again and again. There was no sign of the clown disappearing. She was exhausted because the way back home from the cafe wasn't a short way. It's long and often dangerous because few people come in these streets. Out of sudden, Uma fell down and the clown was there walking toward her.

Author is a student of grade 9 at Thailand. She likes writing stories. Most of her stories are usually about social problems because she wants that the new generation teenagers should understand the social world. She hopes that the guys will learn about the new society from this story.

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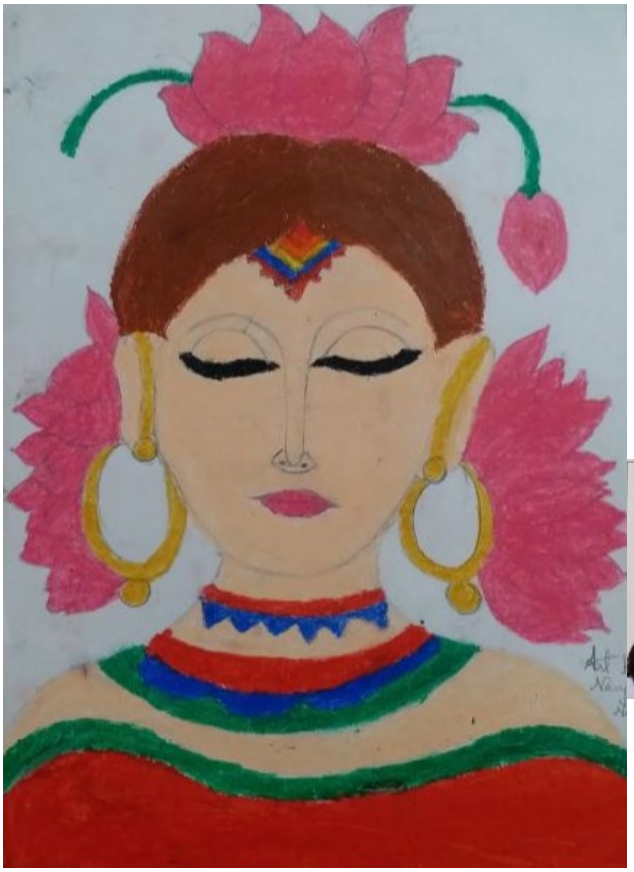
—00—

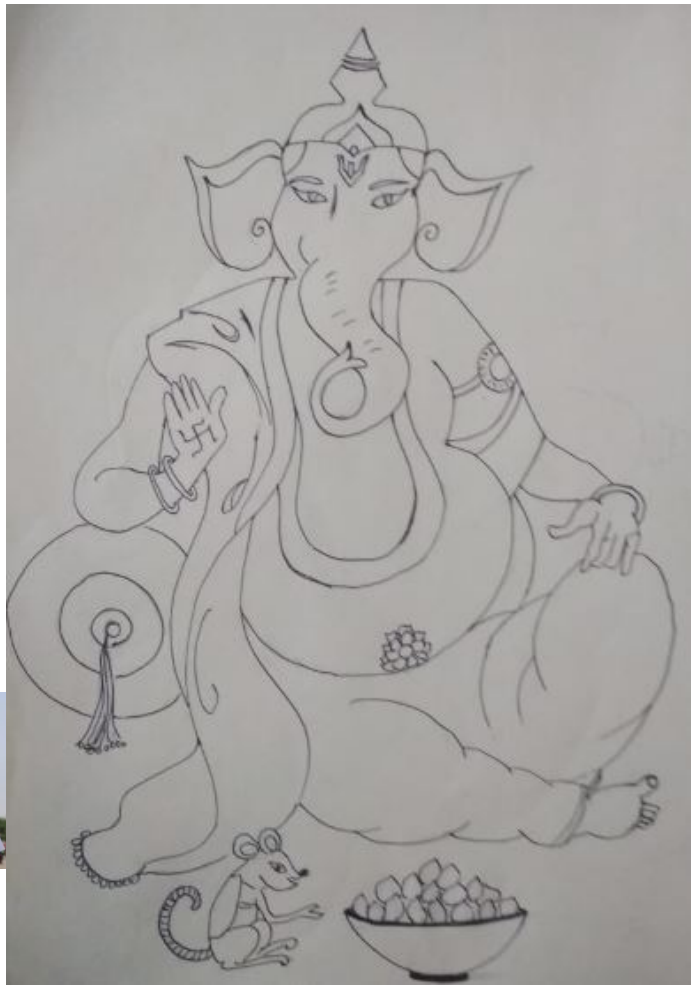
Mannan,

Student of Class 3rd at Birla Vidya Niketan, Delhi



Navya Nayan

Student of Class 4th, Birla Vidya Niketan, Delhi



Dishita

Student of Class 8th, The Khaitan School, NOIDA

Importance of Independent Thinking

K. Nanda Govardhan Reddy

Intellectually active minds open doors to opportunity. Whether your thinking is on a logical or creative wavelength, being an independent thinker, will enable you to increase performance, productivity, efficiency and to reach a greater level of self-awareness. Independent thinking is a tool that can be used to enhance personal expression and creative ability and is a valuable additional skill to acquire.

There are many factors that encourage independent thought. High self-esteem however, is the single most distinguishing characteristic of any creative thinker and is often what propels individual thinking, performance and success. The feeling that each individual has about self can be both limiting and inspiring, so it is essential that a good level of self-awareness is in evidence. Without self acceptance personal progress is slowed down considerably. So to encourage positive self-expression a better awareness must be achieved.

Self-confidence can also be generated externally, through the thoughts and comments of other individuals. Whilst this works wonders to boost confidence in ability it should not be used to replace self-esteem that is personally generated through a belief in your own abilities. All successful independent thinkers therefore have a clear understanding of self worth.

The Qualities of an Independent Thinker: Persistence, belief, independent self-esteem, confidence, determination and creative awareness are just some of the qualities that an independent thinker will bring to the table. These qualities, and others, will enable him/her to become more innovative in their thinking and will help them create the best opportunities to demonstrate independent thinking in a positive manner.

Working at developing these qualities will also inspire an individual to explore their way of thinking and to lift the restrictions and limitations that their current thinking pattern has set. By developing personal qualities independent thinking will begin to flow more freely.

How to Develop Thinking Independence: Independent thinking can only be developed as a result of exploring the structure that has been put into place to expand freedom of thought. To become an innovative thinker, for instance, an individual will have to exercise creativity through thinking and doing. Exploring ventures and opportunities will also lead to the need to develop independent thinking, and this will encourage positive self-esteem to grow.

Compiler is a student of Class XIth at Ramakrishna Mission High School, Sithanagram, Vijaywada, A.P. He is participations in IOMSs being held at the school.

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Nothing is more important than education,
because nowhere are our stakes higher;
our future depends on the quality of education of our children today.
- Arnold Schwarzenegger

—00—

Problems are meant to be solved; every solution open doorway to new problems.
This is an endless journey to discovery of nature.
We are, what we are, because of rigorous efforts of countless persons.

—00—

WHY IT'S OKAY TO FAIL

K. Sai Praneeth

Success is not final, failure is not fatal: it is the courage to continue that counts. There are thousands of reasons why it's okay to fail. It happens to everyone. However, we spend so much time fearing failure that we forget to experience life itself, to live in the present moment, to be happy and grateful for what we have, and to simply enjoy the journey of life rather than fretting over the destination.

FAILURE MAKES YOU SEARCH FOR NEW WAYS TO DO THINGS: "Even when you fail, you search for a new and different way to do things so that, ultimately, you can succeed". Thomas Edison is famous for failing over 10,000 times to invent a commercially – viable electric light bulb. But he never gave up. In an interview in 1921, Edison spoke to an American magazine; he discussed his so called failures. To him, they weren't failures. They simply helped him to find new ways to do things. "Each time it didn't work out, I had to come up with something different. At the end of it all. I had a lot of experience and knowledge…."

FAILURE EMBOLDENS THE MIND, MAKING YOU STRONGER: Fredrick Douglas once said that "without struggle, there can be no progress". Failure epitomizes a tireless struggle that doesn't seem to relent. It forces you to embolden your mind, giving you a mental toughness that doesn't exist when you succeed.

SUCCESS TASTES FAR SWEETER AFTER MAJOR FAILURES: When you reach that ultimate goal after endless sacrifice and struggle, there's almost no greater feeling. It's the culmination of all your efforts and struggles, mental wrangling, overall weariness and physical tiredness that makes the success feel so good. You realize what you had to go through to get there you know just how many hurdles you had to overcome, how many hoops you had to jump through and how focused you had to be.

It's the culmination of all efforts and struggles that make the success fell so good. So, don't worry about your failures and think how we can success. Read any famous persons biography to know how they success in their life.

Author is a student of class XI[th] of Ramakrishna Mission High School, Sitanagram, Vijaywada, AP. He is attending IOMSs for maths and physics held at school.

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Education is not filling of a pail, but lighting of a fire.

- William Buttler Yates

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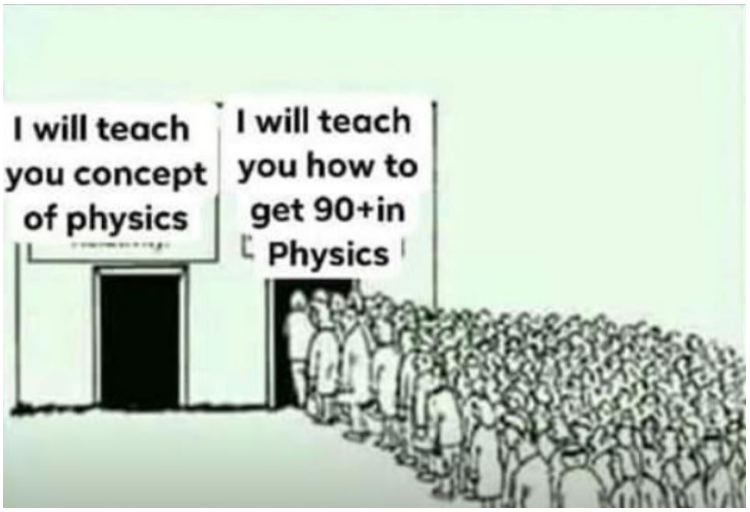

Reforming the Education System for Tomorrow's Youth

Anushka Ahlawat

Swami Vivekananda once said, "*My hope of the future lies in the youth of character, intelligent, renouncing all for the service of the others, and obedient - good to themselves and the country at large*" .He dreamt of a nation with the most disciplined and educated people . But, what if the youth are not trained and taught enough to face the future and, to contribute towards the nations success? What if the youth do not get what they deserve? Yes, I am talking about the educational system.

Fifty years from now, the whole world will be governed by the youth of their countries. There knowledge and thoughts will decide the future path of the world. All these decision will depend on what they have learnt now, what they have experienced and what education system they attend. But, before thinking about world, we must think about our country itself.

In ancient times India had the Gurukual system of education in which anyone who wished to study went to a teacher's house and requested to be taught. The guru taught everything the child wanted to learn, from Sanskrit to Holy Scriptures and from Mathematics to Metaphysics. The students stayed as long as they wished or until the guru felt that he had taught everything he could teach. But, with the times the modern education system was brought to India by Lord Babington Macaulay in 1830s and got confined to memorizing information. However, on the other side Indian education system also helps students to increase their memory power for it is important to remember whatever we learn.

There was a research in which the educationalsystems of different countries like – Japan, Finland, and USA etc. as compared with India .Some of the drawbacks found in the educational system were -

1) Education is not compulsory and free.
2) Education is based on memory skills rather than being application based.
3) It is not research oriented.
4) It doesn't encourage innovation, creativity and practical knowledge.

It was found that the other countries of the world were better than India because they don't limit their education to the school textbooks and focus more on clearing the concepts rather than memorizing things. And also there is not much pressure on the students to memorize things as they don't have examinations until they reach high school which makes sure that all the children develop curiosity for learning.

So, now think about it - *Is our educational system really preparing the youth to face the future*? Our education system needs to be reformed if we want our nation to regain its rightful place in the world order, because we know that we are much capable to do it.

Author is a student of class 9th, at Army Public School, Dinjan, Tinsukia District, Assam. The school has recently implemented Interactive Online Mentoring Sessions (IOMS)

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—00—

Education breeds confidence.

Confidence breeds hope.

Hope breeds peace.

- Confucius

—00—

Growing With Concepts - Mathematics

LET'S DO SOME PROBLEMS IN MATHEMATICS-XV

Prof. SB Dhar

In this article some problems of Mathematics are chosen from the PISA. PISA is the abbreviation of the Programme for International Student Assessment.

This programme is a worldwide study by the **Organisation for Economic Co-operation and Development (OECD)**. Its purpose is to evaluate educational systems by measuring 15-year-old school pupils' scholastic performance on **Mathematics, Science, and Reading**.

The PISA Mathematics literacy test asks students to apply their mathematical knowledge to solve problems set in real-world contexts. Each student takes a two-hour handwritten test. Part of the test is multiple-choice and part involves fuller answers.

The age of the students tested by PISA should be between 15 years 3 months and 16 years 2 months at the beginning of the assessment period.

PISA is sponsored, governed, and coordinated by the OECD, but paid for by participating countries. PISA was first held in 2000 and then repeated every three years. In 2018, 79 countries participated.

ndia firstly participated in 2009. The students did not show good results and bagged the 72nd rank among the 74 participating countries. The government stopped taking part after this. India is ready to participate in PISA 2021. According to Maneesh Garg, Joint Secretary, MHRD, *"India's participation in PISA 2021 is an attempt to move away from rote learning and move towards competency-based education. The assessment will help us set global benchmarks for Indian institutes."*

In 2018, a record 6,00,000 students from 79 nations took the test. Once again Asian countries came out on top. In the latest test, China and Singapore ranked first and second, respectively. Elsewhere, Estonia is noteworthy for its performance, ranking highly in all three subjects.

QUESTIONS

1. *Mount Fuji is only open to the public for climbing from 1 July to 27 August each year. About 200,000 people climb Mount Fuji during this time. On average, about how many people climb Mount Fuji each day?*

(a) 340 (b)710 (c)3,400 (d)7,100 (e)7,400

Ans. (c)

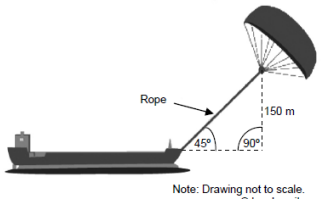
2. *The Gotemba walking trail up Mount Fuji is about 9km long. Walkers need to return from the 18km walk by 8pm. Toshi estimates that he can walk up the mountain at 1.5km/h on average, and down at twice that speed. These speeds take into account meal breaks and rest times. Using Toshi's estimated speeds, what is the latest time he can begin his walk so that he can return by 8pm?*

Ans. 11AM

3. *Toshi wore a pedometer to count his steps on his walk along the Gotemba trail. His pedometer showed that he walked 22,500 steps on the way up. Estimate Toshi's average step length for his walk up the 9km Gotemba trail. Give your answer in centimetres.*

Ans.40cm

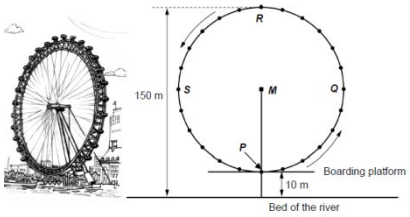
4. *Approximately what is the length of the rope for the kite sail, in order to pull the ship at an angle of 450 and be at a vertical height of 150m, as shown in the diagram :*



(a)173m (b)212m (c)285m (d)300m

Ans (b)

5. *A giant Ferris wheel is on the bank of a river. See the picture below:*



The Ferris wheel has an external diameter of 140 metres and its highest point is 150meters above the bed of the river. It rotates in the direction shown by the arrows.

The letter M in the diagram indicates the centre of the wheel.

How many metres(m) above the bed of the river is point M?

Ans. 80m

6. *The Ferris wheel rotates at a constant speed. The wheel makes one full rotation in exactly 40 minutes.*

John starts his ride on the Ferris wheel at the boarding point P. where will John be after half an hour?

(a) at R (b) between R and S

(c) at S (d) between S and

Ans. (c)

7. *Mount Fuzi is a famous dormant Volcano in Japan.*

Mount Fuji is only open to the public for climbing from 1 July to 27 August each year. About 200000 people climb Mount Fuji during this time.

On average, about how many peole climb Mount Fuji each day?

(a) 340 (b) 710 (c) 3400 (d) 7100 (e) 7400

Ans. (c)

8. *The Gotemba walking trail up Mount Fuji is about 9 kilometres (km) long.*

Walkers need to return from the 18km walk by 8pm.

Toshi estimates that he can walk up the mountain at 1.5km per hour on average, and down at twice that speed. These speeds take into account meal breaks and rest times.

Using Toshi's estimated speeds, what is the latest time he can begin his walk so that he can return by 8m?

Ans. 11 am

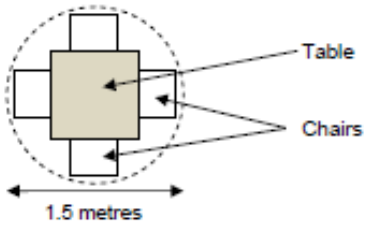
9. *In the picture below a construction has been made using seven identical dice with their faces numbered from 1 to 6.*

When the construction is viewed from the top, only 5 dice can be seen.

How many dots in total can be seen when this construction is viewed from the top?

Ans. 17

10. *Mari wants to have sets of tables and four chairs like the one shown below in her shop. The circle represents the floor space area needed for each set.*

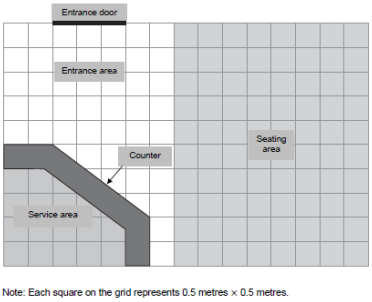


For customers to have enough room when they are seated, each set (as represented by the circle) should be placed according to the following constraints:

(a)each set should be placed at least at 0.5 m away from walls.

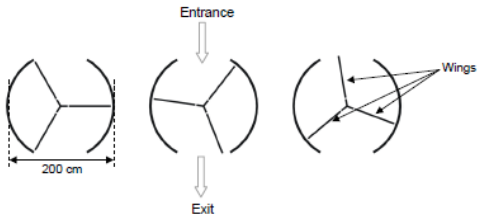
(b) each set should be placed at least at 0.5 m from other sets.

What is the maximum number of sets that Mari can fit into the shaded seating area in her shop?



Ans.4

11. *A revolving door includes three wings which rotate within a circular shaped space. The inside diameter of this space is 2m (200 cm). The three door wings divide the space into three equal sectors. The plan below shows the door wings in three different positions viewed from the top.*



The door makes 4 complete rotations in a minute. There is room for a maximum of two people in each of the three doo sectors.

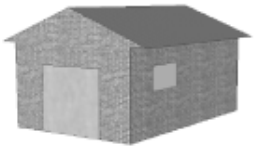
What is the maximum number of people that can enter the building the door in 30 minutes?

(a) 60 (b)180 (c)240 (d)720

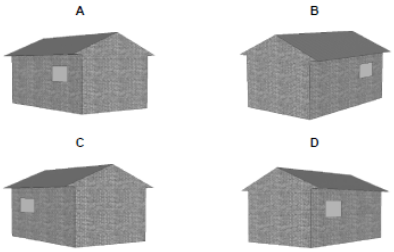
Ans.(d)

12. *A garage manufacturer's "basic" range includes with just one window and one door.*

George chooses the following model from the "basic" range. The position of the window and the door are shown here.



The illustrations below show different "basic" models as viewed from the back. Only one of these illustrations matches the model above chosen by George.



Which model did George choose? Circle A,B,C, or D

Ans. C

The author, is **Editor of this Quartrerly e-Bulletin**. He is an eminent mentor, analyst and connoisseur of Mathematics from IIT for preparing aspirants of Competitive Examinations for Services & Admissions to different streams of study at Undergraduate and Graduate levels using formal methods of teaching shared with technological aids to keep learning at par with escalating standards of scholars and learners. He has authored numerous books of excellence.

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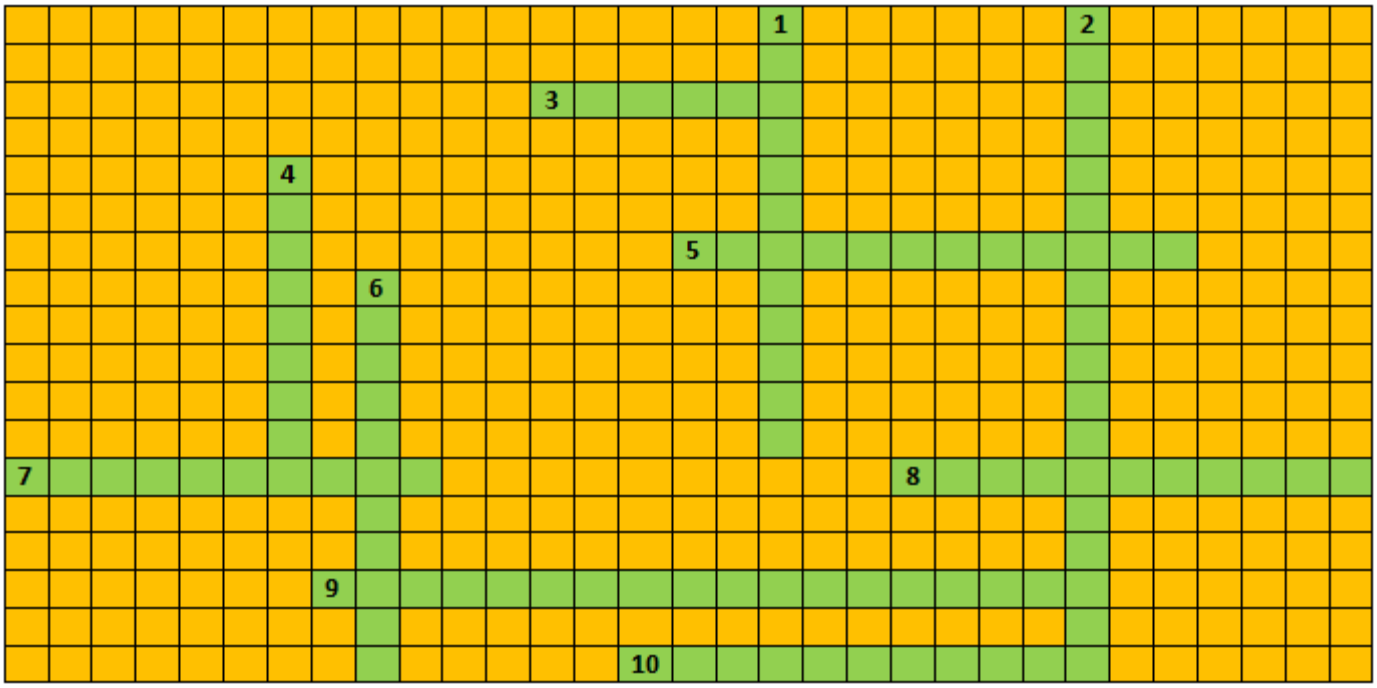
CROSSWORD PUZZLE January'2020 : AGREEING TO DISAGREE

Prof. SB Dhar



Across	Below
3. "Agreeing to Disagree" refers to	1. The word used for respectful disagreeing
5. Another phrase like "agree to disagree"	2. A colourless gas naturally produced by people and Who said: "There are as many opinions as there are experts"
7. The phrase "agree to disagree" was firstly used by	4. Who said: " Respect yourself and others will respect you"
8. The word used for settling an argument	6. When we totally agree woth someone, we use
9. We cannot discover the truth if we are always	
10. Who said:"And now why should we not agree to differ, without either enmity or scorn?"	

Answer to this Crossword Puzzle shall be provided in next issue of this e-Bulletin

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Modern cynics and skeptics... see no harm in paying those
to whom they entrust the minds of their children
a smaller wage than is paid to those to whom
they entrust the care of their plumbing.
- John F. Kennedy

Growing with Concepts : Physics

Wave and Motion : Vibrations In Strings and Waves
Subjective Questions (Typical)

Practice of solving of problems makes concepts so intuitive that one would find it easy to visualize how the concepts are playing role in various phenomenons occurring around. This helps to sharpen observation followed by enhancement in analytical capability, a pre-requisite for creative and innovation of a person of worth.

Vibrations in string and sound are the most perceived experience of Simple Harmonic Motion (SHM). Right form our voice to all musical instruments are influenced by it. Moreover at macro scale all high rise structure, transmission line and rope ways have to be made resistant to such vibrations. In this set of questions problems in respect of vibrations of strings have been incorporated with necessary illustrations involving first principles, to th extent possible.

Solving typical problems on a gradual degree of complexity helps to build power of visualization of concepts that are essential in understanding a problem/n observation and evolving solution/answer. At this stage simpler calculations are being skipped in elaboration, with a hope that reader would be able to decipher intermediate steps.

Mentors' Manual is one of the dimensions of the Gyan Vigyan Sarita through which efforts are being made to reach out to remote teachers through our experience of mentoring unprivileged children who are disconnected from us by virtue of multiple barriers. Direct interaction has been possible through Interactive Online Mentoring Sessions (IOMS) a working model of connecting unprivileged children in a selfless manner. This experience is being disseminated to the teachers spread out by writing of chapters of an open source Mentors' Manual. Simple Harmonic Motion is First of the Three parts of chapter Three covering Sound and Optics..

Science is a subject not to learn but a matter of realization through experiments and its visualization in surrounding. Every student is not equipped either to conduct experiment or an environment for visualization of science in his surroundings. This is where simulation is a technique to verify the concepts and study effect of variation in parameters related to the concept. There are various simulation tools leading to virtual laboratories.

India, growing digital, provides optimism to every student to be able to have an access to virtual laboratory, where without any physical laboratory, involving consumption of equipment and material, it is possible to carry out experiments in an e-environment. There are some excellent videos available on the web either free or on price which provide an experiences of kind in simulation of the concepts, The only problem with this is of sequencing and scaling of concepts and selection of an appropriate video out of a big list of search results. But, it is neither possible nor affordable for a student to first make a survey to select most suitable video and then view it for gaining proficiency in the concepts.

It creates a question, can one wait for suitable virtual labs to become available to each student to gain proficiency in concepts? Definitely not! then the only way to get going on acquiring proficiency in concepts and their applications, Competitive examinations and more particularly in real life rarely expose to problems solved. Yet ability to solve such problems one groomed, it enhances competence to handle unknown problems speedily and correctly with a greater degree of clarity and confidence, an essential attribute of thought process needed for success in life.

soon after learning them, is solving problems of variety. This is a key, have patience and perseverance, to acquire proficiency without consumption of any other resource except time which is available with students. All that they miss is the direction in which they can deploy their efforts. Problem solving in mathematics and physics is inevitable to gain necessary proficiency.

Here, Question Banks include problems from various sources and they are being supported with illustrations. These are not just solutions but an attempt to bring home use of basics involved in solving a problem. In an effort to compile problem there some good text books including those authored by Prof. H.C. Verma and a team of authors Robert Resnick, David Halliday and Kenneth S. Krane and many more. Some objective questions from different examinations have also been included. These questions are graded and authors have attempted to incorporate all concepts covered in the book. Thus it necessitates a student to read each chapter carefully before taking up questions.

In the illustrations to the problems, supported with each question bank, some student may find them to be a bit lengthy and dwelling into basics more than what one requires. Since it targets students, who are in abundance, not directly connected to us, patience of well versed students is requested. Few question with their illustrations are drawn from the set-1, on Waves and Motion : Simple Harmonic Motion, covering and appended here. The complete set of 50 questions is being uploaded as a free web-resource.

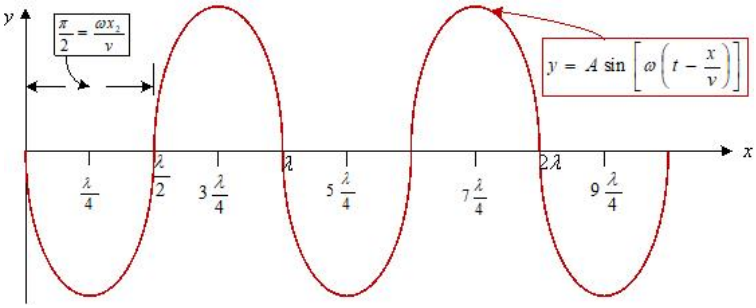
This initiative is aimed at to mentor unprivileged children is of a small group of passionate persons is driven with a sense of Personal Social Responsibility (PSR) in a non-organizational, non-remunerative, non-commercial and non-political manner. You are welcome to add value to this initiative by way of suggestion, advising correction or new type of questions. Or any other form that suits to your competence and convenience.

TYPICAL QUESTIONS WITH ILLUSTRATION

Problem 01: The equation of a wave travelling on a string stretched along the *X*-axis is given by $y = Ae^{-\left(\frac{x}{a}+\frac{t}{T}\right)^2}$.

(a) Write dimension of *A, a* and *T*.
(b) Find the wave speed
(c) In which direction is the wave travelling?
(d) Where is the maximum of the pulse located at $t = T$? And at $t = 2T$?

Illustration-01: Each part is being illustrated separately, considering that each particle of the medium performs oscillatory motion about its mean position (in the instant case it is transverse motion along Y-axis)) and while wave transfers energy along the direction of propagation (in the instant case it is X-axis). Accordingly, -



Part (a): Mathematically $e^p = 1 + p + \frac{p^2}{2!} + \frac{px^3}{3!}$, here since 1 is dimension less and only quantities if same dimension can be added and hence all terms containing p and its exponents must also be dimensionless. Accordingly, $e^{-\left(\frac{x}{a}+\frac{t}{T}\right)^2}$ is dimensionless. Since $[A] = L$ and hence dimensionally $[y] = [A] \Rightarrow \boldsymbol{[A] = L}$.

Further, in the given wave equation exponent of e is $\left(\frac{x}{a}+\frac{t}{T}\right)^2$ and it must also be dimensionless. Since the exponent is square of two terms each of them must also be dimensionless, therefore, $\frac{[x]}{[a]} = \frac{L}{[a]} = 1 \Rightarrow \boldsymbol{[a] = L}$. Likewise, $\frac{[t]}{[T]} = \frac{T}{[T]} = 1 \Rightarrow \boldsymbol{[T] = T}$

Hence, answer is *L, L, T*

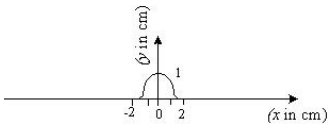
Part (b): Since wave is travelling along x-axis and hence velocity of the wave is $v = \frac{dx}{dt} \Rightarrow \frac{dy}{dt} = \frac{d}{dt}\left(Ae^{-\left(\frac{x}{a}+\frac{t}{T}\right)^2}\right) = A\frac{d}{dp}(e^{-p}) \cdot \frac{dp}{dt}\Big|_{p=\left(\frac{x}{a}+\frac{t}{T}\right)^2} = -Ae^{-\left(\frac{x}{a}+\frac{t}{T}\right)^2} \cdot \frac{dp}{dt} = -y\frac{dp}{dt}$. Now solving for $\frac{dp}{dt}$ we have $\frac{d}{dt}\left(\frac{x}{a}+\frac{t}{T}\right)^2 = \frac{d}{dq}q^2 \cdot \frac{d}{dt}q\Big|_{q=\frac{x}{a}+\frac{t}{T}} = 2\left(\frac{x}{a}+\frac{t}{T}\right)\frac{d}{dt}\left(\frac{x}{a}+\frac{t}{T}\right) = 2\left(\frac{x}{a}+\frac{t}{T}\right)\left(\frac{1}{a}\frac{dx}{dt}+\frac{1}{T}\right)$. Thus we have $\frac{dy}{dt} = -2y\left(\frac{x}{a}+\frac{t}{T}\right)\left(\frac{1}{a}v+\frac{1}{T}\right)$. Here, $\frac{dy}{dt}$ is the velocity of the particle which is oscillating about its mean position velocity of the wave is $v = \frac{dx}{dt}$. Velocity of the wave remains same far all particles participating in the wave motion and hence when $\frac{dy}{dt} = 0$ the factor $\left(\frac{1}{a}v+\frac{1}{t}\right) = 0$. It leads $v = -\frac{a}{T}$ to. **Thus magnitude of the velocity is $\boldsymbol{\frac{a}{T}}$.**

Part (c): It has been derived in part (b) that $v = -\frac{a}{T}$. The negative sign indicates that displacement is in (-) ve direction. Hence wave is travelling in (-)ve direction.

Part (d): The wave function is exponential and hence at $x = 0$ and at $t = 0$ wave-front is at maximum i.e. $y_{max} = A$. Velocity of the wave determined in part (b) is $v = -\frac{a}{T}$. Therefore, at $t = T$ the wave-front will travel $x_1 = v \times T = -\frac{a}{T} \times T \Rightarrow x_1 = -a$. And at $t = 2T$ the wave-front will be at $x_2 = v \times 2T = -\frac{a}{T} \times 2T \Rightarrow x_2 = -2a$. Thus corresponding distances travelled by maximum of the wave at $t = T$ and $t = 2T$ are $-a$ and $-2a$.

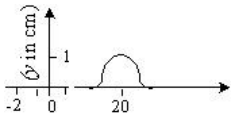
Question-02: With the given data $y = \frac{0.5^2}{(x-20t)^2+0.5^2} \Rightarrow y = \frac{0.25}{(x-20t)^2+0.25}$.

Now at $t = 0$ and $x = 0$, we have $y = \frac{0.25}{0+0.25} = 1$cm; at $x = \pm 1$ cm, we have $y = \frac{0.25}{1+0.25} = \frac{0.25}{1.25} = 0.2$ cm; and $x = \pm 2$ cm, we have $y = \frac{0.25}{4+0.25}$ or $y = \frac{0.25}{4.25} = 0.06$ cm; Accordingly, the wave shape is plotted here.



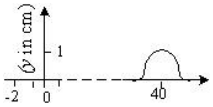
But at $t = 1$ s the wave would have travelled we have $y = \frac{0.25}{(x-20\times1)^2+0.25}$. Thus at $x = 0$ cm $y = \frac{0.25}{(-20)^2+0.25}$ or $y = \frac{0.25}{400+0.25} \approx 0$, at $x = 10$ cm $y = \frac{0.25}{(10-20\times1)^2+0.25}$; or $y = \frac{0.25}{100.25} \approx 0$at $x = 20$ cm $y = \frac{0.25}{0.25} = 1$.

But, along (-)ve direction at $x = -10$ cm $y = \frac{0.25}{(-10-20\times1)^2+0.25} = \frac{0.25}{900.25} \approx 0$; at $x = -20$ the $y = \frac{0.25}{1600.25} \approx 1$. ***This indicates that wave is travelling along (+)x*-direction. Accordingly, shape of the wave is shown here.**



At $t = 2$ s the wave would have travelled we have $y = \frac{0.25}{(x-20\times2)^2+0.25}$. Thus at $x = 30$ cm $y = \frac{0.25}{(-10)^2+0.25}$ or $y = \frac{0.25}{100+0.25} \approx 0$, at $x = 40$ cm $y = \frac{0.25}{(40-20\times2)^2+0.25} = \frac{0.25}{0.25} = 1$ cm

Since, it is seen that the wave is travelling along *(+)x*-direction hence progressively amplitudes in this direction have not been calculated. **Thus, shape of the wave is shown here.**



Question 03: A wave propagates on a string in the positive *x*-direction at a velocity *v*. The shape of the string at $t = t_0$ is given $g(x, t_0) = A\sin\left(\frac{x}{a}\right)$. Write the wave equation for a general time *t*.

Illustration 03: Given the shape of the string at $t = t_0$ is $g(x, t_0) = A\sin\left(\frac{x}{a}\right)$for a wave travelling with a velocity *v* in (+) *x*-direction. For the wave to be there on the string it would have past a point $x' = x - v(t - t_0)$. Thus, $(x, t) = g(x', t_0) = A\sin\left(\frac{x'}{a}\right)$. **Accordingly, $\boldsymbol{f(x,t) = A\sin\left(\frac{x-v(t-t_0)}{a}\right)}$.**

Question 04: A wave is described by the equation $= (1.00\text{ mm})\sin\pi\left[\frac{x}{2.0\text{ cm}} - \frac{t}{0.01\text{ s}}\right]$.

(a) Find the time period and the wavelength.
(b) Write the equation for the velocity of the particles. Find the speed of the particle at $x = 1.0$ cm at time $t = 0.01$ s.
(c) What are the speeds of the particle at $x = 3.0$ cm, 5.0 cm and 7.0 cm at t=0.01 s?
(d) What are the speeds of the particle at $x = 1.0$ cm at *t* = 0.011 s, 0.012 s and 0.013s?

Illustration 04: General equation of a wave travelling along *x*-axis is $y = A\sin(kx - \omega t) = A\sin\left(\frac{2\pi x}{\lambda} - \frac{2\pi t}{T}\right)$ while the given equation is $y = (1.00\text{ mm})\sin\pi\left[\frac{x}{2.0\text{ cm}} - \frac{t}{0.01\text{ s}}\right] \Rightarrow y = (1.00\text{ mm})\sin\left[\frac{\pi x}{2.0\text{ cm}} - \frac{\pi t}{0.01\text{ s}}\right]$.

Part (a): Comparing the two forms we have $\frac{2\pi}{T} = \frac{\pi}{0.01\text{ s}} \Rightarrow \boldsymbol{T = 0.02\text{ s} = 20\text{ ms}}$. While $\frac{2\pi}{\lambda} = \frac{\pi}{2.0\text{ cm}} \Rightarrow \boldsymbol{\lambda = 4.0\text{ cm}}$.

Part (b): Equation of velocity of particle $v_y = \frac{d}{dt}(1.00\text{ mm})\sin\pi\left[\frac{x}{2.0\text{ cm}} - \frac{t}{0.01\text{ s}}\right]$. It leads to a form

$$v_y = (1.00\text{ mm})\cos\pi\left[\frac{x}{2.0\text{ cm}} - \frac{t}{0.01\text{ s}}\right] \times \frac{d}{dt}\left(\pi\left(\frac{x}{2.0\text{ cm}} - \frac{t}{0.01\text{ s}}\right)\right)$$

$$\Rightarrow (1.00\text{ mm})\cos\pi\left[\frac{x}{2.0\text{ cm}} - \frac{t}{0.01\text{ s}}\right] \times \left(\pi\left(\frac{1}{2.0\text{ cm}}\frac{d}{dt}x - \frac{1}{0.01\text{ s}}\right)\right)$$

$$\Rightarrow (-1.00\text{ mm})\cos\pi\left[\frac{1.0\text{ cm}}{2.0\text{ cm}} - \frac{0.01\text{ s}}{0.01\text{ s}}\right] \times \left(\frac{\pi}{0.01\text{ s}}\right), \text{since } \frac{d}{dt}x = 0, \text{as motion at } x = 1.0\text{ cm (is constant)}$$

$$\Rightarrow (10.0\text{ cm})\cos\pi\left[\frac{1}{2}-1\right]=(1.00\text{ mm})\cos\frac{\pi}{2}=0$$

$$\boldsymbol{v_y=0}$$

Part (c): At $t=0.01$s speed of the particle at $x=1.0$ cm has been determined in part (b) to be Zero i.e. it is maximum displacement. Further, wave is sinusoidal and hence maximum displacement either (+)/(-) ve would occur at every $\frac{\lambda}{2}$ spacing along the line of propagation . Since the $\lambda=4$ cm and hence $\frac{\lambda}{2}=2$ cm. Thus corresponding spacing where velocity of the particle is zero at the instant are $x_1=x+\frac{\lambda}{2}\Rightarrow x_1=1+2=3$ cm; likewise $x_2=x_1+\frac{\lambda}{2}\Rightarrow x_2=3+2=5$ cm and for $x_3=x_2+\frac{\lambda}{2}\Rightarrow x_3=5+2=7$ cm. At **all these points speed of particle is Zero.**

Part (d): Therefore, at instances when speed of particle at $x=1.0$ cm is to be determined have been rationalized to $t=0.011\ s$, likewise $t=0.012\ s$ and $t=0.013\ s$. Accordingly, speed of the particles:

At $t=0.011\ s$: Taking forward derivation in part (b)-

$$v_y\Rightarrow\frac{d}{dt}\left((1.00\text{ mm})\sin\pi\left[\frac{x}{2.0\text{ cm}}-\frac{t}{0.01\text{ s}}\right]\right)=(-1.00\text{ mm})\cos\pi\left[0.5-\frac{t}{0.01\text{ s}}\right]\times\left(\frac{\pi}{0.01\text{ s}}\right)$$

$$\Rightarrow 31.4\times\cos\pi\left[0.5-\frac{0.011}{0.01}\right]\text{cm.s}^{-1}=31.4\times\cos(0.6\times\pi)\text{ cm.s}^{-1}=-9.7\text{ cm.s}^{-1}$$

Thus magnitude of speed at all the three instances is 9.7 cm/s

At $t=0.012\ s$: Taking forward derivation at t=0.011 s we have

$$v_y=31.4\times\cos\pi\left[0.5-\frac{0.012}{0.01}\right]\text{cm.s}^{-1}=31.4\times\cos(0.7\times\pi)\text{ cm.s}^{-1}=-18.455\text{ cm.s}^{-1}$$

Thus magnitude of speed at all the three instances is 18 cm/s

At $t=0.013\ s$: Taking forward derivation at t=0.011 s we have

$$v_y=31.4\times\cos\pi\left[0.5-\frac{0.013}{0.01}\right]\text{cm.s}^{-1}=31.4\times\cos(0.8\times\pi)\text{ cm.s}^{-1}=-25.4\text{ cm.s}^{-1}$$

Thus magnitude of speed at all the three instances is 25 cm/s

Thus magnitude of speed at the three given instances is 9.7 cm/s, 18cm/s and 25 cm/s.

N.B.: (1) In transverse waves particle of medium oscillates about its mean position along X-axis, which is fixed and hence while deriving velocity of particle at any location $v_y=\frac{d}{dt}y(x,t)$, x is a constant and hence term $\frac{d}{dt}x=0$, wherever it occurs.

(2) It may not be always necessary to solve each case. Based on data inference of one case can be used for other cases. All that is needed to carefully observe data and the way solution proceeds. This is explicit from solution of part (c) and (d).

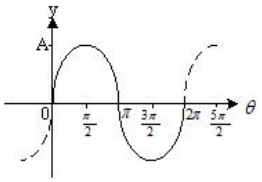
(3) Answer is reported in SDs corresponding to the given data.

Problem 05: A travelling wave is produced on a long horizontal string by vibrating an end up and down sinsusoidally. The amplitude of vibration is a 1.0 cm and displacement becomes zero 200 times per second. The linear mass density of the string is 0.10 kg/m and it is kept under tension of 90 N.

(a) Find the speed and the wavelength of the wave.
(b) Assume that the wave moves in the positive x-direction and at t=0, the end x=0 is at its positive extreme position. Write the wave equation.
(c) Find the velocity and acceleration of the particle at x=50 cm at time t = 10 ms.

Illustration 05: Part (a): Velocity of transverse wave on a string is $v = \sqrt{\frac{F}{\mu}}$. Accordingly, with the given data $v = \sqrt{\frac{90}{0.1}} = \sqrt{900}$. It leads to $\boldsymbol{v = 30}$ **m/s.** Further, it is given that displacement becomes Zero $N = 200$ times per second, and hence frequency of the wave is $f = \frac{N}{2} = \frac{200}{2} = 100$ Hz. Therefore, wavelength of the wave $\lambda = \frac{v}{f} = \frac{30}{100}$. Hence, wavelength is $\boldsymbol{\lambda} = 0.3$ m $= \mathbf{30\ cm.}$

Part (b): General form of equation of a travelling wave with $y = 0$ at $x = 0$ and $t = 0$ is $y = A\sin\left[2\pi\left(\frac{t}{T} - \frac{x}{\lambda}\right)\right]$. But, it is given that at $x = 0$ and $t = 0$ the $y = A$, this is possible when $y = A\sin\left[2\pi\left(\frac{x}{\lambda} - \frac{t}{T}\right) + \frac{\pi}{2}\right]$, this can be written as $y = A\cos\left[2\pi\left(\frac{x}{\lambda} - \frac{t}{T}\right)\right]$, and on substituting values of wave parameters λ and $T = \frac{1}{f} = \frac{1}{100}$ we have $\boldsymbol{y = A\cos\left[2\pi\left(\frac{x}{30\ \text{cm}} - \frac{t}{0.01\ \text{s}}\right)\right]}$**, this is the answer of part (b).**



Part (c): Velocity of the particle at x=50 cm at time t = 10 ms is obtained by taking single derivative $v_y = \frac{dy}{dt}$, taking $\frac{dx}{dt} = 0$, and extending it to $a_y = \frac{dv_y}{dt}$.

Accordingly, $v_y = \frac{d}{dt}A\cos\left[2\pi\left(\frac{x}{30\ \text{cm}} - \frac{t}{0.01\ \text{s}}\right)\right] = -A\sin\left[2\pi\left(\frac{x}{30\ \text{cm}} - \frac{t}{0.01\ \text{s}}\right)\right] \times \left(-\frac{2\pi}{0.01}\right)$. It leads to $v_y = \frac{2\pi}{0.01}A\sin\left[2\pi\left(\frac{x}{30\ \text{cm}} - \frac{t}{0.01\ \text{s}}\right)\right] = \frac{2\pi}{0.01} \times 1 \times \sin\left[2\pi\left(\frac{50\ \text{cm}}{30\ \text{cm}} - \frac{0.01\ \text{s}}{0.01\ \text{s}}\right)\right]$. It solves into $v_y = 200\pi \times \cos\frac{4\pi}{3} = -544.14$ cm/s, or $\boldsymbol{v_y = -5.4}$ **m/s.**

And acceleration for the give values is $a_y = \frac{d}{dt}\frac{2\pi}{0.01}\sin\left[2\pi\left(\frac{x}{30\ \text{cm}} - \frac{t}{0.01\ \text{s}}\right)\right]$. It solves into $a_y = 200\pi \times 2\pi \times \cos\left[2\pi\left(\frac{x}{30\ \text{cm}} - \frac{t}{0.01\ \text{s}}\right)\right] \times \left(-\frac{1}{0.01}\right) = -4 \times 10^4 \times \pi^2 \times \cos\left(\frac{2\pi}{3}\right)$. It reduces to $a_y = -19.7 \times 10^4$ cm/s^2, or $\boldsymbol{a_y = 2.0}$ **km/ s^2.**

Thus part-wise answers are (a) 30 m/s, 30 cm, (b) $\boldsymbol{y = (1.0\ \text{cm})\cos\left[\frac{x}{30\ \text{cm}} - \frac{t}{0.01\ \text{s}}\right]}$**, and (c) -5.4 m/s, 2.0 km/s^2.**

Problem 06: In the arrangement shown in the figure, the string has a mass of 4.5 g. How much time will it take for a transverse disturbance produced at the floor to reach the pulley? Take g = 10 m/s^2.

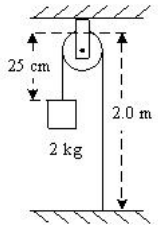
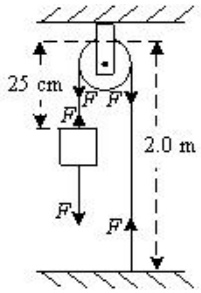


Illustration 06: The mass of 2 kg suspended from free end of the string produces a force $F = 2 \times g = 2 \times 10 = 20$ N. Accordingly, velocity of the transverse wave in the string having mass $m = 4.5$ g has linear mass density $\mu = \frac{m}{l_1 + l_2} = \frac{4.5\ \text{g}}{25\ \text{cm} + 2.0\ \text{m}} = \frac{4.5 \times 10^{-3}\ \text{kg}}{2.25\ \text{m}} = 2 \times 10^{-3}$ kg/m. Accordingly, velocity of transverse wave in the string is $v = \sqrt{\frac{F}{\mu}} = \sqrt{\frac{20}{2\times10^{-3}}} = 100$ m/s. Therefore time taken by the disturbance produced at the floor to reach the pulley is $t = \frac{l_1}{v} = \frac{2}{100} \Rightarrow t = 0.02$ s. **Hence, answer is 0.02 s.**



N.B.: In the figure effective length l_1 of string fixed to the floor would terminate at point of contact with the pulley. Therefore length $l_1 \to l_1 - r$, here r is the radius of the pulley. Since, r is not specified and hence a fair assumption $r \ll l_1$ has been made to calculate t.

Question 07: A piano wire weighing 6.00 g and having a length of 90.0 cm emits a fundamental frequency corresponding to "middle C" ($\upsilon = 261.63$ Hz). Find the tension in the wire.

Illustration 07: Linear mass density of the string is $\mu = \frac{m}{L}$ and with given data $\mu = \frac{6\times10^{-3}}{90\times10^{-2}} = 6.67 \times 10^{-3}$ kg/m. Fundamental frequency is given to be $\nu = 261.63$ and velocity of the wave is $v = \nu \times \lambda = \nu \times 2L = 261.63 \times 2 \times 0.9$, it calculates to 471 m/s. Velocity of transverse wave on a string is $v = \sqrt{\frac{F}{\mu}}$, hence tension in the string shall be $F = \mu v^2 = (6.67 \times 10^{-3}) \times (471)^2 = 1480$ N. **Hence, answer is 1480 N.**

N.B.: In case concept of SDs is applied on intermediate results, answer could be different but it would be in the same range.

Problem 08: A uniform horizontal rod of length 40 cm and mass 1.2 kg is supported by two identical wires as shown in the figure. Where should a mass of 4.8 kg be placed on the rod so that the same tuning fork may excite the wire on the right into its fundamental vibrations and that on left into its first overtone? Take g = 10 m/s^2.

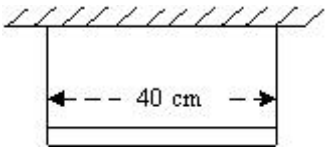
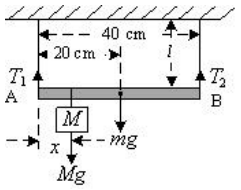


Illustration 08: Let length of wires supporting the horizontal rod of mass m from a horizontal ceiling be l at both ends A and B. The bare uniform rod would produce equal tension $T = \frac{mg}{2}$ in both the strings. But, with an external mass M the tension in wires at end A and B would change to T_A and T_B respectively. Let tuning fork excites wire on the right end B at its fundamental frequency f_B. Since, vibration on the wire on the left end A is first overtone and hence $f_A = 2f_B \Rightarrow \frac{f_A}{f_B} = \frac{2}{1}$…(1). Hence, wavelengths of fundamental waves through both the identical wires having linear mass density μ are $\lambda_B = l$ and wavelengths of first overtone is $\lambda_A = l$. Thus we have $\frac{\lambda_A}{\lambda_B} = 1$…(2).



Speed of transverse wave on on a stretched string $v = \sqrt{\frac{T}{\mu}}$, and hence $\frac{v_A}{v_B} = \frac{\sqrt{\frac{T_A}{\mu}}}{\sqrt{\frac{T_B}{\mu}}} \Rightarrow \frac{v_A}{v_B} = \sqrt{\frac{T_A}{T_B}}$ …(3) Since, $v = f\lambda$ and hence $\frac{v_A}{v_B} = \frac{f_A\lambda_A}{f_B\lambda_B} \Rightarrow \frac{v_A}{v_B} = \frac{f_A}{f_B} \times \frac{\lambda_A}{\lambda_B}$. Using equations (1) and (2) $\frac{v_A}{v_B} = 2 \times 1 = 2$…(4).

Combining (3) and (4) we have $\sqrt{\frac{T_A}{T_B}} = 2 \Rightarrow T_A = 4T_B$…(5)

Next is to determine tensions T_1 and T_2 which are under vertical equilibrium with total weight such that $T_A + T_B = (m + M)g$ …(3). Using the given data $T_A + T_B = (1.2 + 4.8)10 \Rightarrow T_A + T_B = 60$ N…(6).

Using equations (5) and (6) we have $5T_B = 60 \Rightarrow T_B = 12$ N and $T_A + 12 = 60 \Rightarrow T_A = 48$ N.

Now considering rotational equilibrium, moments at end A we have $T_B \times L = mg \times \frac{L}{2} + Mg \times x$… (7), Substituting the given and derived values, $12 \times 0.4 = 1.2 \times 10 \times \frac{0.4}{2} + 4.8 \times 10 \times x \Rightarrow 4.8 = 2.4 + 48x$, or $x = \frac{2.4}{48} = 0.05$ m or $\boldsymbol{x = 5}$ **cm. is the answer**.

N.B.: Wire at both ends with equal length shall have half of the wavelength of waves generated at both ends. Yet the velocity of the transverse waves in the two wires supported by tensions in the wires of same linear mass density would be decide the fundamental frequency and first overtone as stipulated in the wire.

Problem 9: Figure shows a string stretched by a block going over a pulley. The string vibrates in its tenth harmonic in unison with a particular tuning fork. When a beaker containing water is brought under the block so that block is completely dipped into the beaker the string vibrates in eleventh harmonic. Find density of the material of the block.

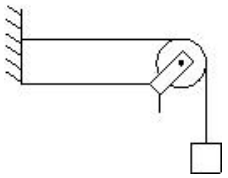
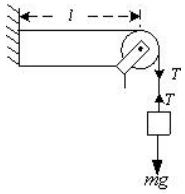
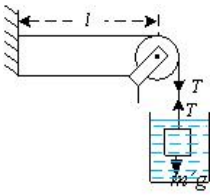


Illustration 09: Initially when the block is hanging in air tension in the string $T = mg$ and the string of length l and linear mass density μ vibrates in tenth harmonic f_{10} unison with tuning fork of frequency f i.e. $f_{10} = 10f$. It implies that $l = 10 \times \frac{\lambda_{10}}{2} = 5\lambda_{10}$. The velocity of the wave in the string $v = \sqrt{\frac{mg}{\mu}}$. It is given that string is vibrating in its 10th harmonic hence $f_{10} = 10f_1 \Rightarrow f_{10} = v_{10} = \sqrt{\frac{mg}{\mu}}$. It solves into $f_{10} \times \lambda_{10} = \sqrt{\frac{mg}{\mu}} \Rightarrow f_{10} \times \left(\frac{l}{5}\right) = \sqrt{\frac{mg}{\mu}}$. Considering that object has volume V and density ρ the relation can be written as $\frac{f_{10}l}{5} = \sqrt{\frac{V\rho\, g}{\mu}}$ …(1)



Now when solid is completely immersed in water let reduced mass due to buoyancy is m' and string vibrates in at a frequency $f_{11} = 11f_1$ and $l = 11 \times \frac{\lambda_{11}}{2} = 5.5\lambda_{11}$. With other parameters viz. f_1, l, μ and g remaining unchanged we will have $v_{11} = f_{11} \times \lambda_{11} = \sqrt{\frac{m'g}{\mu}} \Rightarrow \frac{f_{11}l}{5.5} = \sqrt{\frac{m'g}{\mu}}$…(2)



Now it requires to determined m' for solid of volume V and of density ρ such that $m = \rho V$. But, when solid is immersed in water having relative density $\rho_w = 1$, because of buoyancy the relative mass of solid would be $m' = (\rho - 1)V$. Accordingly, equation (2) can be rewritten as $\frac{f_{11}l}{5.5} = \sqrt{\frac{(\rho-1)V\, g}{\mu}}$…(3)

Combining (1) and (3) we have $\frac{\frac{f_{10}l}{5}}{\frac{f_{11}l}{5.5}} = \frac{\sqrt{\frac{V\rho\, g}{\mu}}}{\sqrt{\frac{(\rho-1)V\, g}{\mu}}}$ …(4)

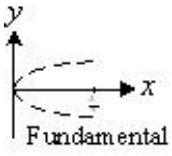
Since in both the cases, despite change of velocity due to change in tension, string is resonating with the same tuning fork and hence Now, that tuning fork is same and hence $f_{10} = f_{11}$. Using this identity in (4) we have $\frac{\frac{f_{10}l}{5}}{\frac{f_{10}l}{5.5}} = \frac{\sqrt{\frac{V\rho\, g}{\mu}}}{\sqrt{\frac{(\rho-1)V\, g}{\mu}}}$, or $\frac{5.5}{5} = \sqrt{\frac{\rho}{\rho-1}} = 1.1 \Rightarrow \frac{\rho}{\rho-1} = 1.21 \Rightarrow 1.21(\rho - 1) = \rho \Rightarrow 0.21\rho = 1.21 \Rightarrow \rho = \frac{1.21}{0.21} = 5.76$ g/cm^3 or $\rho = \mathbf{5.8 \times 10^3}$ **kg/m^3 is the answer.**

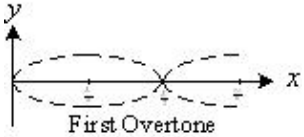
N.B.: Relation of resonating frequency with that of the tuning fork is the key consideration and leads to conclusion that with decrease in tension velocity decreases but frequency increases. This can be realized in skipping rope game.

Problem 10: A 2.00 m long rope, having a mass 80 g is fixed at one end and is tied to a light string at the other end. The tension in the string is 256 N.

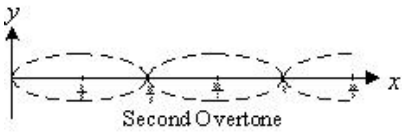
(a) Find the frequencies of the fundamental and the first two overtones.
(b) Find the wavelength in the fundamental and the first two overtones.

Illustration 10: Linear mass density of rope of length $L = 2.00$ m and mass $m = 80$ g is $\mu = \frac{m}{L} = \frac{80\times10^{-3}}{2.00} = 4.0 \times 10^{-2}$ kg/m. Tension in the rope is $F = 256$ N . Hence velocity of transverse wave along the string is $v = \sqrt{\frac{F}{\mu}}$. Accordingly, $v = \sqrt{\frac{256}{4.0\times10^{-2}}} = 80$ m/s.Since rope has one end fixed and the other end being tied to a light string acts like a free to move vertically and $L = \frac{\lambda}{4} \Rightarrow \lambda = 4L = 4 \times 2 = 8$m. Since, $v = f\lambda$ and hence fundamental frequency is $f_1\lambda_1 = 80 \Rightarrow \boldsymbol{f_1} = \frac{80}{8} = \mathbf{10\ Hz}$. This fundamental frequency is Zeroth overtone and thus $\boldsymbol{O_0 = f_1 = 10\ Hz}$





Since anti-node occurs at the free end tied to a light string hence of first overtone will occur at a frequency when next anti-node occurs at free end. Accordingly, it is $\boldsymbol{O_1 = 3f_1 = 3 \times 10 = 30\ Hz}$ and frequency of second overtone will occur at a next frequency when anti-node recurs at free end, thus $\boldsymbol{O_2 = 5f_1 = 5 \times 10 = 50.}$ **Hence, anser of part (a) is 10 Hz, 30 Hz and 50 Hz.**



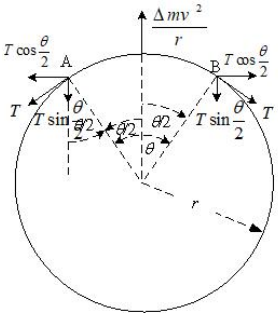
Wavelength of fundamental frequency has been determined above $\boldsymbol{\lambda = 8.00}$ **m.** Extending the logic of frequency of overtones, wavelength for first overtone is $\boldsymbol{\lambda_{01} = \frac{8}{3} = 2.67}$ **m.** and $\boldsymbol{\lambda_{02} = \frac{8}{5} = 1.60}$**m. Thus answer of part (b) is 8.00m, 2.67 m and 1.60 m.**

Thus answers are (a) 10 Hz, 30 Hz, 50 Hz (b) 8.00 m, 2.67 m, 1.60 m.

N.B.: In case of overtones in a string with both ends fixed and with one end free the logic is different and needs to be used appropriately.

Problem 11: A circular loop of string rotates about its axis on a frictionless horizontal plane at a uniform rate so that the tangential speed of any particle of the string is *v*. If a small transverse disturbance is produced at a point of the loop, with what speed (relative to the string) will this disturbance travel on the string?

Illustration 11: The rotation of a circular string on a frictionless horizontal plane is a case of hoop-tension *T* produced in the string. To calculate *T*, a small element of string AB forming a small angle $\theta \to 0$ at the center is considered. Let, m is the mass if the string. Then mass of the string element $\Delta\theta$ is $\Delta m = \frac{r\theta}{\frac{2\pi r}{m}} = \frac{m\theta}{2\pi}$. Taking free-body diagram of the component of the hoop-tension $T\cos\frac{\theta}{2}$ at ends A and B, being in opposite direction, would cancel out; whereas components $T\sin\frac{\theta}{2}$ at both the ends are unidirectional and hence would balance centrifugal force such that $\frac{\Delta m v^2}{r} = 2T\sin\frac{\theta}{2} \Rightarrow \frac{\left(\frac{m\theta}{2\pi}\right)v^2}{r} = 2T\sin\frac{\theta}{2} \Rightarrow T = \left(\frac{mv^2}{2\pi r}\right)\frac{\frac{\theta}{2}}{\sin\frac{\theta}{2}}$. Since, linear mass density of the string is $\mu = \frac{m}{2\pi r}$, and $\theta \to 0$ hence $\frac{\sin\frac{\theta}{2}}{\frac{\theta}{2}} \to 1$. Accordingly, $T = \left(\frac{m}{2\pi r}\right)v^2 = \mu v^2$. Velocity of transverse wave in a taught string is $= \sqrt{\frac{T}{\mu}} = \sqrt{\frac{\mu v^2}{\mu}} = v$.



Hence, answer is *v*.

—00—

Problems are meant to be solved; every solution open doorway to new problems.
This is an endless journey to discovery of nature.

We are, what we are, because of rigorous efforts of countless persons.

—00—

I don't think anybody anywhere can talk about the future...
without talking about education.
Whoever controls the education of our children controls our future.

- Wilma Mankiller

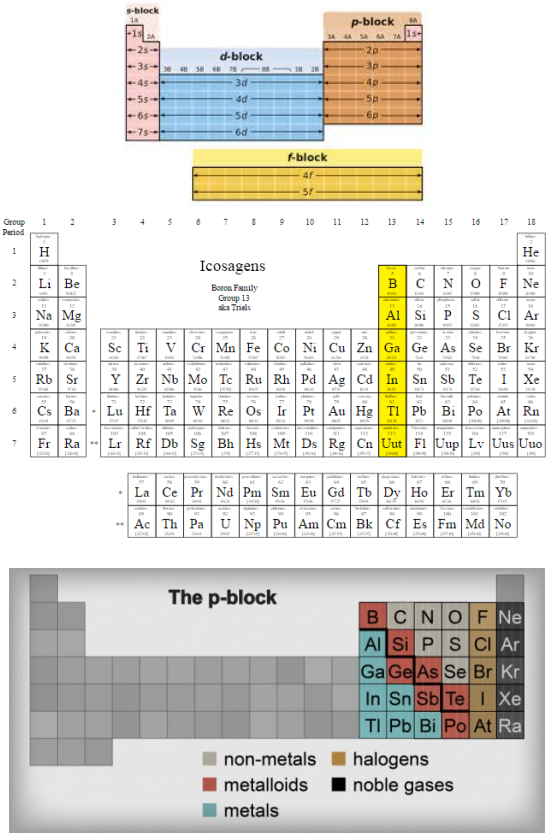
—00—

Growing with Concepts: Chemistry

p-BLOCK ELEMENTS

Kumud Bala

What Are p-Block Elements? Elements in which the last electron enters any one of the three p-orbitals of their respective outermost shells are called p-block elements. Since a p-subshell has three degenerate (same energy) p-orbitals, each of which can accommodate two electrons, therefore in all, there are six groups of p-block elements, i.e. group 13, 14, 15, 16, 17and 18 (except helium). Each group is containing five elements. Thus, in all there are 30 p-block elements in the periodic table. The atoms of elements of these groups receive their last electrons in 2p, 3p, 4p, 5p, and 6p-orbitals. Boron, carbon, nitrogen, oxygen, fluorine and neon are the first members of these groups. The first member of each of group 13 to 17 of p-block differs from the remaining member of their corresponding group in two major respects, (i) small size (ii) absence of vacant d-orbitals in valence shell.



Group 13 (Boron Family): Members of the boron family are boron (B), aluminium (Al), gallium (Ga), indium (In) and thallium (Tl). Boron is non-metal; all other elements of this group are metals. Non-metallic character of boron is due to its small size and high ionization energy.

Occurrence: Boron is a fairly rare element. Mainly occurs in orthoboric acid (H_3BO_3), borax ($Na_2B_4O_7.H_2O$), kernite ($Na_2B_4O_7.2H_2O$) etc. Borax occurs in Puga Valley of Ladakh and also in Sāmbhar Lake of Rajasthan. The abundance of boron in earth curst is less than 0.0001% by mass. Aluminium is the most abundant metal. In fact, it is the third most abundant element in the earth crust (8.3%) by mass after oxygen (45.5%) and silicon (27.7%). Bauxite ($Al_2O_3.2H_2O$) and cryolite (Na_3AlF_6) are the important minerals of aluminium. Gallium, indium and thallium are less abundant in nature.

Some Characteristics of Group 13:

Atomic Size: on moving down a group, the atomic radii of the elements increase. This is due to an increase in atomic number and hence the increase in the number of shells. The increase in nuclear charge is more than compensated by the additional shells.

The atomic radius of gallium (135pm) is slightly lower than that of Al (143). This is due to the filling of electrons in d-orbitals. In between Al (Z=13) and Ga (Z=31), there are ten elements of the first transition series which have electrons in the inner d-orbitals. Due to poor penetration power of d-electrons, the electrons in gallium experience greater force of attraction by the nucleus than in Al. Atomic radii of elements decrease on moving from left to right in a given period. It is because of addition of new electrons in the same shell and are subjected to an increased pull of the nuclear charge at each step.

Elements of group 13	Outer electronic configuration	Nuclear charge	Effective nuclear charge	Atomic size (in pm)
Boron	$2s^2 2p^1$	+5	+2.60	85
Aluminium	$3s^2 3p^1$	+13	+11.60	143
Gallium	$4s^2 4p^1$	+31	+29.60	135
Indium	$5s^2 5p^1$	+49	+47.60	167
Thallium	$6s^2 6p^1$	+81	+79.60	170

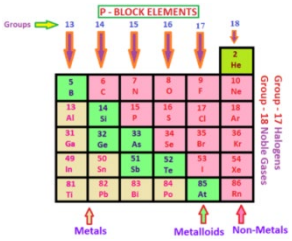
Element	**Boron**	**Carbon**	**Nitrogen**	**Oxygen**	**Fluorine**
Outer electronic configuration	$2s^2 2p^1$	$2s^2 2p^2$	$2s^2 2p^3$	$2s^2 2p^4$	$2s^2 2p^5$
Nuclear charge	+5	+6	+7	+8	+9
Effective nuclear charge	+2.60	+3.55	+3.90	+4.55	+5.20
Atomic size	88pm	77pm	70 pm	66 pm	64 pm

Ionization Enthalpy: Ionization enthalpy decreases on descending a group. This is due to increase in the atomic size. So electrons are less tightly held by the nucleus and therefore, ionization enthalpy decreases. Gallium has higher ionization energy than aluminium. Aluminum's valence electrons are in the 3p shell, and there are 13 protons in the nucleus. Gallium's valence electrons are in the 4p shell, and there are 31 protons in the nucleus. Additionally, the atomic radius of gallium is not too much larger than that of aluminum. Thus, the electrons in gallium are pulled more strongly to the nucleus and they are more difficult to remove. Therefore, more energy is required to ionize gallium than aluminium. The similar increase is also observed from indium (Z= 49) to thallium (Z= 81), which is due to the presence of 14 f-electrons in the inner electronic configuration of thallium which have very poor shielding effect. Ionization enthalpy increases as we move from left to right in a period. It is due to decrease in atomic size and electrons are more tightly held by the nucleus.

Electron Affinity: When an electron is added to a neutral gaseous atom, heat energy is either released or absorbed. The amount of heat energy released or absorbed is termed as electron gain enthalpy i.e. energy change for the process, $X_{(g)} + e^- \rightarrow X^-_{(g)}$. Generally for most of the atoms, the electron gain enthalpy is negative, i.e. energy is released when an electron is added to a neutral gaseous atom. But for some atoms, the electron gain enthalpy is a positive quantity i.e. energy is absorbed during the addition of an electron. Electron affinity generally becomes more negative on moving from left to right along a period. It is because on moving across a period, the atomic size decreases. As a result the force of attraction exerted by the nucleus on the electron increases. Consequently the atom has a greater tendency to gain an electron. Hence, electron gain enthalpy becomes more negative (boron -0.30, carbon -1.25, nitrogen +0.20, oxygen -1.48, fluorine -3.6). Its value decreases from top to bottom in a group, becomes less negative. This is due to the increase in atomic size thus, less attraction for the electrons; the atom will have fewer tendencies to gain an electron. Hence, electron gain enthalpy becomes less negative.

Oxidation State: All the group 13 elements show maximum oxidation state of +3. Except boron and aluminium, all other elements show +1 oxidation state. +1 oxidation state becomes more and more stable as we move down the group. For example, thallous compounds (Tl^+) are more stable than thallic compounds (Tl^{+3}). $Tl^{+3} + 2e^- \rightarrow Tl^+_{(aq)}$ This is due to inert pair effect and decrease in bond energy with increase in size of the elements. For example, in Tl^+ ion $6s^2$ electrons do not participate in bond formation. (What is inert pair effect? The reluctance of the s-electron to participate in bond formation is called inert pair effect. This is due to poor or ineffective shielding of the ns^2 electrons of the valence shell by intervening d and f electrons.)

Metallic Character: The metallic character decreases along a period due to decrease in atomic size and increase in ionization energy. The metallic character increases down the group due to increase in atomic size and decrease in ionization energy. By combining both the factors, size of atom and ionization energy, we observe that elements with strong metallic character are located in the lower left portion of the p-block elements whereas those with strong non-metallic character are found in the upper right portion of the block. Elements lying in a diagonal strip between these elements are called metalloids. Non-metals and metalloids exist only in the p-block of the periodic table. Non-metallic character of elements decreases down the group. The heaviest element in each p-block group is the most metallic in nature. This change from non-metal to metallic character brings diversity in the chemistry of these elements, depending on the group to which they belong. For example- non-metal oxides are acidic or neutral where as metals oxides are basic in nature.



Electronic Configuration: All the elements of group 13 have 3 electrons in their outer most shell (2 in s-orbital and 1 in p-orbital).

Element	Atomic number	Electronic configuration
Boron (B)	5	$1s^2 2s^2 2p^1$
Aluminium (Al)	13	$1s^2 2s^2 2p^6 3s^2 3p^1$
Gallium (Ga)	31	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$
Indium (In)	49	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^1$
Thallium (Tl)	81	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6 5d^{10} 6s^2 6p^1$

Anomalous Behavior of Boron: Boron, the first member of group 13 elements shows anomalous behavior and differ from rest of the members of its family. The main reasons are

(i) exceptional small atomic and ionic size,
(ii) high ionization energy and
(iii) absence of d-orbital in its valence shell.

Some important properties in which boron differs from the rest of the members of its group are as follows:

(i) Being small in size boron is harder than the other elements of its group.
(ii) It has high melting and boiling points.
(iii) Boron forms only covalent compounds while all other members form both ionic and covalent compounds. For example- BF_3 is covalent while AlF_3 is ionic.
(iv) The oxides of boron and its hydroxides are weakly acidic and dissolve in alkalis forming borates. The oxide and hydroxides of aluminium and gallium are amphoteric while those of indium and thallium are basic.

$$B_2O_3 + 2NaOH \rightarrow 2NaBO_2 + H_2O$$

$$B(OH)_3 + NaOH \rightarrow NaBO_2 + 2H_2O$$

$$Al(OH)_3 + NaOH \rightarrow NaAlO_2 + 2H_2O$$

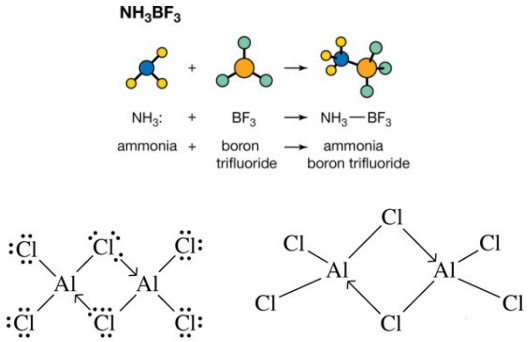
$$Al(OH)_3 + 3HCl \rightarrow AlCl_3 + 3H_2O$$

(v) The trihalides of group 13 being covalent are hydrolysed by water. Whereas boron trihalides, due to the absence of d-orbitals form tetrahedral species $[B(OH)_4]^-$, trihalides of Al and other elements, due to presence of d-orbitals, form octahedral $[Al(H_2O)_6]^{+3}$.

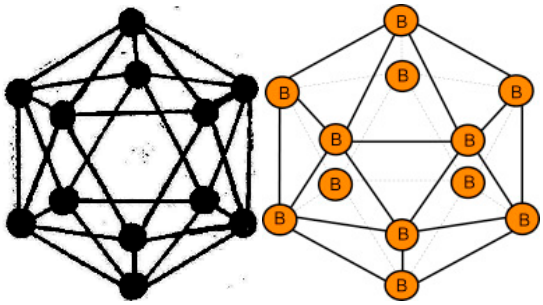
(vi) The trihalides of B are monomeric due to its small size. It cannot accommodate four large sized halogen atoms around it. The monomeric trihalides, being electron deficient, are strong Lewis acids to form complexes with ammonia.

$$BH_3 + NH_3 \rightarrow F_3B \leftarrow NH_3$$

In contrast the trihalides of Al and other elements of group 13 have bridged dimeric structures in which the metals completes its octet by accepting an electron pair from a halogen atom of the other molecule.



Physical Properties of Boron: Boron is extremely hard solid, next to diamond, due to its three dimensional net work structure. The building units of various crystalline forms of boron are B_{12} icosahedra units. Icosahedron is a three dimensional space formed by twenty equilateral triangles meeting at twelve vertices. All the twelve vertices of icosahedrons are occupied by boron atoms to constitute B_{12} unit. Its melting point is ≈ 2450K, boiling point is ≈ 2825K. It exists in four allotropic forms which are obtained under different conditions. ^{10}B (9%) ^{11}B (81%). It has low electrical conductivity.



Chemical Properties: Boron has small size (80pm) and high ionization energy ($I.E_1$= 800kJmol^{-1}, $I.E_2$ =2427kJmol^{-1} , $I.E_3$ = 3658kJmol^{-1}). Therefore, it does not form B^{+3} ions. It shares its three valence electrons with other atoms and forms covalent compounds.

Reactivity Towards Air: Boron is nonreactive in the crystalline form.

$$4B_{(s)} + 3O_{2\,(g)} \rightarrow^{973K} 2B_2O_{3(s)}$$

$$4Al + 3O_2 \rightarrow^{heat} 2Al_2O_3\,(s)\,,$$

$$2B_{\,(s)} + N_{2\,(g)} \rightarrow_{temp}^{high} 2BN_{(s)}$$

Boron nitride (BN) is also called inorganic graphite, because of the similarity of structure of graphite and boron nitride.

Reactivity With Acids: Boron reacts with strong oxidizing acid (2:1 mixture of conc. H_2SO_4 and conc. HNO_3 acid) forming boric acid.

$$B + 3HNO_{3\,(aq)} \rightarrow_{high\ temp} \underset{Boric\ acid}{Conc.\ H_2SO_4 + H_3BO_{3\,(aq.)}} + 3NO_{2\,(g)}$$

$$2Al_{(s)} + 6HCl_{\,(aq)} \rightarrow 2Al^{+3}_{(aq)} + 6Cl^-_{(aq)} + 3H_{2(aq)}$$

(non-oxidising acid)

Al becomes passive due to the formation of a thin protective layer of its oxide (Al_2O_3) on the surface which protects it from further action.

Reactivity with Bases: Boron does not react with NaOH/KOH up to temperatures 773K, but for >773K temperatures, boron reacts with KOH giving potassium borate.

$$2B + 6KOH_{(s)} \rightarrow^{>7773K} 2K_3BO_3 + 3H_{2(g)}$$

Boron also dissolves in fused $Na_2CO_3/NaNO_3$ mixture at 1123K.

$$2B_{(s)} + 3Na_2CO_{3(s)} + 3NaNO_{3(s)} \rightarrow 2Na_3BO_{3\,(s)} + 3NaNO_{2\,(s)} + 3CO_{2\,(g)}$$

$$2Al_{\,(s)} + 2NaOH_{\,(aq)} + 6H_2O_{\,(l)} \rightarrow 2Na^+[Al(OH)_4]^-_{\,(aq)} + 3\,H_{2\,(g)}$$

Sodium tetrahydroxy aluminate (111)

$$2Ga + 2NaOH_{(aq)} + 6H_2O_{(l)} \rightarrow 2Na^+[Ga(OH)_4]^- + 3H_{2(g)}$$

Sodium tetrahydroxy gallate

Reactivity Towards Halogen: due to small size and high ionization, boron forms covalent trihalides. BF_3 is a gas. BCl_3 and BBr_3 are liquid and BI_3 is solid. Trihalides are planner molecules in which boron is sp^2 hybridized.

$$2M_{(s)} + 3X_{3(g)} \rightarrow^{heat} 2MX_3$$

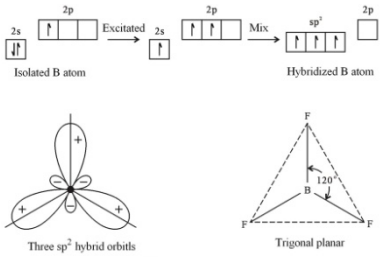
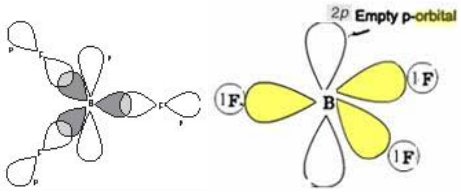
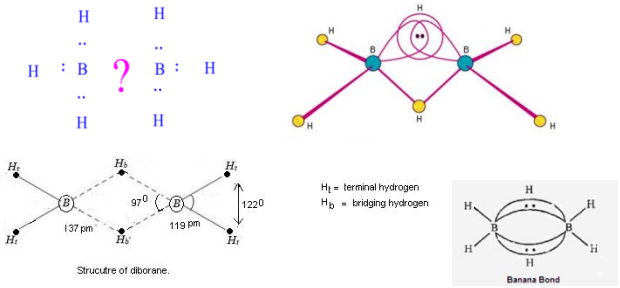


Figure: The sp^2 hybrid orbitals in BF_3



BF_3< BCl_3<BBr_3 <BI_3 Lewis acidic character is increaseing down the group. As the size of the halogen atom increases from chloride to iodine, the extent of overlap between 2p orbital of boron and a bigger p-orbital of halogen decreases.

Reactivity Towards Hydrogen: the binary compounds of boron with hydrogen are called boron hydrides. Actually boron does not combine directly with hydrogen but a number of hydrides of boron are known. These hydrides of boron are collectively called boranes for example; B_2H_6, B_4H_{10}, B_5H_{11}.



These contain special types of bonds known as multicentre bonds. The simplest among the boranes is diborane (B_2H_6). Aluminium forms polymeric hydrides of the general formula $(AlH_3)_n$. Other members form less stable hydrides. Stability of these hydrides decreases as we go down the group. These hydrides are weak Lewis acids and readily form adducts with strong Lewis bases (:B) of the type EH_3:B (where E = Al or Ga). Therefore, they form complex hydrides like lithium aluminium hydride $Li(AlH_4)$, lithium boron hydride $Li(BH_4)$ and lithium gallium hydride $Li(GaH_4)$. The formation of these hydrides is due to presence of vacant p-orbital in their outermost shells which readily takes electron pair from hydride ion $[H]^-$, and form tetra hydrido anions such as $(EH_4)^-$, $EH_3 + H^- \rightarrow [EH_4]^-$ (where E = B, Al, Ga). The complex hydrides act as powerful reducing agents. $LiAlH_4$ is also prepared by the action of LiH with $AlCl_3$ in ether.

$$4LiH + AlCl_3 \rightarrow^{ether} Li[AlH_4] + 3HCl$$

Uses of Boron:- Boron fibres are used in making bullet-proof vest and light composite material for aircraft. The boron-10 '(^{10}B)' isotope has high ability to absorb neutrons and therefore, metal borides are used in nuclear chemistry as protective shield and control rods. Boron is used in steel industry for increasing hardness of steel. It is also used as a semiconductor for making electronic devices.

ASSIGNMENT

The comprehension given below is followed by some multiple choice questions. Each question has one correct option. Choose the correct option.

The compounds of boron and hydrogen are called borones. For example, B_2H_6, B_4H_{10}, and B_5H_{11} etc. These contain special types of bonds known as multicentre bonds. The simplest among the borones is diborane. It is prepared by reduction of boron trifluoride etherate with lithium aluminium hydride in diethyl ether. It is colorless, highly toxic gas. It is stable only at low temperature. It catches fire spontaneously upon exposure to air and readily hydrolyzed by water to form boric acid. Diborane combines with ammonia to form an addition product.

1. From B_2H_6 all the following can be prepared except---
   (A) H_3BO_3 (B) $B_2(CH_3)_4H_2$
   (C) $B_2(CH_3)_6$ (D) $NaBH_4$

2. The structure of diborane(B_2H_6) contains -----
   (A) four 2c-2e bonds and two 3c-2e bonds
   (B) two 2c-2e bonds and four 3c-2e bonds
   (C) two 2c-2e bonds and two 3c-2e bonds
   (D) four 2c-2e bonds and four 3c-2e bonds.

3. The products/s formed when diborane is hydrolyzed is/are -------
(A) B_2O_3 and H_3BO_3 (B) B_2O_3 only
(C) H_3BO_3 and H_2 (D) H_3BO_3 only

4. Three centre two electrons bond is present in --------
(A) BF_3 (B) B_2H_6 (C) H_3BO_3 (D) $AlCl_3$

5. The type of hybridization in diborane is ------
(A) sp (B) sp^2 (C) sp^3 (D) dsp^2

6. In diborane, the number of electrons that account for bonding in the bridges is ----
(A) six (B) two (C) eight (D) four

Directions- in each of the following questions, a statement of assertion is given followed by a corresponding statement of reason. Just below it. Of the statements, mark the correct answer as:

(A) if both assertion and reason are true, and reason is the true explanation of the assertion.
(B) if both assertion and reason are true, but reason is not true explanation of the assertion.
(C) if assertion is true, but reason is false.
(D) if both assertion and reason are false

7. **Assertion**- Boron always forms covalent bond.
Reason- the small size of B^{+3} favours formation of covalent bond.

8. **Assertion**- $TiCl_3$ is more stable than TiCl.
Reason- +1 oxidation state of Ti is more stable than +3.

9. **Assertion**- BF_3 is a weaker Lewis acid than BCl_3.
Reason- in pπ-pπ back bonding is stronger in BF_3 than in BCl_3

10. **Assertion**- in B_2H_6 there is no B-B bond.
Reason- the $B_2H_6.2NH_3$ adduct on heating gives borazine.

11. **Assertion**- Boron does not form BF_6^{-3} ion while AlF_6^{-3} is known.
Reason- Boron does not have d-orbitals in valence shell while aluminium has d-orbitals in valence shell.

12. **Assertion**- Aluminium acts as an oxidizing agent.
Reason- Aluminium has a strong affinity for oxygen.

Multiple choice questions with more than one correct answer.

13. Which of the following are amphoteric oxides?
(A) Tl_2O (B) Al_2O_3 (C) Ga_2O_3 (D) B_2O_3

14. Boron trifluoride is----
(A) electron precise molecule
(B) electron deficient molecule
(C) used as a rocket fuel
(D) Lewis acid

15. The reason for small radius of Gallium compared to Al is------
(A) poor screening effect of d and f orbitals
(B) increase in nuclear charge
(C) presence of higher orbitals
(D) higher atomic number

Multiple choice questions with one correct answer

16. Which of the following is electron deficient molecule?
(A) C_2H_6 (B) B_2H_6 (C) SiH_4 (D) PH_3

17. Which of the following molecule has trigonal planar geometry?
(A) BF_3 (B) NH_3 (C) PCl_3 (D) IF_3

18. $AlCl_3$ dissolves in NaOH to form-----
(A) Al_2O_3 (B) $Na[Al(OH)_4]$
(C) $Na_3[Al(OH)_6]$ (D) Na_3AlO_3

19. Ionization enthalpy ($\Delta H_i kJmol^{-}$) for the elements of group 13 follows the order:
(A) B>Al>Ga>In>Tl (B) B<Al<Ga<In<Tl
(C) B<Al>Ga <In> Tl (D) B>Al<Ga>In<Tl

20. The element which exists in liquid state for a wide range of temperature and can be used for measuring high temperature is --------
(A) B (B) Al (C) Ga (D) In

Author is M.Sc. (Chem.), M.Ed. and Advanced Diploma in German Language (Gold Medallist). She retired as a Principal, Govt. School Haryana, has 3-1/2 years' experience in teaching Chemistry and distance teaching through lectures on Radio and Videos. She has volunteered to complement mentoring of students for Chemistry through Online Web-enabled Classes of this initiative. e-Mail ID: kumud.bala@yahoo.com

—00—

We are about to sacrifice our civilization for the opportunity of a very small number of people to continue to make enormous amount of money...
But it is the sufferings of the many which pay for the luxuries if the few...
You say that you love your children above everything else. And yet you are stealing their future.

- Greta Thumnberg

—00—

The value of a college education is not the learning of many facts but the training of mind to think.

- Albert Einstein

—00—

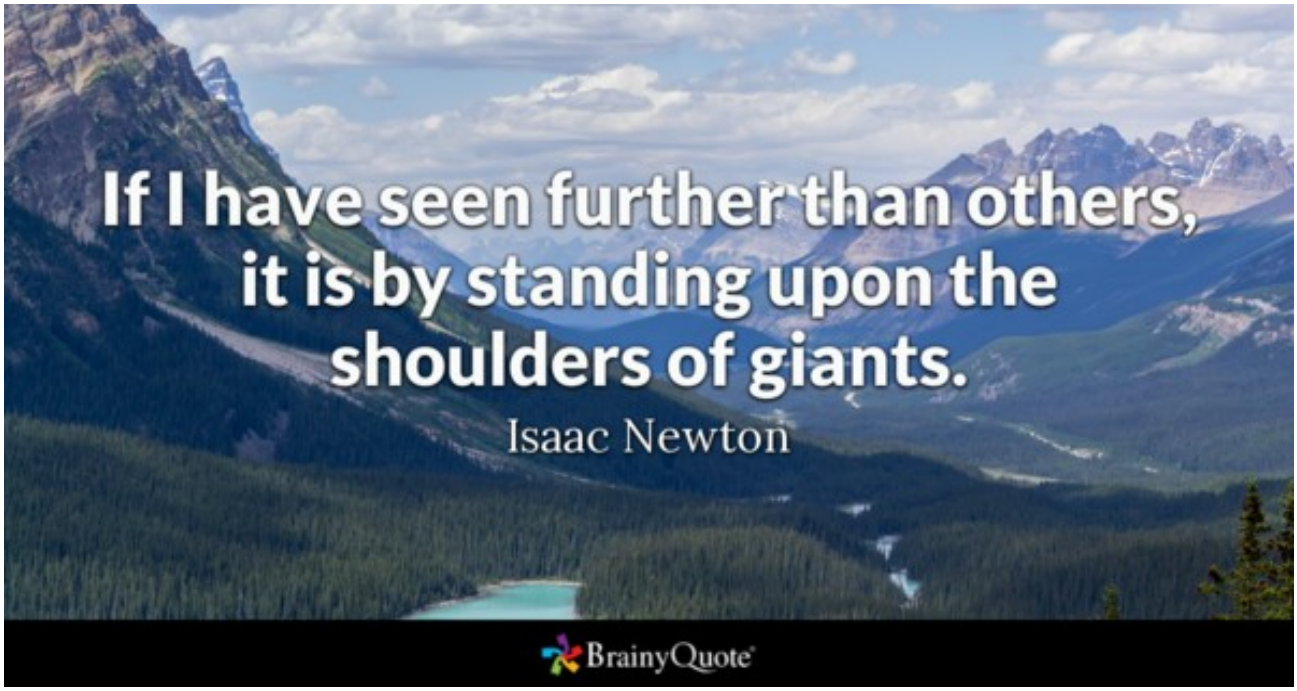
A hundred times every day I remind myself that my inner and outer life are based on the labors of other men, living and dead, and that I must exert myself in order to give in the same measure as I have received and am still receiving.

Albert Einstein

—00—

Who cares what am I or I do, as long as I am not either useful or dreadful.
Can I take first step to befriend other by complementing my usefulness,
for the larger good.

—00—



SCIENCE QUIZ : January'2020

Kumud Bala

1. Reproduction is -----
   (A) biological process of producing young ones
   (B) non-biological process of producing young ones
   (C) biological process of mature ones
   (D) none of these

2. Asexual reproduction is common in ----
   (A) single-celled organism
   (B) plants with relatively simple organization
   (C) animals with relatively simple organization
   (D) all of the above

3. Which of the following statement is false?
   (A) oviparous animals give birth to young ones
   (B) each sperm is a single cell
   (C) external fertilization takes place in frog
   (D) a zygote is formed as a result of fertilization.

4. The production of an exact copy of an animal by asexual reproduction is known as ------
   (A) budding (B) mating
   (C) cloning (D) hatching

5. Tick correct answer. Internal fertilization occurs ----
   (A) in female body (B) outside female body

6. A tadpole develops into an adult by the process of ----
   (A) fertilization (B) metamorphosis
   (C) embedding (D) budding

7. External fertilization and external development takes place in-------
   (A) hen (B) frog
   (C) elephant (D) human beings

8. When the embryo can be identified with body parts, it is known as ------
   (A) zygote (B) foetus
   (C) infant (D) egg

9. Ovaries are present in -------
   (A) males (B) females
   (C) both males and females (D) none of these

10. Breaking of the egg shell and the chick coming out is known as -------
    (A) hatching (B) incubation
    (C) fertilization (D) metamorphosis

11. Reproduction by budding takes place in ------
    (A) hydra (B) paramecium
    (C) amoeba (D) bacteria

12. Which of the following statements about reproduction in humans is correct?
    (A) fertilization take place externally
    (B) fertilization takes place in the testes
    (C) during fertilization, egg moves towards the sperm
    (D) fertilization takes place in the human female

13. In human beings, the correct sequence of events during reproduction is ------
    (A) gamete formation, fertilization, zygote formation, embryo
    (B) embryo, zygote formation, fertilization, gamete formation
    (C) fertilization, gamete formation, embryo, zygote formation
    (D) gamete formation, fertilization, embryo, zygote formation.

14. In the list of animals given below, hen is the odd one out among human being, cow, dog, hen. The reason for this is ------
    (A) it undergoes internal fertilization
    (B) it is oviparous
    (C) it is viviparous
    (D) it undergoes external fertilization

15. Animal exhibiting external fertilization produce a large number of gametes. Pick the appropriate reason from the following.
    (A) the animals are small in size and want to produce more off-springs.
    (B) food is available in plenty in water
    (C) to ensure better chance of fertilization
    (D) water promotes production of large number of gametes.

16. The egg laying mammals are ------
    (A) platypus (B) echidna
    (C) both (A) and (B) (D) none of the above

17. Which amongst the following is the reproductive part of the plant?
    (A) leaf (B) flower (C) stem (D) root

18. Pollen grains are -----
    (A) male reproductive structure
    (B) spore mother cell
    (C) male sperm cell
    (D) female structure

19. Which of the following reproduces only inside a host cell?
    (A) bacteria (B) virus
    (C) amoeba (D) fungus

20. The fusion of male and female gametes is called ---
    (A) ovulation (B) population
    (C) pollination (D) fertilization

(Answers to this Science Quiz shall be provided inMonthly e-Bulletin)

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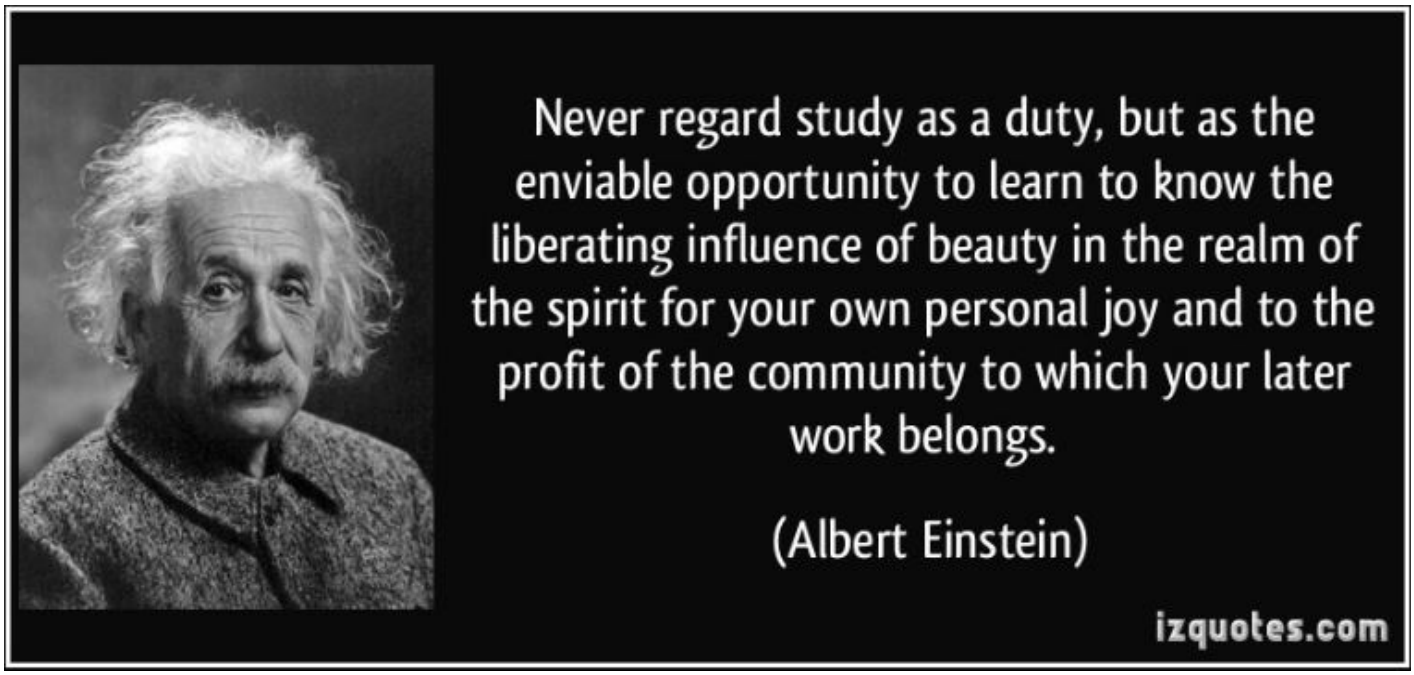

—00—

Nature is a beautiful integration of different entities. Mathematics and science only discover them.

Euler's Identity $0 = 1 + e^{j\pi}$ ***is an excellent example of integration. Each of the constituent was discovered independently, by different mathematicians, at different point of time.***

Yet they all complement each other.

Lest it not be there whole nature shall have to rediscovered

—00—

Theme Song :

PREMISE: ***We are pleased to adopt a song*" इतनी शक्ति हमें देना दाता....."*from a old Hindi Movie*Do Aankhen Barah Haath *दो आँखें बारह हाथ of year 1957, directed by The Late V. Shantaram. The lyrics are by Shri Bharat Vyas, singer Melody Queen Sushri Lata Mangeshkar, and Music Direction by Vasant Desai. It has become a widely accepted inspirational song and/or prayer in many educational institutions and socially inspired initiatives engaged in mentoring of unprivileged children. This newly formed non-organizational initiative, being selflessly operated by a small set ofcompassionate persons, finds its philosophy in tune with the song and conveys its gratitude to all he eminent persons who brought out the song in a manner that it has attained an epitome of popularity. While working its mission and passion, the group invites one and all to collectively complement in grooming competence to compete among unprivileged children. The song/prayer goes as under -***

इतनी शक्ति हमें देना दाता, मन का विश्वास कमजोर होना
हम चले नेक रस्ते पे हम से, भूलकर भी कोई भूल होना ||

दूर अज्ञान के हो अंधेरे, तू हमें ज्ञान की रोशनी दे
हर बुराई से बचते रहें हम, जितनी भी दे भली ज़िन्दगी दे
बैर होना किसी का किसी से, भावना मन में बदले की होना ||

इतनी शक्ति हमें देना दाता, मन का विश्वास कमजोर होना
हम चले नेक रस्ते पे हम से, भूलकर भी कोई भूल होना ||

हमना सोचें हमें क्या मिला है, हम ये सोचे किया क्या है अर्पण
फूल खुशियों के बाँटे सभी को, सबका जीवन ही बन जाए मधुबन
अपनी करुणा का जल तू बहा के, कर दे पावन हर एक मन का कोना ||

इतनी शक्ति हमें देना दाता, मन का विश्वास कमजोर होना
हम चले नेक रस्ते पे हम से, भूलकर भी कोई भूल होना ||

Together **E**ach **A**chieves **M**ore
(**TEAM**)

Every end, so also end of this e-Bulletin, is a pause for a review, before Resuming of the journey far beyond ...