# GYAN VIGYAN SARITA:शिक्षा

A non-organizational, non-remunerative, non-commercial and non-political initiative to Democratize Education as a Personal Social Responsibility (PSR) 9<sup>th</sup> Monthly e-Bulletin dt 1<sup>st</sup> July'19, Fourth Year of the Publication





#### CONTENTS: (Against Each Content Page Number is Indicated for Convenience)

IOMS Graphical perspective (3)

IT Infrastructure (4)

Editorial – शिक्षा प्रणाली की मांग: दकियानू सीपद्धति छोड़ें, काम की बातें सिखाएं (5)

#### Coordinator's Views- Old Age – Waste? (7)

An Appeal (10)

Our Five Year's Journey (33)

Our Mentoring Philosophy

#### **Regular Columns**

- > दाज ए बयां: सात समुंदर पार आती गली.....-समीर लाल 'समीर'(11)
- Ayurveda Health Care: Prevention From Seasonal Problems in Varsha Ritu Dr Sangeeta Pahuja (12)

#### Articles

- > New Education Policy A Review Prakash Kale (14)
- समर्पितशिक्षक एक परिचय (17)

#### Poems

- > वन से घन है .... मृणालिनी घुळे (18)
- मायावी दुनिया.... डॉ. संगीता पाहुजा (18)

#### Students' Section

\* It's Not Just A CLOWN... (Episode 2)– Chyanis Tiwari (21)

#### Growing With Concepts (19)

- Mathematics: Let's Do Some Problems in Mathematics-XI Prof. SB Dhar (22)
- Physics: Understanding Specific Heat of Gases (26) Typical Questions with Illustrations (27)
- Chemistry: Ionic Equilibrium Kumud Bala (34)

#### Quizzes

- Crossword Puzzle: Etiquettes of India Prof. SB Dhar (25)
- Science Quiz: June'19 *Kumud Bala* (41)

#### From Previous e-Bulletin

Answers to Science Quiz: June'19- Kumud Bala (20)

Answer: Crossword Puzzle June'19 - Etiquettes of India - Prof. SB Dhar (20)

Invitation for Contribution of Articles (6)

Theme Song (43)

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

- Cover Page Graphics Deepali Mandsorwale, Vadodara, Master Fine Arts, Freelance Artist/Teacher/Theme Decorator, Contact: (M) 7778092949, E-mail ID: <u>deepalisaiemandsorwale@gmail.com</u>
- Disclaimer: Views expressed in this bulletin are author's view and Gyan Vigyan Sarita মিধ্বা, Publishers of this 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).

--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)



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 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



earning

Centre - 2



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/



Learning

Centre - 3

Learning

Centre

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

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

Learning Center (if asked for by	y 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	nthly data transfer	Internet charges, based on estimated	monthly data transfer which			
which depends upon choice of cloud platf	orm, and tariffs of	depends upon choice of cloud platform, a	nd tariffs of ISP			
ISP						
Cloud platform :						
a. A-VIEW indegeneously devel	oped by Amrita	IOMS is since an initiative driv	ven with Personal Social			
University. It is found to be bes	t among available	Responsibility (PSR) operating n Zero-Fund-&-Zero-Asset (ZFZA)				
options for use in IOMS. It has b	been developed for	basis, the Cloud Platform has to provided by Learning Centers for				
use in imparting Interactive (	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 collectiv	vely complementing the cost			
manner. Cloud platform.		of Cloud Platform, whenever payab	le, for arriving at a mutual			
		agreement for cost sharing.				
b. The IOMS envisages session up	pto Five Learning					
Centers. Charges for the pl	atform whenever	So also IT Infrastructure with the Mentors has been in use and is				
payable may be shared ac	cross in mutual	working. But, at any stage if upgradation becomes essential,				
agreement between Learning Cer	nters.	support of learning centers, beneficiaries of the initiative, is				
		gratefully welcomed on ZFZA basis.				
c. Benefit of sharing of charges	of cloud platform					
can be optimized with offset o	f schedule among	Operating cost of Mentor, if required, shall be supported by				
multiple sessions of IOMS, to	the extent Mentor	Learning Centers				
can deliver.						

**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.

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

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-

# <u>संपादकीय</u> शिक्षा-प्रणाली की मांग : दकियानूसी पद्धति छोड़ें , काम की बातें सिखाएं



मनुष्य को जीवित रहने के लिये तीन चीजें जरूरी होती हैं-भोजन, कपड़ा और मकान। भोजन शरीर को ऊर्जा देता है, कपड़ा शरीर ढंकता है और मकान मनुष्य को काम के बाद आराम देता है। परंतु मनुष्य को प्रतिष्ठापूर्ण जीवन जीने के लिये केवल एक चीज की जरूरत होती है और वह है-उसका ज्ञानवान होना।

ज्ञान एक पूर्ण वस्तु है। इसके बारे में कहा गया है-

ओम् पूर्णमदः पूर्णमिदं पूर्णात्पूर्णमुदच्यते

पूर्णस्य पूर्णमादाय पूर्णमेवावशिष्यते

अर्थात् यह पूर्ण है। यह इस प्रकार की पूर्ण वस्तु है कि उससे पूर्ण निकाल लेने पर भी वह पूर्ण ही बचा रहता है।

यही पूर्ण ज्ञान पाना हर एक इंसान की इच्छा रहती है क्योंकि ज्ञान ही व्यक्ति को यश, श्रेय और संपदा दिलाता है। यश और श्रेय जिस शिक्षा से मिले वही शिक्षा गुणवत्तापरक शिक्षा कहलाती है।

ज्ञान मनुष्य की वह तीसरी आंख होती है जिससे वह उन वस्तुओं को देख पाता है जिसे उसकी दोनों आंखें नहीं देख पाती हैं। ज्ञान की आंख से वह अपने पीठ की तरफ की वस्तुओं को देख सकता है, कमरे में छिपी वस्तुओं को देख पाता है और दूर होने वाली घटनाओं को भी देख पाता है।

ब्रहमांड में करोड़ो किलोमीटर दूर स्थित ग्रहों के बारे में पृथ्वी का वैज्ञानिक इसी ज्ञान की आँख के कारण जान पाता है, वहां अपना यान भेज पाता है और फिर वहां से उसे वापिस भी बुला लेता है।

ब्रिटेन में कई सालों पहले शिक्षा में अधिक निवेश के लिये एक नारा इजाद हुआ था-यदि आप सोचते हैं कि शिक्षा मंहगी है तो फिर ठीक है, अनपढ़ बने रहें। निवेश की इस परंपरा ने शिक्षा को हर देश में बहुत महंगा बना दिया। आज सामान्य शिक्षा भी कीमती हो गयी है। ऐसी विषम परिस्थिति में भी हिंदुस्तानी ही ऐसा जागरूक है जो हर हाल में अपने बच्चों को अच्छी से अच्छी शिक्षा दिलाने के लिये प्रयत्नशील है।

शिक्षा के व्यावसायीकरण के कारण साधारण व्यक्ति की पहुँच शिक्षा से दूर हो रही है। शिक्षा पर सरकार का नियंत्रण नहीं रह गया है। बहुत से शहरों में नर्सरी की पढ़ाई का खर्च, आई0 आई0 टी0 की पढाई के खर्च से अधिक हो गया है।

सरकार की लापरवाही यह है कि वह हर साल कोई न कोई प्रयोग करती रहती है। उसके शिक्षा सलाहकार वे हैं जो खुद बीसवीं सदी में पढ़े और आज की जरूरत के अनुसार अपने को अपडेट रखने में असफल हैं, फिर भी 21 वीं सदी में दकियानूसी पद्धति को चलाये रखने के लिये कमर कसे हुये हैं। उत्तम शिक्षा वह होती है जो समय के अनुकूल हो, सबकी पहुंच में हो और रोजगार दिलाने वाली हो। आज जरूरत है उस शिक्षा पद्धति की, जो बच्चों को वह पढ़ाये-सिखाये जिनमें उनकी रूचि हो, जिसमें समय की बचत हो, जो जीवन पर्यंत उपयोगी रहे और जिससे समाज व राष्ट्र की प्रगति में सहायता मिले।

हमारे विद्यालय-उच्च विद्यालय पहले 20 साल तक की उम्र तक ऐसी शिक्षा देते हैं जिससे पढ़ने वाले को जीविका चलाने के लिये कोई काम नहीं मिलता है। फिर छात्र नौकरी के लिये विशेष कोर्स करते हैं और नौकरी की तलाश शुरू करते हैं।

क्या विडंबना है कि इंजिनियरिंग की पढ़ाई पूरा करने के बाद भी भारत में छात्रों को कोई तकनीकी ज्ञान नहीं होता है। National Employability Report Engineers, 2019 के अनुसार वर्ष 2010 से इंजिनियर्स के ज्ञान-वृद्धि के स्तर में कोई परिवर्तन नहीं हुआ है। केवल 3.84% भारतीय इंजिनियर साफटवेयर संबंधी नौकरी के लिये उपयुक्त पाये गये हैं।

क्या विडंबना है कि हमारे देश के डाक्टर किसी त्राशदी की अवस्था में अधिकांश जानें बचाने में असमर्थ रहते हैं और कोई न कोई बहाना बनाकर चलते बनते हैं? हर साल एक ही बीमारी आती है और अनेकों जानें ले जाती है पर कुछ भी भविष्य के लिये नहीं सीखा जाता है। अभी हाल में इंसेफेलाइटिस ने अनेक बच्चों की जान ले ली है।

हमें प्रारंभ में कई विषयों को छोड़कर बच्चों को केवल भाषा, गणित और विज्ञान की अच्छी से अच्छी शिक्षा देने पर विचार करना चाहिये।

अच्छी भाषा का ज्ञान मनुष्य को अच्छी तरह अपने को अभिव्यक्त करने में सहायता करता है। गणित की जानकारी से रोजमर्रा की जिंदगी सरल हो जाती है। विज्ञान का ज्ञान समस्याओं का समाधान तार्किक तरीके से करने में मदद देता है।

भाषा और गणित का समन्वय ही विज्ञान है। विज्ञान मनुष्य के पास बहुत पहले से है। जब मनुष्य नहीं था, विज्ञान तब भी था। विज्ञान मुख्यतः दो प्रकार का होता है - प्राकृतिक विज्ञान जैसे भौतिकी, रसायन, जीव विज्ञान आदि और दूसरा सामाजिक विज्ञान जैसे- इतिहास, अर्थशास्त्र आदि।

विज्ञान सदा हमारे साथ रहता है। जिस समाज और देश के निवासियों का वैज्ञानिक ज्ञान कम होता है, उनकी उन्नति भी धीमी गति से होती है। विज्ञान का अध्ययन ही पूर्ण ज्ञान की प्राप्ति करना है।

विज्ञान हमारी जीवन शैली को बदलने और उसे ऊँचा उठाने में बहुत मदद करता है। विज्ञान ने हमें अंधेरे से प्रकाश में रहना सिखाया है। विज्ञान ने हमें पैदल की जगह सायकिल, मोटर आदि पर चलाया है। विज्ञान ने मोबाइल फोन दिया, मनोरंजन के लिये टीवी आदि दिया और जानकारी के लिये इंटरनेट दिया है। विज्ञान ने हमें चांद और अन्य ग्रहों तक पहुंचा दिया है। विज्ञान कभी धोखा नहीं देता है।

विज्ञान हममें सत्य को पकड़ने और परखने की शक्ति पैदा करता है। विज्ञान कदम दर कदम आगे बढ़ने की तरकीबें सुझाता है। विज्ञान इंसानी जिंदगी को बेहतर बनाता है। विज्ञान हमें सक्षम बनाता है। विज्ञान ब्रह्माण्ड के रहस्यों को सुलझाने का प्रयत करता है।

आइंसटीन को तर्कशीलता में ही विज्ञान दीखता था। उनका कहना था कि कल से सीखो, आज में जिओ और कल के बारे में आशावान रहो लेकिन तर्कशीलता न छोड़ो।

गणित को एक शाश्वत भाषा माना गया है क्योंकि गणित के बिना विज्ञान का होना संभव नहीं है। गणित के बिना पुल, मकान, अस्पताल आदि कुछ टिक नहीं सकते हैं। गणित ही वह ज्ञान है जो हमें ब्रहमांड के गहन सत्यों का साक्षात्कार कराता है। गणितज्ञ टोबियास डांटजिज के अनुसार, गणित सर्वोच्च न्यायाधीश होता है जिसके फैसलों पर कोई अपील नहीं होती है। क्या आज की शिक्षा हमें यह सोचने पर मजबूर नहीं करती है कि दसवीं और बारहवीं में शत-प्रतिशत अंक पाने वाले विद्यार्थी तब कहां चले जाते हैं जब उनको उच्च शिक्षा संस्थानों में पढ़ने की जरूरत होती है?

प्रश्नों के उत्तर देने की आब्जेक्टिव पद्धति सीखने की क्षमता को बहुत प्रभावित कर रही है। इसके बढ़ते उपयोग से विषयों के प्रति गंभीरता ख़त्म हो रही है। इसके प्रयोग से भाषा पर पकड़ समाप्त हो रही है, उत्तर ढूंढ़ने की चाह खत्म हो रही है, व्याख्यात्मक क्षमता का अभाव होता जा रहा है और चार विकल्पों की तलाश बढ़ रही है। अगर विकल्प नहीं हैं, तो उत्तर देना असंभव हो जा रहा है। सबसे खराब बात यह है कि सही उत्तर की तलाश, अनमान से करने की आदत बढ रही है।

ज्ञान विज्ञान सरिता परिवार ने इस बात की परख की है कि भाषा, गणित और विज्ञान को बहुत आसानी से बच्चों को सिखाया जा सकता है, बशर्ते सिखाने वाले कठिन परिश्रम करें। आज सीखने वाले बच्चों को, सिखाने वाले शिक्षकों से अधिक परिश्रम करना पड़ता है क्योंकि शिक्षकों ने अपना वह उत्तरदायित्व छोड़ दिया है जिसमें वे विषय को आसान बनाकर बच्चे को सिखाया करते थे। चलिए, अच्छे परिणाम की आशा में एक मजबूत शुरुआत

## -00-

## 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:**  $RRR_{I}$  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  $20^{th}$  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: Refer due on 1<sup>st</sup> of ensuing month.
- >This cycle of monthly supplement e-Bulletin <u>Gyan-Vigyan Sarita: रिक्र</u> 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-

**Coordinator's View** 



#### **Old Age - Waste ?**

Basic premise of economics is that resources are never in abundance. Economic process is all about optimizing the gain. Optimization leads to maximizing the profit and minimizing the loss. This eventually leads to classify waste as those products or services which consume the gains from other commodities. Yet certain waste is intrinsic to the gains. There are plethora of knowledge, deliberations and volumes on waste management and that drew attention to understand - what is waste? This article dwells on philosophy of waste, rather than waste management and/or technology in use. It emphasizes upon eradication of aberrations in the thought process in consideration of waste. Once this happens, human are intelligent enough to evolve means of reducing generation of waste and its menace. It also attempts to touch upon emotiona- economical aspects of old age considered to be a burden by a few, a waste. It is an extremely complex socio-economic-cultural-emotional issue. Yet this attempt to trigger brainstorming among elites.

Waste is a relative notion. A businessman treats an activity waste. While doing so, they forget that most of them are that does not yield him expected return as a waste of time. suffering from bronchial infection, lack of plantation, heaps Yet, the activity abandoned by a businessman, is an of inseparable biodegradable and non-biodegradable opportunity for less ambitious one. Thus expectations of profit drive business philosophy. Greed to amass wealth, keeping it unutilized, is another dimension of waste. In economics there is a famous phrase 'wealth generates wealth'. It promotes use of wealth as a resource in fostering economic activities. Yet, there is another perspective to waste – a product or service that whose sustenance consumes more resources than the return it can yield.

Waste for one could be an opportunity of survival for another. Simplest example of the waste is food leftover by affluent families; it has potential to relieve hungry-sleep of starving persons. Every nutritious food of men or animal after completing digestion cycle creates a waste. But, the waste has potential of increasing agricultural yield or a food for other creatures. This surplus food or bio-waste of livestock, unless recycled properly, becomes a burden on the social systems. This burden is in the form of unhygienic conditions leading to spread of epidemics. Fighting out such condition consumes disproportionately high resources. Therefore, efforts and investments on making nation clean is an economic necessity as much as it is an indicator of prosperity.

Production is all about adding value to available resources, and is central to economics. Production involves cost. Unless producers are connected to consumers, production would pile up into generation of waste. This is where trading and commerce comes into play. Commerce is just not piping the produce for consumption, but doing it in most profitable manner. This gives rise to a philosophy that 'there is taker for every product or service and nothing is a waste'. It is seen that rag picking is an opportunity for starving people to make living. Their horrible living conditions bother affluent families only when rag pickers halt their job. Seeing the danger of volcano eruption in waiting local governments and state has formulated regulations and norms of effluent disposal and community waste. Basic problem is control of waste at the point of its generation. It is seen that in National Capital Region (NCR) periodically there are spikes of polythene restriction; they suddenly appear and so also subside. However, members of elite families continue to use polythene and thus indiscriminately generate community

community waste. Every member of the family is quite fluent at dissemination of wisdom on elimination of waste, vet they lack in conscious actions in this regard. This raises a fundamental question: why is waste generation so high? Why is demand on state to act on waste elimination? Is the society really educated or only literate? The basic reason behind these observations is that consciousness cannot be catalyzed with lectures, books, orders etc. It has to become intrinsic in our society; it has to be an integral part of their life cycle. It is quite encouraging to know that north-eastern states have successfully implemented total ban on polythene. In addition to this the cycle of poverty, bad quality, poor economy is a vicious trap. It has been separately elaborated in Economics of Quality.

In young age, the most fruitacious stage of life. In this stage sailing successfully with family is prime objective. Despite, old-age is a gift of GOD and more blessed are the older ones. Yet, economic compulsions are deeply influencing sociocultural dynamics. It is a bitter reality to accept that in old age a person, unless maintains his usefulness, lands gradually into a state of redundancy and liability similar to waste. A TV serial in its Episode-11 of TV Serial Satyamev Jayate on old age is an eye opener in respect of plight of old age with many inspirational initiatives. These stories are from our country which is known for joint families and boasting of at least three generations living together. Indian culture classifies four stages of life - (a) बाल्यावस्था (Balyawastha - childhood) where parental/family care is available, (b) युवावस्था (Yuvawastha - Young age) when one leads a family life, (c) वानप्रस्थ (Wanprasth - Withdrawal Stage), in line with the principle of succession and (d) सन्यास (Sanyas - Renunciation) where persons dedicate rest of their life in spiritual pursuit in waiting for salvation.

In a joint family structure, irrespective of age, stage and capacity, each one has a role to play. But, emerging socioeconomic-technological scenario is driving younger generation, in search of better job opportunities, away from their homes. This has disturbed both joint-family structure with changes in role-definitions of older generation. Thus a new socio-economic order is emerging where domestic help, baby sitters and such jobs are in great demand. Retirement

matter of fact retirement has a socio-economic relevance. Firstly, in service as person grows in age increment or apprisal is granted as a reward of continuity in job, enrichment in capability, performance at work and better understanding of the organization. Secondly, with passage of years there is saturation in value enrichment of a person and a kind of orthodoxy creeps in. This constraints employer to limit increment earned by an employee in successive years. Thirdly, inability of an employee to earn requisite increments in successive years breeds in him a kind of dissatisfaction. *Fourthly*, from the employer's perspective younger person with greater energy, enthusiasm and vision are available at lower package. Fifthly, taking social perspective superannuation is a stage when generally a person has settled his family commitments and can live with thinner needs. Sixthly, from state's perspective it creates opportunities for new generation in waiting for a job. Lastly, grooming successors is the moral responsibility of predecessors; and retirement is a predetermined process of transition for continuity of an organization and needs to be respectfully accepted. It is also in line with natural law of succession.

In case of self-employment or family occupations it is circumstantial. In case a person judges his descendents gaining competence in furtherance of the occupation he can volunteer the transition of authority and decision making. There are circumstances where persons fail to judge capability of successors to carry on, or mismatch in thought process with their successors. It might compel older ones to give up. Those are the wise persons who volunteer for retirement, before it becomes an inevitable compulsion.

Retirement is a stage where one experiences sudden vacuum; it causes psychological instability. In order to rehabilitate after retirement one starts looking for engagement, care and support. The episode of Satyamev Jayate has provided some pointers in this regard. These pointers are enough to stimulate search of out of box options with immense possibilities. Preparation for retirement, in advance and to explore possibilities of engagement helps one to maintain his time-relevance.

HelpAge and Department of Social Justice and Empowerment have taken many initiatives to rescue old men from their plight. They have also brought out a comprehensive document Senior Citizens Guide covering various rights, provisions and programmes. Benefits of old age enumerated in the guide are generally drawn by elite Senior Citizens (SrC) who experience longevity, financial and physical independence. Most of them, by virtue of their profile, have their children grown and settled in life staying away. They are apparently happy, but they generally suffer from the problems related solitude. It becomes more critical to those whose social interaction was in their limited occupational circle. In this context a moral question is posed to these SrCs – *do they really deserve protection from state* or the society ? Is there a way whereby they can complement

# from employment on attaining a certain age, is certain. As a *in efforts of maintenance of Social Support Systems (SSS)? Is* matter of fact retirement has a socio-economic relevance. *it that addressing such affluent SrCs waste of resources ?*

Though the effort to bring forth the SrC Guide is laudable but, it is a bit disappointing to find that the document talks only of rights, privileges and facilities that a person can avail at that age. It is totally silent in respect of role that a SrC can play in maintaining, preserving and growing SSS.

The way retired persons spend their life can be broadly classified into Four categories -(a) remaining commercially active through the lineage that they have created during occupational career, (b) enjoying life to their own leisure without any obligation to others, (c) remain dependent on family, society or state, and (d) engaging in SSS without expectations. Persons in first category are those elites who successfully created their indispensability have in occupational circle so as to be able to maintain their comforts and luxury which they enjoyed while in occupation. Even if they pay taxes on their earning honestly, they are brutal to the need of succession. So are the people in second category who forget that they, like parasites, are squeezing all emotional favours without responding a bit with a sense of Personal Social Responsibility (PSR). Most of the old persons are in non-elite subset of the society and from unorganized sectors fall in third category. They are not even aware of their rights and privileges available to them by virtue of their age-and-stage. They remain in bondage of their emotions and spend rest of their life at the mercy of descendants, if reachable, or the mercy of others; their living conditions are pitiable. In their fragile state, sympathy, mercy and charity act like sweet poisons. It makes subjects bigger parasites and thus kills their ingenuity, if any leftover. Real needs is to lighten fire of self-respect among them and infuse in them confidence that they are still capable to give away more than they receive. Exceptions are the persons in dilapidated condition and need care, irrespective of age.

There are a few SrCs who choose to participate in SSS systems stated above are in Fourth category; their number is insignificant to create a dent. Role that a SrC can play and integrate in SSS encompasses all social interactions providing opportunity for every individual. It grows right from family, to society extending upto town and state. The only necessity of SSS is continuity, consistency and commitment. Any discontinuity in SSS creates a chaos and disruption of life, which is unaffordable. Reliability of support decreases with age, yet coordinated efforts in old age provides a redundancy and a room for each one to address personal and age related needs. Retired persons in First and Second category, stated above, are most apt to take reins of role in Fourth category. It will be a big reform. These persons are self sufficient, both financially and physically, their children have moved away in better career options, and are therefore better placed to integrate in SSSs. The only problem with the democratic system in prevalence is that they cannot be forced into the role. Yet, as a state policy some motivation can be evolved to set on the drift. People can be motivated but an inspiration to take a first step is

missing. Mechanics of <u>motivation and inspiration</u> has been elaborated separately. This is a big opportunity for every social thinker, reformer, administrator, and leader to usher in a reform. One such example is <u>Vidyanjali</u> programme of MHRD, Govt. of India.

*Case Study: This article is based on first-hand experience* of engagement in mentoring unprivileged children after retirement. As an engineer from power-sector, initial journey was tough. There were many distractions to be overcome. It required a discipline with firm conviction that mentoring is not a charity. It is a matter of commitment to those who have accepted their present as their destiny. Deep in their merciful eyes a hope against hope is visible which is looking for a savior. Should it not be a betrayal like that in famous story of Baba Bharati and Dacoit Khadag Singh. With this realization, having taken a plunge into the initiative seven years ago, personal, family and health constraints prompted to upgrade the pursuit from Chalk-N-Talk mode to Interactive Online Mentoring Sessions (IOMS). Being from elite section of society acquisition of IT infrastructure was not formidable. It is now three years of the initiative fully into IOMS mode. There were initial riders, but thanks to in compunication advancements (Computer-cum*communication)* technology that the initiative has entered into Third year at Ramkrishna Mission School, Sithanagram, A.P. and Five new learning centers at Govt. Higher Secondary Schools of M.P. are on the anvil for integration under ICT project of the Education Deptt. The IOMS is an excellent opportunity to connect children disconnected from mainstream of education. It makes it possible to contribute in SSS in the field of education right from place of stay or work. The interactive feature of IOMS makes mentoring-learning experience thrilling. With the kind of satisfaction and joy of good health that it brings in, it is both स्वान्तः सुखाय - परमार्थमें स्वार्थ.

Generally, escapes taken from such a pursuit are that – (a) Very busy, in true sense it being busy without purposeful work (b) have worked hard and this time of leisure is their lifetime earnings. It is denial of the fact that inaction accelerates erosiont. (c) One has forgotten everything learnt. In this regard that it needs to be remembered that cycling, typing, swimming and education is intrinsic to every individual. Being out of context over a long period may initially create slow or sluggish start. It is vouched from personal experience that little efforts on refreshing is enough to gain not only attaining proficiency, rather it infuses an ability of refined mentoring with the experience of resolving problems in journey of life. This makes illustration of such a person touching the ground, just not surficial, and the learning for students more lasting.

Such post-retirement engagements in SSS can help to create a roadmap for descendants to look forward. It is a way to make life **cheerful**, **purposeful and respectful**. Younger generation in prevalent global competition is experiencing fast burn-out. Out of disgust, they are seen to be talking of early retirement and so on. But, such decisions are inspirational and cannot be abrupt. Necessary consciousness to take such decisions grows gradually among those who are part of a family or society which has the rich legacy of choosing SSS. In absence of this even at old age persons explore dishonest reasons for self-fulfillment like their predecessors.

It may not be out of place to state that every SrC has a history of errors, sometimes they are blunders; yet they possess an invaluable experience of surviving out of crisis. Youngsters have lot of energy, drive and dreams. Yet two are out of context for each other. It is the blend of experience and dream that formulates vision, a need of future generations. This vision is never static and keeps moderating dynamically with the experience gained during the journey and changing context. Moreover, the pace of life is increasing rapidly. This places a challenge infront of SrCs to match the changing aspirations. It also places a heavy demand on youngsters to carry forward the experiences even in SSS. Result is sometimes repetition of errors or making unpragmatic choices. Nevertheless, it is a part of continuous learning and the show must go on ....

There are many areas and ways of engagement in SSS and each one, based on strength, passion and capacity has a role to play. The only need is to draw an inspiration from Satyamev Jayate and create a motivation for SrCs to work collectively. Even youngsters can take a lead in this regard in organized societies and big colonies. It is a winwin situation where SrCs get parental respect and children get grandparental affection and culture of caring and sharing.

**Conclusions:** SrCs are invaluable resource and they have an opportunity to selflessly pro-act at this age and stage with full faith in themselves. Equally it is responsibility of the society to integrate them in SSSs. This is also becoming an economic compulsion in wake of increasing longevity. Coordinated efforts by state, society and forums of SrCs, in this direction, would bring in an era of socio-cultural-economic harmony and not a competition. It would definitely accrue benefit of optimization of social waste.

Gaining this realization is a life-time earning. It comes in giving away services selflessly with a sense of PSR to those who are disconnected from main stream or in SSS. It is meta-physical in nature and is much more precious than either engrossment in accumulated wealth and or growing it. Moreover, it suits age and stage of SrCs. It is vouched based of first-hand experience cited above in case study that engagement in educational empowerment of unprivileged children so as to groom in the them competence to compete is highly satisfying to the extent it has become an obsession. Elite SrCs may like to make their own life, unto last breadth more cheerful, purposeful and respectful as much as set an ideal for others to ponder upon. It is never a waste. This would leave behind an immortal legacy with a sense of pride among their most be loved ones to live on.....

## <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 9<sup>th</sup>-12<sup>th</sup> in Maths, Physics and Chemistry, leading to IIT-JEE.

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

#### **Operation:**

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

#### Involvement:

- a. **Promote**r
  - 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 9<sup>th</sup> upto 12<sup>th</sup>. 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 9<sup>th</sup> 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: <a href="mailto:subhashjoshi2107@gmail.com">subhashjoshi2107@gmail.com</a>, Website: <a href="http://www.gyanvigyansarita.in">http://www.gyanvigyansarita.in</a>

-00-

Page 11 of 43

अंदाज ए बयां

# सात समुंदर पार आती गली.....

## समीर लाल 'समीर'

सब कहते कि वो गली मेरे घर आकर खत्म हो जाती है. मैने इसे कभी नहीं माना. मेरे लिए वो गली मेरे घर से शुरु होती थी.

लोग कहते कि गली का आखिरी मकान मेरा है और उसके

बाद गली बन्द हो जाती है. मेरा हमेशा मानना रहा कि गली का पहला मकान मेरा है और वहीं से उसके बाद दूसरों के मकान शुरु होते हैं.

कोई उसे कहता कि श्रीवास्तव जी की, यानि हमारी गली, तो कोई सामने के मकान वाले तिवारी जी की गली, नुक्कड़ पर कृठरिया में रहने वाले घुन्स्

चमार की गली तब भी मैं लोगों के कहे का बुरा नहीं मानता, मगर जब कोई इसे खज़रे कट्खन्ने कुत्ते वाली गली कहता, तो मेरा खून खौल उठता.

खज़रा कटखन्ना कुत्ता- कालू. बस, एक बार पाण्डे जी के बेटे को काटा था उसने, वो भी तब जब उसने उसकी पूँछ पर से साइकिल चला दी थी. अब तो कालू को मरे भी जाने कितने साल गुजर गये थे मगर लोग गाहे-बगाहे मेरी गली को खज़रे कटखन्ने कुत्ते वाली गली कह ही देते हैं.

मेरे लिए वो गली मेरे घर से शुरु होती है. वहीं मैं पैदा हुआ और होश संभाला. वो गली आकर बाजार में जुड़ती और फिर बाजार की सड़क से होती हुई राजमार्ग पर और फिर सीधे शहर में. शहर मुझे विदेश ले आया उस गली से शुरु होकर. वो गली मेरे लिए विदेश तक आती है. लौट लौट कर मैं उस तक जाता हूँ. कभी सच में मगर रोज - यादों में, सपनों में.

माँ मायके से आई और गली में समा गई. हाँ, उसके लिए गली हमारे घर पर समाप्त होती थी..वो जो उस घर में आई तो आँख मींचे ही निकली वहाँ से. उसे गली ने शमशान ले जाकर छोड़ा मगर वो तो माँ ने देखा नहीं. वो तो बस डोली में बैठकर आई थी इस घर में. दो बाँस और चार काँधों वाली सवारी कहाँ ले जाती है, सब जानकर भी नहीं जान पाते हैं जब खुद की सवारी निकलती है.

सामने वाले तिवारी जी मकान बेच कर अपने बेटे के पास शहर चले गये. मकान खरीदा वर्मा जी ने मगर गाँव ने कब भला माना इसे..वो मकान आज भी स्टेट बैंक वाले तिवारी जी का मकान कहलाता है. क्या पुराने और क्या नये- लोग अब भी उसे तिवारी जी की गली कहते हैं. कब मिटती हैं ऐसी पहचानें?

बहुत बदला गाँव. बिजली आई, नहर खुदी, एक सिनेमा बना. सरकारी स्कूल खुला. अस्पताल खुला. कई कुत्तों नें कई लोगों को काटा. सूखा पड़ा. बाढ़ आई. हैजा फैला. गली रुकी रही. मेरे लिए "श्रीवास्तव जी की गली"- मेरे साथ विदेश तक आई.

बचपन में पढ़ी उस भूत की कथा याद आई जिसका हाथ बड़ा होता जाता था दूर का सामान पकड़ने को. गली, जो मेरे घर से शुरु हुई, (और अब भी वहाँ है) मेरे साथ इस विदेशी गोरों की घरती पर भी आई. अजनबियों के इस देश में मेरा साथ निभाती आधी रात के अंधेरों में ढाढस बँधाती. एक तार को जोड़ती -बचपन से अब तक.परिवार के साथ. कुछ दूर न लगता.

एक दिन लौट जाना है - उस छोर पर जहाँ से गली शुरु हुई है. रास्ता याद दिलाती, यही तो दिली इच्छा है मेरी. मेरी ही क्यूँ..हर उस शक्स की जो गली से शुरु होकर दूर तक चला आया है.

सोचता हूँ क्या गली मुझे यहाँ लाई या मैं गली को?

गली चली या मैं ?? ..

रोशन जगमगाहट रोकती है और लालटेन की टिमटिमाती लौ बुलाती है.

पशोपेश में हूँ. फिर लौटने की चाह और रुके रहने की मजबूरी के बीच झूलता मैं.



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

ई-मेल: sameer.lal@gmail.com

—00—

## Ayurveda- Health Care

## Prevention from seasonal problems IN VARSHA RITU(Rainy season)

#### Dr Sangeeta Pahuja

Rainy season has Vata prakop (raised vata), Pitta sanchay (accumulation) and Amal Ras(sour) pradhan predominant in acidity.That's why it leads to problems like weak metabolism, low physical stamina, Indigestion, joint pain, skin diseases, blood Disorders and bacterial and viral infections. As this season is Vata Pradhan, so old age persons should take special care.

**Favourable diet** : Consume Vata Pacifying food which are Sour, salty and sweet (madhur, Amal, lavan), Ghee and milk, In vegetables gourd, parval, bitter gourd, torai, ginger, cumin, meth, garlic, green gram, honey mango lemon, jamun, Haritaki, saindhav lavan etc.

Drink fersh and filtered or boiled water.

Avoid following food items like Potato and other tubers, Rice, cabbage, cauliflower, spicy, heavy and stale food, aerated drinks, fish, mutton, curd, leafy vegetables, chilled water etc.

**Favourable Lifestyle :** Avoid daytime sleeping, night time awakening, don't stay empty stomach for long time.

**Prevention from Viral Infection:** Antiviral Herbs. *Ashwagandha* has antiviral properties. It is used to treat the influenza virus. *Garlic* has antibacterial, antiviral, antifungal properties. It is effective against Rhinovirus. *Soap bark* Soapbark extract is effective in the treatment and prevention of rotavirus gastroenteritis. *Pomegranate* extract is effective in treating genital herpes. Neem has anti-inflammatory, anti-bacterial, and anti-viral properties. Echinacea herb encourages the immune system and reduces the symptoms of cold and flu, as it has antiviral properties .It is also used for Indigestion, chronic fatigue syndrome, diphtheria, genital herpes, gum disease, rheumatism, tonsillitis etc. Oregano has antibacterial, antimicrobial and antiviral properties. It is helpful in respiratory infections, gastrointestinal disorders, urinary tract infections and skin problems like acne and dandruff. Olive leaf has antiviral and analgesic properties and is used for prevention and treatment of cold, flu, toothache and chronic joint pain. Olive leaves are astringent and antiseptic. Lemon balm, has antibacterial, antiviral, antiinflammatory, antihistaminic and antioxidant properties. Licorice root has antibacterial and antiviral properties. It can be consumed regularly for the treatment and prevention from viral infections. Cranberry has anti-viral properties. It is very good antioxidant also. Elderberry has anti-viral properties and has been used to cure viral fever, cough, flu and respiratory tract infections. Astragals root has antiviral properties and increase the immunity. Calendula has antibacterial, antiviral, antifungal, antipyretic properties. It has been used for Eczema, sprain and wounds, for gastritis and blepharitis and to reduce fever. Cat's claw has antifungal, antibacterial and antiviral properties.

Salt and water gargle are also helpful. Ginger, honey, lemon water are also effective remedies. These can be taken in the form of herbal tea with turmeric milk, black pepper and common salt. Antiviral Herbs can be used as herbal teas, herbal infusion, herbal infused oil, essential oils.

#### 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 - <u>sangeeta.pahuja3@gmail.com</u>

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 conclusion.

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 stair far a faster and purposeful journey. This is where role of education come in; it is to streamline the process.

--00---

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

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

--00---

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.

- Swami Vivekananda

-00-

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

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---

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

- John Adams

## **NEW EDUCATION POLICY – A REVIEW**

New comprehensive education policy for India is on the anvil for the first time since 1986 (It was second one, first one was in 1968). The 484-page draft NEP report has been prepared by a committee led by eminent scientist K A Kasturirangan. On May 31, HRD ministry shared it with public for comments. Last date for submitting suggestions regarding new draft education policy is July 1, 2019.

Although the report deals with all aspects of school education, higher education and professional education, greater emphasis is given to school education. Further even in school system, early childhood education, which has been more or less totally neglected so far, is given the highest priority. This is influenced by the fact that over 85% of cumulative brain development occurs prior to the age of six and early childhood education is relevant for the 85% of student population.

It is well known that India's education system is plagued by a number of problems and shortcomings such as huge dropout rates, shortage in the number of teachers, incompetent curriculum and so on. The "learning crisis" is very deep. The education system, in both public and private domain, has been deteriorating rapidly and has affected the quality of our human resources. If this trend is not reversed, the dysfunctional system will become more and more expensive (cause of poverty for family instead enabler of prosperity) and will not deliver the goods. Reversal of trend requires a huge commitment and conviction to make it happen.

The draft NEP acknowledges it and calls it a "severe learning crisis" in India, where children in primary school fail to attain basic math and reading skills. Two goals have been made to remedy this. Firstly, high-quality early childhood care and education will be provided for all children between the ages of three and six by 2025 (making it part of education department and RTE act). This will be done within schools and anganwadis, which will take care of the overall wellbeing of the child, be it nutritional, health, or education. Secondly, every student will get foundational literacy by 2025 to address the issue of students not being able to read, write and do elementary math.

The policy recommends community and volunteer participation in collaboration with schools to overcome the current crisis. Schools generally work in isolation from the community they serve. Not making parents and the larger community partners in the child's learning process aggravates the learning crisis, at least in the early years. To remedy, it makes a rather bizarre proposal that parents become de-facto regulators of private schools instead of the state. But Poor and neo-literate parents cannot be expected to hold the onus of ensuring that much more Prakash Kale

powerful and resourced schools comply with quality, safety and equity norms.

In this regard I recollect that, approximately 3 years back. Allahabad High Court had given a ruling that was historic. Ruling was all wards (son and daughters) of Government Servants, Judges and Elected Members must study only in government schools. Those who do not obey this order will have to deposit money with the govt. equivalent to fees paid in private school. Order was to be implemented by next session. The ruling came while disposing a petition, which drew attention to poor conditions of Govt. schools in terms of infrastructure and lack of teachers in UP and asked courts direction to improve the same. Court observed that previous directions have failed to improve the situation and felt that unless the wards of the authorities who are responsible for improvement go to these schools, situation will not improve. Such direction could not be implemented but they rightly point out the basic lacuna in our public education delivery system (extended to health and transport sector etc).

Unfortunately, India in terms of services, has virtually divided in 2 -3 parts. Affluent and people with influence have developed all these services (world class/ affordable) for themselves outside the government network. Slowlyslowly over the years, especially after liberalization of 1991, government services in any area be it in education, health, transport or any other area came to be identified as work and duty of welfare state directed towards poor. They were/are provided below cost also. So to reduce burden, people who could afford were kept out. This has generated vicious circle. Govt. services for poor and so of poor quality. This must be reversed but draft policy is silent about it. The fact that India has the world's most differentiated school system with at least nine types of schools (from the low-end Ashramshala to the expensive and exclusive international schools) that align with varied socio-economic classes and which defies any attempt to make education a leveler for a deeply hierarchical society is not addressed. Basically, we need to change (feudal) mind set of division of Ruler and Ruled. And this is not a Problem of UP, nor restricted to primary education only. Once this is changed and only through this situation can improve and not by HC directive.

Unfortunately, the policy specifically promotes private schools, yet there is scarce evidence worldwide to suggest that private schools by definition deliver better quality, let alone, equitable education. Private schools often appear to do better because they enroll children from relatively advantaged backgrounds who can afford to pay and not because they deliver better quality of education. Recent research from India suggests that the gender gap in private enrolment is on the rise, even as it is reducing in government schools. The policy could have instead reiterated the need for extension of the public school network to address the hitherto unreached populations in remote areas and urban slums where low fees private schools flourish. It could have also more holistically addressed the aspirations of India's middle class within a strengthened public education system. Data for countries relatively richer than India shows that systems with low levels of competition have higher social inclusion and that upward social mobility is higher in government systems.

While 1986 education policy standardized school education with its push for a uniform 10+2 structure, the 2018 draft pitches for reconfiguration to a "5+3+3+4" (globally accepted) design, which recognizes different stages of development of cognitive abilities in children. This corresponds to the age groups 3-8 years (foundational stage), 8-11 (preparatory stage), 11-14 (middle stage), and 14-18 (secondary stage). It adds that the choice among science, arts and commerce should be delayed so that it is based on a student's experience and interests and not dictated by parents and society. It is at the High School stage where there is complete transformation recommended. In future Board examinations will allow students to sit for the examination twice in any given school year and "Eventually, multiple attempts for Board examinations would be allowed", with modular approach and semester system. With the elimination of public examinations, it will be the end of coaching schools. All schools will be accredited as per the School Quality Assessment and Accreditation Framework.

Calling to transit the higher education system into 'world-class' levels, the report makes the simplistic and deeply problematic (given the mass of educated unemployed and trends in new industrial and work systems) call to increase gross enrolment rates of higher education to 50% of the population by 2035. Why we do have passion for degree when we know we cannot employ them. Presently, against the requirement of 1-1.5 lacs engineering graduates we are producing app. 14 lacs engineering graduates. Further, when we talk about quality, and general public is apprehensive about it due to reservation by caste, nobody is talking dilution of quality due to management quota system etc. Draft National Education Policy moots all-India entrance tests for UG courses in public colleges. Recommended system seems to have some similarities to the SAT, standardized aptitudes test widely used for admissions to colleges and universities in the United States. The SAT, however, is used as a criterion alongside school grades.

Theoretically, higher education is where new knowledge is produced through research and the raw material for curricular renewal and teacher preparation is generated. Currently our universities take no interest in elementary or secondary education except bemoan their quality. Similarly, elementary level teachers do not feel responsible to equip children with secondary level. The same is true in relation to secondary and college level. Every part of education system is working in isolation or vacuum, does not feel that it is part of whole education system and education system does not feel it is part of society.

Our education system has catered to need of other. In short it is an export industry. (That is why sadly it is disappointing that agriculture education received shortshrift in NEP indicating the lack of imaginaries to see the key role that India's diverse agricultural systems can play and the possibilities that lie in fostering new forms of rural-urban and agriculture-industry linkages.) In an inequitable and diverse country such as our social needs differ from region to region. By aggregating ourselves as nation, we lose both sight and grip of the problem our system of education faces: namely it is indifference to the milieu. At every level we notice how educating geared to export of talent is, from village to towns, from provincial towns to metro cities and from metro to overseas. Graduate person do not wish to settle in village and do farming. Our IITans go abroad; our medicos not ready to serve villages and so on. Seed of such problem was sown quite early after independence, when in every sector (in absence of private sector) and in neglect of need of poor, govt. gave priority to Higher education (IIT etc), Best Health services (AIMS) and so on overlooking primary education, primary health center and so on. Result is everyone to see, we are a nation having succeeded in sending Mangalyan in first attempt, but we are also a nation with highest number of hungry people in world and there rate of decrease is far less than in other nation. Learning has little meaning if it does not create sense of engagement with milieu. Unfortunately NEP does not address this problem. Further in the name of standardization, there are many provisions in NEP which will make this problem more acute and we cannot justify it by saying it promotes mobility and economic progress.

While the draft recommends continuance of the three-language formula, it has proposed flexibility in the choice of languages, as long as students can show proficiency in any three languages. However, when English is a pan-Indian language, why should it not be recognized as a national language of India and its teaching expanded by making it the medium of instruction for more subjects in government schools? Policy endorses the idea that English (just another subject while the medium of instruction will be the language of each state). Why this difference of medium for govt and private schools. Andhra Pradesh chief minister Jagan Mohan Reddy has already promised to make all government schools English-medium with one compulsory subject in Telugu. If he does that, Andhra Pradesh will be a model state. In such a situation, why not adopt a two language policy – English and one regional language? And teach it more rigorously to all children in the tribal areas? Why not make all private schools also teach two languages equally – English and the regional language of the state where the schools operate? Across India, people in the future could then speak in English to those from other regions while within their state; they could speak both their regional language and English. That is what Tamil Nadu is doing.

Teacher preparation for all school stages will be offered only in multidisciplinary universities through a four-year programme, with the curricula and processes being revamped to address current issues with teacher preparation. Institutions currently offering the two-year programme will either transition to this mode or be phased out; no new two-year programmes will be given recognition.

While the policy talks about the need to bring "unrepresented groups" into school and focus on educationally lagging "special education zones", it misses a critical opportunity of addressing inequalities within the education system. It misses to provide solutions to close the gap of access to quality education between India's rich and poor children. It proposes to remove the expectations that all schools meet common minimum infrastructure and facility standards, and that primary schools be within a stipulated distance from children's homes.

It does look forward-looking, but what the final draft needs to do is differentiate between deregulation and liberalization. The incentive for the private sector to invest, grow and stand on quality parameters needs to be clearly articulated," What is and Why is there but missing in the NEP, as with much policy thinking, is the critical 'how'. Just as the Sarva Shiksha Abhiyan and RTE Act were targeted measures to address the issue of access to elementary education, the government needs a similar approach to improve the quality of education.

The ideas proposed are progressive, but there could be roadblocks in their implementation relating to funding requirements and governance architecture. The new government must priorities implementation as much as, if not more than, developing new policies. Unless there is a vibrant movement to support the NEP, it will remain a pipe dream, and India would have a lost another golden opportunity to usher in a million mutinies in the education sector, as recommended by the NEP The NEP, if implemented fully, will completely transform India's education. There will be no fear of one examination deciding the destiny of a student. Going to school will be enjoyable, and not boring like today. Students will have far more flexibility to select courses. Rote-learning will be replaced by creative thinking. Minimum bureaucracy, less regulation and less scope for corruption. Only honest elected leaders will opt to become education ministers.

In order to drive the vision of the NEP and to facilitate the efficient and holistic implementation of the NEP, a high-level body called the Rashtriya Shiksha Aayog (National Education Commission) headed by the Prime Minister has been proposed. This body will be responsible for developing, articulating, implementing, evaluating and revising the vision of education in the country on a continuous and sustained basis.



Author is M.Sc.( Physics) and a retired Banker, settled at Dewas, M.P.During his career he was also a faculty, at CBD 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: <u>kaleprakash23@gmail.com</u>

-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

# समर्पित शिक्षक -एक परिचय

6 जुलाई 1966 को माता श्रीमती प्रेमलता शुक्ला एवं पिता श्री रमेश चंद्र शुक्ला की 5 में से तीसरी संतान के रूप में मध्यप्रदेश के सनावद नगर जिलानिर्माण प्रमुखरूप से विद्यालय की शान बढा रहे हैं।



खरगोन में श्री संजय शुक्ल ने जन्म लिया | 3 माह की शिशुवस्था में पोलियो हो जाने से दाहिना पैर ता-उम्र हेतू कमजोर हो जाने से सहज-जीवन स्वयमेव चुनौतीपूर्ण हो गया जो अनवरत जारी है 45 वर्ष की आय में एक और भयावह विभीषिका का सामना किया जब 3<sup>rd</sup> स्टेज पर पहुँच चुके थ्रोट कैंसर के कारण कमाण्डो सर्जरी से गजरना

पड़ा | इन संघर्षों ने चुनौतियों का सामना करने का जो जज्बा इनमें पैदा हुआ वही

इनकी विद्यार्थियों और समाज की सेवा करनेके संकल्प का आधार बना।

विद्यालयीन शिक्षा धार जिले के छोटे से गाँव बिड़वाल के शिक्षक विहीन शासकीय विद्यालय में पूरी करने के बाद शासकीय महाविद्यालय धार से B.Sc.(PCM), M.A. English literature में द्वितीय श्रेणी में उत्तीर्ण किया | 9 जनवरी 1989 को व्याख्याता (हिन्दी) के पद पर पदस्थ पिता के साथ उंनकी ही संस्था में व्याख्याता (अंग्रेजी) के पद पर शासकीय सेवा आरम्भनीति आयोग भारत सरकार के एम टू इनोवेट मिशन के तहत विद्यालय में हुई ! संस्कृत में विषारद की उपाधि प्राप्त विदुषी माता एवं हिन्दी के शिक्षक हुई । राष्ट्रिय न विवारित की विवास हो अध्य विवास है। अध्य के संव की होन्वेज्ञानिक सोच को पुष्पित-पल्लवित होने के लिये STEAM एजुकेशन की से शासकीय सेवा में आने के बाद स्वयं के व्यय पर B.Ed, M.Ed., FC(SEDE), PGPD(SEDE-HI), Exploring The World Of English(Cambridge University) से उपाधियाँ एवं प्रमाण-पत्र अर्जित किये | 20 वर्षों तक उच्चतर माध्यमिक विद्यालयों में अध्यापन कार्य किया 4 वर्षों तक डाइट धार में पदस्थ रहते अनेकों प्रशिक्षणों में सहभागिता की | 1 वर्ष अतिरिक्त जिला परियोजना समन्वयक राष्ट्रीय माध्यमिक शिक्षा अभियान इंदौर के दायित्वों का निर्वहन किया | दिनांक 11-09-2015 से प्राचार्य, शासकीय उच्चतर माध्यमिक विद्यालय, कानवन, जिला धार, के पद पर कार्यरत रहते हुए स्वतंत्र रूप से कार्य करने का अवसर प्राप्त होने से ग्रामीण क्षेत्र में अवस्थित इस विद्यालय के गुणवत्तापूर्ण शिक्षा से वंचित बच्चों को गुणवत्तायुक्त, आधुनिक शिक्षाव्यवस्था उपलब्ध कराने का सपना देखा | इस सपने को यथार्थ में बदलने के लिए की जा रही कोशिशों का सार-संक्षेप अधोलिखित है–

"अनुशासन सफलता की बुनियाद है।" इस उक्ति को चरितार्थ करने के लिए अपनाये गए अनेकों तरीकों में से विद्यार्थियों के लिए अनिवार्य यनिफार्म एवं परिचय पत्र के साथ-साथ समस्त स्टाफ को ड्रेस कोड अपनाने के लिए प्रेरित करना, पश्चात् संकुल अंतर्गत समस्त कर्मचारियों द्वारा स्वेच्छा से ड्रेस कोड का 🕨 जिला प्रशासन धार द्वारा बोर्ड परीक्षा 2017 में 100% परिणाम देने से पालन करना ! इस सकारात्मक सोच की सफलता ने सकारात्मक एवं रचनात्मक वातावरण की जमीन तैयार की

अनुशासित वातावरण में शैक्षणिक गुणवत्ता सुनिश्चित करना, लक्षित कर समयबद्ध कार्य-योजना तैयार कर क्रियान्वयन आरम्भ किया ! इस दिशा में आवश्यक एवं उपयोगी संसाधनों को जन-सहयोग के माध्यम से जुटाया गया, इनमें प्रमुख हैं – 18 सी.सी.टी.व्ही. केमरे (वाकी–टाकी के साथ), 60 प्रेरणादायी-ज्ञानवर्धक फ्लेक्स, 30 पंखे, वाटर कुलर, आदि | पश्चात फुलप्रुफ मासिक मल्यांकन, शिक्षा में आय.सी.टी . का उपयोग एवं सीखने-सिखाने के नवाचारी तरीके, सतत प्रेरणादायी उद्बोधनों एवं नियमित मानिटरिंग के द्वारा प्रतिवर्ष बोर्ड परीक्षाओं में 100% परिणाम प्राप्त करने का इन्हें गौरव प्राप्त हुआ | ग्रामीण क्षेत्र के विद्यालय में अनुशासन, शैक्षिक वातावरण, पाठ्येत्तर गतिविधियों से बच्चों में उत्पन्न उत्साह और आत्मविश्वास की सूचनाएं प्राप्त कर 🍃 ग्राम पंचायत, जनपद पंचायत एवं सामाजिक संगठनों ने विद्यालय विकास के कार्यों में बढ़-चढ़कर सहभागिता की । जिससे सम्पूर्ण विद्यालय भवन का

निर्माण, 300 विभिन्न प्रजातियों के गुलाब तथा 100 हर्बल पौधों के बगीचे का

आकर्षक भौतिक वातावरण एवं उपयोगी शैक्षिक वातावरण निर्माण में नियमित रूप से आयोजित की जाने वाली साहित्यिक-संस्कृतिक गतिविधियों, जिम, योगा, आत्मरक्षा प्रशिक्षण, प्रयोगशाला एवं पुस्तकालय का नियमित उपयोग जैसी गतिविधियों के आयोजन की महत्वपूर्ण भूमिका रही परिणामस्वरूप विद्यालय का नामांकन दो नवीन हाईस्कूल आरम्भ होने के

बावजूद कम होने के स्थान पर्25% बढकर 400 से 500 हो गया।

दिव्यांग बच्चों शिक्षा हेतू विशेष प्रयास करने की भावना से प्रथमतइन्होंने स्वयं विशेष शिक्षा में 90 दिवसीय आधारभूत पाठ्यक्रम एवं Post Graduate

Professional Diploma (श्रवण-बाधित) उत्तीर्ण कर स्वयं को रिहेबिलिटेशन काउंसिल ऑफ़ इंडिया में स्पेशल एडकेटर के रूप में पंजीकत कराया एवं दिव्यांग बच्चों को शिक्षा की मख्य धारा में लाने. उनके अधिकारों का संरक्षण एवं उनमे आत्मविश्वास जाग्रत करने की दिशा में सतत प्रयास किये।

Atal Tinkering Lab की स्थापना कर ग्रामीण बच्चों में अन्तर्निहित बुनियाद तैयार की।

सकारात्मक सोच एवं समर्पित प्रयासों के कारण दिनांक 2 से 6 जून 2019 तक दक्षिण कोरिया की शिक्षा व्यवस्था को जानने के लिये वहां जाने वाले 30 सदस्यीय प्रतिनिधिमंडल में स्थान मिला । इसी दौरान कुछ ऐसे व्यक्तियों से परिचय हुआ जो निःशुल्क, निस्वार्थ भाव से कमजोर एवं वंचित बच्चों को बेहतर शिक्षा प्रदान करने के लिये निरन्तर प्रयत्नशील हैं। ऐसे ही एक व्यक्ति की मदद एवं मार्गदर्शन से इन्होने अपने विद्यालय के बच्चों को गणित एवं विज्ञान विषयों के ऑनलाइन अध्ययन (IOMS) की सुविधा को विकसित किया है, जो की नए सत्र (2019-20) से पूर्णरूपेण कार्यशील हो रही है।

इस प्रकार शिक्षा-शिक्षक-शिक्षार्थी विषय पर अधिकांश समय चिंतन करने. रचानात्मेक विचारों को मर्तरूप देते रहने स्हेनके जीवन में गौरव के कुछ पल भी आये जब शासन, प्रशासन, समाज, एवं विभिन्न सामाजिक संगठनों ने इन्हें सम्मानित किया-

- > मध्यप्रदेश शासन स्कूल शिक्षा विभाग द्वारा राज्य स्तरीय शिक्षक सम्मान
- सम्मान
- जिला प्रशासन धार द्वारा बोर्ड परीक्षा 2018 में 100% परिणाम देने से सम्मान
- दिव्यांग बच्चों की शिक्षा के क्षेत्र में उत्कृष्ट कार्य करने से सामाजिक न्याय एवं निःशक्तजन कल्याण विभाग धार द्वारा सम्मान
- विनय उजाला समूह द्वारा राज्य स्तरीय नेशन बिल्डर अवार्ड्2018  $\triangleright$
- रोटरी क्लब ऑफ़ धार सेन्टल द्वारा सम्मान ≻
- ⊳ जिला स्तरीय शिक्षक सम्मान समारोह समिति धार द्वारा सम्मान
- $\triangleright$ ग्राम पंचायत कानवन द्वारा सम्मान
- सद्गुरु साख संस्था धार द्वारा सम्मान ≻
- ≻ वन्दे मातरम विचार मंच कानवन द्वारा सम्मान
- श्री मारुती व्यायाम एवं योगशाला कानवन द्वारा सम्मान  $\triangleright$
- पटेल
- ⊳ ग्रूप ऑफ़ इंस्टिट्यूटस द्वारा सम्मान

प्लास्टिक पेंट से रंग-रोगन, दरवाजे-खिड़कियों की मरम्मत, खेल-मैदानों का इनके जीवन का एक ही सूत्र है – "कर्मण्ये वाधिकारस्ते माँ फलेषु कदाचन...

-00-

# वन से घन है ....

वन से घन है, घन से वन है

घन और वन से ही जीवन है।

जल है जीवन, जीवन ही जल

जल बिन तो जीवन मरुथल है।

वन हों सघन, तब ही हैं घन

घन को सजल कर देते वन।

वन को घन से,घन को वन से

कभी विभक्त न करना

जल और जीवन की खातिर

वृक्षारोपण करना।

# मृणालिनी घुळे

# मायावी दुनिया....

# डॉ. संगीता पाहुजा

माया की माया से भ्रमित प्राणी का मन,ऐसा भरमाया। छूट गया पीछे,खुद का भी साया आत्म चिंतन का समय भी न मिल पाया।

चहूँ दिशा में दिलोदिमाग दौड़ाया, सिर्फ स्वयं को न समझ पाया। न हृदय में ईश्वर को बिठाया मायाजाल में भ्रमित हुआ, साराजग घूम आया।

टीका टिप्पणी में हुआ मदहोश माया से आकर्षित मित्रो से,स्वयं को घिरा पाया। स्वयं को चक्रवर्ती समझ, फूला न समाया।

जब आयी,जीवन की सांझबेला, तब पाया स्वयं को नितांत अकेला। इस मायाजाल से बाहर निकल ए बंदे, ले हरि का नाम, बन जाएंगे सब बिगड़े काम। हरि स्मरण में ही हैं,चारों धाम।



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 प्रकाशितहै।

ई-मेल: mrinalinighule46@ gmail.com



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

-00---

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

-00-



## **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) <u>Mathematics</u>, b) <u>Physics</u>, and c) <u>Chemistry</u>. 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- June'19

#### Kumud Bala

1. (A)	2. (B)	3. (B)	4. (A)	5. (B)	6. (B)	7. (A)	8. (A)	9. (B)	10. (B)
11. (C)	12. (A)	13. (C)	14. (B)	15. (B)	16. (A)	17. (C)	18. (A)	19. (B)	20. (D)
21. (D)	22. (C)	23. (D)	24. (A)	25. (A)	26. (C)	27. (B)	28. (A)	29. (D)	30. (D)
31. (A)	32. (B)	-	-	-	-	-	-	-	-

-00-

## ANSWER: CROSSWORD PUZZLE June'19: ETIQUETTES OF INDIA

### Prof. S.B. Dhar

															<b>1A</b>			
<b>2</b> B	E	Ν	G	Α	L	31									R			
Е						Ν									Α		<b>4H</b>	
Е				5F	E	D	E	R	Α	L	R	E	Р	U	В	L	1	С
F						0									l.		Ν	
						Α			6R	1	G	7H	Т	Н	Α	Ν	D	
						R		8C				1			Ν		1	
		9B	0	L	L	Υ	W	0	0	D		Ν			S			
		I				Α		W				D			E			
		R				Ν						U			Α			
		Т								10		1						
		Н										S						
								11				Μ						





Students' Domain

## It's Not Just A CLOWN (Episode 2)

#### **Chyanis Tiwari**

"Hmm... CLOWNS?" Archer said in surprise on his face.

"Yep. That's right. You're the one who knows the best about him." Nina said to him.

"Jeramin Brown was a most dangerous serial killer in history. We captured him 5 years ago when I wasn't fired yet." Archer said. "He has been killed by an electric chair. This case must not be caused by his hand."

"But this is actually same to what happened." Nina said.

"Uh-uh. Are you sure?" Archer said as if he knows something.

"What do you mean by that? I'm sure about it." Nina said.

"I guess you have missed a really important point in this case?" Archer said "Look at this and you'll find out that it's not EXACTLY same as what happened."

Archer passed the last photograph to Nina which is in the last page of the file. In the photo, there was a death body which has he letter 'V' that is scraped onto the body using a sharp knife. That picture is so scary. Nina thought in her mind that those who had caused the incidence like this must be very cold-blooded.

"V? I have no idea what's going on." Nina said.

"This is not Jeramin. I speculate that we are already in acomplicated circuit."

"Can you join us in this case?" Nina asked for Archer's hand. He's the one who can help her in this case.

"Of course." Archer easily accepted the request.

(At the police station)

Nina just arrived to the police station with Archer. She walked into the station. The woman who was crying has gone home already. The crowd is less than before.

"You're here at the right time, Nina. Chief is calling you and... this is..?"

"Archer, detective Archer Garcia."

"Ah... it's you, detective. I'm Andy Miller, Nina's partner in the duty." Andy introduced himself before leading us to the chief's room. "Follow me."

At the chief's room, there was a young lady with brown hair and green eyes sitting at the table which is in the middle of the room.

"Did you call me?" Nina asked.

"Yes, take a seat." The Chief said while looking at Archer.

"Detective Archer, I heard that you were fired from being police 5 years ago. This is the secret negotiations in the Police Division. Can you please get out of this room?" The chief said to Archer.

"As you say, Chief." Archer was walking out of the room when Suddenly Nina said...

"Let him stay, Chief. Please. He's the one who can help us solve this case."

Chief was in silent while thinking something.

"Alright, I'm going to give you one last chance. Come and sit here." Chief said "We received the voice message from someone. I think it's related to the case you're doing. Listen to it."

...hello? test, test. Is the signal okay? Yes, it is. Hi, my dearest New York police. You must be finding me, right? Hahahaha Oh man, you'll never find me. Just sit there and watch people DIE. I'll kill each person every night at 11 pm. And remember, you're the last one on the list. PIP!

Nina was totally shocked. Does he mean her? Is she going to die soon? She is a brave policewoman but still, she is scared of this. How about her family and the people she loves? Does she have toleave them?



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

E-mail: prgd2000@yahoo.com

-0

#### Growing With Concepts - Mathematics

## LET'S DO SOME PROBLEMS IN MATHEMATICS-XI

#### **Prof. SB Dhar**

JEE-Advanced 2019 was conducted by IIT-Roorkee on 27<sup>th</sup> May. This test is conducted by the seven IITs-Kanpur, Kharagpur, Bombay, Madras, Delhi, Roorkee, and Gauhati on a rotational basis as per the guidelines of the Joint Admission Board, the IIT exam governing body. This test gives the opportunity to the successful aspirants to study Technology courses in 23 IITs and some Centrally Funded Institutes like Indian Institute of Science, Bangalore (IISc); Indian Institutes of Science Education and Research (IISERs) located in Berhampur, Bhopal, Kolkata, Mohali, Pune, Thiruvananthapuram and Tirupati; Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram; Rajiv Gandhi Institute of Petroleum Technology (RGIPT), Rae Bareli; Indian Institute of Petroleum & Energy, Visakhapatname. There are around 11500 undergraduate seats in the 23 IITs.

The JEE-Advanced was totally on line. Maharashtra boy Kartikey Chanrdresh Gupta scored 346 out of 372 and got the first rank. Himanshu Gaurav Singh of Allahabad got 340 and stood second. Archit Bubna of Delhi got 335 and stood third. Miss Shabnam Sahay of Ahmedabad got 308 and was topper among girls.

Some questions of Mathematics segment are selected here for the readers to understand the standard and the pattern of the Question Papers. Solutions are not being given. Only answers are given. If the readers find any difficulty in solving the questions, they may request the coordinator for the solutions.

#### Questions From Paper I

- 1. A line y=mx+1 meets the circle  $(x-3)^2+(y+2)^2=25$  at points P and Q. If midpoint of the line segment PQ has x-coordinate  $-\frac{3}{5}$ , then which one of the following options is correct? (a) $6 \le m < 8$  (b) $2 \le m < 4$ (c) $-3 \le m < -1$  (d) $4 \le m < 6$  Ans (b)
- 2. Let S be the set of all complex numbers satisfying  $|z - 2 + i| \ge \sqrt{5}$ . If the complex number  $z_0$  is such that  $\frac{1}{|z_0 - 1|}$  is the maximum of the set  $\left\{\frac{1}{|z - 1|} : z \in S\right\}$ , then the principal  $\arg\left(\frac{4 - z_0 - \overline{z_0}}{z_0 - \overline{z_0} + 2i}\right)$  is (a) $\frac{\pi}{4}$  (b) $\frac{3\pi}{4}$  (c) $-\frac{\pi}{2}$ (d) $\frac{\pi}{2}$  Ans(c)
- 3. Area bounded the points (x,y) in cartesian plane satisfying  $xy \le 8$  and  $l \le y \le x^2$  will be (a) $16ln2 - \frac{14}{3}$  (b)  $8ln2 - \frac{7}{3}$  (c)  $8ln2 - \frac{14}{3}$ (d) 16ln2 - 6 Ans (a)
- 4.  $M = \begin{pmatrix} \sin^4\theta & -1 \sin^2\theta \\ 1 + \cos^2\theta & \cos^4\theta \end{pmatrix} = \alpha I + \beta M^{-1}$ where  $\alpha = \alpha(\theta)$  and  $\beta = \beta(\theta)$  are real numbers and I is an Identity matrix of 2 x 2. If  $\alpha^* = M$ in of set  $\{\alpha(\theta):\theta \in [0,2\pi]\}$  and  $\beta^* = M$ in of set  $\{\beta(\theta):\beta \in [0,2\pi]\}$ , then the value of  $\alpha^* + \beta^*$  is  $(a) \frac{37}{16}$  (b)  $\frac{17}{16}$ (c)  $- \frac{31}{16}$  (d)  $- \frac{29}{16}$ Ans (d)

5. If  $a_n = \frac{\alpha^n - \beta^n}{\alpha - \beta}$  where  $\alpha$  and  $\beta$  are the roots of equation  $x^{2} - x - l = 0$  and  $b_n = a_{n+1} + a_{n-1}$ , then (a) $b_n = \alpha^n + \beta^n$  (b) $\sum_{n=1}^{\infty} \frac{b_n}{10^n} = \frac{8}{89}$ (c)  $\sum_{n=1}^{\infty} \frac{a_n}{10^n} = \frac{10}{89}$  (d) $a_1 + a_2 + \dots + a_n = a_{n+2} - 1$  Ans (a)(c)(d) 6. If a matrix M is given by  $\begin{pmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{pmatrix}$  and  $M\begin{pmatrix} \alpha \\ \beta \\ \gamma \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$  then (a)adj(M<sup>-1</sup>)+(adjM)<sup>-1</sup>=-M

(b)
$$|adj(M^2)|=81$$
  
(c) $\alpha+2\beta+3\gamma=2$   
(d) $\beta+2\gamma=3$   
(a) (c)  
Ans

7. There are three bags  $B_1$ ,  $B_2$ ,  $B_3$ .  $B_1$  contains 5 red and 5 green balls. B<sub>2</sub> contains 3 red and 5 green balls.  $B_3$  contains 5 red and 3 green balls. Bags  $B_1$ ,  $B_2$  and  $B_3$  have probabilities 3/10, 3/10 and 4/10 respectively of being chosen. A bag is selected at random and a ball is randomly chosen from the bag. Then which of the following is/are correct? (a) Probability that the chosen ball is green equals 39/80 (b) Probability that the chosen ball is green, given that the selected bag is B3, equals 3/8(c) Probability that the selected bag is B3, given that the chosen ball is green, equlas 4/139 (d)Porbability that the selected bag is B3, given

that the chosen ball is green, equals 3/10 Ans (a)(b)(c)

8. Let L<sub>1</sub> and L<sub>2</sub> denote the lines
r
<sup>7</sup> = î + λ(-î + 2ĵ + 2k̂), λ∈R and
r
<sup>7</sup> = μ(2î - ĵ + 2k̂), μ∈R respectively. If L<sub>3</sub> is a line which is perpendicular to both L<sub>1</sub> and L<sub>2</sub> and cuts both of them, then which of the options describe(s) L<sub>3</sub>?
(a) r
<sup>7</sup> = t(2î + 2ĵ - k̂), t∈R
(b) r
<sup>7</sup> = <sup>2</sup>/<sub>9</sub>(4î + ĵ + k̂) +t(2î + 2ĵ - k̂), t∈R
(c) r
<sup>7</sup> = <sup>1</sup>/<sub>3</sub>(2î + k̂) +t(2î + 2ĵ - k̂), t∈R (d) r
<sup>7</sup> = <sup>2</sup>/<sub>9</sub>(2î - ĵ + 2k̂) +t(2î + 2ĵ - k̂), t∈R

9. Let 
$$f: R \to R$$
 be given by  
 $f(x) =$ 

$$\begin{cases}
x^5 + 5x^4 + 10x^3 + 10x^2 + 3x + 1, x < 0 \\
x^2 - x + 1, 0 \le x < 1 \\
\frac{2}{3}x^3 - 4x^2 + 7x - \frac{8}{3}, 1 \le x < 3 \\
(x - 2) \ln(x - 2) - x + \frac{10}{3}, x \ge 3
\end{cases}$$

Then which of the following option(s) is/are correct?

(a)f is onto (b)f'differentiable x=1at is not (c)f'has local maximum at x=1а (d)f is increasing on  $(-\infty, 0)$ Ans (a)(b)(c)

10. If 
$$I = \frac{2}{\pi} \int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \frac{dx}{(1+e^{\sin x})(2-\cos 2x)}$$
, then find 27I<sup>2</sup>.  
Ans 4

- 11. If (a,d) denotes an AP with first term a and common difference d. If the AP formed by intersection of three APs given by (1,3)., (2,5) and (3,7) is a new AP (A,D). Then the value of A+D is *Ans* 157
- 12. That  $\omega \neq l$  be a cube root of unity. Then minimum value of set  $|a + b\omega + c\omega^2|^2$ ; *a,b,c* are distinct non-zero integers} equals *Ans 3*

#### **Questions From Paper 2**

1.

If lim	$\frac{\sqrt{1}+\sqrt{2}+\sqrt{3}}{\sqrt{1}+\sqrt{2}+\sqrt{3}}$		54 then	
If $\min_{n \to \infty} n \to \infty$	$n\frac{7}{3}\left(\frac{1}{1}+\frac{1}{1}\right)$	_ <del></del> +···+	<u>1</u> )	J4 then
	$(na+1)^2$ $(na+2)^2$	$(n^{2})^{2}$	a +n)² /	
possible	values	of	а	is/are
(a)-9	(b)8			(c)7
	(d)-6			Ans

2. Let  $f(x) = \frac{\sin \pi x}{x^2}$ , x>0. Let  $x_1 < x_2 < x_3 < \dots < x_n < \dots$ be all points of local maximum of f(x) and  $y_1 < y_2 < y_3 < \dots < y_n < \dots$  be

All the points of local minimum of f(x) then correct option is/are  $(a)|x_n - y_n| > 1 \text{ for every n}$   $(c)x_n \epsilon \left(2n, 2n + \frac{1}{2}\right) \text{ for every n}$   $(d)x_{n+1}-x_n > 2 \text{ for every n}$  *Ans* (a)(c)(d)

3. If 
$$P = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 2 & 2 \\ 0 & 0 & 3 \end{pmatrix}$$
,  $Q = \begin{pmatrix} 2 & x & x \\ 0 & 4 & 0 \\ x & x & 6 \end{pmatrix}$  and R=PQP<sup>-1</sup> then which are correct?

(a)det R=det 
$$\begin{pmatrix} 2 & x & x \\ 0 & 4 & 0 \\ x & x & 5 \end{pmatrix}$$
 + 8 for all  $x \in \mathbb{R}$   
(b)for x=1 there exists a unit vector  $\alpha \hat{i} + \beta \hat{j}$  +

$$\gamma \hat{k}$$
 for which are R  $\begin{pmatrix} \alpha \\ \beta \\ \gamma \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$   
(c)for x=0 if R $\begin{pmatrix} 1 \\ a \\ b \end{pmatrix} = 6 \begin{pmatrix} 1 \\ a \\ b \end{pmatrix}$  then a+b=5

/α\

<u>///\</u>

(d)there exists a realnumber x such that PQ=QP Ans (a)(c)

4. Let  $f: R \rightarrow R$  be a function we say that f has

Property 1 if  $\lim_{h\to 0} \frac{f(h)-f(0)}{\sqrt{|h|}}$  exist and is finite.

Property 2 if  $\lim_{h\to 0} \frac{f(h)-f(0)}{h^2}$  exist and is finite. Then which of the following options is/are correct? 2 (a)f(x)=x|x|has property  $(b)f(x)=x^{2}$ has property 1 2 (c)f(x)=sinxhas property X (d)f(x) =has roperty 1 Ans (b) (d)

- 5. For non-negative integer n, let  $f(n) = \frac{\sum_{k=0}^{n} \sin\left(\frac{k+1}{n+2}\pi\right)\sin\left(\frac{k+2}{n+2}\pi\right)}{\sum_{k=0}^{n} \sin^{2}\left(\frac{k+1}{n+2}\pi\right)}$ 
  - Assume  $\cos^{-1}x$  takes values in  $[0,\pi]$  which of the following options is/are correct?

(a) if  $\alpha = tan(cos^{-1}f(6))$ , then  $\alpha^2 + 2\alpha - 1 = 0$ (b)  $\lim_{n \to \infty} f(x) = \frac{1}{2}$ (c)  $f(4) = \frac{\sqrt{3}}{2}$ (d)  $\sin(7cos^{-1}f(5)) = 0$ Ans (a)(c)(d)

- 6. Let  $f: R \rightarrow R$  be given by f(x) = (x-1)(x-2)(x-5). Define  $F(x) = \int_0^x f(t) dt$ , x > 0. Then which of the options following is/are correct? (a)F(x)≠0.  $\forall x \in$ (0.5)(b)F(x) has two maxima and one local minima in  $(0.\infty)$ maxima at (c)F(x)has local x=2a (d)F(x)has a local minima at x=1Ans (c) (d)
- 7. A set S is given by  $\{1,2,3,4,5,6\}$ . |X| is a number of elements in set X. Subsets A and B of set S are chosen such that each elements of S is equally likely and  $1 \le |B| < |A|$ . then the number of ordered pairs of (A,B) are *Ans* 1523

8.  $\begin{vmatrix} \sum_{k=0}^{n} k & \sum_{k=0}^{n} n_{C_k,k^2} \\ \sum_{k=0}^{n} n_{C_k,k} & \sum_{k=0}^{n} n_{C_k,3^k} \end{vmatrix} = 0 \text{ holds for some}$ <br/>positive integer n, then  $\sum_{k=0}^{n} \frac{n_{C_k}}{k+1}$  equals<br/>Ans 6.20

9. 
$$\sec^{-1}\left[\frac{1}{4}\sum_{k=0}^{10}\left(\sec\left(\frac{7\pi}{12}+\frac{k\pi}{2}\right)\sec\left(\frac{7\pi}{12}+(k+1)\frac{\pi}{2}\right)\right)\right]$$
 will be Ans  
0.00

10.If 
$$= \int_0^{\pi/2} \frac{3\sqrt{\cos x}}{(\sqrt{\sin x} + \sqrt{\cos x})^5} dx$$
, then I<sup>2</sup> is equal to  
Ans.  $\frac{1}{2}$ 

11. Five persons A,B,C,D and E are seated in a circular arrangement. If each of them is given a hat of one of the three colours red, blue and green, then the numbers of ways of distributing the hats such that the person seated in adjacent seat gets different coloured hats is *Ans 30.00* 



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-

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-



# **ROSSWORD PUZZLE July'19 : \$1 MILLION GLOBAL TEACHER PRIZE NOMINEES**

#### **Prof. SB Dhar**



Acro	OSS	Down			
5	Kenya's Teacher who combats terrorism and radicalism	1	USA teacher teaching media by combining project - based learning		
7	Palestine teacher that develops trusty relationship	2	Pakistan's Afghan refugee teaching at Pakistan's Kot Chandana Camp for over 20 years		
8	Microsoft Innovative Educator expert	3	Australian science teacher who launched country's first science lab		
9	Former Us Air Force Lieutenant now based in Mumbai	4	Japan's teacher who uses Lego-based instructions to harness students		
10	UK teacher teaching Math	6	Finlands's Math teacher who teaches by asking real-life problems		

# 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

## **Understanding Specific Heat of Gases**

Specific Heat of Gases is very special section of Heat and Thermodynamics. Compressibility of gases and the process that it undergoes under varying pressure and volume, both or only one of them, which affects thermal properties of gases and in turn its specific heat. This section involves concepts of everything learnt in heat and thermodynamics together with mechanics. Thus it is a good drill into the integrated assimilation of the subject matter. Accordingly, in this set of questions, problems are taken up with their illustrations from the Chapter 27, Vol II, Concepts of Physics, a book by Prof. H.C. Verma.

Any understanding of theory is useful in problem solving only when it is followed by rigorous practice in solving problems of verities involving various concepts. In this connection there are various test books and question banks available at book stores. Yet books by Resnick-Halliday-&-Krane and H.C. Verma are placed at first choice for a systematic growth of excellence. This choice is not by any other consideration except that the authors have formulated problems so nicely that taking any of two books would give a good spectrum of problems are graded with increasing complexity, as one proceeds with them. They involve different concepts on the chapter and integration of concepts studied earlier. As against this questions from various examination and competitions are abrupt and at the level of competition being targeted. It is, therefore, appropriate to questions from different sources only when practice problems from such text books have been practiced.

It may not be out of context to place on record that *solving any toughest problem is simpler than formulating a problem*. In light of this efforts of the authors in writing book and supplementing it with question bank is highly revered. In view of this, in the supplement to Mentors' Manual initial preference is given to the by H.C. Verma. It covers Objective Questions (both SCQ and MCQ) together with exercises. Going forward this is to be supplemented with questions from other sources also.

It is a common experience that a rich web resource is available on a wide spectrum. It is just a matter of posing a problem and solution is available either free or some on price. Here, it is pertinent to emphasize that web resource is meant to reach students who are not able to connect the solution provider. While, students from deprived section of society may find it difficult to always make a sense with the available web solution. Moreover, there are multiple solutions, videos and/or responses to each quarry on web. This makes it difficult for students to choose what to bank upon in his pursuit of learning. In view of this question banks for the students that we target are supplemented with illustrations. The illustrations to start from first principle, to the possible extent, with special note wherever necessary. This is expected to be useful to those students who never had an opportunity to learn from passionate mentors. Since each illustration is handled as an independent difficulty of a student or user repetition of steps is unavoidable. In illustrations figures wherever necessary for elaborations have been used, else student is supposed to use figure given in the problem supposed to be readily available with him while referring to the illustration.

Students are advised to revise basics before attempting question bank under examination conditions. It will help to gain proficiency in terms of accuracy and speed. In case of mismatch of answers, students are advised to retry problems after revisiting concepts. Despite, if difficulty exists, the illustrations may be referred and again the problem may be attempted independently. After successfully attempting question bank, students may like to refer to illustrations for appreciating nuances of concepts.

Yet students are advised to start with it. Gradually as students attain proficiency in applying concepts and handling long calculations, crisp steps and calculations will evolve automatically without being conscious of it. As regards brilliant students, teachers and professionals may like to pick up random illustrations or those of problems encountered with mismatch of answers. They would find the approach in illustrations worth refreshing the concepts for themselves. In case they wish to add value to illustrations by pointing out ambiguities and typographical errors, they are gratefully welcome.

Practicing of problems at times involves numerical skills and handling of data in different system of units. This requires care and clarity of variables and their units for correctness and speed; it is a necessity for success in examination. It is also advised that during solution, students stick to one system of units, preferably SI, and convert the given data into it wherever necessary. It facilitates burden of remembering standard values in different system of units. This approach may take some extra efforts, yet it would certainly avert possibility of errors and loss due to negative marking.

A small group of passionate persons are engaged in this initiative to mentor unprivileged children so as to groom competence to compete among them. This is driven with a sense of Personal Social Responsibility (PSR). It is a nonorganizational, non-remunerative, non-commercial and nonpolitical manner. Teachers, mentors, students and professionals who can collectively complement the efforts to the extent it is possible and it suits to their passion, experience, expertise and convenience, are gratefully welcomed.

Typical problems and illustrations are brought below for a ready reference, while a question bank with answers and illustrations is being uploaded on the our website separately.

Page 27 of 43

## **ILLUSTRATIONS OF TYPICAL QUESTIONS ON Specific Heat of Gases** (Set 4, on Chapter 2: Heat and Thermodynamics, Mentors' Manual)

**Ouestion 1:** Two samples A and B are initially kept in the same state. The sample A is expanded through an adiabatic process and the sample B through an isothermal process. Final volume of the samples is same. The final pressure in A and B are  $p_A$  and  $p_B$  respectively.

(a)  $p_A > p_B$  (b)  $p_A = p_B$  (c)  $p_A < p_B$  (d) The relation between  $p_A$  and  $p_B$  cannot be deduced.

**Illustration:** Given that initially  $p_{A-i} = p_{B-i}$ ,  $V_{A-i} = V_{B-i}$  and  $T_{A-i} = T_{B-i}$  there for as per IGE pV = nRT, number of moles in two samples are  $n_A = n_B = n$ . Sample B undergoes isothermal process, therefore  $p_{B-i}V_{B-i} = p_{B-f}V_{B-f}$ .

Therefore final pressure  $p_{B-f} = \frac{p_{B-i}V_{B-i}}{V_{B-f}}$ . As regards sample A which undergoes adiabatic process

$$p_{A-i}V_{A-i}{}^{\gamma} = p_{A-f}V_{A-f}{}^{\gamma} \Longrightarrow p_{A-f} = p_{A-i}\left(\frac{V_{A-i}}{V_{A-f}}\right)^{\gamma}.$$
 Therefore,  $\frac{p_{A-f}}{p_{B-f}} = \frac{p_{A-i}\left(\frac{V_{A-i}}{V_{A-f}}\right)}{p_{B-i}\left(\frac{V_{B-i}}{V_{B-f}}\right)}.$  Further it is given that

 $V_{A-f} = V_{B-f}, \text{ accordingly } \frac{p_{A-f}}{p_{B-f}} = \left(\frac{p_{A-i}}{p_{B-i}}\right) \left(\frac{V_{A-i}}{V_{B-i}}\right) \left(\frac{V_{B-f}}{V_{A-f}}\right). \text{ Accordingly, using the given data it leads to}$  $\frac{p_{A-f}}{p_{B-f}} = 1 \times \left(V_{A-i}\right) \left(V_{A-f}\right) = \left(\frac{V_{A-i}}{V_{A-f}}\right)^{\gamma-1}. \text{ The problem states that in the both the process there is expansion of gas therefore}$ 

$$V_{A-f} > V_{A-i} \Longrightarrow \frac{V_{A-i}}{V_{A-f}} < 1 \quad \text{Hence,} \quad \frac{p_{A-f}}{p_{B-f}} = 1 \times \left(V_{A-i}^{\gamma-1}\right) \left(V_{A-f}^{1-\gamma}\right) = \left(\frac{V_{A-i}}{V_{A-f}}\right)^{\gamma} \implies \frac{p_{A-f}}{p_{B-f}} < 1 \implies p_{A-f} < p_{B-f} \quad \text{or} \quad p_A < p_B \quad \text{.This is}$$

matching with option (c) and hence answer is option (c).

N.B.: Instead of this quantitative analysis can be a quick answer can be obtained from qualitative analysis. According to this in adiabatic expansion in sample A no heat is supplied to the system whereas in isothermal expansion in gas B heat is supplied by the system. This will lead to higher final pressure in gas B

Question 2: Consider the processes A and B shown in the figure. It is possible that -

- (a) Both the processes are isothermal
- (b) Both the processes are adiabatic
- (c) A is isothermal and B is adiabatic
- (d) A is adiabatic and B is isothermal

**Illustration:** As per ideal gas equation pV = nRT. For a sample of gas undergoing isothermal process  $p_1V_1 = p_2V_2$ Thus for process A,  $p_i V_i = p_{f-A} V_{f-A}$  and  $p_i V_i = p_{f-B} V_{f-B}$ . Thus the initial points for process is same, the final points are different and thus  $p_{f-A}V_{f-A} \neq p_{f-B}V_{f-B}$  and hence the two processes are not isothermal. This makes option (a) to be incorrect. Yet, the given p-V graph A apparently of inverse proportion.





Further in adiabatic process  $p_1V_1^{\gamma} = p_2V_2^{\gamma}$ . For process A to be adiabatic necessary requirement is  $p_iV_i^{\gamma} = p_{f=A}V_{f-A}^{\gamma}$ and for process B  $p_iV_i^{\gamma} = p_{f=B}V_{f-B}^{\gamma}$ . In these two identities LHS are equal and hence  $p_{f=A}V_{f-A}^{\gamma} = p_{f=B}V_{f-B}^{\gamma}$ . Principle of equalities of polynomial requires that variables of same index must be equal. Since,  $V_{f-A} \neq V_{f-B}$  and hence the Two processes are adiabatic. **This makes option (b) to be incorrect.** 

Yet, the given p-V graph by observation **process A is of inverse proportion and therefore isothermal**. Further, process B has different final point that of process A. Therefore, process B cannot be isothermal, this leaves only one possibility for **process B is adiabatic**. Thus option (c) is correct.

Since a process has to be either isothermal and adiabatic, with no chance of being the both, having concluded option (c) to be correct, **option** (d) is incorrect. Thus answer is option (c).

N.B.: The graph is since not scaled and hence discrimination between the process A and B shall have to be done based on its visual observation. Equality of polynomials to valuate option (b) is a good example of integration of mathematics in physics.

Question 3: Figure shows a cylindrical container containing oxygen ( $\gamma = 1.4$ ) and closed by a 50 kg frictionless piston. The area of cross-section is 100 cm<sup>2</sup>, atmospheric pressure is 100 kPa and g is 10 m.s<sup>-2</sup>. The cylinder is slowly heated for some time. Find the amount of heat supplied to the gas if piston moves out through a distance 20 cm.

**Illustration:** F.B.D. of forces acting on the piston is shown in the figure. Accordingly, pressure exerted by the gas on the piston is  $p = \frac{p_{atm} \times A + mg}{A} = \frac{(100 \times 10^3)(100 \times 10^{-4}) + 50 \times 10}{100 \times 10^{-4}} = 1.50 \times 10^5 \text{ Pa.}$  It is stated that cylinder is heated slowly and therefore, piston without getting acceleration utilizes heat supplied in moving the piston through a distance 0.2 m and pressure remains same i.e. it is an isobaric process. Further,  $W = (p \times A)\Delta x = p \times (A \times \Delta x) = p \times \Delta V = ((1.50 \times 10^5) \times (100 \times 10^{-4})) \times 0.2 = 300 \text{ J}.$  As per ideal gas equation  $pV = nRT \Rightarrow p\Delta V = nR\Delta T$ . Therefore,  $R\Delta T = 300 \text{ J}.$  Here there are only two variables, one is *n* number of moles and other is change in temperature  $\Delta T = \frac{300}{nR}$ . Using this expression  $\Delta T$  is eliminated in terms of *n* in  $\Delta Q = nC_p\Delta T = nC_p \left(\frac{300}{nR}\right) \Rightarrow \Delta Q = \frac{300C_p}{R}$ .

We know that  $\frac{C_p}{C_V} = \gamma$  and  $C_p = C_V + R \Rightarrow 1 = \frac{C_V}{C_p} + \frac{R}{C_p} \Rightarrow \frac{R}{C_p} = 1 - \frac{1}{\gamma} \Rightarrow C_p = \frac{\gamma R}{\gamma - 1}$ . Substituting this value of  $C_p$  in

 $\Delta Q \text{ we get } \Delta Q = \left(\frac{300}{R}\right) \left(\frac{\gamma R}{\gamma - 1}\right) = \frac{300\gamma}{\gamma - 1}. \text{ Using the given value of } \gamma \text{ heat supplied is } \Delta Q = \frac{300 \times 1.4}{1.4 - 1} = \frac{420}{0.4} = 1250$ J. Hence answer is 1250 J.

Question 4: Two ideal gases have same value of  $\frac{C_P}{C_V} = \gamma$ . What will be the value of this ratio for a mixture of the two gases in the ratio 1:2 ?

mixture

**Illustration:** Two ideal gases when mixed each will have same pressure and temperature. Therefore, as per IGE  $pV = nRT \Rightarrow \frac{pV_1}{pV_2} = \frac{n_1RT}{n_2RT} \Rightarrow \frac{V_1}{V_2} = \frac{n_1}{n_2} = \frac{1}{2}$ . Further both have same ratio  $\frac{C_P}{C} = \gamma$ . Further, the relation  $C_{p} = C_{v} + R \Rightarrow \frac{C_{p}}{C_{v}} = 1 + \frac{R}{C_{v}} \Rightarrow \gamma = 1 + \frac{R}{C_{v}} \Rightarrow \frac{C_{v}}{R} = \frac{1}{\gamma - 1} \Rightarrow C_{v} = \frac{R}{\gamma - 1} \quad \text{Likewise,} \quad 1 = \frac{C_{v}}{C_{v}} + \frac{R}{C_{v}} \Rightarrow 1 = \frac{1}{\gamma} + \frac{R}{C} \Rightarrow C_{p} = \frac{\gamma R}{\nu - 1} \quad \text{These}$ values of  $C_p$  and  $C_V$  will be useful in following steps.

Heat gained for  $\Delta T$  rise of temperature of gas 1 as per FLT will be  $\Delta Q_{p-1} = \Delta Q_{V-1} + \Delta W_1$ . Since  $\Delta W = p\Delta V = p(nR\Delta T). \text{ Accordingly, } n_1C_{p-1}\Delta T = n_1C_{V-1}\Delta T + n_1R\Delta T \Longrightarrow C_{p-1} = C_{V-1} + R. \text{ Likewise for gas 2 it is}$  $n_2 C_{\scriptscriptstyle p-2} \Delta T = n_2 C_{\scriptscriptstyle V-2} \Delta T + n_2 R \Delta T \Longrightarrow C_{\scriptscriptstyle p-2} = C_{\scriptscriptstyle V-2} + R \, .$ Thus the  $\Delta Q_p = \Delta Q_{p-1} + \Delta Q_{p-1}; \ \Delta Q_V = \Delta Q_{V-1} + \Delta Q_{V-2} \text{ and } \Delta W = \Delta W_1 + \Delta W_2. \text{ Adding respective elements of energy equations}$ for the two gases it leads to  $(n_1C_{p-1} + n_2C_{p-2})\Delta T = (n_1C_{V-1} + n_2C_{V-2})\Delta T + p(n_1 + n_2)R\Delta T$ . It leads to

$$\left(n_1\frac{\gamma R}{\gamma-1} + 2n_1\frac{\gamma R}{\gamma-1}\right) = \left(n_1\frac{R}{\gamma-1} + 2n_1\frac{R}{\gamma-1}\right) + \left(n_1 + 2n_1\right)R \Longrightarrow 3n_1\frac{\gamma R}{\gamma-1} = 3n_1\frac{R}{\gamma-1} + 3n_1R$$

Taking  $C_p$  and  $C_V$  as molar heat capacities of the mixture at constant pressure and volume respectively, accordingly,  $(n_1 + n_2)C_p = (n_1 + n_2)C_V + (n_1 + n_2)R \Longrightarrow (n_1 + 2n_1)C_p = (n_1 + 2n_1)C_V + (n_1 + 2n_1)R$ . It leads to  $3n_1C_p = 3n_1C_V + 3n_1R \Longrightarrow C_p = C_V + R$ , therefore  $C_p = C_V + R$ . It leads to  $C_V = \frac{R}{v-1}$  and  $C_p = \frac{\gamma R}{v-1}$ . Moreover, such

equations for gas 1, Gas 2 and the mixture have similar variables with identical coefficients and therefore the  $\frac{C_P}{C}$  for the mixture is same as  $\gamma$ . Hence answer is  $\gamma$ .

Question 5: An ideal gas at pressure  $2.5 \times 10^5$  Pa and temperature 300 K occupies 100 cc. It is adiabatically compressed to half its original volume. Taking  $\gamma = 1.5$ , calculate –

- (a) The final pressure,
- (b) The final temperature
- (c) The work done by the gas in the process.

**Illustration:** On given sample of gas adiabatic process is carried out accordingly  $p_1V_1^{\gamma} = p_2V_2^{\gamma} = K$ . It is also given that

 $\frac{V_1}{V_2} = 2$ . Accordingly, using the given data  $\frac{p_2}{p_1} = \left(\frac{V_1}{V_2}\right)^7 \Rightarrow p_2 = p_1 \left(\frac{V_1}{V_2}\right)^7 \Rightarrow p_2 = \left(2.5 \times 10^5\right) 2^{1.5} = 7.07 \times 10^5$ . Thus using SGs answer to part (a) is  $7.1 \times 10^5$  Pa.

From IGE, using given and proved data final temperature  $\frac{p_2V_2}{p_1V_1} = \frac{nRT_2}{nRT_1} \Rightarrow T_2 = \left(\frac{p_2}{p_1}\right) \left(\frac{1}{2}\right) T_1$ . Thus final temperature is

$$T_2 = \left(\frac{7.1 \times 10^5}{2.5 \times 10^5}\right) \left(\frac{1}{2}\right) \times 300 = 426 \text{ K.}$$
 Thus using SGs answer to part (b) is 426 K.

In adiabatic process 
$$\frac{p}{p_1} = \left(\frac{V_1}{V}\right)^{\gamma} \Rightarrow p = \left(p_1 V_1^{\gamma}\right) \frac{1}{V^{\gamma}}$$
 and work done in the process  $W = \int_{V_1}^{V_2} p dV = K \int_{V_1}^{V_2} \frac{1}{V^{\gamma}} dv$ . Thus, .

$$W = \frac{1}{1 - \gamma} \left[ \frac{K}{V^{\gamma - 1}} \right]_{V_1}^{V_2} = \frac{1}{1 - \gamma} \left[ \frac{p_2 V_2^{\gamma}}{V_2^{\gamma - 1}} - \frac{p_1 V_1^{\gamma}}{V_2^{\gamma - 1}} \right] = \frac{1}{1 - \gamma} \left[ p_2 V_2 - p_1 V_1 \right] = \frac{1}{\gamma - 1} \left[ p_1 V_1 - p_2 V_2 \right].$$
 Substituting the data

$$W = \frac{1}{1.5 - 1} \Big[ \Big( 2.5 \times 10^5 \Big) \Big( 100 \times 10^{-6} \Big) - \Big( 7.1 \times 10^5 \Big) \Big( 50 \times 10^{-6} \Big) \Big] = \frac{1}{0.5} \Big[ 25 - 35.5 \Big] = -21 \text{ J. Thus answer to part (c) is - 21 J.}$$

Question 6: Two vessels A and B of equal volume are connected by a narrow tube which can be closed by a valve. The vessels are fitted with pistons which which can be moved to change the volumes. Initially, the valve is open and the vessels contain an ideal gas  $\left(\frac{C_P}{C_V} = \lambda\right)$  at atmospheric pressure  $p_0$  and temperature  $T_0$ . The walls of the vessel A are

diathermic and those of B are adiabatic. The valve is now closed and the pistons are slowly pulled out to increase the volumes of the vessels to doubles the original value.

- (a) Find the temperatures and pressures in the two vessels.
- (b) The valve is now opened for sufficient time so that the gases acquire a common temperature and pressure. Find the new values of the temperature and pressure.

**Illustrsation:** When valve of the system, after attaining equilibrium, is closed as shown in the figure both the vessels will undergo different processes as under-

**Vessel A:** Since the walls of vessel are diathermic and hence and piston is pulled slowly it will undergo heat transfer with environment to make the process isothermal. Accordingly,  $p_{A-i}V_{A-i} = p_{A-f}V_{A-f}$ . Using the given data





would remain  $T_0$ .

**Vessel B:** Since the walls of vessel B are adiabatic and hence it will undergo adiabatic process accordingly  $p_{B-i}V_{B-i}^{\gamma} = p_{B-f}V_{B-f}^{\gamma}$ . Thus using the given data  $p_{B-f} = \frac{p_0V_0^{\gamma}}{(2V_0)^{\gamma}} = \frac{p_0}{2^{\gamma}}$ . In respect of temperature of vessel B, using

 $\text{IGE } pv = nRT \Rightarrow \frac{p_{B-i}V_{B-i}}{p_{B-f}V_{B-f}} = \frac{T_{i-B}}{T_{f-B}} \Rightarrow T_{f-B} = T_{i-B} \frac{p_{B-f}V_{B-f}}{p_{B-i}V_{B-i}}.$  On using given and derived data it leads to

$$T_{f-B} = T_0 \frac{\frac{p_0}{2^{\gamma}} \times 2V_0}{p_0 V_0} = \frac{T_0}{2^{\gamma-1}} .$$

Thus answer to part (a) is for vessel temperature and pressure of gas in vessel A are  $T_0$ ,  $\frac{p_0}{2}$  and the values for vessel B are  $T_0/2^{\gamma-1}$ ,  $p_0/2^{\gamma}$ .

Now again value is opened with pistons held in the new position for sufficiently long time and allowing the gases to attain common temperature and pressure. In this condition gases in vessel will be able to communicate with gases in vessel A and also heat transfer with environment will take place. Thus the gases in both the vessels will attain an equilibrium with the environment at a **temperature**  $T_0$  and uniform pressure  $p_f$ . Thus extending IGE to new situation

 $p_f(4V_0) = p_0(2V_0) \Rightarrow p_f = \frac{p_0}{2}$ . Thus answer to part (a) is for vessel temperature and pressure of gas in the two vessels is  $T_0$ ,  $\frac{p_0}{2}$ .

Thus consolidating answer for both the parts it is (a)  $T_0$ ,  $\frac{p_0}{2}$  in vessel A and  $T_0/2^{\gamma-1}$ ,  $p_0/2^{\gamma}$  in vessel B **(b)**  $T_0$ ,

 $\frac{p_0}{2}$ 

Question 7: Figure shows an adiabatic cylindrical tube of volume  $V_0$  divided in two parts by a frictionless adiabatic separator. Initially, the separator is kept in the middle, an ideal gas at pressure  $p_1$  and  $p_1, T_1$ temperature  $T_1$  is injected into the left part and another ideal gas at pressure  $p_2$  and  $p_{2}, T_{2}$ temperature  $T_2$  is injected into the right part.  $\frac{C_P}{C_V} = \gamma$  is same for both the gases. The

separator is slid slowly and is released at a position where it can stay in equilibrium. Find-

- (a) The volume of the two parts,
- (b) The heat given to the gas in the left part,
- (c) The final common pressure of the gases.

**Illustration:** Gas in left part is injected at pressure and temperature  $p_1$  and  $T_1$ respectively and in right side at  $p_2$  and  $T_2$ . When separator is slid to an equilibrium position and released both parts will exert equal and opposite pressure  $p_{f}$ . Thus, in the adiabatic process both parts will attain different volumes and corresponding new values of different temperature.



Thus as per adiabatic process for left part  $p_1\left(\frac{V_0}{2}\right)^{\gamma} = p_{fL}\left(kV_0\right)^{\gamma} \Rightarrow p_{fL} = \frac{p_1}{\left(2k\right)^{\gamma}}$ .

Likewise, for right part  $p_2\left(\frac{V_0}{2}\right)^{\gamma} = p_{fR}\left((1-k)V_0\right)^{\gamma} \Rightarrow p_{fR} = \frac{p_2}{\left(2(1-k)\right)^{\gamma}}$ . Since piston stays in equilibrium it is possible

only

when  $p_{fL} = p_{fR} \Rightarrow \frac{p_1}{(2k)^{\gamma}} = \frac{p_2}{(2(1-k))^{\gamma}} \Rightarrow \frac{1-k}{k} = \left(\frac{p_2}{p_1}\right)^{\frac{1}{\gamma}}$ . On applying componendo

$$\frac{1}{k} = \frac{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}{p_1^{\frac{1}{\gamma}}} \Longrightarrow k = \frac{p_1^{\frac{1}{\gamma}}}{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}.$$
 Thus volume of left part is  $V_{Lf} = kV_0 = \left(\frac{p_1^{\frac{1}{\gamma}}}{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}\right)V_0$  and volume of right part is  $V_{Rf} = (1-k)V_0 = \left(1 - \frac{p_1^{\frac{1}{\gamma}}}{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}\right)V_0 = \left(\frac{p_2^{\frac{1}{\gamma}}}{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}\right)V_0$ . This is answer of part (a).

Since process is adiabatic and hence heat is not given to either part, accordingly heat given to left part is Zero. This is answer of part (b).

Page 32 of 43

Final common pressure is 
$$p_1\left(\frac{V_0}{2}\right)^{\gamma} = p_{fL}\left(kV_0\right)^{\gamma} \Rightarrow p_{fL} = \frac{p_1}{\left(2\left(\frac{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}\right)\right)^{\gamma}} = \left(\frac{p_1\left(\frac{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}{2}\right)^{\gamma}}{\left(2\left(\frac{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}\right)\right)^{\gamma}} = \left(\frac{p_1\left(\frac{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}{2}\right)^{\gamma}}{\left(\frac{p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}}{2}\right)^{\gamma}}\right)^{\gamma}$$
 This

answers in part (a) can be expressed in reduced form by taking  $A = p_1^{\frac{1}{\gamma}} + p_2^{\frac{1}{\gamma}}$ . Accordingly, answer to part (a) is

 $V_{Lf} = \frac{p_1^{\overline{\gamma}} V_0}{A}$  and  $V_{Rf} = \frac{p_2^{\overline{\gamma}} V_0}{A}$ . On similar lines answer to part (c) in reduced form is  $\left(\frac{A}{2}\right)^{\gamma}$ .

Thus consolidated answer is 
$$\frac{p_1^{1/\gamma}V_0}{A}$$
,  $\frac{p_2^{1/\gamma}V_0}{A}$  (b) Zero (c)  $\left(\frac{A}{2}\right)^{\gamma}$  where  $A = p_1^{1/\gamma} + p_2^{1/\gamma}$ 

Question 8: 1 liter of an ideal gas ( $\lambda = 1.5$ ) at 300 K is suddenly compressed to half its original volume.

- (a) Find the ratio of the final pressure to the initial pressure,
- (b) If the original pressure is 100 kPa, find the work done by the gas in the process,
- (c) What is the change in internal energy?
- (d) What is the final temperature?
- (e) The gas is now cooled to 300 K keeping its pressure constant. Calculate the work done during the process,
- (f) The gas is now expanded isothermally to achieve its original volume of 1 liter. Calculate the work done by the gas,
- (g) Calculate the total work done in the cycle.

**Illustration :** Given that  $V_i = 1 \times 10^{-3}$ ,  $V_f = 0.5 \times 10^{-3}$  and  $T_i = 300$  K. Since compression is sudden and hence it will not have enough time to dissipate heat developed during compression. Therefore process is virtually adiabatic.

Accordingly, 
$$pV^{\gamma} = K \Rightarrow p_i V_i^{\gamma} = p_f V_f^{\gamma} \Rightarrow \frac{p_f}{p_i} = \left(\frac{V_i}{V_f}\right)^{\gamma} = \left(\frac{1 \times 10^{-3}}{0.5 \times 10^{-3}}\right)^{1.5} = 2^{1.5} = 2\sqrt{2}$$
. This answer for part (a).

Work done in an adiabatic process is  $W = \int_{V_i}^{V_f} p dv = \int_{V_i}^{V_f} \frac{K}{V^{\gamma}} dv = \frac{K}{1-\gamma} \left[ \frac{1}{V_i^{\gamma-1}} \right]_{V_i}^{V_f} = \frac{1}{1-\gamma} \left[ \frac{p_f V_f^{\gamma}}{V_f^{\gamma-1}} - \frac{p_i V_i^{\gamma}}{V_f^{\gamma-1}} \right].$  Therefore.

$$W = \frac{p_i V_i - p_f V_f}{\gamma - 1} = \frac{(100 \times 10^3)(1 \times 10^{-3}) - (2\sqrt{2} \times 100 \times 10^3)(0.5 \times 10^{-3})}{1.5 - 1} = 200(1 - 1.414) = -82 \text{ J. This is answer of}$$

part (b).

As per FLT  $\Delta Q = \Delta U + \Delta W \Rightarrow 0 = \Delta U + \Delta W \Rightarrow \Delta U = -\Delta W = -(-82) = 82$  J. This is answer of part (c).

As per IGE using given and derived data  $pV = nRT \Rightarrow \frac{p_f V_f}{p_i V_i} = \frac{T_f}{T_i} \Rightarrow T_f = \left(\frac{p_f}{p_i}\right) \left(\frac{V_f}{V_i}\right) T_i = 2\sqrt{2} \times \frac{1}{2} \times 300 = 300\sqrt{2} \text{ K.}$ Thus final temperature  $T_f = 300 \times 1.414 = 424.2 \text{ K.}$  This is answer of part (d).

Work done in cooling from 
$$T_f = 424$$
 K to  $T_f' = 300$  K at constant pressure  

$$\Delta W_p = \int_{V_f}^{V} p dv = p \int_{V_f}^{V} dv = pV - pV_f = nRT - nRT_f$$
 J. It leads to  $\Delta W_p = nR(300 - 424)$ . Here it needs to determine  

$$n = \frac{p_i V_i}{RT} = \frac{(100 \times 10^3)(1 \times 10^{-3})}{R \times 300} = \frac{1}{3R}$$
. Thus  $\Delta W_p = nR(300 - 424) = -41.4$  This is answer of part (e).  
During cooling, under constant pressure, in part (e) of the problem volume of gas would decrease as per IGE such that

During cooling, under constant pressure, in part (e) of the problem volume of gas would decrease as per IGE such that  $\frac{V_f}{T_f} = \frac{V_f}{T_f}' \Longrightarrow V_f' = \frac{V_f}{T_f} T_f' = \frac{0.5}{300\sqrt{2}} \times 300 = \frac{1}{2\sqrt{2}}.$  The gas is now expanded isothermally from  $V_f' = \frac{1}{2\sqrt{2}}$  itr to

original volume  $V_i = 1$  ltr. It requires to know volume attained in part (e) in this case work done. In this case V is the volume attained in part (e) of the problem which as per IGE at constant pressure  $\Delta W_{iso} = \int_{\frac{1}{2\sqrt{2}}}^{1} p dV = \int_{\frac{1}{2\sqrt{2}}}^{1} \frac{nRT}{V} p dV = \frac{1}{3R} R \times 300 \int_{\frac{1}{2\sqrt{2}}}^{1} \frac{1}{V} p dV = 100 [\ln V]_{\frac{1}{2\sqrt{2}}}^{1} = 100 \ln (2\sqrt{2}) = 100 \times \frac{\log 2\sqrt{2}}{\log 2.718}.$  This

solves into  $\Delta W_{iso} = 100 = 100 \times 1.03 = 103$ . Thus **answer to part (f) is 103 J**.

Total work done in the process is equal to [work done in part (b)] + [work done in part (e)] + [work done in part (f)] = (-82) + (-41.4) + 103 = -20.4 J. This is answer to part (g)

**Consolidating answers to all parts (a)**  $2\sqrt{2}$  (b) -82 J (c) 82 J (d) 424 K (e) -41.4 J (f) 103 J (g) -20.4 J

**N.B.:** Here natural logarithm  $\ln x \Rightarrow \log_e x$  obtained in integration is converted to logarithm to the base 10  $\log x \Rightarrow \log_{10} x$ . Here, Napier's Constant or Euler's Number e = 2.718. Accordingly, the conversion is  $\ln x = \log_{10} x \times \log_e 10 \Rightarrow \ln x = \frac{\log_{10} x}{\log_{10} e}$ . In the instant problem in part (f) is  $x = 2\sqrt{2}$ .

\_\_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.

## Growing with Concepts: Chemistry

## **IONIC EQUILIBRIUM**

Chemical reaction in solutions play very important role in chemistry. For example, sodium chloride does not conduct electricity in the solid state. However, when it is dissolved in water, it becomes good conductor of electricity. Michael Faraday classified the substance into two types: electrolytes and non-electrolytes. The substances which conduct electricity in their molten states or in the form of their aqueous solution are called electrolytes. For example, aqueous solutions of inorganic acids, bases and salts conduct electricity. Hence, they are electrolytes. The substances which do not conduct electricity in the molten states or in the form of their aqueous solutions are called non-electrolytes. For example, aqueous solutions of sugar, urea and glycerin etc. do not conduct electricity. Hence, they are nonelectrolytes. Arrhenius in 1880 explained that the conductance by an electrolyte is due to the presence of ions produced by the dissociation of the substance. However, different electrolytes dissociate to different extents. "The fraction of the total number of molecules which dissociates into ions is called the degree of dissociation or degree of ionization and is usually represented by  $\alpha = \frac{No.of moles dissociated}{Total No.of moles taten}$ . Depending upon the extent of ionization, the electrolytes are divided into two categories, called strong electrolytes and weak electrolytes. "A strong electrolyte is defined as a substance which dissociates almost completely into ions in aqueous solution and hence is a very good conductor of electricity". For examples, NaOH, KOH, HCl, H<sub>2</sub>SO<sub>4</sub>, NaCl and KNO<sub>3</sub> etc. As strong electrolytes are completely ionized in the aqueous solution, therefore, their ionization is represented by putting a single arrow pointing towards right;  $HCl + H_2O \rightarrow H_3O^+ + Cl^-$ ,  $NaOH + aq \rightarrow Na^{+}(aq) + OH^{-}(aq)$ . A weak electrolyte is defined as a substance which dissociates to a small extent in aqueous solution and hence conducts electricity also to a small extent. The example are; NH<sub>4</sub>OH, CH<sub>3</sub>COOH etc. Weak electrolytes are partly ionized; equilibrium is set up between the ions and the unionized electrolyte. Hence, their ionization is represented by putting double arrows  $(\leftrightarrow)$  in between. For example, CH<sub>3</sub>COOH  $H_2O\leftrightarrow CH_3COO^- + H_3O^+$ ,  $NH_4OH + aq \leftrightarrow NH_4^+$  (aq) + OH (aq) etc. In general, the ionization of a weak electrolyte, AB, is represented as follows: AB(s) + aq  $\leftrightarrow$  $A^+$  (aq) +  $B^-$  (aq). Such equilibrium is called ionic equilibrium between the ions and the undissociated electrolyte. Applying the law of chemical equilibrium to the above equation, we get  $\frac{[A^+][B^-]}{[AB]} = K_i$ , here  $K_i$  is called

#### Kumud Bala

ionization constant. When acetic acid is dissolved in water, it dissociates partly into  $H^+$  or  $H_3O^+$  and  $CH_3COO^-$  ions;  $CH_3COOH + H_2O \leftrightarrow CH_3COO^- + H_3O^+$ . Applying law of chemical equilibrium,  $K = \frac{[CH_3COO^-][H_3O]^+}{[CH_3COOH][H_2O]}$ . In dilute solution,  $[H_2O]$  is constant. The product of K and constant  $[H_2O]$  is denoted as  $K_a$ , the ionization constant or dissociation constant of the acid.

Thus, 
$$\mathbf{K}_{a} = \frac{[CH_{3}COO^{-}][H_{3}O^{+}]}{[CH_{3}COOH]}$$
 ------ (i)

In the equation below *C* represents the initial concentration of the acid in moles L<sup>-</sup> and  $\alpha$ , the degree of dissociation, then equilibrium concentration of the ions (CH<sub>3</sub>COO<sup>-</sup> and H<sub>3</sub>O<sup>+</sup>) is equal to *C* ×  $\alpha$  and that of the undissociated acetic acid = *C*(1- $\alpha$ ), i.e. we have

$$CH_{3}COOH + H_{2}O \iff CH_{3}COO^{-} + H_{3}O^{+}$$
  
Initial concentration

0

Cα

 $C(1-\alpha)$ 

С

0

Concentration at equilibrium

Cα

Substituting the values of the equilibrium concentrations in equation (i) we get  $K_a = \frac{C\alpha.C\alpha}{C(1-\alpha)} = \frac{C^2\alpha^2}{C(1-\alpha)} = \frac{C\alpha^2}{1-\alpha}$  In case of weak electrolytes, the value of  $\alpha$  is very small and can be neglected in comparison to 1 in the denominator, so we get  $K_a = C\alpha^2$  or  $\alpha = \sqrt{\frac{K_a}{C}}$ ------ (ii).

The degree of dissociation ( $\alpha$ ) can, therefore, be calculated at a given concentration C if K<sub>a</sub> is known. Further, if V is the volume of the solution in liters containing 1 mole of the electrolyte, C =  $\frac{1}{V}$ , hence, we have  $\alpha = \sqrt{K_a V}$ . Similarly, for a weak base like NH<sub>4</sub>OH, we have  $\alpha = \sqrt{\frac{K_b}{C}} = \sqrt{K_b V}$ . The above equations lead to the following result:

For a weak electrolyte, the degree of ionization is inversely proportional to the square root of molar concentration or directly proportional to the square root of volume containing one mole of the solute. This is called Ostwald's dilution law.

Calculate the degree of dissociation and concentration of  $H_3O^+$  ions in 0.01M solution of formic acid.  $K_a = 2.1 \text{ x}$   $10^{-4}$  at 298K.

0

Solution: Formic acid is a weak electrolyte. In reaction, HCOOH +  $H_2O \leftrightarrow H_3O^+ + HCOO^-$ , let  $\alpha$  be the degree of ionization. Then the concentration of the various species present at equilibrium would be as under: HCOOH +  $H_2O \leftrightarrow H_3O^+ + HCOO^-$ 

Initial concentration

0.01

Concentration at equilibrium

 $\alpha$  is very small and can be neglected in comparison to 1 in 0.01(1- $\alpha$ ). Thus,  $K_a = \frac{C\alpha^2}{1-\alpha} = \frac{0.01\alpha^2}{1} = 0.01x\alpha^2$  2.1 x  $10^{-4} = 0.01\alpha^2$  ( $K_a = 2.1 \times 10^{-4}$  given)  $\alpha^2 = \frac{2.1 \times 10^{-4}}{0.01} = 2.1 \times 10^{-2}$  $\alpha = \sqrt{2.1 \times 10^{-2}} = 0.14$ 

Concentration of  $H_3O^+$  ions =  $C\alpha = 0.14 \times 0.01 = 1.4 \times 10^{-3} \text{mol } L^{-1}$ 

#### Various concepts of acids and bases:

- 1. Classical concept of acids and bases: Acid was defined as a substance whose aqueous solution possessed the following characteristic properties: (i) conducts electricity (ii) reacts with active metals like zinc, magnesium etc. to give hydrogen (iii) turns blue litmus red (iv) has a sour taste (v) whose acidic properties disappear on reaction with a base. Base was defined as a substance whose aqueous solution possessed the following characteristic properties: (i) conducts electricity (ii) turns red litmus blue (iii) has a bitter taste (iv) has a soapy touch (v) whose basic properties are destroyed on reaction with an acid. The above definitions of acids and bases are called operational definitions as they are based upon certain operations (tests) to be performed on the substances. However, these have been replaced by conceptual definitions (put forward by Arrhenius, Bronsted -Lowry and Lewis) which go into the causes of the observed behavior, based upon structure and composition of the substances.
- 2. Arrhenius concept of acids and bases:- Arrhenius in 1884 put forward a theory known as Arrhenius theory of ionization. The main idea contained in this theory was that when an electrolyte is dissolved in water, it dissociates into positively and negatively charged ions. Based upon this theory, "An acid is defined as a substance which contains hydrogen and which when dissolved into water gives hydrogen ions (H<sup>+</sup>)". Examples: HCl, H<sub>2</sub>SO<sub>4</sub> and HNO<sub>3</sub> contain hydrogen when dissolved in water dissociate completely into H<sup>+</sup> ions and the negative ions as follow: HCl + aq  $\rightarrow$  H<sup>+</sup>

+ Cl , H\_2SO\_4 + aq  $\rightarrow$  2H  $^+$  + SO\_4  $^{-2}$  HNO\_3 + aq  $\rightarrow$  H  $^+$  +  $NO_3^{-1}$ . Such acids are called strong acids. Substances like acetic acid (CH<sub>3</sub>COOH), carbonic acid (H<sub>2</sub>CO<sub>3</sub>) and phosphoric acid (H<sub>3</sub>PO<sub>4</sub>) etc. when dissolved in water dissociates into ions to small extent. Thus, equilibrium is set up between the ions and the undissociated molecules as follows: CH<sub>3</sub>COOH + aq  $\leftrightarrow \text{CH}_3\text{COO}^- + \text{H}^+, \text{H}_2\text{CO}_3 + \text{aq} \leftrightarrow 2\text{H}^+ + \text{CO}_3^{-2},$  $H_3PO_4 + aq \leftrightarrow 2H^+ + PO_4^{-3}$ . Such, acids are called weak acids. In fact, all the properties of an acid are due to the H<sup>+</sup> ions which it furnishes in aqueous solution. "A base is defined as a substance which contains hydroxyl groups and which when dissolved in water gives hydroxide ions (OH<sup>-</sup>)". Examples: NaOH and KOH containing -OH groups, when dissolved into water, dissociate completely to gives OH<sup>-</sup> ions as follows: NaOH + aq  $\rightarrow$  Na<sup>+</sup> + OH<sup>-</sup>  $KOH + aq \rightarrow K^+ + OH^-$ . These are called strong bases.  $NH_4OH + aq \leftrightarrow NH_4^+ + OH^-$ , Ca  $(OH)_2 + aq \leftrightarrow Ca^{+2} +$ 20H<sup>-</sup>. Al(OH)<sub>3</sub> + ag  $\leftrightarrow$  Al<sup>+3</sup> + 30H<sup>-</sup>. These are called weak bases because they dissociate to a small extent. Existence of  $H^+$  ion and  $OH^-$  in aqueous solution:-  $H^+$ ion is simply a proton which is very small in size (radius  $\approx 10^{-13}$  cm). It has a strong electric field. It takes up a lone pair of electrons from water molecule  $\mu^{\dot{\Theta}}$ to form  $\left[ H^{A_{H}^{o}}_{H} \right]^{\oplus}$ , i.e  $H_{3}O^{+}$ , called hydronium ion.

This ion in the aqueous solution can combine with more than one  $H_2O$  molecules to form species like  $H_5O_2^+$ ,  $H_7O_3^+$  and  $H_9O_4^+$ . This process is called hydration. Hence, we simply represent it as



Similarly, OH<sup>-</sup> ions in aqueous solution can combine with one or more H<sub>2</sub>O molecules to form species like H<sub>3</sub>O<sub>2</sub><sup>-</sup>, H<sub>5</sub>O<sub>3</sub><sup>-</sup>, H<sub>7</sub>O<sub>4</sub><sup>-</sup> etc. Hence, we represent it as OH<sup>-</sup> (aq).

 $HCl + H_2O \rightarrow H^+ (aq) + C\Gamma (aq)$   $NaOH + H_2O \rightarrow Na^+ (aq) + OH^- (aq)$   $CH_3COOH + H_2O \leftrightarrow H^+ (aq) + CH_3COO^- (aq)$   $NH_4OH + H_2O \leftrightarrow NH_4^+ (aq) + OH^- (aq)$ 

Arrhenius described neutralization as the process in which hydrogen ions and hydroxide ions combine to form unionized molecules of water.

$$NaOH \rightarrow Na^+ + OH^-$$
,  
 $HCl \rightarrow H^+ + Cl^-$ ,

 $Na^+ + OH^- + H^+ + Cl^- \rightarrow Na^+ + Cl^- + H_2O$ 

As a result of this process, the characteristic properties of acids and bases are destroyed.

#### Limitations of Arrhenius theory :

- (i) Nature of H<sup>+</sup> ions and OH<sup>-</sup> ions:- According to Arrhenius concept, acids and bases were defined as substances which gave H<sup>+</sup> ions and OH<sup>-</sup> ions respectively in aqueous solution. But these ions cannot exist as such in aqueous solution but exist as hydrated ions. Written as H<sup>+</sup> (aq) and OH<sup>-</sup> (aq).
- (ii) Inability to explain acidic and basic character of certain substances:- Arrhenius concept demands that an acid must contain hydrogen and a base must contain hydroxyl (OH<sup>-</sup>) groups. However, a number of substance like NH<sub>3</sub>, Na<sub>2</sub>CO<sub>3</sub>, CaO etc. are known to be basic but do not contain any hydroxyl groups. Similarly, a number of substances like CO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub> etc. are known to be acidic but do not contain any hydrogen. This limitation is, however, overcome if water is supposed to play an important role. For example, NH<sub>3</sub> (g) + H<sub>2</sub>O  $\leftrightarrow$  NH<sub>4</sub><sup>+</sup> (aq) + OH<sup>-</sup> (aq)

 $Na_2CO_3 (s) + H_2O \leftrightarrow HCO_3 (aq) + OH^- (aq) + 2Na^+ (aq)$ 

$$CaO + H_2O \leftrightarrow Ca^{+2} (aq) + 2OH^{-}(aq)$$
$$CO_2 + H_2O \leftrightarrow CO_3^{-2} (aq) + 2H^{+} (aq)$$

 $SO_3 + H_2O \leftrightarrow SO_4^{-2}$  (aq) + 2H<sup>+</sup> (aq)

- (iii) Inability to explain the reaction between an acid and base in absence of water:- for example,
  NH<sub>3</sub> (g) + HCl (g) → NH<sub>4</sub>Cl (s)
  CaO (s) + SO<sub>3</sub> (g) → CaSO<sub>4</sub> (s)
- 3. Bronsted-Lowry concept of Acids and Bases: To overcome the limitations of Arrhenius concept, Bronsted and Lowry in 1923, proposed a broader concept of acids and bases. According to this concept, an acid is defined as a substance which has the tendency to give a proton  $(H^+)$  and a base is defined as a substance which has a tendency to accept a proton. An acid is a proton donor where as a base is a proton accepter. For example: a.  $HCl + H_2O \leftrightarrow H_3O^+ + C\Gamma$ 
  - b.  $CH_3COOH + H_2O \leftrightarrow H_3O^+ + CH_3COO^-$
  - c.  $NH_3 + H_2O \leftrightarrow NH_4^+ + OH^-$
  - d.  $CO_3^{-2} + H_2O \leftrightarrow HCO_3^{-} + OH^{-}$
  - e.  $HCl + NH_3 \leftrightarrow NH_4^+ + C\Gamma$

The following important results may be derived from these equations:

(i) HCl and CH<sub>3</sub>COOH are acids because the y donate a proton to  $H_2O$ .

- (ii)  $NH_3$  and  $CO_3^{-2}$  are bases because they accept a proton from water.
- (iii) Not only molecules but even the ions can act as acids or bases, e.g.  $CO_3^{-2}$  ion in the above case is acting as a base.
- (iv) In the first two (a,b)reactions water is accepting a proton and hence is a base. In the next two (c,d)reactions water is donating a proton and hence is acting as an acid. Thus water acts both as an acid and as well as a base hence is called amphoteric or amphiprotic.
- (v) The presence of hydroxyl (OH<sup>-</sup>) groups is not essential for a substance to act as a base. The only requirement is that it should have a tendency to accept a proton.
- (vi) The reverse reactions are also acid -base reactions. For example, in reaction(a), in the reverse process, H<sub>3</sub>O<sup>+</sup> can give a proton and hence is an acid while CI can accept proton and hence is a base. Thus, there are two acid- base pairs in reaction (a). These are HC1-CI and H<sub>3</sub>O- H<sub>2</sub>O. "A conjugate pair of acid and a base differs by a proton only". i.e. conjugate acid ↔ conjugate base + H<sup>+</sup>. The conjugate acid-base pairs in reactions (a) to (e) may be represented as follows:

$Acid_1$		Base <sub>2</sub>		$Acid_2$		Base <sub>1</sub>
HCl	+	$H_2O$	$\leftrightarrow$	$H_3O^+$	+	Cľ
CH <sub>3</sub> COOH	+	$H_2O$	$\leftrightarrow$	$H_3O^+$	+	CH <sub>3</sub> COO <sup>-</sup>
$H_2O$	+	$\mathrm{NH}_3$	$\leftrightarrow$	$NH_4^{+}$	+	OH
$H_2O$	+	$\text{CO}_3^{-2}$	$\leftrightarrow$	HCO <sub>3</sub> <sup>-</sup>	+	OH
HCl	+	NH <sub>3</sub>	$\leftrightarrow$	$\mathrm{NH_4}^+$	+	Cl

According to this concept, if two acids ( which are acids with respect to water) are mixed, the weaker acid will act as a base with respect to stronger acid, e.g.

$$\begin{array}{rcl} HClO_4 &+ H_2SO_4 &\leftrightarrow & H_3SO_4^+ &+ & ClO_4 \\ Acid_1 & Base_2 & Acid_2 & Base_1 \end{array}$$

Thus,  $H_2SO_4$  is a amphoteric or amphiprotic.

(vii) The above reactions indicate that a substance acts as an acid, i.e. gives a proton only when another substance to accept the proton, i.e. a base, is present. For example, acetic acid does not act an acid in benzene solution because benzene does not accept the proton.

- **Remember:** All Arrhenius acids are also Bronsted acids but all Arrhenius bases are not Bronsted bases. This is because an Arrhenius acid is a substance which can give  $H^+$  ion whereas Bronsted acid is a substance which can donate a proton which is also  $H^+$  ion. An Arrhenius base is a substance which gives  $OH^-$  in the solution but Bronsted base is a substance which accepts a proton. It may not contain  $OH^-$  ion. For example, NaOH is an Arrhenius base because it gives  $OH^-$  ion in aqueous solution but not a Bronsted base because it cannot accept a proton. Advantages of Bronsted- Lowry concept over Arrhenius concept:
  - Bronsted- Lowry concept is not limited to molecules but includes even the ionic species to act as acids or bases.
  - (ii) It can explain the basic character of the substances like Na<sub>2</sub>CO<sub>3</sub>, NH<sub>3</sub> etc. (which do not contain OH<sup>-</sup> groups, hence were not bases according to Arrhenius definition.) on the basis that they are proton acceptors.
  - (iii) It can explain the acid-base reactions in the nonaqueous medium or even in the absence of a solvent e.g. between HCl and NH<sub>3</sub>.
- Limitations of Bronsted-Lowry concept:
- (i) It cannot explain the reactions between acidic oxides like CO<sub>2</sub>, SO<sub>2</sub>, SO<sub>3</sub> etc. and the basic oxides like CaO, BaO, MgO etc. which take place even in the absence of the solvent, e.g. CaO + SO<sub>3</sub> → CaSO<sub>4</sub>. Obviously, there is no proton transfer involved in this reaction.
- (ii) Substance like  $BF_3$ ,  $AlCl_3$  etc. do not have any hydrogen and hence cannot give a proton but are known to behave as acids.



4. Lewis Concept of Acids and Bases: G.N. Lewis in the 1923, proposed a broader concept of acids and bases. This concept eliminated the necessity of the presence of hydrogen in an acid and this included many more substances as acids and bases. According to this concept (also called electron concept) an acid is defined as substance (atom, ion or molecule) which is capable of accepting a pair of electrons and a base is defined as a substance which is capable of donating an unshared (lone) pair of electrons. An acid is an electron pair acceptor while a base is an electron pair donor. Obviously,the reaction between an acid and a base, according to this concept, amounts to the formation of a coordinate bond or dative bond between them. For example-

(i) Reaction between BF<sub>3</sub> and NH<sub>3</sub>



 $NH_3$  can donate a lone pair of electrons while  $BF_3$ (in which boron atom has only 6 electrons in the outermost orbit) can accept a pair of electrons,  $NH_3$  is a base and  $BF_3$  is an acid.

(ii) Reaction between  $NH_3 \mbox{ and } H^{\scriptscriptstyle +} \mbox{ ion}$ 

(iii) reaction between  $BF_3$  and F ion



(iv) Hydration of metal ions

$$\begin{array}{rcl} \mathrm{Al}^{3^{+}} &+& \mathrm{6(:\overset{\odot}{O}-H)} \longrightarrow & \mathrm{Al(:\overset{\odot}{O}-H)_{6}}^{3^{+}} \\ & & & \\ & & & \\ \mathrm{H} & & & \\ \mathrm{Lewis} & & \\ \mathrm{acid} & & \mathrm{base} \end{array}$$

**Types of Lewis Bases:** Lewis bases can, obviously, be of two types. These are -

- (i) Neutral molecules like :NH<sub>3</sub>, R-NH<sub>2</sub>, R-OH,  $H^{-H} \xrightarrow{CH} H^{-H}$  in which one of the atoms has got at least one lone pair of electrons.
- (ii) All negative ions like F, CI, Br, I, OH, CN etc.
- **Types of Lewis acids:** Lewis acids can be of four types. These are –
- (i) Molecules having a central atom with incomplete octet:



hence, central atom can accept a pair of electrons e.g.



 (ii) Simple Cations for example- Ag<sup>+</sup>, Cu<sup>+2</sup>, Fe<sup>+3</sup> etc. These ions can accept pairs of electrons and hence are Lewis acids. e.g.





(iii) molecules having central atoms with empty dorbital: the central atoms in these molecules can expand their outer octet by taking up electrons in their empty d-orbital, e.g. SnCl<sub>4</sub>, SiF<sub>4</sub>, PF<sub>5</sub> etc.

(iii) Occupation of empty d-orbitals :

SnCl <sub>4</sub>	+	2Cl <sup>-</sup> →	SnCl <sub>6</sub> <sup>2–</sup>
Lewis acid		Lewis base	
SiF <sub>4</sub>	+	2F <sup>-</sup> →	Si F <sub>6</sub> <sup>2–</sup>
Lewis acid		Lewis base	

(iv) Molecules containing a multiple bond between two atoms of different electro-negativities, e.g.  $CO_2$ contains double bonds between carbon and oxygen (O=C=O). Since oxygen is more electro-negative than carbon, therefore, carbon acquires a slight positive charge and thus can accept a pair of electron. Hence,  $CO_2$  acts as a Lewis acid.



#### Limitations of Lewis Concept:

 (i) It does not explain the behaviour of well known protonic acids like HCl, H<sub>2</sub>SO<sub>4</sub> etc. which do not form coordinate bonds with bases. Therefore, these are not regarded as acids according to Lewis concept. The necessary requirement in

#### Assignment

1. Ostwald's dilution law gives satisfactory results for --

Lewis concept is the formation of a coordinate bond between the acid and base.

- (ii) Acid-base reactions are usually fast but the formation of coordination compounds is slow. Hence, it does not fit in the acid-base reaction concept.
- (iii) It does not explain the relative strengths of acids and bases.
- (iv) The catalytic activity of many acids is due to H<sup>+</sup>(aq) ion. Since the presence of hydrogen is not an essential requirement for a Lewis acid, many Lewis acids will not have this property.
- (v) Lewis concept is so general that it considers every reaction forming a coordinate bond to be acid-base reaction. This, however, may not be always true. For example, according to this concept, even some metals are acids, e.g. nickel is acid because it forms the coordination compound with CO, i.e. Ni(:C=O:)<sub>4</sub> called nickel tetracarbonyl.
- **REMEMBER:**All Lewis bases are also Bronsted bases but all Bronsted acids may not be Lewis acids. This is because a substance that is capable of giving an electron pair has the tendency to accept a proton. For example- consider the reaction,  $H_3N: + H_2:O: \rightarrow$  $[NH_4]^+ + OH^-$ . Here,  $NH_3$  is Lewis base as well as bronsted base. However, in the above case,  $H_2O$  is Brondted acid because it is giving a proton but is not a Lewis acid because it is electronically satisfied. Similarly, HCl and  $H_2SO_4$  are bronsted acids but not Lewis acids as they cannot accept pairs of electrons.
- **Problem:** Classify the following species into Lewis acid and Lewis base and show how these act as such:
  - (a)  $OH^{-}$  (b)  $F^{-}$  (c)  $H^{+}$  (d)  $BCl_{3}$

#### Solution:

- (a) OH<sup>-</sup> (hydroxyl ion) is a Lewis base because it can donate an electron pair.
- (b) F is a Lewis base as it has 4 lone pairs of electrons and can donate any one of these.
- (c) H<sup>+</sup> is a Lewis acid as it can accept electron pair from bases like OH<sup>-</sup>, F ions etc.
- (d) BCl<sub>3</sub> acts as a Lewis acid because it is electron deficient and can accept a lone pair of electrons.

(A) HCl	(B) $HNO_3$
(C) CH <sub>3</sub> COOH	(D) NaOH

2. Ostwald's dilution law for a weak acid HA may be given as ------

(A) 
$$K_a = \frac{\alpha . C}{(1-\alpha)C}$$
 (B)  $K_a = \frac{\alpha^2 . C}{(1-\alpha)}$   
(C)  $K_a = \left[\frac{\alpha^2}{(1-\alpha)} . C\right]^2$  (D)  $K_a = \frac{\alpha^2 . C}{1-\alpha^2}$ 

3. Which of the following species is amphoteric in nature?

(A)  $H_3O^+$  (B)  $CI^-$  (C)  $HSO_4^-$  (D)  $CO_3^{-2}$ 

- 4. Which of the following can act as Bronsted-Lowry acid as well as a base?
  (A) Cl<sup>-</sup> (B) HCO<sub>3</sub><sup>-</sup> (C) H<sub>3</sub>O<sup>+</sup> (D) SO<sub>4</sub><sup>-2</sup>
- 5. In the acid-base reaction, HCl + CH<sub>3</sub>COOH ↔ CI + CH<sub>3</sub>COOH<sub>2</sub><sup>+</sup> the conjugate acid of acetic acid is ----(A) CH<sub>3</sub>COOH<sub>2</sub><sup>+</sup>
  (B) HCl
  (C) H<sub>3</sub>O<sup>+</sup>
  (D) CI
- 6. In the reaction HCN + H<sub>2</sub>O ↔ H<sub>3</sub>O<sup>+</sup> + CN<sup>-</sup> the conjugate acid-base pair is ----(A) HCN, H<sub>3</sub>O<sup>+</sup>
  (B) HCN, CN<sup>-</sup>
  (C) H<sub>2</sub>O, CN<sup>-</sup>
  (D) CN<sup>-</sup>, H<sub>3</sub>O<sup>+</sup>
- 7. Which of the following species can act as Lewis acid?
  (A) Cl<sup>-</sup> (B) H<sub>3</sub>O<sup>+</sup> (C) BF<sub>3</sub> (D) C<sub>2</sub>H<sub>5</sub>OH
- 8. Which of the following species can act as Lewis base?
  (A) Cu<sup>2+</sup> (B) AlCl<sub>3</sub> (C) NH<sub>3</sub> (D) BF<sub>3</sub>
- 9. The conjugate acid of  $NH_2^-$  is ----(A)  $NH_3$  (B)  $NH_2OH$  (C)  $NH_4^-$  (D)  $N_2H_4$
- 10. Of the following the strongest Bronsted base is------(A)  $ClO^{-}$  (B)  $ClO_{3}^{-}$  (C)  $ClO_{2}^{-}$  (D)  $ClO_{4}^{-}$
- 11. Which of the following pair cannot act both as Bronsted acid as well as Bronsted base?
  (A) HSO<sub>4</sub>, OH<sup>-</sup> (B) H<sub>2</sub>SO<sub>4</sub>, HCO<sub>3</sub><sup>-</sup>

- (C) H<sub>2</sub>O, O<sup>-2</sup>
  (D) NH<sub>2</sub>, OH<sup>-</sup>
  12. Which one of the following is the correct statement?
  (A) HCO<sub>3</sub> is the conjugate base of CO<sub>3</sub><sup>-2</sup>
  (B) NH<sub>2</sub> is the conjugate acid of NH<sub>3</sub>
  (C) H<sub>2</sub>SO<sub>4</sub> is the conjugate acid of HSO<sub>4</sub><sup>-</sup>
  - (D)  $NH_3$  is the conjugate base of  $NH_2$
- 13. Identify a species which is NOT a Bronsted acid but a Lewis acid.
  (A) BF<sub>3</sub> (B) H<sub>3</sub>O<sup>+</sup> (C) NH<sub>3</sub> (D) HCl
- 14. Which of the following is Lewis acid? (A)  $Ag^+$  (B)  $[SiF_6]^{-2}$  (C) F (D)  $O^{-2}$
- 15. Acidity of BF<sub>3</sub> can be explained on the basis of which concepts?
  - (A) Arrhenius concept
  - (B) Bronsted Lowry concept
  - (C) Lewis concept
  - (D) Bronsted Lowry as well as Lewis concept.
- 16. Three reactions involving  $H_2PO_4^-$  are given below:
  - (i)  $H_3PO_4 + H_2O \rightarrow H_3O^+ + H_3PO_4^-$
  - (ii)  $H_2PO_4^- + H_2O \rightarrow HPO_4^{-2} + H_3O^+$
  - (iii)  $H_2PO_4^- + OH^- \rightarrow H_3PO_4 + O^{-2}$
  - (iv) In which of the above does H<sub>2</sub>PO<sub>4</sub><sup>-</sup> act as an acid?
    (A) (i) only
    (B) (ii) only
    (C) (ii) and (iii)
    (D) (iii) only
- 17. The dissociation constant of a monobasic which is 3.5% dissociation in N/20 solution at 20°C is –

(A)  $3.5 \times 10^{-2}$  (B)  $5 \times 10^{-3}$ (C)  $6.34 \times 10^{-5}$  (D)  $6.75 \times 10^{-2}$ 

- 18. A 0.01M solution of acetic acid is 1.34% ionised (α= .0134) at 298K. What is the ionization constant of acetic acid?
  (A) 1.80x10<sup>-6</sup> (B) 2.80 x 10<sup>-6</sup>
  - (C)  $1.34 \times 10^{-5}$  (D)  $3.8 \times 10^{-6}$

#### ANSWERS

-	-	(A) .81	(D) .71	(B) .ðt	12. (C)	(A) .41	(A) .EI	(A) .21	11. (C)
(A) .01	(Å) .e	(C) .8	7. (C)	(B) .ð	(A) .č	4. (B)	(C) .£	2. (B)	(C) .1



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: <u>kumud.bala@yahoo.com</u>

# 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

If I have seen further than others, it is by standing upon the shoulders of giants.

Isaac Newton



Kumud Bala

## **SCIENCE QUIZ : July-2019**

- 1. What are microorganisms?
  - (A) organisms that are so small that they can only be seen through a microscope.
  - (B) organisms that they can be seen without the help of a microscope.
  - (C) Are not found in air, water and in the bodies of plants and animals.
  - (D) None of these.
- 2. What are the major groups of microorganisms?
  - (A) Bacteria, fungi, protozoa, algae
  - (B) Antibiotics, fungi, pathogens, virus
  - (C) Yeast, antibiotics, protozoa, anopheles mosquito
  - (D) None of these.
- 3. Microorganisms can be seen with the help of a -----(A) Telescope
  (B) Microscope
  (C) Camera
  (D) None of these.
- **4.** The process of conversion of sugar into alcohol is known as ------

(A) Fermentation	(B) Antibiotics
(C) Pathogens	(D) Virus

- 5. Alcohol is produced with the help of ------
  - (A) Bacteria(B) Yeast(C) Nitrogen(D) Fungi
- 6. Medicines which are manufactured by growing specific microorganisms to kill or stop the growth of the disease- causing microorganisms are called ------
  - (A) Antibiotics (B) Pathogens
  - (C) Yeast (D) Virus
- 7. Witch of the following is an antibiotics?
  (A) Sodium bicarbonate
  (B) Streptomycin
  (C) Alcohol
  (D) Yeast
- 8. The bread or idly dough rises because of -----(A) Heat
  (B) Grinding
  (C) Growth of yeast cells
  (D) Kneading
- 9. Which are two diseases caused by bacteria?
  - (A) Tuberculosis, typhoid
  - (B) dysentery, malaria
  - (C) Polio, chicken pox
  - (D) Measles, malaria

- 10. Vaccine for small pox was discovered by -----(A) Louis Pasteur
  (B) Alexander Fleming
  (C) Edward Jenner
  (D) John Mendal
- 11. Microorganisms are ---(A) Unicellular
  (B) Multicellular
  (C) Both unicellular and multicellular
  - (D) None of these
- 12. Name of the scientist who discovered the process of fermentation is ------(A) Alexander Fleming (B) Louis Pasteur
  - (C) John Mendal (D) Edward Jenner
- 13. Carrier of malaria-causing protozoan is ------(A) Female anopheles mosquito(B) Cockroach(C) Housefly(D) Butterfly
- **14.** Microorganisms exhibiting the characteristics of living and non-living organisms are known as ---
  - (A) Bacteria (B) Virus
  - (C) Algae (D) Fungi
- 15. A person bitten by dog gets -----
  - (A) Malaria(B) Tetanus(C) Typhoid(D) Rabies
- 16. Amoebic dysentery is transmitted by -----(A) Sneezing (B) Using contaminated water
  - (C) Direct contact (D) Wound
- 17. Anthrax in cattle is caused by ------(A) Fungi (B) Virus (C) Bacteria (D) Algae
- 18. Jams and jellies are preserved by-----
  - (A) Drying
  - (B) Using chemical preservatives
  - (C) Using acetic acid
  - (D) Using heat and cold treatments.
- **19.** Pasteurization is the method used for preserving------(A) Milk (B) Jam (C) Pickles (D) Grains
- **20.** Which microorganism causes foot and mouth diseases of cattle?

http://www.gyanvigyansarita.in/

(A) Bacteria	(B) Virus
(C) Fungi	(D) Algae

**21.** Microbial diseases that can spread from an infected person to a healthy person through air, water, food or physical contact are called ------

- (A) Communicable diseases (B) Tuberculosis
- (C) Citrus canker (D) Rust of wheat

#### 22. What is meant by food poisoning?

- (A) food poisoning is caused by consuming food that has been spoilt by some microorganisms
- (B) chemicals that check the growth of microorganisms
- (C) spoiled food emits bad smell and has a bad taste and colour change.
- (D) none of these
- **23.** Which plant disease is transmitted by insects and caused by virus?
  - (A) Yellow vein mosaic of bhindi
  - (B) Rust of wheat
  - (C) Citrus canker
  - (D) Smut of rice.
- **24.** For which of the following, microorganisms are useful ?
  - (A) Alcohol, wine(B) Curd, cakes(C) Crushed fruit juices(D) None of these
- **25.** Which bacteria turn milk into curd?

- (A) Lactobacillus(B) Yeast(C) Alcohol(D) Wine
- **26.** How are bacteria beneficial for us?
  - (A) Nitrogen fixing bacteria increase the fertility of the soil
  - (B) They can be used to form curd, alcohol
  - (C) They can decomposed organic matter
  - (D) All the above
- **27.** Who discovered the bacterium (Bacillus anthraces) which causes anthrax disease?
  - (A) Edward Jenner(B) Robert Koch(C) Alexander Fleming(D) Louis Pasteur
- 28. What is the category of microorganism for plasmodium?
  (A) Protozoan (B) Algae
  (C) Virus (D) Bacteria
- 29. What are the three types of bacteria?
  (A) Coccus, spirillum, bacillus
  (B) Lacto, algae, yeast
  (C) Paramecium, protozoa, chlamydomonas
  (D) chlamydomonas, zinc sulphate, copper sulphate
- 30. The gas released during the preparation of bread is ---

(A) Oxygen	(B) Carbon dioxide
(C) Nitrogen	(D) Sulphur dioxide

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

---

-00-

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

-00-

## **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 औंखें 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 of compassionate 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 ...





