GYAN VIGYAN SARITA: शिक्षा

A non-organizational, non-remunerative, non-commercial and non-political initiative to Democratize Education as a Personal Social Responsibility (PSR) 11th Monthly e-Bulletin dt. September 01,2019, Fourth Year of the Publication









Wishing you

A Happy Teachers' Day

"Instead of celebrating my birthday separately, it would be my proud privilege, if 5th September is observed as Teachers' Day" – Dr. dr. Sarvepalli Radhakrishnan





33NTENTS: (Against Each Content Page Number is Indicated for Convenience)

IOMS Graphical perspective (3) IT Infrastructure (4) Editorial – सभी अध्यापकों को श्रद्धापूर्ण नमन (5) Coordinator's Views- Teaching: Passion, Profession, Option or Compulsion? (8) An Appeal (11) Our Five Year's Journey (42) Our Mentoring Philosophy (22) **Regular Columns** 🕨 अंदाज बयां: दाज ए बयां: सब कर लियो..बस टॉप न करियो प्लीज़! - समीर लाल 'समीर' (13) > Ayurveda – Health Care: Cancer - Dr Sangeeta Pahuja (14) Articles Homage of a Teacher to His Teacher: Prof. J. Audretsch – Prof Ramesh Chandra (12)

Education and Competition – *Prakash Kale* (17)

Poems

- **Go Not to The Temple –** *Rabindranath Tagore* (6)
- Is It A New Order – M.V. Poornima Rao (15)
- पसीने का उबटन मुकेश आनंद (15)
- बडा हॅं मैं या हॅं छोटा ! निरंजन धुलेकर (21)
- शिक्षक...... मृणालिनी घुळे (23)
- अब आजाद है हर शख्स.... *डॉ. संगीता पाहुजा* (23)

Students' Section

- Teacher A Guide, Friend, Mentor sand Everything | World Without Borders P. Madhavilatha (27
- V. Madhuri Krishna Rao (26)
- Circle Art V. Charitha (26)

- Chandrayan 2 G Praneetha (27)
- Learning for Self Rearing environment for growth • of all (28)

Growing With Concepts (24)

- Mathematics: Let's Do Some Problems in Mathematics-XIII Prof. SB Dhar (29)
- Physics: Waves and Motions: Simple Harmonic Motion (34)
 - Illustration of Typical Questions: Waves and Motion (35)
- Chemistry: S-Block Elements Kumud Bala (43)

Quizzes

- Crossword Puzzle: Independence Days of The World Countries Prof. SB Dhar (33)
- Science Quiz: September'19 Kumud Bala (48)

From Previous e-Bulletin

Answers to Science Quiz: August'19– Kumud Bala (25) Answer: Crossword Puzzle August'19: World Humanitarian Day – Prof. SB Dhar (25) Invitation for Contribution of Articles (7) Theme Song (50)

Editor: Gyan Vigyan Sarita – शिक्षा,e-Bulletin:Dr SB Dhar; Coordinator-Gyan Vigyan Sarita,: Dr Subhash Joshi

Cover Page Graphics – Gyan Vigyan Sarita

- Views expressed in this bulletin are author's view and Gyan Vigyan Sarita शिक्ष, Publishers of this **Disclaimer:** bulletin, are not responsible for its correctness or validity
- Rights of Publication: Core Committee of ज्ञान विज्ञान सरिता reserves right of moderation or publication of a content of this e-Bulletin

Address: #2487, Betina, Mahagun Moderne, Sector-78, NOIDA, Uttar Pradesh, PIN: 201309,, (INDIA). e-Mail ID: subhashjoshi2107@gmail.com

-00---

Aim at the Best, but...



Equipments at Mentoring Center 1.Desk-/Lap-top (Linking platform : cloud based with as low bandwidth as 2. WebCam 3. Headset with Microphone 4. Digital Pen AND

Broadband-Internet Connection

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)

Cloud Internet

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 modern 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



Mentoring



Learning

Centre - 3

Learning

Centre

Learning Centre - n



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.i n/contact/



earning

Centre - 2

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

Learning Center (if asked for by	(Mentor)	Mentoring Center (if asked for by Mentor)			
	Estimated Ca	pital Cost (One Time)			
Particulars	Cost (in Rs)	Particulars	Cost (in Rs)		
Desktop (without monitor)	20,000	Laptop	25,000		
Projector	15,000	Projector	-		
Web camera	10,000	Web camera	-		
Mixer cum amplifier with Speaker and	15,000	Headset with Microphone	3,000		
Wireless microphones					
Wireless Surface Writing device	15,000	Wireless Surface Writing device	15,000		
Total	75,000		43,000		
	Estimate	d Recurring Cost			
Internet charges, based on estimated mor	thly data transfer	Internet charges, based on estimated monthly data transfer which			
which depends upon choice of cloud platfe	orm, and tariffs of	depends upon choice of cloud platform, and tariffs of ISP			
ISP					
Cloud platform :					
a. A-VIEW indegeneously development	oped by Amrita	IOMS is since an initiative driven with Personal Social			
University. It is found to be best	t among available	Responsibility (PSR) operating n Zero-Fund-&-Zero-Asset (ZFZA)			
options for use in IOMS. It has b	een developed for	basis, the Cloud Platform has to provided by Learning Centers for			
use in imparting Interactive C	Online Education,	deriving benefit of IOMS. Gyan Vigyan Sarita will be pleased to			
with bilateral audio-visual access	s, in an interactive	connect Learning Centers for collectively complementing the cost			
manner. Cloud platform.		of Cloud Platform, whenever payable, for arriving at a mutual			
-		agreement for cost sharing.			
b. The IOMS envisages session up	to Five Learning				
Centers. Charges for the pla	atform whenever	So also IT Infrastructure with the Men	tors has been in use and is		

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

c. 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.
 gratefully welcomed on ZFZA basis.
 Operating cost of Mentor, if required, shall be supported by Learning Centers

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 centers and mentoring centers.

working. But, at any stage if upgradation becomes essential, support of learning centers, beneficiaries of the initiative, is

These specifications have been updated based on experience of operation of IOMS with available options. Whiteborad application in the tried out cloud platforms are a bit inadequate in terms of writing lucidity. This deficiency is being managed with Microsoft OneNote application. Suggestions for a proper Whiteboard application as a shared space are welcomed; it will be extremely helpful in exploiting Interactive feature of IOMS with a wireless surface-writing device at each learning center.

Web Camera: Logitech HD 1080p, with a tripod or wall mounting

payable may be shared across in mutual

agreement between Learning Centers.

Projector: Portronics LED Projector Beam 100", 100 Lumen, 130" Screen size, 800x480px resolution

Mixer-cum-Amplifier: Ahuja Make PA Mixer Amplifier Model DPA-370, 30 W Max/37W Max, with Two Cordless Mikes and Speakers. This device offers echoless input/output communication with base computer and Mikes and Speakers in the Class.

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 Intuos with wireless device makes it suitable for communication with base computer in class like environment.

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

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

__00__

सभी अध्यापकों को श्रद्धापूर्ण नमन

हम उन सभी अध्यापकों के प्रति कृतज्ञ हैं जिन्होंने हमें इस योग्य बनाया कि हम दूसरों को अपने से अधिक योग्य बना पाते हैं।

सिखाना और सीखना दोनों ही कठिन कार्य हैं। सीखने वाला, सीखने के बाद सिखाने वाले का प्रतिरूप बन जाता है। सिखाने वाले के बहुत से गुण, सीखने वाले के जीवन में अपने आप आ जाते हैं। सीखने वाले को शिष्य कहते हैं और सिखाने वाले को अध्यापक कहते हैं।

सामान्य भाषा में, अध्यापक की सीख, शिक्षा कहलाती है। शिक्षा वह गुण है जो अंधकार, अगम्य, और आफत की परिस्थितियों में सकुशल निकलने का रास्ता बताती है।

भारत के अंतरिक्ष यान, चंद्रयान-2 का उदाहरण लीजिये। वैज्ञानिकों ने इस यान को वहां भेजा है, जहां कोई गया नहीं है। उस रास्ते से भेजा है, जिसे किसी ने कभी देखा नहीं है। उस स्थान पर भेजा है, जहां कोई पहुंचा नहीं है। यह ज्ञान की ही शक्ति है, जिसने यह असंभव कार्य कर दिखाया है।

सामान्य जन के लिये आश्चर्य की बात है कि यान तक संदेश पृथ्वी से जा रहा है, यान से संदेश व चित्र पृथ्वी पर आ रहे हैं, और यान पृथ्वी से न दिखने वाले मार्ग पर भी सफलतापूर्वक अपने लक्ष्य चंद्रमा की ओर बढ़ता जा रहा है।

सिखाने के लिये जहां अध्यापक विभिन्न तरीकों का प्रयोग समय और सीखने वाले की क्षमता के आधार पर करता है, वहीं सीखने वाला समयबद्ध होकर नियमों का पालन करते हुये, अनुशासित तरीके से, सीखने की अभिलाषा जगाकर, अभ्यास करते हुये सीखता रहता है।

एक अध्यापक अपने कौशल, गुणों और प्रवीणता की वजह से एक अच्छा मार्गदर्शक होता है। वह हमेशा सकारात्मक सोचता है, और दूसरों को भी सकारात्मक सोचने के लिये प्रोत्साहित करता है। उसका व्यवहार ईमानदारी से भरा, सबके लिये खुला और प्रामाणिक होता है। उसका कार्य योजनाबद्ध तरीके से होता है। वह अपने साथ विचार-विमर्श में दूसरों के तर्कों को भी उचित स्थान देता है।

अध्यापक आत्मविश्वासी होता है और यह आत्मविश्वास उसके कार्यों में हमेशा संतुलन बनाये रखता है।

अच्छा अध्यापक हमेशा संवेदनशील और सहानुभूति से पूर्ण रहता है। वह समय अथवा असमय दूसरों की सहायता के लिये उपलब्ध रहता है। वह अपने ज्ञान का कभी अभिमान नहीं करता है। वह दूसरों के ज्ञान और व्यवहार से हमेशा कुछ न कुछ सीखता रहता है।

संपादकीय

एक अच्छा अध्यापक सदैव अपने ज्ञान का प्रयोग और उपयोग करता रहता है। वह एक प्रभावशाली वक्ता होता है, अच्छा विवेचक होता है, अच्छा प्रेरक होता है, और सबसे बड़ी बात है कि वह एक अच्छा सलाहकार होता है। एक अच्छा अध्यापक भलीभांति जानता है कि कोई भी व्यक्ति वह नहीं पढा-सिखा सकता है जो वह खुद नहीं जानता है।

अच्छा अध्यापक तो वह माना और जाना जाता है जो अपने बच्चों को गृहकार्य में कुछ ऐसा काम देता है जिसमें बच्चों को सोचना पड़ता है, अपने अंदर झांकना पड़ता है और खुद से समझना पड़ता है।

अध्यापक अपने बच्चों में सीखने के लिये जुनून पैदा करता है और उनके अंदर रचनात्मक भाव जगाता है। एक योग्य अध्यापक अच्छी बातें, अच्छे तरीके से सिखाता है। एक अच्छा अध्यापक सिखाता है कि मार्ग पता न होने पर, हमें मार्ग को जानने वाले से ही, मार्ग पूछना चाहिये अन्यथा भटकने की संभावना बढ जाती है।

अध्यापक के पास ज्ञान की वह पूंजी रहती है, जो अपने शिष्यों को चाहें जितना दे दे, फिर भी वह उसके पास पूरी की पूरी बची रहती है। आइये, अध्यापक दिवस के अवसर पर हम अच्छे अध्यापकों के अनमोल गुणों को याद करें।

अच्छे होते हैं वे अध्यापक जिन्हें पहली पंक्ति से अंतिम पंक्ति तक में बैठे हर बच्चे का नाम याद रहता है। अच्छे होते हैं वे अध्यापक जो उस बच्चे को भी बोलने का मौका देते हैं जिसे उत्तर तो पता रहता है, पर संकोचवश बोल नहीं पाता है।

अच्छा होते हैं वे अध्यापक जो कमजोर बच्चों को भी मुख्य धारा में जोड़ लेते हैं। अच्छा होते हैं वे अध्यापक जो परीक्षा-कक्ष में गिरी पेन्सिल अथवा कलम को थोड़ा झुककर, उसे उठाकर बच्चे की मेज पर, उसके पास रख देते हैं।

अच्छा होते हैं वे अध्यापक जो बच्चे का उदास चेहरा देखकर, उसकी तकलीफ पूछ लेते हैं। अच्छा होते हैं वे



अध्यापक जो कभी-कभी बच्चों के साथ उनकी बातों को सुनकर, ठठाकर हंस भी लेते हैं।

अच्छा होते हैं वे अध्यापक जो बजाय लाल गोला कापी में बनाने की जगह सही शब्द अथवा सही पंक्ति लिख देते हैं। अच्छा होते हैं वे अध्यापक जो बच्चों के खेलते समय उनके साथ होते हैं और उन बच्चों के साथ थोड़ा खेल भी लेते हैं।

अच्छा होते हैं वे अध्यापक जो बच्चों को अपनी सोच बताने, अपना तर्क रखने और अपनी तरकीब से समस्यायें सुलझाने का मौका देते हैं।

अच्छा होते हैं वे अध्यापक जो अपने बच्चों के अंदर की छिपी प्रतिभा को बाहर निकाल कर उसे तरासने का काम करते हैं। अच्छा होते हैं वे अघ्यापक जो अपने बच्चों को बताते हैं कि उनके अंदर प्रतिभा है और वे सबकुछ कर सकते हैं। अच्छा होते हैं वे अध्यापक जो नम्रता और श्रद्धा से भरे रहते हैं। अच्छा होते हैं वे अध्यापक जो अपने शिष्यों को हमेशा वह फूल मानते हैं जिसकी सुगंध से, समाज का भविष्य सुगंधित होना है।

अच्छा होते हैं वे अध्यापक जो अपने बच्चों को सिखाते हैं कि समय का सदुपयोग बहुत जरूरी है। दुनिया में केवल समय ही एक वस्तु है जो किसी भी कीमत पर न तो खरीदा जा सकता है और न ही किसी भी तरह से बीत जाने के बाद वापिस लाया जा सकता है।

ज्ञान विज्ञान सरिता परिवार, अध्यापक दिवस के अवसर पर, सभी अध्यापकों को तथा उनके निःस्वार्थभाव से किये जा रहे समाजसेवा के कार्यों को श्रद्धापूर्वक नमन करता है।

-00-

-00

Go not to the temple

Go not to the temple to put flowers upon the feet of God, First fill your own house with the Fragrance of love and kindness.

Go not to the temple to light candles before the altar of God,

First remove the darkness of sin, pride and ego, from your heart..

Go not to the temple to bow down your head in prayer,

First learn to bow in humility before your fellowmen.

And apologise to those you have wronged.

Go not to the temple to pray on bended knees,

First bend down to lift someone who is down-trodden.

And strengthen the young ones.

Not crush them.

Go not to the temple to ask for forgiveness for your sins, First forgive from your heart those who have hurt you!



Rabindranath Tagore

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: Ref. 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.

-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-

Nothing is more important in our national life than the welfare of our children.

- Harry S. Truman (33rd President of the US)

--00---



Teaching : Passion, Profession, Option or Compulsion?

"A good teacher is like a candle - it consumes itself to light the way for others" - Mustafa Kemal Ataturk

There are many inspiring quotes on a teacher, some of them set a bench mark while other inspire to put in the best as a teacher. Everyone, as grows in life, has a pyramid of descendents. These descendents knowingly or unknowingly, intentionally or unintentionally look upon their elders, seniors or mentors as benchmark, roadmap or a role model. This is quite natural. Therefore, the day of 5th September that is celebrated as **Teachers' Day** in India is an opportunity for all of us to introspect and gauge ourselves as a teacher in whatever way one deems fit.

Pursuit of a teacher to consume himself in upbringing his students is possible only when teacher takes his role arising out of inspiration and not motivation. Motivation works in job and profession but the notion in words of Ataturk comes in only when one is passionate about his role. It requires a sense of deep love to mentor students without discrimination. This epitome of love is depicted in one of the immortal shayari of Mirza Ghalib reads as

> इश्रत-ए-क़तरा है दरिया में फ़ना हो जाना दर्द का हद से ग़ुज़रना है दवा हो जाना

(ishrat-e-qatra hai dariyā meñ fanā ho jaanā, dard kā had se guzarnā hai davā ho jaanā)".

This brings us to a point to ponder upon what is the role of a teacher. This is crystallized in requirement if a good students who is -(i) a visionary (ii) an achiever and (iii) a person of integrity having human sensitivity and credibility. Each of the three crucial dimensions is complementary to each other in a positive personality and is being analyzed separately.

(i) Life is prospective while history is full of lessons of glories, shortcomings or failures. Future cannot be carved by either boasting glorious past or living under the burden and repentance of either shortcomings or failures in the past, by whomsoever. Therefore, it requires one to live in the present, in a responsible and proactive manner to carve a roadmap for self and all associated persons. This roadmap is nothing but a vision. Every achiever, in his initial days had a dream and had strived to realize it in the prevailing circumstances with full consideration of realities without a sense of pleasure or pain. Thus grooming a student into a visionary requires a teacher to know the background of each student, uplift him from his ground realities providing him motivation specific to each individual. This is to encourage him to dream first and then live his best in the present. As the students proceed in life mist in their vision clears and they tend to regulate their efforts in realizing their vision. Brad Henry has rightly said that - "A good teacher can inspire hope,

ignite the imagination, and instill a love of learning".

Coordinator's View

(ii) Thought process of an achiever is found to be very systematic and stepwise. It needs to (a) observe first the happenings around, (b) correlate and differentiate similar observations, (c) analyze the causes of the occurrence of the observations to associate similarities and dissimilarities among them, (d) judge desirable and undesirable aspects of the observations, (e) explore alternatives of maximizing the desirable and minimize undesirable aspects of observation, (f) select most appropriate way of handling the effects of observation; this selection is based on considerations of viability, adaptability, economy, and sustainability for coexistence in the environment comprising of nature and people, (g) implement the selected alternatives, (h) last but not the least review the observations of remedies implemented and correct wherever necessary. The whole system makes a closed loop of evolution of thought process and growth of human race. Everyone cannot be lucky like Alexander Fleming whose mistake led him to discovery of Penicillin. Yet it was the systematic deep thought process of Fleming that led his observations, triggered by mistake, to suggest that Penicillin was an antibiotic medicine. Everyone keeps making observations and mistakes. Those are the few who have patience and perseverance to bring their observations to a logical conclusion and such persons are the achiever.

It may appear that the thought process contemplated above is extremely tedious and time consuming. Requirement of the extent and depth of analysis is circumstantial and based on criticality of the problem. Yet, it is just a matter of getting into the mould and it works so intuitively that for routine problems it takes blink of eye to arrive at decision.

Learning a subject, right from language, history to mathematics and science, is a means to cultivate the thought process and not an end limited to securing high scores; teacher has a big role to play in cultivation of this thought process. This is where a notion 'A teacher has no bad student, because he teaches by example and not by sermons. Therefore, a Teacher has an opportunity to be a greatest role model for his students' gains firm ground.

(iii) All logic and science learned through rote learning fails to handle real life issues which involve people. Nevertheless, all the knowledge, discoveries and inventions in the world were made by the great achievers not for self; rather they were result of pursuit of observations for a respite from problems being faced. These persons must have been groomed in a thought process where they did not give importance to their personal suffering/sacrifice in their pursuit. Incidentally, it is only the human being that can think beyond self; rest of all creatures just complete their life cycle. In case they have any role complementary to other creatures it is performed unknowingly. Therefore, ability to think beyond self and contribute for coexistence and sustainable future is objective of education. In this scenario a teacher has an opportunity to pro-act to groom students. Swami Vivekananda has said that "May He who is the Bramhn of the Hindus, the Ahura-Mazda of the Zoroastrians, the Buddha of Buddhists, the Jehovah of Jews, the Father in Heaven of the Christians, give strength to you to carry out your noble idea". Albert Einstein, one of the most accomplished and illustrious scientist had said "Try Not To Become a Man of Success But Rather Try To Become a Man of Value".

Credibility is another attribute of a person which is judged from the coherency in thoughts, speech and action. Such a person can be trusted upon. If actions are initiated by a person with a thought for the larger and sustainable good of all, then the person is regarded as one having positive personality; in case it is coercive and detrimental to the sustainable coexistence, the persons is considered to have a negative personality. Further, variance in thought and speech leads to randomness in utterances and is an indicator of a confused personality, whereas mismatch in speech and action is judged as lack of integrity to the extent of being untrustworthy and in fraudulent person. Drill in extreme cases a education process is to groom students into persons of integrity, while subjects serve as medium of transformation along with adding to professional value.

India a country of Rishis who were primarily researchers and teachers more by passion than profession. It may sound abysmal to ponder upon role of a teacher. That was the era when knowledge was transmitted by speech (Shruti) and skill by action (Kruti) and it carried on for thousands of years with every generation adding its own wisdom, experience and understanding, but the getting depleted. Since 326 B.C. from Alexander to middle of 20th century, India was a victim of continuous invasion. There must have been something in India which attracted multiple invaders coming across difficult terrains for about two thousand years. Under foreign rule whatever remained in India was brutally destroyed. Yet traces of Guru-Shishya tradition are still seen in fragmented form.

In human history, few centuries before Christ, Taxila in ancient India and Platonic Academy by Plato, disciple of Socrates in Europe are known for institutionalizing education. It was in renaissance period $(14^{th} to 17^{\bar{th}})$ century) in Europe a new scientific order influenced education. It transformed imparting of education from personalized form into institutionalized form. Mentor or Guru was replaced by Teachers appointed to impart knowledge in different subjects. And few disciples of each mentor were replaced by large number of students, under a group of teachers, with diversity of focus and wide variance in their learning capacity. This makes educational scenario highly complex and statistical parameters like laws of average lead to create mediocrity. In this system excellence, if any, is achieved largely through efforts beyond institution; it is either due to ability to spend or intense desire. In the process unprivileged children remain deprived of opportunities of growth, while teaching is getting drifted from passion to highly commercial profession. This environment is more conducive to people whose compulsion is to find a means of survive in this commercial world.

A passionate teacher sees in his students an opportunity to ignite fire of learning among passive students, and blow a wild fire a into students having a spark. He starts from the bottom of the box and from within, and takes his students to explore, dream and envision out-of-box and correlate his learning with the environment with sky as the limit. This requires a teacher to understand, beyond school, students' retardants. This helps him to regulate method, mode, pace and illustrations so as to synchronize group of students in a narrow bandwidth. Managing this kind of complexity, diversity and variance is a tough challenge. Teaching students of select class or mere teaching within the box is quite simple while outof-box approach creates a situation where students come with curiosity for which the teacher at times might not be ready to answer or provide proper explanation. Only a mentor is an apt person to handle such a situation with a simple approach to accept the mistake and take out time to provide proper answer understandable to the students in a manner that they can visualize in their surroundings. This approach has multiple benefits in grooming personality of students. Firstly, they learn that accepting mistake one does not get belittled in any way. Secondly, it is like 'stitch in time saves nine' and students tend to

gain time in finding solution for which mentor is better placed. **Thirdly**, students are mentored by a living example of courage to go ahead, take risk of unknown, with a confidence that *an error in honesty is always corrigible*.

Yet passionate teacher is prepared to accept nonresponse of his students as his personal failure and credits their rise to those who gave him the opportunity to be a teacher. Such a passionate teaching, also called *mentoring*; it is quite different from simple teaching the syllabus, coaching or tuition. Mentor is always conscious of consequences of discrimination, inappropriate seeding of concepts and their correlation and any mistake in handling his students. His focus is always welfare of his students. In the Indian scriptures Guru Dronacharya, despite creating a great archer Arjun, is a debatable character on account of his denial of learning opportunity to Karn and Eklavya; that was in accordance with his policy of discrimination. As against this, less referred to, Sandeepan Rishi is more reverable; he did not discriminate between his disciples Krishna and Sudama despite their contrasting background.

A mentor is imitable by way of his openness to think out of box and evolve better solution to each problem for the larger good. In real life it is *simple living high thinking*. A mentor is the greatest human wealth of a country and not run of the mill,

But, some questions are posed to all persons of relevance be in government, administration, management and society for brainstorming. These questions pertain to management of passionate teachers -(a) Is there any mechanism in place to identify them? (b) Are their socioeconomic needs different from others? (c) Has any effort been made to assess their needs? (d) Is there any mechanism to attract more of them in education and create a sound foundation for nation building? Passionate teachers are highly inspired and ambitious, yet their needs are minimal. They carve their way in prevalent circumstances and are therefore not demanding. Little of concern, efforts and support of people in place, who can make a difference, can yield manifold dividend. These questions are based on ground level experiences of Gyan Vigyan Sarita in reaching out to deprived students through its Interactive Online Mentoring Sessions (IOMS). Deprivation can be economical, social, cultural, ethnical, and/or geographical. No person can grow strong with any of his organ malfunctioning or weak. So is the significance of deprived children in society. They form a large population, citizens of tomorrow, for stable and sustainable growth of society and country. Imparting quality education to deprived children is a real creation of human wealth out of a large population considered to be a burden by taxpayers. This is more valid in Indian context which has been battling to see reading, writing and numerical competencies among the target students through RTE.

IOMS is an option that needs consideration for inclusive participation of elite senior citizens who had their innings and are best placed to discharge their Personal Social Responsibility (PSR) right from their place of stay. They form a rich repository of experience; experience emerging out of mistakes and even some blunders and emerge successfully with feathers in their caps. Greatest merit of this option is an increase in longevity with better health and financial conditions of senior citizens. Moreover it helps them beyond many of their psychological, family and social problems and organizes a human capital to complement teachers and mentors on the ground, which is otherwise being wasted

Conclusion: Transformation of students through mentoring cannot be achieved as a one or multistep change. It requires continuous, consistent efforts and perseverance in pursuit. It is, therefore, extremely important to debate on these questions and evolve strategies, options, methods to create an environment where teaching comes out of domain of a few passionate persons and becomes a highly coveted option. It should not remain either a profession or a compulsion for survival, if we are really sincere and serious to bring back the glory of India. It is important to recall an idiot turned into a greatest scholar in Indian history Kalidas who said that "Yesterday is but a dream, Tomorrow is only a vision. But today well lived makes every yesterday a pleasant dream and every tomorrow a vision of hope".

--00---

"Science in general and Physics in particular are not a subject to learn, but an area of observation and exploration by correlation, integration and analysis of repetitive nature, and then derive conclusions. It is a real thrill, full of fun.

But, it can't be done in dicrete manner, it has to be done patiently, like climbing long stair for a faster and purposeful journey. This is where role of education come in; it is to streamline the process."

<u>An Appeal</u>: 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:** <u>Interactive Online Mentoring Sessions (IOMS)</u> 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 <u>website</u> and operational aspects of can be online accessed at <u>IOMS</u>.

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.

Contact: Dr. Subhash Kumar Joshi, Coordinator – Gyan Vigyan Sarita.

Address: #2487, Mahagun Moderne, Sector-78, NOIDA, UP- 201309, (R): 0120-4969970;

(M):+91-9711061199,

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

-00-

Homage of a Teacher to His Teacher: Prof. J. Audretsch



On the occasion of 'Teacher's Day ' I want to pay deepest homage to my Prof. J. Audretsch who died recently.

In 1981, I got DAAD Fellowship (German academic exchange service Fellowship) for

post -doctoral research. This Fellowship is awarded through the Ministry of Education and Culture, Gov. of India. In this fellowship, I needed to contact to a professor; I wrote a letter to Prof. Audretsch, Dept. of Physics, Konstanz University and he kindly accepted my request.He not only agreed to guide me in my research work but also, to help me in other matters arising during my stay in Germany. For example, in getting a suitable accommodation, insurance. registration in the city etc.

During my stay in Germany, I had to attend four months language course and then I had to join the Univ. for research work. After the completion of two months language course Prof. Audretsch called me at Konstanz. It was my first meeting with Prof. Audretsch and his family and it was a pleasant experience.

In Sep.1981, I joined the Dept. of Physics, Konstanz Univ. Prof Audretsch had kindly provided me all possible facilities and I was able to begin my study from day one. The subject of my study was the relativistic quantum mechanics. At that time I was alien quantum mechanics and, therefore, what to talk of relativistic quantum mechanics. It was far from my imagination. Yet, in one year, I was able to complete

Prof. Ramesh Chandra

the relativistic quantum mechanics. It was possible only due to pro-active support of Prof. Audretsch.

During the first year of my stay at Konstanz I visited two or three times to the family of Prof. Audretsch on his invitation during week ends. We together with Prof. Audretsch visited some sights and the most interesting one is the Fassnacht fest.

After the completion of my one year stay at Konstanz, Prof. Audretsch insisted me to stay one year more and advised me to bring my family at Konstanz for which again Prof. Audretsch helped me a lot. My family and Prof. Audretsch's family got togetherseveral occasions and one of them was to watch film Ghandhi. It is noteworthy to recall his act of his kindness in arranging the surgery of my teacher late Prof. Verma at Friburg hospital.

In Sep.1983, I came back to India. It was a very painful decision for me and also, for Prof. Audretsch as he wanted to settle me in Germany.

We continued to correspond till 2008 via post the possible mode of communication then available. In June 2017 my elder daughter and her family visited Germany and wanted to meet Prof. Audretsch and his family but, in vain due to his serious illness. In Sep..21017 his wife informed me about the sad demise of Prof. Audretsch due to cancer. It was a matter of shock for us, as a family, and we fail to stop tears rolling down.

I take this occasion to pay my tribute to my great Teacher, mentor, well wisher and a family friend. May God bless the soul to rest in peace.



Author is a hard core researcher in the field of Theory of Relativity. In addition, he is a mentor of Mathematics. He has been pillar of this initiative at its offing through Chalk-N-Talk mode. He continues to be readily available for any advise in furtherance of this Initiative of Gyan Vigyan Sarita.

e-Mail ID:geetgunj@rediffmail.com

--00---

अंदाज ए बयां

सब कर लियो..बस टॉप न करियो प्लीज़!

समीर लाल 'समीर'

परीक्षा के परिणाम आते ही टॉपर ऐसे चर्चा में आ लेते हैं कि लगने लगता है कि अगर ये न होते तो हम किसकी बात करते?

टॉपर होना कोई आसान बात तो है नहीं ..मगर है बड़ा बवाले जान. जैसे ही आपने टॉप किया नहीं कि बस घिर गये मीडिया से लेकर कोचिंग वालों के चक्कर में . अब आप सोचेंगे कि मीडिया तो समझे मगर ये कोचिंग का अब कैसा चक्कर ? अब तो टॉप कर ही लिया ..अब किस बात की कोचिंग?

दरअसल होता यूँ हैं कि यह भी एक बिजनेस मॉडल ही है जिसमें हर कोचिंग क्लास का प्रयास होता है कि आप उन्हें इस बात का दावा कर लेने दो कि आप मेक इन उनकी कोचिंग क्लास वाले टॉपर हो ..मेक इन इंडिया टाईप मेक इन शर्मा सर की कोचिंग..इसके लिए अच्छी खासी रकम से लेकर तरह तरह के ऑफर दिये जाते हैं ..और बस, आपकी हाँ के साथ ही आप टंग लिए उनकी कोचिंग के बैनर पर ...टॉपर एक - बैनर अनेक..हालत यह हो जातें हैं कि एक ही टॉपर इतने सारे कोचिंग के बैनरों पर टंग लेता है कि अगर आप हिसाब लगायें तो एक कोचिंग से दूसरी कोचिंग से तीसरी कोचिंग आते जाते ही साल निकल लेता..बंदा स्कूल कब जाता? पढ़ता कब और परीक्षा कब लिखता? टॉप करना तो खैर दूर की बात होती.

उस पर से मीडिया आप के पिछले साल के हर दिन का हिसाब पूछ पूछ कर हालाकान हुआ जाता है कि कितना पढ़ते थे? कितनी देर सोते थे? क्या खाते थे? कौन सी कोचिंग में जाते थे? कैसे तैयारी की? अब टॉप किया है तो जबाब भी टॉपर टाईप देना पड़ते हैं. भले शाम को आलू चिप्स और आधी रात में मैगी बना कर खाई हो मगर बताना तो पोष्टिक खाना ही होगा क्यूँकि यह स्वस्थ तन देता है तो पढ़ाई में मन लगता है आदि आदि टाईप बातें जो पिछले साल के टॉपर से टीवी पर सुनी थी . टॉपर होते ही आप न जाने कितनों के रोल मॉडल हो जाते हो , यह आपको भी पता होता है . जैसे सेलीब्रेटी लोग आधा आधा शब्द खा खा कर जबाब देते हैं, कुछ वैसे ही बात करना होती है.

कई बार तो सोचता हूँ कि टॉपर्स के लिए एक ओरिन्टेशन कोर्स चला दूँ कि टॉपर होने और मीडिया से मिलने की बीच चार घंटे के लिए पधारो म्हारी क्लास ..हम आपको कोचिंग वालों से बेस्ट डील करना भी बोनस में सिखायेंगे.

इनसे इतर कुछ क्षेत्र ऐसे भी हैं जहाँ अगर आज के जमाने में आप पैदा हो गये तो घर परिवार शुभचिंतक सब यही आशीर्वाद देते मिलेंगे कि बेटा सब कर लेना बस १२ वीं में टॉप न करना नेता बन जाओ, खून कर लो, किसी को अगवा करके फिरौती काट लो, बलात्कार से लेकर दलाली जैसा चमत्कार कर लो..बाहुबली हो जाना मगर बस टॉप न करना . बाकी के हर काम की काट है ..कभी न फंसोगे और न कभी जेल होगी . बस, टॉपर और जेल की जो जुगलबन्दी है, उससे कोई न बच पा रहा है अब. कम से कम बिहार में तो.

एक बार जेल हो गई तो कैरियर खराब हो जायेगा बच्चे ..टॉप न करियो प्लीज़!!



लोकप्रिय चिट्ठाकार समीर लाल व्यवसाय से चार्टर्ड एकाउंटेंट 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

They are only saints or prophets who can keep forgiving evils.

__00___

Anyone who supports and/or camoulfleges inactions or evils of others, on pretext of divinity or any other excuse is an accomplice in the evil. Such persons are against cause of the larger good and are opposed to the passionately committed selfless mission

.—00—

Ayurveda- Health Care

Cancer

Helpful tips for Cancer patients about diet and lifestyle are brought in this article. In Ayurvedic view imbalance of Tridoshas causes problems in the body. Poor diet and lifestyle causes imbalance of Tridoshas and leads to diseases. Irregular and poor lifestyle and diet causes metabolic disturbances and non assimilated/non eliminated matter which is called Aama in Ayurveda gets accumulated in the different organs or parts of the body by the circulatory system which if untreated later causes cancerous growths.

Following diet and lifestyle is helpful.

Vegetables: Carrot, tomato, peas, pumpkin, turnip for vitamin and fiber. Cruciferous vegetables like broccoli, cauliflower and cabbage contains plant chemicals that can convert bad oestrogen into good oestrogen and hence reduce cancer risk as well as the risk of relapse. Asparagus and brussel sprouts are rich in antioxidants. Bitter gourd is good for lowering blood sugar level. Green leafy vegetables are rich as calcium and iron supplement..

Fruits: Orange and other citrus fruits provides vitamin C. Likewise, banana, kiwi, peaches, mangoes, pears and strawberries provide vitamin C and fiber.

Protein: Lean meat, fish, poultry eggs provide protein.

Carbohydrates: Rice, whole grain ,pasta, oats, corn, potatoes are rich in carbohydrates. Beans and dairy products and honey consumed in moderation are helpful as they have anti bacterial, antifungal properties help in preventing infections.

Vitamin B17 Rich Diet: Consume apple, apricot, peach, pear, sprouts, beans, strawberry, blueberry, blackberry, almonds, cashewnuts, flaxseeds, oats, brownrice, pumpin, jowar, bajra are rich in vitamin B17.which prevent cancer

Apple,Apricot,Peach,Pear,Sprouts,Beans,Strawberry,Blue berry,Blackberry,,Almonds,Cashewnuts,Flaxseeds,Oats,B rownrice,Pumpkin,Jowar,Bajra are rich in Vitamin B17.which prevent cancer.

Unfavorable Food: Deep fried, grilled, Barbequed, baked meat is since subjecting animal protein to high h\temperature it creates carcinogenic byproducts heterocyclic amines are harmful.

Excessive intake of salt, sugar and oily food, Red meat and processed meat such as bacon, ham and sausages.

Preserved food like pickles, jams and century eggs contain nitrites which are carcinogenic.

It is advised to avoid alcohol and excessive intake of vitamins.

Helpful Herbs: These are ashwagandha, garlic, ginger, turmeric, green tea, aloevera, calendula, dashmool.

Balanced PH: Maintain the alkalinity of your body. An Alkaline body can prevent disease and remain much healthier as illness and infections mainly occur in acidic body. Excess meat, dairy and refined sugars make your body more acidic. So avoid them. Take coconut water.

Healthy fats: Essential fatty acids (Plant based foods are rich in EFA like spinach , avocado, broccoli, cauliflower, beans, nuts and seeds) must be consumed.

Vitamins: Consume diet rich in zinc, vitamin C and D.

Use non-plastic bottles for drinking water.

Life style: Use non-plastic bottles for drinking water. Opt for active lifestyle. Do meditation and pranayam.

diseases.Know Ayurveda, Follow Ayurveda and Stay Healthy.



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,

e-Mail - sangeeta.pahuja3@gmail.com

—00—

Dr. Sangeeta Pahuja

Page 15 of 50 10th Monthly e-Buletin dt. Augusst 01,2019 in Fourth Year of GgyanVigyanSarita: शिक्षा http://www.gyanvigyansarita.in/

Is It A New Order? M.V. Poornima Rao

Recently, The honourable Supreme Court rejected a plea for a 10 year old rape victim from Chandigarh to undergo abortion on medical reasons. Later she delivered a female child. This incident triggered the following thoughts.

> No words no emotions no anger no outburst It is the silence that seems to be all engulfing Is this the end or the beginning of a new order I know not and my understanding fails me.

A child in a child - a biological anamoly but The sun rises, shines and sets to rise again The villain caught shamed and sent to jail You can sigh relief till he's out on bail.

What crime pray the child - mother commit To be a victim toy to the pervert's lust What innocence might have numbed her To brave the plight and still know not.

The shudder through the spine spreads Through my insides in a restless tumble Seeking answers to awkward questions Constantly buzzing in a growing maze.



Poet is a a PGT in Physics, at the Christ Church Boys' Senior Secondary School, Jabalpur. She has been in the teaching profession for last 3-1/2 decades. Her UG and PG degrees were from the Mysore University and B.Ed

from the Annamalai University. Along with teaching Physics, she evinces a keen interest in training her students for debating competitions. She is fond of reading and writing

E-mail ID: mvpoornimarao@gmail.com

पसीने का उबटन

मुकेश आनंद

चमकता है इंसान धूप और पसीने के उबटन से,

रंगत निखारने का इससे बेहतर कोइ नुस्खा नहीं होता।

तुम्हे गुमा होगा, कि तेरे हुस्न पे मरता है ये शख्श,

कायल हैं तेरे हम क्यूँकि तुझमें दिखता है अपना अक्स।

सुना था बहुत बड़े खानदान से है ताल्लुक, पर यकीन न था,

झुक कर जो अदब से मिले नाचीज से, तो इत्मीनान हो गया।

तेरी उदासी है मानो किसी आलीशान महल पे रखी खाली ताबूत; बिना वाजिब वजह के उदासी से कुछ हासिल नहीं होता।

तू खुश रहा कर, तू खुद ख्वाब है एक खूबसूरत;

तुझे तो पता है हर चाहने वाले को तू भी तो नहीं मिलता।



कवि एक अधिवक्ता एवं सामाजिक कार्यकर्ता हैं| सामाजिक विषयों पर लेखन एवं पाठन उनकी अभिरुचि है|

E-mail ID: lawexcel@gmail.com

The moment I have realized God sitting in the temple of every human body, the moment I stand in reverence before every human being and see God in him – that moment I am free from bondage, everything that binds vanishes, and I am free.

-00-

- Swami Vivekananda



__00___

There are two educations. One should teach us how to make a living, and the other how to live.

- John Adams

--00---

Education and Competition

Prakash Kale

The month is September, and we shall be observing 5^{th} September as "Teachers Day". So it is appropriate and timely that we discuss one of the most debated issues in learning and education. Whether or how much competition is relevant- for good or bad- in learning (education) process?

The relevance comes in to existence /play only when we / student take learning (hence forth only one word to mean learning as well as education) as means or tool to achieve something- may be first rank in Board Exam or get through a job interview. That is, something is not available in abundance and only winner will have it. On the other hand, if we take learning, as aim in itself and not a means to achieve something through it there is no relevance of competition. As Newton said "I know as much as only a single sand particle on beach of Sea (knowledge). Meaning knowledge is vast and abundant but I know or could take little of it. This aspect of learning will be taken at the end of article, and to begin discussion, let us now discuss about first aspect- where 99.99 % student, teacher ,school and parent pay attention or feel that primary function of learning is to prepare self /student for something tangible in life.

In this, one type of reasoning asserts that it helps the students to develop, prepare to fit in today's competitive world; counter argument is that it ruins students, self esteem, relationship and fuel resentment. Does not competition create winners and losers? Should our student compete? What about collaboration? Like that arguments and counter arguments goes on and on.

Before we discuss above pro and cons of Competition, let us understand "Competition" word itself. "Competition" simply describes an act or a situation in which two or more participants desire the same resource or outcome. In neutral term a competition is about finding the most efficient path to achieving a goal. In over 3.8 billion years of evolution, nature has found that repeated competition is the best way to identify this efficiency. Competition is an unavoidable natural process woven into the very nature of life. As humans evolved over the past few millennia our bodies have developed physiological mechanisms to address the competitions we face in nature and in more recent years in our complex societies. It is these adaptations through competition, over successive generations, that have made us the most successful species on the planet.

Further, competition is an integral part of innovation and is critical to many career and life situations, training and team-building exercises. Successful teamwork, 21st century skills, and the ability to manage stressful, competitive situations are major success factors in today's fast-paced technologydriven economy. Educational competitions can help students gain these critical real-world skills. Thus education and academic competitions are two most important ingredients of human life and these two have always been considered as important issues.

In spite of above facts, why is it that we continue to debate and oppose competition in our educational systems? We debate and oppose because of the emotions the word "Competition" generates in us. In recent years, the term "Competition" has been branded as being synonymous with aggression. Many of us automatically identify competition with having a winner and a loser. We think that the only way to use competitions in our education system is in a zero-sum, winner take all scenario. We think that a competition will dissuade the losing students from wanting to continue in their studies. We think that the mere act of competing will cause the students involved to automatically start fighting with each other and break apart relationships.

Thus our hesitancy to embrace competition in education is based on above bias, misinformation, and fear. Are there bad competitions? Yes. Can they have negative impacts on students? Yes. One of the common concerns and misconceptions most regarding education competitions is the "Competition vs Collaboration" thinking. We think of competition as the antithesis of collaboration. However, most team based competitions actually foster They create what we call "Net collaboration. Collaborative Impact" .This means - overall students will gain more than they lose through participation.

Before we analyze further, even at the cost of some repetition, for better clarity let us list out separate – separate, advantages and disadvantages claimed from competition in learning,

The advantages claimed are: Competition is a great way to motivate students, by challenging them to put in their maximum effort. Competition nurtures growth mindset, students constantly looks for ways to improve themselves. When children face competitive activities at school, they not only gain individual skills, like resilience and motivation, but they also build on important interpersonal skills. Competitive activities actually help students learn to let others have their turn, see things from others' point of view, and build a strong character in spite of failure. Thus it helps them succeed socially and academically in school. They also learn to mange subjectivity in their lives. Competition allows seeking opportunities to repeat the competition, developing new talents, and experiencing higher score. They learn to better gauge and evaluate risks. Students learn how to bend and not break under pressure. He/ she learn how to handle competitive situations. stressful. Persistence. resiliency, and grit are all components of Mental Toughness. Educational competitions in a higher secondary level provide students with safe scenarios in which they can practice these skills.

One critical piece to increase a student's academic self --identity is in having heroes and idols they can look up to. Comparison is built in to human nature and it is natural way to evaluate how one is doing on the matter that matters. For Higher secondary students comparison is mostly around items of social status; how likable are they, how many friends they have, how much respect others give us and so on. Competition in learning changes the items on which comparison is made. It helps students increase their respect for academics and interest in learning. Further, they learn through their participation that failing to achieve the best marks is not the end of the journey, but just a stepping stone, and an amazing learning experience. Limiting students from participating in competitive environments during their secondary level education can be a huge detriment to their future careers.

Above are just a few of the broad spectrum of benefits and skills that students can achieve through

educational competitions, that helps students to prepare for the workplace later in life. As, in real life, companies look for employees who are able to analyze situation, chose course of action and handle the stress of competitive situations. Unfortunately, our traditional lecture and test model of schooling leaves no opportunity for students to practice these skills. Competitions on the other hand fill this gap.

The cons of competition in schools: The first drawback is that competition, create the boundaries between individuals, or, if concerned, groups in class. Some student's eagerness to be always first, gives rise to unpleasant learning environment in which the vigor takes over the friendliness and calmness. Further by creating external incentives (we high-light the value of the task achievement as only being valuable because of external reward), we end up decreasing intrinsic motivation of students to learn. It ends curiosity for learning, student value marks then knowledge. While coaching, I know of many students, who clearly focus what is in syllabus, which problem is going to be asked etc, without showing any sign of actually learning anything. In worst case, they become a bird or animal- carrier of pollen or germs from one place (class room) and depositing at other place (exam hall) without absorbing anything for self. Competitions also easily lead to stress and especially if it promotes academic anxiety. competition between individual students. A less-thanperfect result may affect child's emotions, or hurt their confidence. In extreme case it leads to suicide. This stress forces students to push back other interests and extra-curricular activities, leading to an unbalanced life.

Losing definitely isn't easy, with some jumping ahead and others ending up left in the dust. As Competition is focused on winning, instead of honing in on learning a new skill or working as a team, it creates anxiety and a diminished desire to participate in activities. This also Increases the gaps between participating and non participating (because of indifference or fear) students at different levels and is another problem in competition in learning. It elicits the fact that, while a few achieve the advantages from competition, majority of students hardly improve their knowledge, as well as the experience they may need in the future (speaking in public, critical thinking, etc.) and all the fun they may have. Thus, what to do? Is it better to keep competition out of the way at school, so no one gets hurt? Or allow competition which is the key to unlocking even more of your child's potential?

Learning is a complex area of development for students and educators trying to help them. There are so many factors at play here it is sometimes difficult to determine what will have an impact, and if the same (competition) will have the same impact on all students. Some student appears to be motivated by competition, whereas others are not. Students who are motivated by competition are motivated for at least three reasons: competition allows them to satisfy the need to win, competition provides the reason for opportunity or improving their performance, and competition motivates them to put forth greater effort that can result in high levels of performance.

Further academic competition has its downfall, as it leads to high stress and anxiety, especially in younger students who aren't equipped to handle the pressure. Pushing kids to compete around things that don't require competition (4th grade spelling tests etc) skews the purpose of learning, elevating winning and prizes over the joy of simply doing well. However the reality are competition is everywhere. If competition is not encouraged in school, we shall deprive students of a valuable life skill (and fact). Sure we can tell kids/students that everyone is a winner, well but what happens when they get out in the real world and realize that everyone is competing for that same job at that same company? Are they prepared for this real life?

So question goes beyond yes competition or no competition, and rest in, at what age and from which class onward and in what format. This is just like what is appropriate age/class for co-education, entry of democratic process and other issues of education system. Whether competition in learning is a positive way to boost learners' knowledge and skills or not, depends on how well and adequately it is organized. We should aim for competitive activities that involve setting attainable goals and encouraging teamwork. And of course, above all, students should be kept engaged and allowed to have fun. One will harvest many things if he takes part in an appropriately constructed competition. So far as the maintenance of friendliness among classmates is concerned, students should be taught to not to always aim at the reward, neglecting his friends, and encourage them to join in and develop altogether.

Further, as seen earlier, it is a fact that competitions create winners and losers, where the losers feel that they are not good enough to perform in academics and have their academic self-concept crushed. We need to mitigate the negative impacts of not-winning competition and highlight the benefit of a participation. In basic zero-sum-game competitions, it may happen that students who repeatedly lose end up having lower self-concept in the challenge topics. Celebrate their participation. Highlight their effort that it took to get them there, and showcase how the team enjoyed every minute of the challenge. This is just one mechanism to ensure that even the "notwinners" end up benefiting from their participation. It should be ensured that just because you don't win the end goal, doesn't mean that you are a worthless goodfor-nothing student. Losing in a competition does not have to diminish the participant's self-concept.

Many good practices go hand in hand with each other, but none are guaranteed. It is critical that our educators, coaches, parents, and competition organizers understand the best-practices in executing competition design in ways to ensure these benefits are realized. Education and completions are very closely related as competitions are put in education for the development of educational skills. Indeed, without competitions, we cannot imagine education. A student has to fight in admission tests and once he/she has passed, he/she admitted in the institution. Then the institution arranges several kinds of competitions that enhance the knowledge as well as skills of a student. The exam itself is a biggest competition where a student competes to surpass others.

To conclude, competition can be a double-edged sword for students, promoting positive values under the right conditions but creating negative environments that de-motivate under the wrong ones. It is good when it provides feedback to students about their performance and improvement, when winning is not the sole or primary objective. Unfortunately winat-all costs mentality generally associated with competition can undermine motivation and dissuade them from activities they may be otherwise enjoyed. It can kill curiosity. It is critical that teachers and parents work to teach students these valuable lessons from competitions. This way win or lose, our children will learn, grow and be better prepared for life, which (like competition) provides adversity but continual opportunities to play well with others and treat opponents with dignity and respect.

But all this was all about learning as means to achieve something in life. But learning for the sake of learning (sometimes called hobby also) is really bliss in life. Inner joy, that comes, from algebra which gives end formulas to be applied without repeated calculation of arithmetic, eureka moment of knowing the height of Everest, without measuring (impossible task), with the help of Trigonometry and so on is more worthwhile than achieving something tangible. Just try to learn for learning and enjoy life . And of course age is no bar.



Staff College o-f Indian Bank, Mumbai. Currently he associated with IFBI, a joint venture of ICICI Bank and NIIT) for skill development of newly recruited bank officers, and NIBM, Pune RBI's Apex College for Executive Training. He is passionate about sharing his thought through blogs and newsletters and guiding college students for competitive exams in a non-commercial manner.E-mail: kaleprakash23@gmail.com -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-

"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

-00-

A mountain is composed of tiny grains of earth. The ocean is made up of tiny drops of water Even so, life is but an endless series of little details, actions, speeches, and thoughts. And the consequences whether good or bad even the least of them, are far reaching Swami Siyananda

-00–

बड़ा हूँ मैं या हूँ छोटा !

निरंजन धुलेकर

बनू बड़ा या मैं रह जाऊँ छोटा, जागूँ या फिर , रह जाऊँ सोता ,

हँस दूँ तो हूँ में सोने का लोटा रोऊँ तो कहलाऊँ सिक्का खोटा,

लंगोट में सुसु पॉटी कर देता कहलाता फिर , प्यारा बच्चा,

दादा दादी की गोद मे गीला, पोतड् धोते सब पीला पीला ,

छी छि ही करते चाची चाचा, गोदमे लेते पर मैं नही जाता,

घुटनों पर चलता उठ जाता, फिर घर भर में दौड़ लगता,

बस्ता बोतल खाने का डिब्बा, लाद पीठ चले ये छोटा बच्चा,

कभी झट-पट बस पर चढ़ जाता, मूड न हो तो घर पर लोट लगाता ,

टीवी पोगो पोकीमोन बच्चा, शैतानी कर घर भर दौड़ाता । टीचर मेम वो स्कूल की प्रेयर , कुछ बोलता कुछ सोता जाता,

पेंसिल गयी नया पेन है आता, मोटी किताब ये पलटता जाता,

झगड़ा झंझट बहन से करता, माँ बोलती तू नही अब बच्चा,

अपने आप क्यूँ बढ़ता जाता, जूता पैर में काटता ही जाता,

खेल खिलौने से मन भर जाता, मम्मी का मोबाइल मुझे सुहाता,

पापा मुझे देख ख़ुश हो जाते मम्मी कहती छोटा था अच्छा ।

आप बताओ , मैं क्या करता, छोटा कैसे वापस हो सकता ?

मैं तो हूँ हरदम बढ़ता बच्चा , कच्चा पक्का , मन का सच्चा ।



The author is retired banker, and graduate in G.B. Pant University of Agriculture and Technology, Pantnagar, and Master Degree in Sociology. He has experience of working numerous NGOs connected with micro-finanacing. He was associated programs on agriculture credit and priority sector financing. Doordahrdan and Akashjwani, Lucknow. He is a social thinker and writer. His poems, short stories and articles in various newspapers and magazines e-Mail ID:<u>pekushekhu@gmail.com</u> There are two educations. One should teach us how to make a living, and the other how to live.

- John Adams

--00---

- **OUR MENTORING PHILOSOPHY:** Mentoring is not teaching, neither tuition nor coaching. It is an activity driven by passion, and commerce has no place in it. In this effort is to caution students that -
- This place is not where they will be taught how to score marks and get higher ranks, but to *conceptualize and visualize subject matter in their real life* so that it becomes intuitive.
- This place is not to aim at solutions but inculcate competence *to analyze a problem and evolve solution*.
- This place does not extend selective and personalized attention, rather an opportunity to become a part of *a group of students who are focused on learning and problem solving ability collectively.*
- This place provides an opportunity to find students above and below one's own level of learning. Thus students develop not in isolation but learn from better ones and associate in problem solving to those who need help. This **group dynamics** while create a **team spirit**, *an essential attribute of personality, while one learns more by teaching others*.
- Online Mentoring is a strategic choice, so that those who are unprivileged can gather at one point and those who can facilitate learning of such students by creating, necessary IT setup. Aseperate <u>Mentor's</u> <u>Manual</u> has been developed and is being progressively supplemented with Question Banks to help students attain a proficiency in problem solving, a necessity in mathematics and science, and to support the cause.

We have completed three years of implementing this philosophy through Interactive Online Mentoring Session.

--00---

Real knowledge, like everything else of the highest value, is not to be obtained easily. It must be worked for, studied for, thought for and more than all, it must be prayed for.

Thomas Arnold

No one should teach who is not in love with teaching

Margaret E. Sangster

Education is what survives when what has been learnt has been forgotten

- BF Skinner

Page 25 of 50 10 Monthly e-Buletin dt.	Augusst 01,2019 III F	ourth fear of Ggyan vigyansarita: (sig) http://www.gyanvigyansarita.h
থিঞ্ধিক	मृणालिनी घुळे	अब आजाद है हर शख्स डॉ. संगीता पाहुजा
पहली शिक्षक माँ ही होती ममता से हमको दुलराती चलना-बोलना वो सिखाती सदाचार का पाठ पढ़ाती।		हवा चली कुछ ऐसी, आज़ादी की, कि हर शख्स आजाद हो गया, हर शख्स विदान हो गया।
दूजे शिक्षक पिता ही होते साहस और हिम्मत भरदेते अनुशासित रहना सिखलाते हाथ पकड़ शाला पहुँचाते।		न सलाह की आवश्यकता, न मशवरे की। हर शख्स उस्ताद और सलाहकार हो गया।
शाला में जो शिक्षक होते अक्षर से पहचान कराते सही ग़लत का ज्ञान कराते सद् विवेक को जागृत करते।		सबल हुए सब नर नारी,सबकी आकांक्षाएं न्यारी, एक जिस्म, दोकदमों पर टिका, स्वाभिमान का हुआ अधिकारी। होते थे कभी,एक जान,दो जिस्म नर-नारी, अब बन बैठे सब अधिकारी।
दुरूह को आसान बनाते वंद्य निंद्य का भेद बताते घन तिमिर को दूर भगाते नव प्रकाश की राह दिखाते । धन निर्धन का भेद न करते हताश को प्रोत्साहित करते जीवन पथ को प्रशस्त करते		अपनी अपनी पहचान से , कमाया सबने नाम, किन्तु फिर भी अधूरे रहे कुछ अरमान। कातर दृष्टि तलाशती,चहूं ओर उन बीते लम्हों और रिश्तों को, जिनकी अनुभूति मात्र से धन्य लगता था जीवन।
गागर में सागर भर देते। शिक्षक का सम्मान करें हम उनका नित गुणगान करें हम उनका ग्रीन गुणगान करें हम		आसमां की ऊंचाई यो को छूने में, कब डोर छूट गई स्नेहिल यादों की, न समझ पाया अधिकारी।



उनका सदैव स्मरण करें हम उनको सदैव नमन करें हम।

> 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।

ई-मेल: mrinalinighule46@gmail.com



-00---

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 | संपर्क: मो. क्र.- 9953967901, ई-मेल : sangeeta.pahuja3@gmail.com

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



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.

During growing into an expert, 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 examinations and a guide to their solutions in a structured manner, as a dynamic exercise to catalyse the conceptual thought process.

--00---

Answers: Science Quiz- August'19

Kumud Bala

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

-00-

ANSWER: CROSSWORD PUZZLE August'19: World Humanitarian Day Prof. S.B. Dhar



-00-



Students' Domain

TEACHER - A GUIDE, FRIEND, MENTOR AND EVERYTHING

V.Madhuri Krishna Priya

A teacher is the person who shapes the future of everyone by providing best education to students. A teacher plays a great role in the education of every student. A good teacher has many qualities and fully able to make students successful in life.

The teacher is very intelligent and knows well that how to draw attention on students towards study. The teacher uses creativity while teaching students, so that the students can concentrate on the same.

The teacher who takes responsibility of the future of the students is a good conductor of knowledge. He/she is ______ having lots of confidence and patience

.The teacher knows the ability of each and every student and tries to do best for them accordingly. The teacher is the God's gift in everyone's life. The teacher leads us towards success without any selfishness.

Really we can call them as builders of the dazzling future of our nation through education. Teachers who help the students are also their best friends in deciding a true path in their lives.

Our life can't be cherished without teachers. One's life without teacher is incomplete.



Author is student of class IXth at Ramakrishna Mission School, Sithanagram, Distt. Guntur, A.P. She is attending IOMS. The High School is in Third year as a learning center of IOMS for class IXth and Xth.

-00-

e-Mail ID: <u>rkmvsp@gmail.com</u>





--00---

WORLD WITHOUT BORDERS

P.Madhavilatha

God intended humans to live as one big family and we misinterpreted this. Hence boundaries came up, divisions were created and we become so involved in worrying about castes and creed that we forgot that we are humans, made of earth and will return to earth, all the same. I want these barriers to go. The ethnic cleansing taking place in China and Myanmar should be stopped. We should Seriously consider each other as fellow humans and not members of a particular caste or religion. I am not saying you demolish religions. But they should not be a division creator amongst people. The world and India, specifically, needs to learn to live with everyone. You don't get to choose who are you, which religion you are born into, which caste you belong to. But you get to choose the kind of human you are. So, make use of it.



Author is student of class IXth at Ramakrishna Mission School, Sithanagram, Distt. Guntur, A.P. She is attending IOMS. The High School is in Third year as a learning center of IOMS for class IXth and Xth.

e-Mail ID: <u>rkmvsp@gmail.com</u>

--00---

Chandrayan-2

G. Praneetha

Chandrayaan-2 is India's second lunar exploration mission after Chandrayaan-1 developed by the Indian Space Research Organization. The mission was launched from the second launching pad at Satish Dhawan Space Centre on 22 July 2019 at 2.43 PM IST to the Moon by a Geosynchronous Satellite Launch Vehicle Mark III.

The lander and the rover will land on the near side of the Moon, in the south polar region at a latitude of about 70° south on 7 September 2019. The wheeled Pragyan rover will move on the lunar surface and will perform on-site chemical analysis for 14 days (one lunar day). It can relay data to the Earth through the Chandrayaan-2 orbiter and launder, which were launched together on the same rocket. The orbiter will perform its mission for one year in a circularized lunar polar orbit of 100×100 km.

Launch of Chandrayaan-2 was originally scheduled for 15 July 2019 but was called off due to a technical snag noticed while filling the cryogenic engine of the rocket with helium about one hour before launch. It was launched on 22 July 2019 from the Satish Dhawan Space Centre at Sriharikota in Nellore district of Andhra Pradesh.

A successful landing would make India the fourth country to achieve a soft landing on the Moon, after the space agencies of the USSR, the USA and China.

If successful, Chandrayaan-2 will be the southernmost lunar landing, aiming to land at 67°S or 70°S latitude.

India's Lunar Programme will get a substantial boost. Our existing knowledge of the Moon will be significantly enhanced.



Author is student of class IXth at Ramakrishna Mission School, Sithanagram, Distt. Guntur, A.P. She is attending IOMS. The High School is in Third year as a learning center of IOMS for class IXth and Xth.

e-Mail ID: rkmvsp@gmail.com

--00---



Learning for self growth, Rearing environment for growth of all









Set-2 of Students attending IOMS who pro-acted to celebrate वृक्षारोपण महोत्सव this year are -

(1) Amrutha Varshini, Class Xth, RKM School, Vijayawada, A.P.
 (2) Shivani Panwar, Class Xth, GHSS, Kanwan Distt. Dhar, M.P.
 (3) Vikas Bhati, Class IXth, GHSS, Kanwan Distt. Dhar, M.P.
 (4) Virendra Girwal, Class IXth, GHSS, Kanwan Distt. Dhar, M.P.
 (5) Vijay Katara, Class IXth, GHSS, Kanwan Distt. Dhar, M.P.

This is not an end, just beginning to integrate nature and science

Growing With Concepts - Mathematics

LET'S DO SOME PROBLEMS IN MATHEMATICS-XIII

Prof. SB Dhar

This article contains some typical and interesting mathematical problems asked in Olympiads and different talent search tests. I hope that the readers will enjoy the problems and the way they have been solved here. The readers may try their own way to reach the results as the problems can be solved in different ways.

1. If x, y and z are strictly positive integers, and 3x=4y=9z, then find the least values of x+2y+3z.

Solution:

Let n=3x=4y=9zObviously, n is a positive integer and is equal to the LCM(3,4,9)=36 It means 3x=4y=9z=36 $\Rightarrow x=12, y=9, z=4$ Hence the least value of x+2y+3z=12+2(9)+3(4)=42

2. Let Z be the set of integers. Determine all functions $f: Z \to Z$, such that for all integers a and b, f(2a) + 2f(b) = f(f(a + b)).

Solution:

For a=0

f(0)+2f(b)=f(f(b)) ...(i)

For a=1

$$f(2)+2f(b)=f(f(b+1))$$
 ...(ii)

Replacing b by b+1 in equation (i) f(0)+2f(b+1)=f(f(b+1)) ...(iii)

On eliminating f(f(b+1)) from (ii) and (iii)

 $f(0)+2f(b+1)=f(2)+2f(b) \Longrightarrow f(b+1) - f(b) = \frac{f(2)-f(0)}{2}$

This is true for all integers b because this represents the difference of two consecutive terms i.e. common difference of an AP.

So, f(x) can be written as f(x)=mx+c

On putting this value in original equation (i)

f(2a)+2f(b)=f(f(a+b)) $\Rightarrow \{m(2a)+c\}+2(mb+c)=f\{m(a+b)+c\}$ $\Rightarrow 2m(a+b)+3c=m^{2}(a+b)+(mc+c)$

On equating coefficients of (a+b) and c from both sides

 $2m=m^2$ (iv) 3c=mc+c(v) On solving we get m=2, and c=any integer i.e. f(x)=2x+c

3. Find the area of the shaded region in the following figure.



Solution: Let *r* be the radius of the inner circle. \Rightarrow 2r+18= diameter of the large circle. \Rightarrow radius of large circle= r+9



 \Rightarrow distance between two centers = 9 Also, vertical distance from the large circle's center to the small circle= r + 9 - 10 = r - 1.



Now draw one more radius of the small circle to form a right triangle with legs 9, r-1 and a hypotenuse of r.



In the right triangle shown in the inner circle we have: $r^2 = 9^2 + (r-1)^2$ So we can solve: $r^2 = 9^2 + (r-1)^2 \Longrightarrow 0 = 9^2 + 2r + 1$ $\Longrightarrow r = 41$

Therefore, Shaded area=(Area of the large circle) -(Area of the small circle) = $\pi((r+9)^2 - r^2)$ = $\pi(50^2 - 41^2)$

- $= 819\pi$
- 4. The square is of side length 1 unit. The inscribed semi circle is on one of its side as shown in the figure. The line inside the square is starting from the top left corner. It is a tangent to the semi circle. It ends at the side of the square. Find the length of this line.



Solution: We know that the lengths of the two tangents drawn from an external point to the circle are of equal lengths.



5. Find the time shown in the clock in the figure:



Solution: The timepiece had no numbers, and it may

have been rotated out of position. Also, the second, minute and hour hands had the same length (the hands are labeled A, B, C in the diagram).

Hands A and C are pointing exactly to the hour marks on



the dial. If either was the hour hand, then the minute and the second hands would coincide at the number 12. But the clock is showing hands at 3 different positions, so this is not possible. Hence B must be the hour hand.

Since A and C are exactly at hour marks, the minute hand must be a whole number. This means that the second hand is pointing at 12 for 0 seconds. Now two cases are possible:

Case I: A is the second hand and C is the minute hand. If this is the case then A would be at 12 and then C would be at 2.

The minute hand C is then 10 minutes past the hour.



But that would mean that the hour hand B should be 10/60=1/6 past the hour or closer to 6 than 7. But the timepiece is showing the hour and closer to 7, hence this case cannot be true.

Case II: C is the second

hand and A is the minute hand.

In this case, C would be at 12 and hence A would be at 10.

The minute hand A is here 50 minutes past the hour. It means that the hour hand B should be 50/60=5/6 past the hour. This is the time that timepiece is showing because B is closer to 5 than 4.



So the time is 4:50exactly (0 seconds)

6. Simplify to the lowest terms:
$$\frac{x^6 + a^2 x^3 y}{x^6 - a^4 y^2}$$

Solution: $\frac{x^6 + a^2 x^3 y}{x^6 - a^4 y^2} = \frac{x^3 (x^3 + a^2 y)}{(x^3 + a^2 y)(x^3 - a^2 y)}$
 $= \frac{x^3}{(x^3 - a^2 y)}$

7. If *a*,*b*,*c*, *d* are positive integers with sum of 63, then find the maximum value of ab+bc+cd.

Solution: We know that, ab+bc+cd=(a+c)(b+d)-ad to have the maximum value of it, put ad=1

=

Or, *32×31-1=991*

8. Find the radius of the circle in the figure.



Solution: Let us do this problem using coordinate geometry.



From
$$A(-2,0)$$
 and $C(p,q)$
 $(-2-p)^2+q^2=r^2$
From $B(6,0)$ and $C(p,q)$
 $(6-p)^2+q^2=r^2$
On solving these equations,

p=2 , q=1/2, r = $\sqrt{16.25}$ = 4.03 (*approx*)

9. Simplify the following: $\frac{(10^4 + 324)(22^4 + 324)(34^4 + 324)(46^4 + 324)(58^4 + 324)}{(4^4 + 324)(16^4 + 324)(28^4 + 324)(40^4 + 324)(52^4 + 324)}$

Solution: We know that $a^4 + 4b^4 = (a^2 + 2b^2 - 2ab)(a^2 + 2b^2 + 2ab)$ $\Rightarrow x^4 + 4(3^4)$ $[x^2 + 2(3^2) - 2x(3)][x^2 + 2(3^2) + 2x(3)]$ $\Rightarrow x^4 + 4(3^4) = [x^2 - 6x + 18][x^2 + 6x + 18]$ $\Rightarrow x^4 + 4(3^4) = [x(x - 6) + 18][x(x + 6) + 18]$ On applying, this formula for every term in the Numerator and denominator, we get all terms cancel except $\frac{58(64)+18}{4(-2)+18} = \frac{3730}{10} = 373$

10. Simplify: $\sqrt[3]{8+3\sqrt{21}} + \sqrt[3]{8-3\sqrt{21}}$

Solution: Let $8 + 3\sqrt{21} = a$ and $8 - 3\sqrt{21} = b$ Let $x = \sqrt[3]{a} + \sqrt[3]{b}$ $\Rightarrow x^3 = a + b + 3(\sqrt[3]{a})(\sqrt[3]{b})(\sqrt[3]{a} + \sqrt[3]{b})$ $\Rightarrow x^3 = a + b + 3(\sqrt[3]{ab})(\sqrt[3]{a} + \sqrt[3]{b})$ $\Rightarrow x^3 = 8 + 3\sqrt{21} + 8 - 3\sqrt{21} + 3(\sqrt[3]{64} - 189)(x)$ $\Rightarrow x^3 = 16 - 15x$ $\Rightarrow x^3 + 15x - 16 = 0$ $\Rightarrow x = 1$ 11. Solve for x: $(x^2 - 7x + 11)^{(x^2 - 13x + 42)} = 1$

Solution: Case I:
$$1^x = 1$$
; $\forall x$
 $\Rightarrow x^2 - 7x + 11 = 1$
 $\Rightarrow x=2 \text{ or } x=5$

Case II:
$$x^0 = 1$$
; $\forall x, except \ x \neq 0$
 $\Rightarrow x^2 - 13x + 42 = 0$
 $\Rightarrow x=6 \text{ or } x=7$

For both of these values, the base is not zero, so these are the solutions as 0^0 becomes undefined.

Case III: $(-1)^{2x} = 1$; $\forall x \in Z$ $\Rightarrow x^2 - 7x + 11 = -1$

 \Rightarrow x= 3 or x=4 but we should check whether for these values the exponent is an even number or not.

For x=3, exponent is 4, an even number. For x=4, the exponent is again an even number, so these are solutions.

12. Find the sum of the corner angles of the star shown in the figure.



Solution: Let the corner angles be a,b,c,d, and e.



We know that the sum of two interior angles is equal to its exterior angle, i.e.,



Similarly, for angles c and e has an angle measure c+e



Thus the angles a, b+d, c+e are the angles of a triangle and their sum must be equal to 180 degrees, i.e., a+b+c+d+e=180 degrees.

13. Solve for x:615 + $x^2 = 2^y$, where x and y both are integers.

Solution: For $x \ge 0$, $615 \le 2^{y}$ \Rightarrow y>9 as 2⁹=512 For solution, the last digits of both sides should be equal. Hence if last digit x = 0, 1, 2, 3, 4, 5, 6, 7, 8, 9Last digits of $x^2 = 0, 1, 4, 9, 6, 5, 6, 9, 4, 1$ Let us write $615+x^2=2^y$ Or, $615+x^2=2^{2n} \implies 615=2^{2n}-x^2=(2^n-x)(2^n+x)$ We know that 615 = 1 x 615, 3 x 205, 5 x 123, 15 x 41 Also $2^{n}-x+2^{n}+x=2^{n+1}$ \Rightarrow sum of the factors must be power of 2 \Rightarrow only 5+123=128=2⁷ $\Rightarrow 2^7 = 2^{n+1}$ ⇒n=6 \Rightarrow y=2n=12 \Rightarrow y=2n=12 Also, $(2^{n}-x)-(2^{n}+x)=-2x$ So difference of factors=123-5 = -2x $\Rightarrow x = -59$ So, x=-59 and y=12

14. If a, b, c are in harmonic progression, prove that $\frac{b+a}{b-a} + \frac{b+c}{b-c} = 2$

Solution: *a,b,c* are in HP $\Rightarrow \frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ will be in AP $\Rightarrow \frac{1}{a} = A, \frac{1}{b} = A + D, \frac{1}{c} = A + 2D$ $\Rightarrow a = \frac{1}{A}, b = \frac{1}{A+D}, c = \frac{1}{A+2D}$ After putting these values in the given equation, we can find the RHS.

15. Two persons, A and B, have the exact same walking speed and the exact same running speed. One day they started the same trip to the same place. A walked for half of the distance and ran the rest while B walked for half of the time and ran for the other half of the time. Which one of A and B reached the end of the trip first?

Solution: The problem does not give any distance or speed numbers, so we can start with any number. Let A walks 500 km and then runs 500 km more. Let both A and B walk at a rate of 5 km/hour and run at the rate of 10 km/hour.

A takes time:
$$\frac{500}{5} + \frac{500}{10} = 100 + 50 = 150$$
 hours

B runs twice as fast as he walks, he has to run twice the distance so that his walking time equates his running times.

i.e., B runs $1000x_3^2 km$ and walks $\frac{1000}{3} km$. Thus, B takes time:

 $\frac{1000}{3\times5} + \frac{1000\times2}{3\times10} = \frac{200}{3} + \frac{200}{3} = 133\frac{1}{3}$ hours So, B takes less time.



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. **e-Mail ID:** <u>maths.iitk@gmail.com</u>

-00-

Mathematics is mother of all sciences

CROSSWORD PUZZLE August'19 : INDEPENDENCE DAYS OF THE WORLD COUNTRIES

Prof. SB Dhar

									1				
							2						
							3						
											4		5
6			7			8							
		9											
		10											
							11						
	12												

Acro	DSS	Down		
2	October 1	1	August 17	
6	June 12	3	July 4	
8	August 1	4	July 1	
9	August 9	5	August 14	
10	March 26	7	February 4	

- 11 August 19
- 12 July 14

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

--00---

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

-00-

Growing with Concepts : Physics

Waves and Motions : Simple Harmonic Motion

Every phenomenon that we experience has a cycle. Be it occurrence of day and night or sound created by dropping an object, human utterances, lightning thunder etc. These phenomenon are invariably observed yet their How and Why are ignored. Any cyclic phenomenon is composed of one or more sinusoidal functions. The sinusoidal function is most fundamental variation called Simple Harmonic Motion (SHM). In different SHMs their parameters frequency, amplitude and/or phase may be different but the basic function remains common. Sound waves and light waves are also cyclic and therefore understanding SHM becomes primary to understand and apply SHM. The SHM is most perceivable phenomenon yet often left un-noticed.

In light of the above, though invariably SHM is a subject matter of study in Mechanics, yet its elaboration has been integrated as a precursor of Sound and Optics in the Mentors' Manual.

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 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 lot of search results. In absence of this 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 the 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, 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.

Question Banks comprises of 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. Questions in these books 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 addition, progressively, questions from different examinations provide an opportunity to handle questions of sorts, a necessary practice to be followed once graded questions are solved.

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 required. Their patience is requested for the benefit of those students who did not have proper opportunity to understand, basics at their level, and apply them. Such students are in plenty spread all across, yet disconnected from main stream and interactive learning through IOMS. Brighter students, however, may like to take that part which matches with the wavelength of their conceptual understanding.

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 nonorganizational, 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.

ILLUSTRATIONS OF TYPICAL QUESTIONS : Waves and Motion

(Set 1, on Chapter 3 Part I: Waves and Motion, Mentors' Manual)

Question 1: Consider that a particle executes simple harmonic motion under the restoring force provided by a spring. The time period is T. If the spring is divided in two equal parts and one part is used to continue the simple harmonic motion, the time period will

(a) Remain T (b) Become 2T (c) Become $\frac{T}{2}$ (d) Become $\frac{T}{\sqrt{2}}$

Illustration 1: SHM executed by a particle under restoring force $k \text{ N.m}^{-1}$ (here it is not per meter length of spring but it is per unit deformation) of a spring has frequency $\omega = \sqrt{\frac{k}{m}} \Rightarrow 2\pi f = \sqrt{\frac{k}{m}} \Rightarrow T = 2\pi \sqrt{\frac{m}{k}}$, here *m* is mass of the particle

and spring is considered to be mass less. However, in problem mass of the particle is not given at the same time spring is also not stated to be mass less and hence m is taken to be mass of the spring which is performing SHM and hence every particle on it will experience same SHM.

Let initial time period for full length of the spring having mass m is $T = 2\pi \sqrt{\frac{m}{k}}$. When spring is divided in two equal

parts each part will have mass $\frac{m}{2}$. Accordingly, time period of the one part of spring executing SHM will be

$$T' = 2\pi \sqrt{\frac{m}{2}} = 2\pi \sqrt{\frac{m}{k}} \cdot \frac{1}{\sqrt{2}} = \frac{T}{\sqrt{2}}$$
. This derived value is provided in option (d). Hence answer is option (d).

N.B.: Here assumptions made in the solution are important and have been specially brought out for the answer to be correct.

Question 2: Two bodies A and B of equal mass are suspended from two mass less springs of spring constant k_1 and k_2 respectively. If the bodies oscillates vertically such that their maximum velocities are equal, the ratio of amplitudes of A to that of B is

(a)
$$\frac{k_1}{k_2}$$
 (b) $\sqrt{\frac{k_1}{k_2}}$ (c) $\frac{k_2}{k_1}$ (d) $\sqrt{\frac{k_2}{k_1}}$

Illustration 2: For two equal masses to attain equal maximum velocities they must stretch through equal lengths and such that net change of potential energy are equal so that as per law of conservation of energy it attains equal maximum velocities during oscillation.

Now since masses are stated to be suspended from mass less spring maximum velocity at mean position will have two different values since gravitational force external to spring-mass system is impeding the SHM. Accordingly, in for spring with its constant k_1 the equations evolve into ---

(a) during descend from top most position at height h_2 the energy equation will be $\frac{1}{2}mv_{d-\max}^2 = \frac{1}{2}k_1h_2^2 + mgh_2$. This form of equation in this case is since gravitational and spring forces additive.

(b) during ascend from bottom most position at depth h_1 the energy equation will be $\frac{1}{2}mv_{a-\max}^2 = \frac{1}{2}k_2h_1^2 - mgh_1$. This form of equation in this case is since gravitational and spring



forces subtractive.

But, here we have two equations with four variables h_1 , h_2 , v_a and h_d and they are unsolvable and same is true for other spring having different spring constant k_2 . This unsolvable situation in this problem is solved with an assumption that component of gravitational potential energy is considered negligible in comparison to spring potential energy in both the cases. This will make maximum velocity of ascend equal to maximum velocity of descend with respective maximum ascend/descend in two cases as amplitude of oscillation.

Accordingly comparing two equations taking maximum velocities for two springs $\frac{1}{2}mv_{\text{max}}^2 = \frac{1}{2}k_1h_1^2 = \frac{1}{2}k_2h_2^2 \Rightarrow \frac{h_1}{h_2} = \sqrt{\frac{k_2}{k_1}}.$ This derived value matches with answer (d), **Hence answer is option (d).**

N.B.: Here assumption made in the solution is important and have been specially discussed to derive the answer into a solvable form.

Question 3: A spring-mass system oscillates with a frequency v. If it is taken in an elevator slowly accelerating upward the frequency will –

(a) Increase (b) Decrease (c) Remain same (d) Become zero

Illustration 3: Requirement of SHM is $a_x = \frac{d^2x}{dt^2} = -kx \Rightarrow x = k\omega^2 \sin \omega t$ where $\omega = 2\pi f$ and $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$. This

relation is satisfied by the restoring force of the spring. But, when the system is taken in an elevator accelerating upward slowly, it will be acting against gravitational force and in turn diminishes its effect on maximum displacement from mean

position along Y-axis, but the frequency shall be regulated by $f = \frac{1}{2\pi} \sqrt{\frac{k}{m}}$ which is independent of acceleration of the

escalator. And hence frequency shall remain constant as provided in option(c) only. Hence answer is option (c).

N.B.: Answered arrived at with proper analysis of concept with its mathematics, it would always lead to correct answer.

Question 4: The free end of a simple pendulum is attached to the ceiling of a box. The box is taken to a height and the pendulum is oscillated. When the bob is at its lowest point, the box is released to fall freely. As seen from the box during this period the bob will

- (a) Continue its oscillation as before
- (b) Stop
- (c) Will go in a circular path
- (d) Move on a straight line

Illustration 4: It is given that a box with a simple pendulum tied to its ceiling is released for a free fall when bob of the oscillating pendulum is at its lowest point,

shown in the figure. The FBD of the bob analyzed in three different cases to analyze motion of the bob.

Case 1: It is when bob reaches its lowest as in figure. In this case string remains

taught with
$$T = m\left(g + \frac{v^2}{l}\right)$$
 . This



instant is taken to be t = 0.

Case 2: Keeping box in it position at t = 0 string is cut allowing bob to make a free fall. In this case at $t = 0^+$, on the bob – (i) along vertical axis initial velocity is $u_{y=0^+} = 0$ but acceleration remains constant at $a_y = g$, (ii) but along

horizontal direction acceleration $a_h = 0$ and hence horizontal velocity remains constant at $v_h = v$. This will lead to a projectile motion with a parabolic trajectory. But, this is not the case to be solved.

Case 3: Box is released at t = 0 as shown in the figure. Therefore, at $t = 0^+$ acceleration on the bob and the box due to gravity is equal to g. Therefore, net acceleration of the bob w.r.t. box (i.e. as seen from the box) will be

 $a_{p-b} = a_p - a_b = \left(g + \frac{v^2}{I}\right) - g = \frac{v^2}{I}$. This is the case of a circular motion of a particle experiencing centripetal force

balanced by centrifugal force of the string of fixed length l holding the bob on a circular motion about point O. This circular motion is provided only in option (c). And hence answer is option (c).

N.B.: The kind of analysis adds clarity and conviction to answer and leaves no room for the doubt.

Question 5: In simple harmonic motion

- (a) The potential energy is always equal to kinetic energy
- (b) The potential energy is never equal to kinetic energy
- (c) The average potential energy in any time interval is equal to average kinetic energy in that interval
- (d) The average potential energy in one time period is equal to average kinetic energy in this period

Illustration 5: Acceleration in SHM is defined as $a = -ky \Rightarrow \frac{d^2y}{dt^2} = -ky \dots$ (1), and displacement and velocity of the projection of particle P on Y-axis at any instant is defined as $y = A \sin \omega t$... (2), and

 $v = \frac{d}{dt}x = \frac{d}{dt}(A\sin\omega t) = A\omega\cos\omega t$...(3), where A is the amplitude of SHM, which is nothing but radius of the circular path. Acceleration of the projection is $a = \frac{d}{dt}v = \frac{d}{dt}(A\omega\cos\omega t) = -A\omega^2\sin\omega t = -\omega^2 y_t \dots$ (4), such that $k = \omega^2$ with time $y_t = x\sin\theta = r\sin\omega t$ period T such that $T = \frac{2\pi}{\omega} \dots$ (5).



In the figure displacement, potential energy, kinetic energy and total energy at different angular $\theta = \omega t$ position is shown. Kinetic energy at any instant is $KE_t = \frac{1}{2}mv^2 = \frac{1}{2}m\left(\frac{d}{dt}(A\omega\cos\omega t)\right)^2 = \frac{1}{2}m(A\omega)^2\cos^2\omega t$. It solves into $KE_{t} = \frac{1}{4}m(A\omega)^{2}(1-\sin^{2}\omega t) \dots$ (6) Thus kinetic energy at $\theta = 0, \frac{\pi}{2}, \pi, \frac{\pi}{2}$ and $2\pi \dots$ is $\frac{1}{2}m(A\omega)^{2}, 0, \frac{1}{2}m(A\omega)^{2}, 0, \frac{1}{2}m(A\omega)^{2}$ and $0\dots$ Thus it is seen that Kinetic energy is always (+) with time period $\frac{T}{2}$. $KE_t = \frac{1}{4}m(A\omega)^2(1-\sin^2\omega t)\dots$ (6) Thus kinetic energy at + 6 As regards potential energy, unlike KE energy, it is a cumulative effect such $PE_t = -\int F_t dy_t$. Here at instant *t* force $F_t = ma_t = -m\omega^2 y_t$.. that

Accordingly, $PE_r = -\int_{1}^{x} F dx = -\int_{1}^{x} -m\omega^2 y_t dt = m\omega^2 \left[\frac{y_t^2}{2}\right]^t$ it solves into $PE_r = \frac{1}{2}m\omega^2 A^2 \sin^2 \omega t = \frac{1}{2}m(A\omega)^2...(7)$, since at $t = 0 \rightarrow y_t = 0$ and using equation (2). Thus, PE energy also oscillates with twice the frequency of displacement, in a manner similar to that of kinetic energy with only one difference that it phase displaced such that when PE is maximum, KE is Zero and vice-versa in line with the principle of Conservation of Energy. Accordingly, total energy at any instant is $TE_t = KE_t + PE_t$. This leads $TE_t = \frac{1}{2}m(A\omega)^2(1-\sin^2\omega t) + \frac{1}{2}m(A\omega)^2\sin^2\omega t = \frac{1}{2}m(A\omega)^2$, using equation (6 & 7).

Thus Total energy TE_t is constant at any point of time as shown in the figure.

In light of the above analysis each of the given option is being analyzed –

Option (a): Both PE and KE are pulsating a frequency twice the displacement and both of out of phase and always $PE_t \neq KE_t$. Hence option (a) is incorrect.

Option (b): Comparing KE_t and PE_t , and testing them for equality and if it is found to be wrong then the given would

be correct. Accordingly taking
$$\frac{1}{4}m(A\omega)^2(1+\cos(2\omega t)) = \frac{mA^2\omega^2}{4}(1-\cos 2\omega t)$$
, it leads to $\cos(2\omega t) = -\cos(2\omega t) \Rightarrow 2\omega t = \frac{\pi}{2} \Rightarrow t = \frac{\pi}{4\omega} \Rightarrow t = \frac{\pi}{4\omega} = \frac{\pi}{4\left(\frac{2\pi}{T}\right)} = \frac{\pi}{8}$. It leads to corresponding angles such that

$$T \to 2\pi \Rightarrow \frac{T}{8} \to \theta = \frac{2\pi}{8} = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{3\pi}{4}, \dots$$
 Hence option (b) is correct.

interval

is

an

derived.

Using

Option (c): Average equation (6) KE in any time interval t_1 to t_2 is $KE_{Av} = \frac{\left[\frac{1}{2}m(A\omega)^2 \int_{t_1}^{t_2} \frac{(1+\cos(2\omega t))}{2}dt\right]}{t_2-t_1}$, since

$$\cos(2\omega t) = 2\cos^2 \omega t - 1 \Longrightarrow \cos^2 \omega t = \frac{1 + \cos(2\omega t)}{2}.$$
 It leads to $KE_{Av} = \frac{m(A\omega)^2}{4(t_2 - t_1)} \left[1 + \frac{\sin(2\omega t)}{2\omega}\right]_{t_1}^{t_2}$. This leads to

$$KE_{Av} = \frac{m(A\omega)^2}{4(t_2 - t_1)} \left[(t_2 - t_1) + \frac{\sin(2\omega t_2) - \sin(2\omega t_1)}{2\omega} \right]$$
 further simplifies into

$$KE_{Av} = \frac{m(A\omega)^2}{4} \left[1 + \frac{\sin(2\omega t_2) - \sin(2\omega t_1)}{2\omega(t_2 - t_1)} \right] = \frac{m(A\omega)^2}{4} (1 + D) \quad \dots \quad (8), \text{ here a new term Discriminant}$$

$$D_{Av} = \frac{\sin(2\omega t_2) - \sin(2\omega t_1)}{2\omega(t_2 - t_1)} = 0 \text{ is being a block or the simple set of t$$

$$D = \frac{\sin(2\omega t_2) - \sin(2\omega t_1)}{2\omega(t_2 - t_1)} \dots$$
(9) is being defined which will become clear when average potential energy (PE_{Av}) in

equation (7) is
$$PE_{Av} = \frac{\left[\frac{1}{2}m(A\omega)^2\int_{t_1}^{t_2}\sin^2(\omega t)dt\right]}{t_2-t_1}$$
. Since

$$\cos(2\omega t) = 1 - 2\sin^2 \omega t \Rightarrow \sin^2 \omega t = \frac{1 - \cos(2\omega t)}{2}.$$
 It further on definite integration of $\cos(2\omega t)$ occurring inderivation of equation (8) simplifies into $PE_{A\nu} = \frac{1}{4(t_2 - t_1)}m(A\omega)^2 \left[1 - \frac{\sin(2\omega t)}{2\omega}\right]_{t_1}^{t_2}.$ It leads to

$$PE_{Av} = \frac{1}{4}m(A\omega)^{2} \left[1 - \frac{\sin(2\omega t_{2}) - \sin(2\omega t_{1})}{2\omega(t_{2} - t_{1})}\right] = \frac{1}{4\omega}m(A\omega)^{2}(1 - D)\dots(10).$$
 Here, discriminant D is same as that in

equation (8), and can be considered to be analogous to discriminant in roots of a quadratic equation.

Thus for $PE_{Av} = KE_{Av}$ it is essential that $D = \frac{\sin(2\omega t_2) - \sin(2\omega t_1)}{2\omega(t_2 - t_1)} = 0 \Longrightarrow t_2 \to t_1$. In such a situation it is an instant

and not an interval. Thus this discriminant make $PE_{Av} \neq KE_{Av}$ Hence option (c) is incorrect.

Option (d): It is seen that time period of one cycle of KE and PE is $\frac{T}{2}$ and hence interval shall be $t_1 = t$ to $t_2 = t + \frac{T}{2}$.

$$2\omega t_1 = 2(2\pi f)t = 2 \times \frac{2\pi}{T} \times t = \frac{4\pi}{T}t \Longrightarrow \sin(2\omega t_1) = \sin\left(\frac{4\pi}{T}t\right).$$
 Likewise,

$$2\omega t_2 = 2\left(2\pi f\right)\left(t + \frac{T}{2}\right) = 2 \times \frac{2\pi}{T} \times \left(t + \frac{T}{2}\right) = 2\pi + \frac{4\pi}{T}t \Rightarrow \sin\left(2\omega t_2\right) = \sin\left(2\pi + \frac{4\pi}{T}t\right) = \sin\left(\frac{4\pi}{T}t\right) \quad , \quad \text{since}$$

 $\sin(2\pi + \theta) = \sin\theta$ it leads to the discriminant substituting these limiting of time in *D* defined in equation (9) it leads to $D = 0 \Rightarrow PE_{Av} = KE_{Av} = \frac{1}{4}m(A\omega)^2$, hence option (d) is incorrect.

Thus answer is option (b) and (d)

N.B.: Mathematical analysis helps in creating a conviction to the answer and in event of coming across a disagreement; it helps to arrive at logical conclusion and/or its correction, if needed. Thus it helps to enhance intuitive skill. Therefore, approaching answers mathematically is most recommended over intuitive.

Question 6: The position, velocity and acceleration of a particle executing simple harmonic motion are found to have magnitude 2 cm, 1 m.s^{-1} , and 10 m.s^{-2} at a certain instant. Find the amplitude and time period of the motion.

Illustration 6: For a particle executing SHM its displacement from mean position at any point of time *t* is $x = A\sin(\omega t + \phi)$ where *A* is amplitude of SHM, ϕ is phase displacement depending upon initial angular displacement of the particle at t = 0, and ω is angular velocity such that $\omega = 2\pi f = \frac{2\pi}{T}$, here *f* is frequency of SHM and *T* is the time period of SHM.

Accordingly, at any instance velocity of the particle is $v = \frac{d}{dt}x = A\omega\cos(\omega t + \phi)$ and acceleration of the particle is

$$a = \frac{d^2x}{dt^2} = \frac{d}{dt}v = \frac{d}{dt}\left(A\omega\cos\left(\omega t + \phi\right)\right) = -A\omega^2\sin\left(\omega t + \phi\right)$$

Using the given data at an instant, displacement is $x = A\sin(\omega t + \phi) = 2 \text{ cm} \dots (1)$, velocity is $v = A\omega\cos(\omega t + \phi) = 1 \text{ m.s}^{-1} \dots (2)$ and acceleration is $a = -A\omega^2\sin(\omega t + \phi) = 10 \text{ m.s}^{-2} \dots (3)$.

Taking ratio equations (1) and (3) $\frac{x}{a} = \frac{A\sin(\omega t + \phi)}{A\omega^2 \sin(\omega t + \phi)} = \frac{1}{\omega^2} \Rightarrow \frac{x}{a} = \frac{1}{\left(\frac{2\pi}{T}\right)^2} \Rightarrow T = 2\pi \sqrt{\frac{x}{a}}$ s. Using the given data

 $T = 2\pi \sqrt{\frac{0.02}{10}} = 0.28$ s. Thus answer of part (b) of the problem is 0.28 s.

Amplitude of oscillation A is maximum displacement. From trigonometric identity $\sin^2(\omega t + \phi) + \cos^2(\omega t + \phi) = 1$. Substituting value of $\sin(\omega t + \phi) = \frac{x}{A}$ and $\cos(\omega t + \phi) = \frac{v}{A\omega}$ from equation (1) and (2)

 $\left(\frac{x}{A}\right)^2 + \left(\frac{v}{\omega A}\right)^2 = 1 \Rightarrow A = \sqrt{x^2 + \left(\frac{vT}{2\pi}\right)^2}$. Substituting given data a value of *T* derived for part (b) of the solution $A = \sqrt{\left(0.02\right)^2 + \frac{1 \times 0.28}{2\pi}} = 0.049 \text{ m or equal to } 4.9 \text{ cm.}$ Thus answer of part (a) of the problem is 4.9 cm.

Thus answer of parts are (a) 4.9 cm and (b) 11 cm.s^{-2} .

N.B.: (a) Care is required to check units; displacement is given in cm while base unit of displacement in velocity and acceleration is meter. (b) It is not necessary that each part of the problem is independent and only solution of later part at times forms data for previous part.

Question 7: The maximum speed and acceleration of a particle executing simple harmonic motion are 10 cm.s⁻¹ and 50 cm.s⁻². Find the position(s) of the particle when the speed is 8 cm.s⁻¹.

Illustration 7: For a particle executing SHM its displacement from mean position at any point of time *t* is $x = A\sin(\omega t + \phi)$ where *A* is amplitude of SHM, ϕ is phase displacement depending upon initial angular displacement of the particle at t = 0 and ω is angular velocity such that $\omega = 2\pi f = \frac{2\pi}{2}$ here *f* is frequency of SHM and *T* is the

of the particle at t = 0, and ω is angular velocity such that $\omega = 2\pi f = \frac{2\pi}{T}$, here f is frequency of SHM and T is the time period of SHM.

Accordingly, at any instance velocity of the particle is $v = \frac{d}{dt}x = A\omega \cos(\omega t + \phi)$, and acceleration of the particle is

$$a = \frac{d^2 x}{dt^2} = \frac{d}{dt} v = \frac{d}{dt} \left(A\omega \cos\left(\omega t + \phi\right) \right) = -A\omega^2 \sin\left(\omega t + \phi\right).$$

Each of the terms has a sinusoidal multiplier whose maximum value is ONE accordingly $x_{Max} = A$, $v_{Max} = A\omega$ and $a_{Max} = A\omega^2$. Thus from given data $\frac{a_{Max}}{v_{Max}} = \frac{A\omega^2}{A\omega} = \omega \Longrightarrow \omega = \frac{50}{10} = 5$ rad.s⁻¹. Accordingly, amplitude of oscillation is $A = \frac{v_{Max}}{\omega} = \frac{10}{5} = 2$ cm.s⁻¹.

Now, since
$$v = v_{Max} \cos \omega t = v_{Max} \sqrt{1 - \sin^2 \omega t} = v_{Max} \sqrt{1 - \left(\frac{x}{A}\right)^2} \Rightarrow \left(\frac{x}{A}\right)^2 = 1 - \left(\frac{v}{v_{Max}}\right)^2 \Rightarrow x = A \left(1 - \left(\frac{v}{v_{Max}}\right)^2\right)^{\frac{1}{2}}$$
. Using

the given and derive value of A, we get $x = 2\left(1 - \left(\frac{8}{10}\right)^2\right)^{\frac{1}{2}} = \pm 1.2$. Hence answer is ± 1.2 cm from the mean position.

N.B.: Since in final expression exponent is $\frac{1}{2}$ and hence answer is assigned sign \pm

Question 8: Consider a particle moving in simple harmonic motion according to equation $x = 2.0\cos(50\pi t + \tan^{-1} 0.75)$ where x is in centimeter and t is in second. The motion is started at t = 0.

- (a) When does the particle comes to rest for the first time?
- (b) When does the acceleration have its maximum magnitude for the first time?
- (c) When does the particle comes to rest for the second rime?

Illustration 8: Motion of particle starting at t = 0 is defined by $x = 2.0 \cos(50\pi t + \tan^{-1} 0.75)$. Taking solution of each part separately –

Part (a): For particle to come to rest its velocity should be $v = 0 \Rightarrow \frac{dx}{dt} = -5 \times 50 \sin(50\pi t + \tan^{-1} 0.75) = 0$. Nearest (+)ve value of angle for its cosine to be equated to zero is $(50\pi t + \tan^{-1} 0.75) = \pi \Rightarrow t = \frac{1}{50\pi} (\pi - \tan^{-1} 0.75) = \frac{3.14 - 0.64}{50\pi} \Big|_{\tan^{-1} 0.75 = 0.64} = \frac{2.5}{50\pi} = \frac{1}{20\pi} = 1.6 \times 10^{-2}$. Hence answer of part (a) is $\frac{1}{20\pi} = 1.6 \times 10^{-2}$ s.

Part (b): For acceleration of particle to be zero $a = a_{\max} \Rightarrow \frac{dv}{dt} = 5 \times (50)^2 \cos(50t + \tan^{-1} 0.75)$. For the required solution, it leads to $50t + \tan^{-1} 0.75 = \pi \Rightarrow t = \frac{1}{50\pi} (\pi - \tan^{-1} 0.75)$. On further solving

$$t = \frac{3.14 - 0.64}{50\pi} \bigg|_{\tan^{-1} 0.75 = 0.64} = \frac{2.5}{50\pi} = \frac{1}{20\pi} = 1.6 \times 10^{-2}$$
. Hence answer of part (a) is $\frac{1}{20\pi} = 1.6 \times 10^{-2}$ s.

Part (c): For particle to come to rest second rime its velocity should be $v = 0 \Rightarrow \frac{dx}{dt} = -5 \times 50 \sin(50\pi t + \tan^{-1} 0.75) = 0$. Nearest (+)ve value of angle for its cosine to be equated to

zero
$$is(50\pi t + tan^{-1}0.75) = 2\pi \Rightarrow t = \frac{1}{50\pi}(2\pi - tan^{-1}0.75)$$
. It's solution leads to

$$t = \frac{6.28 - 0.64}{50\pi} \bigg|_{\tan^{-1} 0.75 = 0.64} = \frac{5.64}{50\pi} = 3.6 \times 10^{-2}$$
. Hence answer of part (a) is 3.6×10^{-2} s

Thus answers to each part are (a) 1.6×10^{-2} s, (b) 1.6×10^{-2} s, and (c) 3.6×10^{-2} s.

N.B.: (1) Since answer to part (c) cannot be expressed with rational coefficient of π hence answers to all parts are expressed in scientific notation to maintain coherency across all answers.

(2) Care should be taken to notice that equation of SHM is cosine function unlike generally y=used sign function. It affects the answers abruptly.

Question 9: A spring stores 5 J of energy when stretched by 25 cm. It is kept vertical with lower end fixed. A block fastened to its other end is made to undergo small oscillations. If the block makes 5 oscillations each second, what is the mass of the block?

Illustration 9: From the given data potential energy of the spring $PE_s = \frac{1}{2}kl^2 \Rightarrow 5 = \frac{1}{2}k(0.25)^2 \Rightarrow k = 160 \text{ N.m}^{-1}.$

The block fastened at free end oscillates such that its time period is $T = \frac{1}{n} = \frac{1}{5} = 0.2$ s. Time period of a spring-mass

system is $T = 2\pi \sqrt{\frac{m}{k}} \Rightarrow m = k \left(\frac{T}{2\pi}\right)^2 = 160 \left(\frac{0.2}{2\pi}\right)^2 = 0.16$ kg. Hence answer is 0.16 kg. -00-

.<u>हमारा पंचवर्षीय प्रवास</u>



Start: June-2012



April-2015



June-2016......

पारम्परिक शैक्षणिक मार्दर्शन से प्रारम्भ कर आज हम तकनीकी-विकास के सहारे मूलभूत प्रासंगिकता को आगे बढ़ने में संलग्न हैं. यह प्रयास अपने सामाजिक कर्त्तव्य के प्रति सहजविनीत आग्रह है; कृपया इस पर विचार करें.



Paradox of Learning

Growing with Concepts: Chemistry

The S-block Elements

Kumud Bala

The s-block elements are those in which the last electron enters the outermost s-orbital. Since s-sub-shell has only one orbital which can accommodate only two electrons, therefore, there are only two groups of s-block elements, alkali metals and alkaline earth metals.

Chemistry of Alkali metals: These elements belong to group 1 of the periodic table and are called alkali metals. Members of this group are Lithium (Li), Sodium (Na), Potassium (K), Rubidium (Rb) , Cesium (Cs) and Francium (Fr). These are called alkali metals because they can readily be dissolved in water to form hydroxides which are strongly alkaline in nature. They can also form alkaline oxides. Francium is a radioactive element.



	Group 1: The Alkali Metals								
Li									
Na									
ĸ									
Rb									
Cs									
Fr									

General characteristics of alkali metals: Electronic configurations of alkali metals have one electron in their outermost s-orbitals preceded by the noble gas configuration. Thus, the general configuration of alkali metals may be written as [Noble gas] ns¹ where 'n' represents the valence shell.

The electronic configuration of alkali metals are given in table below.

Atomic and ionic radii: Alkali metals have the largest atomic and ionic radii in their respective periods of the periodic table. As we move in a period, the atomic radius and ionic radius tend to decrease due to increase in the effective nuclear charge. On moving down the group atomic and ionic radii increase due to increase in the number of shells.

Element	Atomic No.	Electronic Configuration	Noble gas EC
Lithium (Li)	3	1s ² 2s ¹	[He]2s ¹
Sodium (Na)	11	1s ² 2s ² 2p ⁶ 3s ¹	[Ne]3s ¹
Potassium (K)	19	$1s^22s^22p^63s^23p^64s^1$	[Ar]4s ¹
Rubidium (Rb)	37	$1s^22s^22p^63s^23p^63d^{10}4s^24p^65s^1$	[Kr]5s ¹
Cesium (Cs)	55	$1s^22s^22p^63s^23p^63d^{10}4s^24p^64d^{10}5s^25p^66s^1$	[Xe]6s ¹
Francium (Fr)	87	$1s^22s^22p^63s^23p^63d^{10}4s^24p^64d^{10}4f^{14}5s^25p^65d^{10}6s^26p^67s^1$	[Rn]7s ¹

Ionisation enthalpy: Alkali metals have the lowest ionisation enthalpy in each period, because the valence electrons are loosely held by the nucleus, easily lose valence electrons to acquire stable noble gas configuration. Hence, they have low ionisation enthalpy. On moving down the group, the ionisation enthalpy decreases due to increase in atomic size and the magnitude of screening effect (number of inner shells). Second Ionisation enthalpies of alkali metals are very high. Because when an electron is removed from the alkali metals, they form monovalent cations which have very stable electronic configuration. Therefore, it becomes very difficult to remove the second electron from stable noble gas configuration and hence their second ionization enthalpy is very high.

For example-

 $\begin{array}{cccc} Na & \rightarrow & Na^+ & + & e^- \\ 1s^2 2s^2 2p^6 3s^1 & 1s^2 2s^2 2p^6 \end{array} I.E_1 = 496 \ kJ \ mol^- \end{array}$

Na⁺ \rightarrow Na⁺² + e⁻ I.E₂ = 4562 kJ mol⁻ 1s²2s²2p⁶ (Noble gas configuration)

Melting and boiling points: All these metals are soft and have low melting and boiling points. The alkali metals have only one valence electron per metal atom and therefore, the energy binding the atoms in the crystal lattice of the metal is low. On moving down the group from Li to Cs, melting and boiling points decrease due to increase in size of the atom and weak inter metallic bond.

Density: The densities of alkali metals are quite low as compared to other metals. Li, Na and K are even lighter than water. On moving down the group from Li to Cs, there is increase in atomic size as well as atomic mass. But the increase in atomic mass is more than the increase in atomic size. As a result, the densities (mass/volume) of

alkali metals gradually increase. However, potassium is lighter than sodium probably due to abnormal increase in atomic size of potassium.

Electropositive or metallic character: All alkali metals are strongly electropositive or metallic in character. As we move down the group metallic character increases due to decrease in ionization enthalpy and increase in electron releasing tendency. $M \rightarrow M^+ + e^-$

Oxidation state: All the alkali metals exhibit an oxidation state of +1 in their compounds. The alkali metals have only one electron in their valence shell and therefore they can lose the single valence electron readily to acquire the stable configuration of a noble gas. Thus, they form monovalent ions M^+ (M^+ = Li⁺, Na⁺, K⁺, Rb⁺, Cs⁺). Since I.E₂ is very high, they cannot form divalent ions. Thus, alkali metals are univalent and form ionic compounds.

Characteristic flame coloration: All the alkali metals and salts impart a characteristic colour to the flame.

Metal	Li	Na	K	Rb	Cs
colour	Crimson	Yellow	Pale	Red	Blue
	red		violet	violet	
λ/nm	670.8	589.2	766.5	780.0	455.5

On heating an alkali metal or its salt especially chloride due to its more volatile nature in a flame, the electrons are excited easily to higher energy levels because of absorption of energy. When these excited electrons return to their ground states, they emit extra energy in form of electromagnetic radiation which falls in the visible region there by imparting a characteristic colour to the flame.

Photoelectric effect: The alkali metals emit electrons when any radiation strikes on their surfaces. This phenomenon of emission of electrons is called photoelectric effect. Therefore, alkali metals exhibit photoelectric effect. Alkali metals have low ionization enthalpies and therefore, the electrons are easily ejected when exposed to light. Among alkali metals, cesium has lowest ionization enthalpy and hence it can show photoelectric effect to the maximum extent. Because of strong photoelectric effect, cesium is frequently used in solar cells.

Lattice enthalpies: The alkali metal salts consist of cations and anions which are held up by strong electrostatic force of attraction. Therefore, the lattice enthalpies of alkali metal salts are very high. The lattice enthalpy is defined as the amount of energy required to break one mole of an ionic compound into its free ions. MX (s) lattice energy \rightarrow M⁺(g) + X⁻(g). Therefore, lattice

enthalpy gives a measure of the force of attraction between the ions. Larger the forces of attraction, the greater will be lattice enthalpy. The lattice enthalpy also depends upon the size of the ion and its charge. For the cation of the same valency the lattice enthalpy of ionic solids having same anion decreases with increase in size of the cation due to decrease in forces of attraction between them.

Salt	Lattice enthalpy (kJ mol ⁻) decreases
LiCl	802.6
NaCl	758.7
KCl	681.4
RbCl	660.6
CsCl	618.7

Similarly, the lattice enthalpy of ionic solids having the same cation decreases with increase in size of the anion.

Salt	Lattice enthalpy (kJ mol ⁻) decreases
NaF	894.5
NaCl	758.7
NaBr	714.8
NaI	668.8

Chemical properties: The alkali metals exhibit high chemical reactivity. This is due to (i) their low ionization enthalpy (ii) low heat of atomization. Therefore, the reactivity of alkali metals increases down the group from Li to Cs.

Reactivity towards air and moisture: All the alkali metals get tarnished on exposure to air and moisture due to the formation of oxides or hydroxides or carbonates on their surfaces.

 $4M + O_2 \rightarrow 2M_2O$

 $M_2O + H_2O {\rightarrow} 2MOH$

 $2MOH + CO_2 \rightarrow M_2CO_3 + H_2O$

It is because of these reactions that alkali metals are stored in inert hydrocarbon solvent like petroleum ether and kerosene oil which prevent them from coming in contact with air and moisture.

Reactivity towards oxygen: When alkali metals are heated in excess of air or oxygen, they burn vigorously forming different types of oxides depending upon the nature of metal. Lithium forms monoxide (Li₂O), sodium forms peroxide (Na₂O₂), the other elements form super oxides (MO₂, M = K, Rb, Cs).

 $4Li + O_2 \rightarrow 2Li_2O$, Lithium monoxide $2Na + O_2 \rightarrow Na_2O_2$, Sodium peroxide

 $K + O_2 \rightarrow KO_2$

Potassium superoxide

Thus, the reactivity of alkali metals with oxygen increases down the group. Further, the increasing stability of peroxide or superoxide, as size of the metal ion increases, is due to the stabilization of larger anions by larger cations through higher lattice energies.

Explanation: Because of the small size, Li^+ has a strong positive field around it which attracts the negative charge so strongly that it does not permit the oxide anion, O^{2^-} to combine with another oxygen atom to form peroxide, $O_2^{2^-}$. On the other hand, Na^+ ion because of its larger size than Li^+ ion has comparatively weaker positive field around it which cannot prevent O^{2^-} ion to combine with another oxygen atom to form peroxide ion, $O_2^{2^-}$. The larger, K^+ , Rb^+ , and Cs^+ ions have still weaker positive fields around them which cannot prevent even peroxide ion, $O_2^{2^-}$ to combine with another oxygen atom to form superoxide, $O_2^{2^-}$.

 $\begin{array}{ccc} O_2^{2-} &+ \frac{1}{2} O_2 \rightarrow O_2^{2-} &+ O_2 \rightarrow 2O_2^{-} \\ O_2^{2-} &+ \frac{1}{2} O_2 \rightarrow 2O_2^{-} \\ O_2^{2-} &+ O_2^{2-} \\ O_2^{2-} &+ O_2^$

Reactivity towards hydrogen: All the alkali metals react with hydrogen at about 673K (except Li which reacts at 1073K) to form hydrides which are ionic in nature (M⁺H⁻).

 $2M + H_2 \xrightarrow{673} 2M^+ H^- (M = Na, K, Rb_and Cs)$

 $2Li + H_2 \rightarrow 2LiH$ (Lithium hydride)

Metal hydrides:

(i) The reactivity of alkali metals with hydrogen decreases from Li to Cs.

(ii) Aall the alkali metal hydrides are ionic solids with high melting point. However, the ionic character of the hydrides decreases from LiH to CsH.

(iii) The stability of hydrides decreases from Li to Cs. This is due to the fact that as the size of alkali metal increases from Li to Cs, the M-H bond becomes weak. Therefore, the stability of hydrides decreases.

(iv) The hydrides behave as strong reducing agents and their reducing nature increases down the group.

(v) Since these hydrides contain the hydride ion (H), therefore, they liberate hydrogen at the anode on electrolysis.

(vi) They react with proton donors such as alcohols, gaseous ammonia and alkynes liberating H_2 gas.

 $\begin{array}{lll} LiH_{(s)}+H_2O_{(l)}\rightarrow & LiOH_{(aq)} & +H_{2(g)} \ ,\\ NaH_{(s)}+ROH_{(l)}\rightarrow & RONa_{(S)}+H_{2(g)},\\ NaH_{(S)}+& NH_{3(g)}\rightarrow & NaNH_{2(s)}+H_{2(g)}\\ 2KH_{(s)}+HC\equiv CH_{(g)}\rightarrow & KC\equiv CK & + & 2H_{2(g)} \end{array}$

Potassium acetylide

Reactivity towards water: Alkali metals react with water to form hydroxides and hydrogen gas is evolved.

 $2Na+2H_2O{\rightarrow}2NaOH+H_2\text{,}$

 $2K+2H_2O \rightarrow 2KOH+H_2$

Alkali metals cannot be kept either in air or in water because they react so explosively with water that hydrogen gas evolved immediately catches fire. They are normally kept in kerosene oil or petroleum ether. Lithium reacts with water less vigorous than other alkali metals because it has least E° value, small size and very high hydration energy among the alkali metals. The hydroxides of alkali metals are strongly basic and strength of the base increases down the group.

Reactivity towards halogens: The alkali metals readily combine with halogens to form ionic halides M^+X^- e.g. $2M + X_2 \rightarrow 2MX$ (X = halogen), $2Na + Cl_2 \rightarrow 2NaCl$. The reactivity of halogens towards alkali metals increases on moving down the group. This is due to decrease in ionization enthalpy or increase in electropositive character as we move down the group. On the other hand, reactivity of halogens towards a particular alkali metal decreases from F_2 to I_2 . F_2 >Cl₂>Br₂>I₂

All the metal halides are ionic crystals. However, LiI is slightly covalent because of the polarization $(Li^+$ being the smallest cation has maximum polarizing power and iodide ion, on the other hand, being largest anion can be polarized to the maximum extent).

Solubility in liquid ammonia: All alkali metals dissolve in liquid ammonia (solubility may be as high as 5M) giving highly conducting deep blue solutions. This is due to:

(i) alkali metal atom, in the solution, readily loses the valence electron. Both the cation and the electron combine with ammonia to form ammoniated cation and ammoniated electron.

 $\begin{array}{c} M + (x{+}y) \ NH_3 \rightarrow & [M \ (NH_3)_x]^+ + [e(NH_3)_y]^- \\ Ammoniated \\ Cation \\ Electron \end{array}$

The ammoniated electron is responsible for the blue colour of the solution. The electrical conductivity is due to the ammoniated cation as well as ammoniated electron. The dilute solutions are paramagnetic because they contain free ammoniated electrons. When the concentration increases, the ammoniated metal ions may get bound by free unpaired electrons. This is described as expanded metals. The solutions become bronze in colour and paramagnetic character decreases. The decrease in paramagnetic character suggests that in concentrated solutions, the ammoniated electrons also associate to form electron pairs $(2e^{-}(NH_3)_y \rightarrow [e^{-}(NH_3)_y]_2)$ thus, blue colored solutions (less concentration) are paramagnetic while bronze colored solutions (high concentration) are diamagnetic. The conductivity decreases as the concentration increases.

(ii) On standing, the solutions slowly liberate hydrogen and therefore, are unstable with respect to amide formation $(2M + 2NH_3 \rightarrow 2MNH_2 + H_2)$.

(iii) In presence of impurities or catalysts, such as Fe, Pt, Zn etc., the blue colored solutions decompose to form metal amides with the libration of H_2 . However, under anhydrous condition and in the absence of catalytic impurities such as transition metal ions, these solutions can be stored for several days.

Hydration of ions: The alkali metal ions are highly hydrated. The smaller the size of the ion, the greater is the degree of hydration. Thus, Li^+ ion gets much more hydrated than Na⁺ ion which is more hydrated than K⁺ ion and so on. Therefore, the extent of hydration decreases from Li⁺ to Cs⁺. As a result of larger hydration of Li⁺ ion than Na⁺ ion , the ionic radii in water decrease in the order: Li⁺>Na⁺>K⁺>Rb⁺>Cs⁺. The hydrated Li⁺ ion being largest in size has the lowest mobility in water. On the other hand, the hydrated Cs⁺ ion being smallest in size has the highest mobility in water. Li⁺ has highest degree of hydration and therefore, lithium salts are mostly hydrated e.g. LiCl.2H₂O.

Reducing nature: Alkali metals are strong reducing agents. This is due to their greater ease to lose electrons. This is also indicated by the very large negative values of their reduction potentials (E°).

Element	Li	Na	Κ	Rb	Cs
E° value	-3.04	-2.714	-2.925	-2.930	-2.927
(V)					

All of them are better reducing agents than hydrogen ($E^{\circ} =$ zero). Therefore, these metals react with compounds containing acidic hydrogen atoms, such as alcohols and acetylene, liberating hydrogen.

 $\begin{array}{rcl} 2\text{Li} + 2\text{C}_2\text{H}_5\text{OH} & \rightarrow & 2\text{C}_2\text{H}_5\text{OLi} + \text{H}_2 \\ 2\text{Na} + 2\text{HC} \equiv \text{CH} & \rightarrow & \text{NaC} \equiv \text{CNa} + \text{H}_2 \end{array}$

Lithium, the first element of the group is expected to be the weakest reducing agent due to its very high ionization enthalpy. However, it is the strongest reducing agent as indicated by its reduction potential value (-3.04V). This anomaly can be explained as:

We know that ionization is the property of isolated atoms in the gaseous state.

 $M(g) \rightarrow M^+(g) + e^-$ (Ionization enthalpy)

and oxidation potential is the property when the metal goes into the solution as $M^{\scriptscriptstyle +}\left(aq\right)$ ions:

 $M(s) \rightarrow M^+(g) + e^-$ (Oxidation potential).

The process of oxidation may be thought to proceed as:

(i) M (s) \rightarrow M (g) Δ H sublimation

(ii) $M(g) \rightarrow M^+(g) + e^-$ Ionization enthalpy

(iii) $M^+(g) + H_2O \rightarrow M^+(aq)$ Hydration enthalpy

The overall tendency for the change depends upon the net effect of three steps. Now, we know that Li^+ has the smallest size and is hydrated to maximum extent. Therefore, large amount of energy (called hydration enthalpy) is released in the third step. The amount of energy released (third step) is so large that it compensates the higher energy needed to remove electron (second step). The net effect is that it has greater tendency to lose electrons in solution than other alkali metals and the reaction:

Li (s) \rightarrow Li⁺ (aq) + e⁻ occurs easily.

Therefore, lithium is the strongest reducing agent because of its greater hydration energy.

Assignment

1. Which of the following is not alkali metal? (A) Na (B) Fr (C) Ca (D) K

2. Which of the following is radioactive alkali metal?

 $(A) Fr \qquad (B) Ra \qquad (C) At \qquad (D) Rn$

3. The metallic luster exhibited by sodium is explained by

- (A) diffusion of sodium ions
- (B) oscillation of loose electrons
- (C) excitation of free electrons
- (D) existence of body centred cubic lattice in aqueous solution

4. The correct order of mobility of alkali metal ions in aqueous solution is

- (A) $Na^+ > K^+ > Rb^+ > Li^+$
- (B) $K^+ > Rb^+ > Na^+ > Li^+$
- (C) $Rb^+ > K^+ > Na^+ > Li^+$
- (D) $Li^+ > K^+ > Na^+ > Rb^+$

5. The ionic mobility of alkali metal ions in aqueous solution is maximum for

(A) Rb^+ (B) Li^+ (C) Na^+ (D) K^+

6. The correct order of reducing character of alkali metals is

(A) Rb<K< Na <Li

(B) Li<Na< K< Rb(C) Na< K<Rb<Li(D) Rb <Na<K<Li

7. The increasing order of the density of alkali metals....

(A) Li<K<Na<Rb<Cs (B) Li<Na<K<Rb<Cs (C) Cs<Rb<Na<K<Li (D) Cs<Rb<K<Na<Li

8. The strongest base among the following is...... (A) NaOH (B) KOH (C) LiOH (D) CsOH

9. Alkali metals have negative reduction potential and hence they behave as.....

(A) Oxidizing agent(B) Lewis bases

- (C) Reducing agents
- (D) Electrolytes

10. The metal that produces red-violet colour in the non-luminous flame is

(A) Na (B) Cs (C) Rb (D) K

ANSWERS

$$1 (C) \quad 5(W) \quad 3(B) \quad 4(C) \quad 2(W) \quad 6 (C) \quad 1(W) \quad 8(D) \quad 0(C) \quad 10(C)$$



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-

Take care of your thoughts, For they are formed and moulded by our thoughts. Those whose minds are shaped by selfless thoughts, Give joy when they speak or act. Joy follows them like a shad, that never leaves them.

Gautama Buddha



Never regard study as a duty, but as the enviable opportunity to learn to know the liberating influence of beauty in the realm of the spirit for your own personal joy and to the profit of the community to which your later work belongs.

(Albert Einstein)

izquotes.com

SCIENCE QUIZ : September-2019

1. Which of the following petroleum product is used for surfacing of roads?

(A) Coke (B) Bitumen

- (C) Coal (D) Petroleum
- 2. Various materials which are obtained from nature are called natural resources. Which of the following is not a natural resource?

(A) Minerals	(B) Water
(C) Soil	(D) Plastic

- 3. Choose the correct statement from the following:
 - (A) It is difficult to transport natural gas through pipes.
 - (B) The disadvantage of natural gas is that it cannot be used directly for burning in homes.
 - (C) Natural gas is stored under high pressure as compressed natural gas.
 - (D) Natural gas cannot be used for power generation.
- 4. Choose the correct statement from the following:
 - (A) Fossil fuels can be made in the laboratory.
 - (B) CNG is more polluting fuel than petrol.
 - (C) Coke is almost pure form of carbon.
 - (D) Kerosene is not a fossil fuel.
- 5. Coal is processed in industries to get some useful products. Which of the following is not obtained from coal?

(A) Coke(B) Coal tar(C) Coal gas(D) CNG

6. Air is a natural resource and cannot be exhausted by human activities. It is known as inexhaustible natural resource. Which of the following is another inexhaustible natural resource?

(A) Coal	(B) Petroleum
(C) Sun light	(D) Minerals

- 7. Coal is formed from the remains of
 - (A) Vegetation only
 - (B) Animals only
 - (C) Both vegetation and animals
 - (D) Neither vegetation nor animals.
- Fossil fuels are obtained from
 (A) Remains of non-living materials

- (B) Dead remains of birds only
- (C) Dead remains of insects only
- (D) Dead remains of living organisms
- 9. Petroleum is as formed from
 - (A) Organisms living in the sea
 - (B) Organisms living on the land
 - (C) Organisms living on the rocks
 - (D) Organisms living on the plants.
- 10. Petroleum is a mixture of various constituents such as
 - (A) Petroleum gas, petrol, diesel, lubricating oil, paraffin wax.
 - (B) Paraffin wax, coal tar, coal gas, diesel
 - (C) Lubricating oil, paraffin wax, petrol, coke
 - (D) Petroleum gas, coal gas, petrol, coke, coal.
- 11. Which of the following is used as starting materials for manufacturing synthetic dyes, drugs, explosives, perfumes plastics, paints etc.(A) Coal(B) Coke
 - (C) Coal tar (D) Coal gas
- 12. Which of the following is least polluting fuel for vehicles?
 - (A) CNG (B) Petrol
 - (C) Diesel (D) Coke
- 13. What is the slow process of conversation of dead vegetation into coal called?
 - (A) Carbonization (B) Lubrication
 - (C) Petroleum refinery (D) Petroleum
- 14. 'Black gold' is another name for
 - (A) Coal(B) Coke(C) Charcoal(D) Petroleum
- 15. Out of the following, which fuel is best used in the homes?
 - (A) Wood (B) CNG
 - (C) LPG (D) Kerosene oil
- 16. Which of the following is a group of products obtained from coal?
 - (A) Paraffin wax, lubricating oil, coke
 - (B) Bitumen, paraffin wax, coal tar
 - (C) Coke, coal tar, coal gas
 - (D) Naphthalene, lubricating oil, bitumen

Kumud Bala

- 17. Which of the following is a pair of inexhaustible natural resources?
 - (A) Soil and coal
 - (B) Water and petroleum
 - (C) Wildlife and minerals
 - (D) Air and sunlight
- 18. Which of the following substances is formed by the carbonization of dead vegetation?
 - (A) Coke (B) Coal tar
 - (C) Coal gas (D) Coal
- 19. In India, the petroleum conservation research association (PCRA) advises people how to save petrol/diesel while driving. Their tips are:
 - (A) Drive at a constant and moderate speed
 - (B) Switch off the engine at traffic lights
 - (C) Ensure correct type pressure and regular maintenance of the vehicle.
 - (D) All the above

.

20. The unit of calorific value of combustion of fuel is

(A) Kkilojoules	(B) Joule
(C) Kilojoules/kilogram	(D)Kilogram

21. Two disadvantages of using fossil fuels are------

(i) Air pollution (ii) Global warming (iii) Better environment (iv) Less risk of global warming

- (A) (i) and (ii) (B) (ii) and (iii)
- (C) (i) and (iv) (D) (iii) and (iv)

- 22. How is petroleum gas obtained?
 - (A) Petroleum gas is obtained during fractional distillation of petroleum.
 - (B) When coal is heated in absence of air.
 - (C) It was formed from the remains of vegetation.
 - (D) None of these
- 23. The process of heating a substance in absence of air is called
 - (A) Destructive distillation
 - (B) Carbonization

(C) Fossil fuel

- (D) fractional distillation
- 24. The places where natural gas is found in India------
 - (A) Tripura and the Krishna Godavari delta
 - (B) Assam, Tripura
 - (C) Rajasthan, Gujarat
 - (D) Maharashtra, Tamil Naidu
- 25. Coal and petroleum resources are limited. We should use them judiciously because
 - (A) It will delay the energy crisis.
 - (B) It will give the scientists more time to develop more efficient alternate sources of energy.
 - (C) It will result in better environment, less risk of global warming and they will be available for a longer period.
 - (D) All the above

Education is not the answer to the question. Education is the means to the answer to all questions. - William Allin

—00—

Education is not job training; the function of education is to instill an appreciation

of our place in the flow of time and space, to expand our intellectual and empathetic understanding of nature and people.

-Jonathan Lockwood Huie

Theme Song :

<u>PREMISE:We are pleased to adopt a song</u>" इतनी शक्ति हमें देना दाता....."from a old Hindi MovieDo 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 nonorganizational 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 Each Achieves More (TEAM)

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





