GYAN VIGYAN SARITA:शिक्षा

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Aim for the Best, but...

Online Mentoring From Texas

Equipments at Mentoring Center
1. Compatible Desk-/Lap-top
2. WebCam
3. Headset with Microphone
4. Wacom Tablet Pen
AND
Broadband-Internet Connection:
Minimum Bandwidth: 8 Mbps and Monthly Data Capacity: (1xN) GB ; Here, N= No of Hours of Monthly

Conceptual Representation
of
Interactive Online Mentoring Sessions
(IOMS)
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)

An Ideal Smart Training Center
(If we can afford it for all)

- Equipments at Learning Center
1. Compatible Desk-/Lap-top
2. WebCam
3. Speakers
4. USB Microphone
5. Overhead Projector.
6. Wacom Tablet Pen with Wireless Accessory
7. UPS (For Continuous Power Supply to computer, internet modem and L&F)
AND
Broadband-Internet Connection: **Min. 8 Mbps and (1xN) GB monthly data capacity; N= No of Hours of Monthly sessions**

Cloud WebEx (Internet Connected)

WebEx Whiteboard – a Fully Shared Space between Students and Mentor using Wacom Tablet **(Interactive Online Mentoring)**

Primitive Mentoring-cum-Learning Centre (Demo)

Important Links
1. Good Internet Connectivity (Preferably-Wired Broadband Connection, or 4 G Mobile)- Exclusive
2. Subject-wise Coordinator for Each Session to Bridge Learning Gaps between Mentor & Students

Mentoring Centre

Learning Centre -1

Learning Centre - 2

Learning Centre - 3

Learning Centre-4

Learning Centre - 5

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

subhashjoshi2107@gmail.com

Learning Centre With LCD Screen Display at RKM School, Sitanagram, Guntur

We start with what is available in ground; Aim at best Grooming for Competence Building Unprivileged; Welcome better and more economical, but functionally suitable for IOMS, setup to reach Unprivileged Students : Spiritually Democratize Education.

Learning Centre With Projector Display (Widely Practiced)

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

राष्ट्रीय प्रौद्योगिकी दिवस   (NATIONAL TECHNOLOGY DAY)

प्रौद्योगिकी अंग्रेजी भाषा के TECHNOLOGY का हिन्दी भाषा में समान अर्थ देने वाला शब्द है। इसके समान अर्थ देने वाले अन्य शब्द हैं - तकनीकी, अभियांत्रिकी आदि। मनुष्य के रहन सहन, जरूरतों और उसकी सुरक्षा में तकनीकी विकास ने बहुत योगदान दिया है। आदिकाल से ही मानव का सड़कें बनाना, दुर्ग का निर्माण करना, जानवरों के शिकार और अपनी रक्षा के उपकरण बनाना, इसी तकनीकी विकास के उदाहरण हैं।

तकनीक आवश्यकता से जुड़ा सहायता करने वाला विज्ञान का एक हिस्सा है। कभी यह पूर्ण विज्ञान बन जाता है तो कभी अपने को हर विज्ञान से जोड़कर हमारे जीवन का हिस्सा बन जाता है।   हर समाज, हर देश आज तकनीकी विकास में जुटा हुआ है और आधुनिक शिक्षा विज्ञान, स्वास्थ्य विज्ञान, अंतरिक्ष विज्ञान, रक्षा विज्ञान, आदि में इसका उपयोग अधिक से अधिक हो रहा है।

जहां विज्ञान किसी वस्तु की सत्यता को परखने के लिये हमें दो विधियां देता है - सिद्धांत और प्रयोग, वहीं तकनीकी ज्ञान हमें इन विधियों में नये प्रयोगों की इजाजत देता है।

विज्ञान का नियम है कि किसी सिद्धांत पर पहुंचने के पहले कुछ परिकल्पनायें बनानी होती हैं। फिर उनको सत्य की कसौटी पर परखना होता है। भिन्न परिस्थितियों में अगर वे परिकल्पनायें सत्य प्रमाणित हो जाती हैं, तब हम उस परिकल्पना को सत्य मानकर उसे प्रामाणिक सिद्धांत का नाम दे देते हैं। फिर उस सिद्धांत को सही मानकर बहुत से दूसरे प्रयोग भिन्न भिन्न परिस्थितियों में करते हैं।

परिकल्पनायें प्रौद्योगिकी की जन्मस्थली होती हैं। यहीं से भाषा अंकों में परिवर्तित होना शुरू होती है। एक अच्छे इंजिनियर का मानना होता है कि जिसके बारे में आप बात कर रहे हैं उसे अगर आप माप सकते हैं और संख्याओं में व्यक्त कर सकते हैं, तब तो आप उस सोच के बारे में कुछ जानते हैं, अन्यथा आपका ज्ञान सतही है और असंतोषजनक है।

बहुत से सिद्धांत कालांतर में आगे चलकर गलत साबित हो जाते हैं। फिर विज्ञान तर्क का सहारा लेता है और नये तर्कों के साथ नयी परिकल्पनायें गढ़ कर नये सिद्धांतों की खोज करता है। नये तर्कों की खोज हमें बुद्धिमान बनाती है, और तार्किक बनाती है। सामान्य भाषा में परिकल्पनायें सत्य की प्राप्ति के झरोखें हैं।

मानव का विकास, उसके चारों ओर के वातावरण में हो रही घटनाओं के प्रभाव के कारण उसकी बदलती जीवन शैली जिसे संक्षेप में सभ्यता कहा जाता है, के विकास के साथ साथ होता है। मानव की विकास यात्रा, मूलतः इंजिनियरिंग अथवा अभियांत्रिकी अथवा प्रौद्योगिकी के विकास की कहानी है। इंजिनियरिंग, प्रकृति की शक्तियों को मानव की भलाई के लिये कम करने का प्रयास करती है।   प्रकृति की शक्तियां अथाह हैं। इंजिनियरिंग इन शक्तियों के प्रभाव को कम करने के तरीके इजाद करके उपयोगी बनाने का काम करती है।

इतिहास का निर्माण वास्तव में इंजिनियर करता है। वैज्ञानिक संसार को उस रूप में पढ़ते हैं जैसा उनको मिलता है। इंजिनियर वह संसार बनाते हैं जो कभी था ही नहीं। कभी तकनीक को सुधार कर और कभी बिल्कुल नयी तकनीक लाकर ऐसा किया जाता है।

एक अजीब सी बिडंबना है कि जटिल से जटिल मशीन मनुष्य बनाता है पर सभी मशीनें मिलकर भी मनुष्य नहीं बना पाती हैं। एक मशीन सैकड़ों साधारण मनुष्यों का काम कर सकती है पर कोई भी मशीन एक असाधारण मनुष्य के बराबर काम नहीं कर पाती है।

वैज्ञानिक सोच किसी एक समय में विकसित नहीं होती है। यह निरंतर चलने वाली प्रक्रिया है लेकिन श्रेष्ठ तकनीक श्रेष्ठ दिमाग की उपज अवश्य होती है। तकनीक जबतक हमारे नौकर की तरह

काम करती है तब तक वह हमारा और हमारे समाज का भला करती है, परंतु जैसे ही वह नौकर से ऊपर उठकर मालिक बन बैठती है, वह सभी का अहित कर देती है।

हमारे देश में 11 मई राष्ट्रीय प्रौद्योगिकी दिवस के रूप में मनाया जाता है। इसी दिन भारत ने प्रौद्योगिकी के क्षेत्र में सफलता हासिल करते हुये वर्ष 1998 में दूसरा सफल परमाणु परीक्षण किया था। यह परीक्षण पोखरण (राजस्थान) में हुआ था। उस समय देश के प्रधानमंत्री श्री अटलविहारी बाजपेयी थे।

11मई को ही भारत में निर्मित देश के पहले एयरक्राफट हंस-3 ने सफलतापूर्वक उड़ान भरी थी। इसी दिन त्रिशूल मिसाइल का सफल परीक्षण भी हुआ था।

11 मई का दिन औद्योगिक घरानों और भारतीय वैज्ञानिकों के लिये अत्यंत महत्वपूर्ण होता है। जहां औद्योगिक घरानों को अपने

तकनीकी विकास को प्रदर्शित करने और दूसरों की अपेक्षा स्वयं को श्रेष्ठ दिखाने का मौका मिलता है, वहीं देश अपने प्रतिभा संपन्न वैज्ञानिकों को सम्मानित करता है। इन सम्मानों के कारण देश के वैज्ञानिक देश के विकास के लिये बहुमुखी तकनीक की खोजें करने के लिये प्रोत्साहित होते हैं। विकास प्रोत्साहन का पिछलग्गू होता है।

ज्ञानविज्ञान सरिता परिवार की तरफ से सभी पाठकों, बुद्धिजीवियों, वैज्ञानिकों, और औद्योगिक संस्थानों को राष्ट्रीय प्रौद्योगिकी दिवस पर कोटि कोटि बधाइयां, इस आशा के साथ कि उनके आने वाले कल के हर कार्य आम आदमी, उसके चारों ओर के समाज, और भारत की प्रगति में सहयोग करने वाला और उसके सम्मान को बढ़ाने वाला होगा।

—00—

OUR MENTORING PHILOSOPHY: Mentoring is not teaching, neither tuition nor coaching. It is an activity driven by passion, and commerce has no place in it. In this effort is to caution students that -

- This place is not where they will be taught how to score marks and get higher ranks, but to conceptualize and visualize subject matter in their real life so that it becomes intuitive.

- This place is not to aim at solutions but inculcate competence to analyze a problem and evolve solution.

- This place does not extend selective and personalized attention, rather an opportunity to become a part of which is focused on learning and problem solving ability collectively.

- This place provides an opportunity to find students above and below one's own level of learning. Thus students develop not in isolation but learn from better ones and associate in problem solving to those who need help. This group dynamics while create a team spirit, an essential attribute of personality, while one learns more by teaching others.

- This place has strategically chosen Online Mentoring, so that those who are unprivileged can gather at one point and those who can facilitate learning of such students by creating, necessary IT setup. Aseperate **Mentor's Manual**is being developed to support the cause.

We are implementing this philosophy through **Online Mentoring**

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An Appeal: Gyan Vigyan Sarita

A Non-organizational Initiative of a Small Set of Co-passionate Persons

Philosophy: Personal Social Responsibility (PSR)

Objective: Groom competence to Compete among unprivileged children from 9th-12th in Maths and Physics, 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 to the participators

Operation:

a. **Mode:** Online since July'16, using Google Hangouts, a free we-conferencing S/w, with connectivity upto 15 nodes.
b. **Participation:** Voluntary and Non-remunerative, Non-Commercial and Non-Political

Involvement:

a. **As 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,
   iv. Sponsor Website.
b. **As Facilitator** –
   i. Provide space and infrastructure for **Online Mentoring Sessions (OMS)**, which is generally available, with a marginal add-on,
   ii. Garner support of elite persons to act as coordinators at a Learning Centre.
c. **As Participator** –
   i. As a Mentor,
   ii. As Coordinator,
   iii. As Editor and or contributor of thought provoking articles for e-Bulletin, which are relevant to the initiative, and make it more purposeful and reachable to the target audience.
   iv. As author of Chapters for Mentors' Manual, being uploaded as a Free Web Resource,
   v. Anything else that you feel can add value to the mission and make it more purposeful.

vi. *Anything else that you consider to make this initiative to become more effective.*

Background: *The initiative had its offing in May'12, when its coordinator, a power engineer by profession, soonafter submission of Ph.D. Thesis in April'12, at IIT Roorkee, at the age of 61 years, decided to mentor unprivileged students.*

SARTHAK PRAYASH, a Ghaziabad based NGO, warmly accepted the proposition and created a facility to mentor students from 8+ to prepare in mathematics and physics and prepare them for engineering entrance tests. They warmly reciprocated and created a class room.

*Experience in this selfless social work were used to navigate across without losing focus. He was associated with SUBODH FOUNDATION from Sept'15 to Sept'16 during which he published a monthly e-Bulletin **SUBODH-पत्रिका** to create visibility across persons who could make a difference.*

*In Sept'16, post transition, the mission has been continued as a non-organizational entity **Gyan Vigyan Sarita**, with a set of Four persons, including retired **Prof. SB Dhar**, Alumnus-IIT Kanpur, a middle aged **Shri Shailendra Parolkar**, Alumnus-IIT Kharagpur, settled at Texas, US and **Smt. Kumud Bala**, Retired Principal, Govt. School Haryana. Earlier, they were complementing the OMS. While, the initiative survived transition, a website:* http://gyanvigyansarita.in*has been launched. It contains under its**Menu: Publication>e-Bulletins,** and>**Mentors' Manual.** You may like to read them.*

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 at **Involvement**, above, to make the mission more purposeful and reachable to target children.

Ideology vis-à-vis Purpose

Ideology of a person, group, society or nation has been a motivational factor in orientation of their efforts. Ideology is derived from high ideals which make one singularly or collectively distinct from commoner. Evolution of every ideology is deliverance of a person who lived life in most sacred manner. Followers of an ideology with their utter faith in the character, either that lived or creation by a seer, in his epic to idealize it. Each ideology as it perpetuates undergo either gradual dilution or imbibes aberrations. Socrates pedagogy was different from theological pedagogy. The Socrates school of thoughts grew on dialectical methods and evolved into philosophy of scientific pursuit. Later, it got coined as Dialectical Materialism in writing of Karl Marx and Friedrich Engels which revolutionized global socio-economic-politic. Dialectical Materialism is different from communism a socio-political thought.

Gyan Vigyan Sarita (GVS), during pursuit of its ideology, has drawn inspiration from the vision of Swami Vivekananda to democratize education by way of grooming competence to compete among deprived children with a sense of personal social responsibility (PSR). In the process interactions were held with many established spiritual orders of international acclaim, NGOs, reputed academic institutions, administrators and accomplished persons. Each of them has his own ideology. It is observed that each ideology as it perpetuates creates a clout of its followers to read, write, think and practice. Gradually it evolves into a structure, rules and processes. Invariably these ideologies, engage in creating and enlarging sphere of their influence. Eventually, they end up relentlessly to any upcoming school of thought, perhaps an identity crisis.

These experiences pose a million dollar question whether ideology is to serve the purpose or purpose to serve an ideology? In this article an effort has been made to broadly review the experiences for arriving at a reasonable stand on the premise.

Human race, among all the creations of GOD, either living or non-living, is most gifted with ability to think and act creatively. In this pursuit, thinkers at different point of time and in different parts of world have experienced life in-depth and proclaimed principles and practices of life for coexistence and perpetuation. This has been perpetuated by their disciples as ideology, religion or a sect. In Indian mythology, considered to be the oldest, principle of living is defined in three words शरीरो रक्षितो धर्मः **(**Shariro rakshito dharmah – protecting self is religious**).** Another ideology stipulates that "**वदनी कवळ घेता, नाम घ्या श्रीहरीचे, सहज हवन होते, नाम घेता फुकाचे; जीवन करी जिवित्वा, अन्न हे पुर्ण ब्रह्म, उदरभरण नोहे, जाणीजे यज्ञ कर्म**" **(**Vadani kaval gheta naam ghya Shri Hari che, sahaj havan hote naam gheta fuka che; jivan kari jivatvan aana he poorna Bramha, udaran bharan nohe janije yagya karma) . Meaning of this verse is that, *while taking every bite of food remember God; while performing a spiritual sacrifice, His name is recited for free. Every life on this earth is food for the other and this is a truth of coexistence in nature, and therefore it needs to be understood that this food is just not to fill the belly but is an integral to the existence of complete nature. One who understands this, for him taking food is just not satisfying hunger but it is an act of sacrifice for the larger good.* ***This verse is an excellent spiritual narration on role of an ideology to serve a purpose, like a barb which protects crops for the larger good***. If the purpose exists, ideology would have relevance. On the contrary, it would be counterproductive if an ideology allows the purpose to flourish just for the sake of itself staying in relevance. It is comparable to encouraging charity merely for spiritual satisfaction and thereby makes subjects of charity perpetually dependent on alms. Instead needs is to evolve ingenuity for their self-dependence. In absence of grooming self-dependence among weaker any charity is an act of spiritual betrayal and serves only self-glorification and breach of ideology. An ideology in fact has to work towards empowerment of the subjects so that ideologies can perpetuate by reaching out to those remaining deprived of competence.

Bill Gates has established a precedence of an extremely shrewd businessman. He chose to engage in philanthropy in India by funding computers in education sectors. In the process he has captured one of the biggest market for Microsoft products. In the process education has become a highly adorable charity. Such a charity in education is mushrooming and getting sanitized by state policy of privatization of education. The trend has been since more than a decade. Such a policy shift provides more resources for government to spend in areas of their immediate interest, while education sector which offers long term dividend rests on hopes. It is known that no private sector shall invest in charity, unless it caters to its immediate business interests. Despite, private educational venture under the name of philanthropy and Corporate Social Responsibility (CSR) are extracting financial benefits to expand their empire, and an additional dividend in the form of name and fame. It has set on a rat race among corporate houses to build institutions of academic excellence and name them after their own selves or their financer, who hardly had anything to do with education. In this race spiritual institution, social groups, individuals have joined. Basic aim of grooming competence to compete among children deprived of opportunities by way of their social,

economical, cultural, racial and geographical context has become secondary.

This article is a case study, in which anonymity of institutions and individuals have been maintained to observe objectivity of purpose of social reform through education and not to antagonize those who were found short of in their PSR. At the end it takes an optimistic posture to motivate persons new into the initiative to convey them that all is not that bad, and there is a big opportunity for those who are passionately committed to the cause.

In this context example an epic from Mahabharata becomes relevant, where Four criminals for killing a rich man were produced before Duryodhan and Yudhishthir to pronounce a judgement. Duryodhan pronounced execution of four criminals to death being accomplice to the heinous crime of robbing and killing. But, Yudhisthir proceeded by asking profession of each of the criminal. The teacher was pronounced execution till death, the warrior was pronounced life imprisonment, The businessman was pronounced rigorous imprisonment for Ten years. Lastly, the butcher was sent to rehabilitation home. Duryodhan ridiculed discrimination in the judgement. But, given an opportunity Yudhisthir explained that severity of crime of accomplice is not to be judged by the act, but it has to be discriminated based on their failure to choose between right and wrong before committing the crime. Teacher is a role model of radiating wisdom and therefore he should not have indulged in such a crime; this makes him most vulnerable for the act. The warrior is supposed to guard truth and weaker which he failed and hence his crime is serious but less severe than that of the teacher. Businessman has enough wealth, but out of greed to amass more he became an accomplice to the crime and hence severity of his act lesser than that of the warrior. The butcher by way of his upbringing, and living compulsions became an accomplice to the act with a hope of some gain. Such a person needs rehabilitation to learn skills for a better living, and in turn to discriminate between a good and a bad act. Finally, the judgement of Yudishtir was applauded and he was adjudged to be competent successor of the crown.

This epic very thoughtfully presented by Ved Vyas to bring forth another important consideration that discriminates duty, responsibility and ownership that goes behind an ideology and purpose behind every act. Duty is that which is required to be performed for survival. If one fails to perform an assigned duty, a substitute shall come in place, keeping in view its urgency and necessity. Duty is generally relevant to ground level operators in an organization. But, responsibility is the higher manifestation of duty where one is conscious of consequence of failure in discharge of duty. Thus, responsibility is an attribute of a middle level persons in an organization, generally supervisor and/or managers who looks after team performance. Ownership is the attribute of an enterprise which is aimed at achieving a purpose. Therefore, unless basic purpose is judiciously achieved for larger good any amount of effort or ideology shall fall short in its being. This attribute of ownership is

with top level person in an organization who has to ensure that the ideology and purpose remain coherent.

In recent past there were some bold judgements by Supreme Court of India in respect of **a)** Hindu, Hinduism, Hindutva, **b)** Anti Dowery Act, **c)** SC/ST protection against atrocities and **d)** Polygamy and Talak reflect socio-cultural awareness in the country for the larger good. Such bold decisions cannot happen unless one assumes ownership in a role or position which has come upon either by choice or assigned. This is another example of purpose driven ideology, and just not an ideology for the sake of ideology.

An organization, as it grows, ideology propagates like light from a lamp post. Intensity of the light on the ground decreases squarely with the increases in the height of lamp post. This, however, leads to creeping in of aberrations in an organization, either in use of discretion while resolving day-to-day issues or carrying forward the ideology as perceived by the incumbent. This is where some organizations either refrain from delegation of authority or frame strict rules and regulations, accounting and audit process to guard against aberrations, which could dissuade the purpose of ideology.

GVS started with the premise that educational reform is a mammoth task and none, howsoever omnipotent may be can achieve it unless all likeminded persons make collective efforts to complement each other's boundaries; like playing jig-saw puzzle in real life. During nearly last six years, in pursuit of this initiative, few academic institutions of national importance were approached. Each of them patronizes at least one on-the-campus schools for their staff and locals who cannot afford expensive education. These institutions despite having environment and complete infrastructure fell short in extending their hand to welcome the initiative, Interactive Online Mentoring Sessions (IOMS). It is really pitiable that institutes of excellence should fail in evaluating, judging and capitalizing upon such a selfless proposal. It reflects divergence in ideology of the institution and their purpose on the ground.

There are many national level NGOs manned by highly qualified and competent people. They enjoy credibility at all levels which enable them an extravaganza in display of their infrastructure, annual functions to exhibit eye widening performances through cultural shows. They address target students upto a certain level, which serves as a sound foundation in their future growth. IOMS can complement their efforts, as a forward path, by grooming competence among them to compete a necessity to change their fortune, the real purpose. But, response of such NGOs was short in accepting hands, extended to them, by such a selfless initiative; rather they kept themselves insulated to the proposition. This non-transparency creates a question mark on their credibility and purpose of serving the society.

There are individuals who have grown from a humble background and wish to reciprocate to the society with a sense of PSR. Pressures of survival in corporate world are so

pressing that they have little time to associate with तन और मन (Tan aur Man i.e. bodily and mentally) in initiatives of social reform and welfare. Most convenient way adopted by most, in this situation, is to donate funds to most popular NGO which without going into its integrity. It may not be out of context to say that popularity index is a marketable commodity. This creates a business opportunity for NGOs to focus on donor and activities which fascinate them. This is where many popular slogan have been coined Adopt a child, Have-One-Own-One etc. And mushrooms growth in NGOs is being experienced. Every resourceful person is seen to have an NGO.

Invariably all private schools are front end of charitable trust or an NGO. These schools have infrastructure and students. Moreover, each school under RTE Act 2009 [Art 12 (1-c), ChIV] has to extend free education among 25% of seats to students coming from economically weaker families. In prevalent scenario when such schools were approached were they were unable to embrace IOMS. This experience is beyond common reasoning. Eventually there is a distinct delink between their ideology and purpose.

Rules and regulations (R&R) in an organization are guidelines for persons with uncommon reasoning. People with feeble constitute a large work force, a necessity for an organization to perform. With their understanding, they can walk safe during discharge of their duties and responsibilities. On the contrary the R&R exercises a restraint across persons with higher reasoning, should they not fall out of step while discharge of their responsibility, which could defeat the basic purpose behind it. Nevertheless, these R&R always have provisions for extraordinary situations demanding unconventional decisions for which authority and process is defined. Such decisions can be prior to an action or ex-post-facto. This is based on basic premise that- a) R&R is not पत्थर पे लकीर (Patthar pe Lakeer it means a rigid line on stone and b) it needs to be implemented with full honesty and pure common sense to accomplish the purpose of the ideology. It is seen that at times in the pretext of R&R opportunities knocking the door are missed.

Recently, a social-&-religious society offered to donate Rs 25,000/- to GVS, with due consideration to its credentials and support needs of upkeep of its infrastructure in use in IOMS. The donation is to support perpetuation of the social cause through education. The GVS, in consultation with the donor, being non-organizational initiative approached organizations and NGOS with whom it is associated through IOMS. The donors have a simple requirement of an advance receipt to close the transaction by issue of cheque. We are far of the age of साहूकार (Sahukaar i.e. money lender), when physical receipt was the basic instrument. Prevalent accounting processes have advanced a lot. Now the transaction is complete only on encashment of cheque and no exemption in income tax, under section 80G, can be availed until it is included in its ITR-7 by the receiver. These processes have been automated with e-transaction and e-

returns which are totally paperless. This is matter of common-sense/knowledge which was not acceptable to accounting experts supporting the organization that were approached. The GVS which operates Zero-Fund-&-Zer0-Asset financial model is still waiting for an NGO to comply with the requirement of the donors so as to utilize the fund in pursuit of its purpose, glaring case study as to how pretext of R&R is obstructing a selfless purpose. This is where it is seen that genuine common sense becomes uncommon when persons manning an organization and are called लकीर के फकीर (lakir ke faquir – verbatim follower). Such a mindset makes R&R to be static, and at times it defeats the basic purpose of the ideology.

There are accomplished individuals who during interaction showed varied degree of responses, Some felt this selfless engagement to be an outcome of skewed mind, who is digging out some work as time pass activity. Some gave priority to capitalizing upon opportunities, upto the last, that their lifetime experience and contacts. Some felt that they have done enough in their career and old age is their right for relaxation without engagement in social purpose. Some considered that in old age such initiatives are good for them to engage, whenever they are free, which never happens. Some were watchful to take away the model of IOMS for their educational initiatives. This is with the people who are aware of its ideology of GVS and its journey in an environment which is highly materialistic and commercial, and reflects mismatch between ideology and purpose.

These views based on first-hand-experiences have gone a bit critical and might create a pessimistic view and thus cause a negativity among readers towards claimants of philanthropy. *This is where it is prudent to respectfully identify spiritual organizations, NGOs, schools and individuals who came out to support GVS and have brought visibility to this small group of co-passionate persons, and infused a hope to do more.*

Sarthak Prayash, Vasundhara, Ghaziabad, an NGO which is mostly working in Uttarakhand is struggling for its existence ever since we associated with it. It has chronic problems of financial paucity. Despite, it provided a platform by creating a class room in May'2012 to seed in ideology of GVS through Chalk-N-Talk mode. Despite constraints, it created a Learning Centre for IOMS in June 2016. Their focus and operations are since different, they are not able to gather students for keeping their learning centre active, but complete IT setup is in place. A student Shri Rohit Chauhan, who comes from really an economical weaker section and associated with us since Dec'12, while he was in Class 8th. In this journey of past six years we passed through many hurdles in our operation. *But, Rohit continued the association and is currently in 2nd Semester of BE(CSE), having secured 81.5% in 1st Semester of the engineering.*

Shri Sameer Lal, a Chartered Accountant by profession and currently a director of RBC, settled at Canada, an NRI has

made available a laptop to Rohit to enable him to continue his pursuit. So much so, he has also kindly agreed to write for a column अंदाज़ ऐ बयां (Andaz e Bayan) in our monthly e-Bulletin. He looks forward for a continued association to take educational empowerment in rural areas.

Mahagun Moderne Pooja Samiti, Sec 78, Noida in July, 2016, volunteered to support our initiative by way providing equipment needed to stabilize IOMS, which was crumbling due outage of equipments in use. The case of donation of Rs 25,000- cited above pertains to them.

Sunshine Society, an NGO at Sec 50, Noida, has a programme Learning Outside the school for assorted students from unprivileged families. The programme spear headed by Shri Vinod Gupta, a senior citizen cum social reformer, is joined by many men and women in different age group. In July' 2016, it created a Learning Centre for IOMS. Despite interruptions, the society is waiting for resolution of some infrastructural issues to restart IOMS in the community centre.

Ramakrishna Mission, Vijaywada, in its school at Sithanagram, Andhra Pradesh was incidentally introduced by an NGO to GVS in Aug'17. Management, teachers and students of the RKMM school responded to the initiative with a deep involvement and it has evolved into a prototype of IOMS where concepts driven mentoring and group dynamics are of special significance. It also pro-acted to disseminate their experiences to the other schools of Ramakrishna Order and any other school which can take the model for larger good. As a result this prototype has been adopted by RKMM School at Vizag. Likewise, RKMM Schools at Gwalior and Coimbatore are considering integration in IOMS. It is being experienced that spiritual serenity of RKMM which perpetuates spirit of Swami Vivekananda to carry out social reform through education, has a great influence on the thought process that shall go into resolving problems whenever encountered.

Shri Mohan Rao, was formerly a Scientist at CISO, is closely associated with RKMM as a dedicated volunteer in multiple projects involving value education and technology adaption in education including virtual class rooms leading to IOMS.

Madam Saraswathi Tenneti, a veteran Teacher, who has been engaged in Online Teaching of English Literature and Grammar since last Five years, keeps sharing her experiences and expertise to this initiative.

Prof. Hari Om Gupta, Director, JIIT, and Retd. Dean-cum-Professor, IIT Roorkee, has created a Learning Centre (LC) at his native village Porsa in Morena District, MP with a sense of PSR. The centre is planned to come in operation, shortly. Bijnor Public School, in rural belt of UP, is also working upon to create a LC of IOMS. Likewise, Kendriya Vidyalaya (KV) at Bhusawal is preparing to implement IOMS. It is inspired by Ayudh Ratna Shri H.M. Gupta, IOFS, Member, Board of Ordinance Factories, Kolkata. Two more KV at Ishapore and Dehu Road are likely join the stream with KV, Bhusawal. All that sees light if the day and perpetuates is a reality; it reminds of a famous phrase '*there is lot of gap between lip and the sip*'.

It is with HIS grace that after a long time of slow inching a cross-roads has been reached where stabilizing IOMS at centres already committed is first priority, before we make any new commitment.

Conclusion: *There are hurdles in pursuit of everything. But, it is sheer will to serve the purpose for the larger good in a selfless manner is the ideology that has been driving force. There are people with honest spirit and dedication. It is requires patience, perseverance and conviction to get connected with co-passionate persons. Perpetuation of an ideology to accomplish purpose necessitates collectively complementing and co-existing. All that it needs to be done is simply mutual trust, honesty, spirit of co-existence and group dynamics. There are millions of people waiting for us to take upon the ownership to transform their lives from a state of poverty, alienation, neglect into the one in the main stream. Let us pro-act our bit. This is our vision, ideology and purpose.*

It is inspiring to recall some relevant quotes to meditate, as to what can we do?

"This life is short, the vanities of the world are transient, but they alone live who live for other, rest more dead than alive ." – Swami Vivekananda

Abraham Lincoln in his letter to the teacher of his son "...Try to give my son the strength not to follow the crowd when everyone else is doing it....."; every word in it precious to everyone, be it in any walk of life.

"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.

Simple verse of Sant Kabeer – बड़ा हुआ तो क्या हुआ, जैसे पेड़ खजूर | पंथी को छाया नहीं, फल लागे अति दूर || *(Bada hua to Kya Hua, Jaise Ped Khajoor, Panchi ko Chhaya Nahi, Fal Lage Ati Door – meaning, there is no use of being tall like palm tree, its fruits are too high to reach and its shadow is too thin for a pedestrian).*

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विज्ञान और तकनीकी : वरदान या अभिशाप !

निरंजन धुलेकर

लाखों वर्ष पहले जब ने मनुष्य वानर रूप में जन्म ले कर अपनी स्पीसीज को आगे बढ़ाया तो उसका पहला ज्ञान था हाथ बढ़ा कर खाना ले कर मुह में डालना !!

यानी हाथ का उपयोग एक टूल या लीवर युक्त औजार के रूप में ! परंतु उसी औजार का उपयोग एक दूसरे की जान लेने में भी होने लगा । डार्विन की वैज्ञानिक परिभाषा, हिंदी में ..जो जीता वही सिकंदर! जो जीतेगा वही जियेगा !!.

उसके बाद जीने के लिए ज़रूरतें बढ़ने लगीं और अनुभवों की सीढ़ी लगा कर होने लगे आविष्कार । अनुभव यानी ज्ञान, और उत्सुकता का तड़का लग कर आ गया विज्ञान !

झड़ी लग गयी, नोकिले भाले , छुरी , चाकू , रस्सी और फिर उसने खोज निकाली ..आग! जिसके उपयोग से उसने खाना बनाया , सर्दी से बचा और ...एक दूसरे को जला भी डाला !

समय मे तब और तेज़ी आयी जब उसमे मानव ने लगाया दुनिया का दूसरा महानतम आविष्कार..पहिया, चक्का !! . अब दुरियाँ सिमटने लगीं, एक दूसरे से मिलने के लिए भी और ... पीछा कर के कत्ल करने के लिए भी !

मानव के पास संग्रह की मानसिकता जन्मजात थी ,प्रश्न उठा उसकी सुरक्षा का और और ज़्यादा पाने का ... जन्म लिया और घातक हथियारों ने , तलवार भाले खंजर नश्तर समय के पहिये ने पीछे छोड़ दिये और फिर जन्म हुआ दुनिया का तीसरा वैज्ञानिक आविष्कार ..बारूद !

इस बारूद ने जहाँ मानव के रास्ते के पहाड़ों को उड़ाया, रास्ते बनाए ,वहीं उसको दे दी संहारक बूटी ,जिसकी मदद से उसने उस हर चीज़ को नष्ट करना शुरू कर दिया जो उसकी राह में कांटे पैदा कर रही थी ! बंदूक , तोप , फिर मिसाइल की मदद से उसकी मारक घातक क्षमता में अब अदृश्य लक्ष्य भी आ गए !

उसका चौथा सबसे बड़ा आविष्कार था ,दूरबीन ! सबसे छोटी से छोटी और दूर से दूर की वस्तु को अपनी आंखों से देखना समझना ! क्या, क्यूँ , कैसे ,किसलिए ..अगणित प्रश्न और जवाब खोजने के लिए आँखे जम गई लेंस पर ...

और उसका पाँचवा आविष्कार .. अणु फिर परमाणु और उसे मिल गयी अथाह शक्ति ,ऊर्जा जिसकी मदद से उसे मिलने वाली थी दुनिया चलाने की असीम शक्ति ! और उसने पहचानी परमाणु की शक्ति ! बनाने लगा विद्युत , चलने लगी गाड़िया ,उसकी दुनिया को ताकत मिली और मिल गया परमाणु बम ! मानवता को क्षणों में समाप्त करने वाला अंतिम ब्रह्मास्त्र !

औऱ फिर छटा आविष्कार वो हुआ ... जिसे होना ही था, दिमाग़ को एक मशीन ने कब्जे में ले लिया! आया कम्प्यूट , औऱ अब ज़ेब का अजब तमाशा यानी मोबाइल ! वाक़ई आ गयी दुनिया मुट्ठी में । सब कुछ पल भर मे मालूम हो जाए, कहीं आने जाने की ज़रूरत नही ! बैठे बैठे ही सब काम घर बैठे !

नाते रिश्ते यार महफ़िलें, चौपाल गप्पें, छतों की गपशप, दोस्त, आत्मीयता सब भूल भाल कर आँखें, दिल, दिमाग ध्यान सब केंद्रित हुआ ..छोटे से पर्दे पर ! इश्क़ मोहब्बत की तो बाँछे ही खिल गयीं । खरीद फरोख्त भी, टिकट, घरेलू सामान सब घर मे आ रहा, बटन का जादू, पिछली सदी के हातिम ताई वाला जिन्न , अब हर घर में । पर साथ मे निजी बातों में सेंध लग गयी, कुछ भी अपना न रहा, न बही और न बैंक का खाता ।

उसी ज़मीन में बगिया खिलती है, उसी पर चिता जलती है और कब्रगाह भी उसी ज़मीन पर ही ! हाथ सभी के दो और एक जैसे पर ...दिमाग? बिल्कुल अलग, हमेशा अलग, सदैव और हर समय अलग !

बस इसी में विषय का सत्य छुपा हुआ है ! एक ही आविष्कार , दो दिमाग ! एक सजा दे दुनिया और दूसरा कर दे नेस्तनाबूद ! आग एक ही चाहे खाना बना लो या घर मे ही आग लगा दो !

विज्ञान और तकनीकी सामने आ कर बोलती है, लो मैं आ गयी , अब दवा समझ के पी जाओ और ख़ुश रहो या फिर दुआ के लिए हाथ उठाओ और ज़िंदा रहने की भीख मांगो ।

आर या पार ! विज्ञान और तकीनीकी के आविष्कार !
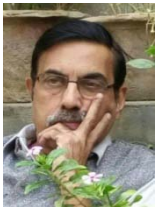
लेखक एक सेवानिवृत्त बैंक अधिकारी है | आपने गोविन्द वल्लभ पंत विश्वविद्यालय के कृषि विधा के स्नातक है, तत्पश्चात समाजशास्त्र में स्नातकोत्तर की उपाधि ग्रहण की | आपको माइक्रो -फिनान्सिंग क्षेत्र में वृहत अनुभव है | सामाजिक पर्यवेक्ष में चिन्तन एवं लेखन आपकी विशेष रूचि है |

e-Mail ID: pekushekhu@gmail.com

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हमारापंचवर्षीयप्रवास
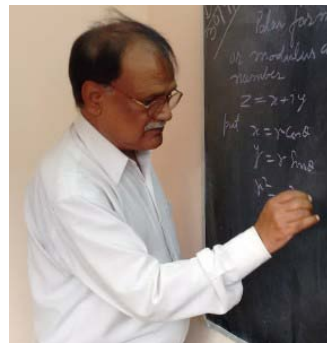
Start: June-2012   April-2015   June-2016……..

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.

अंदाज ए बयां

विज्ञान और कला: एक अध्ययन पछुआ हवा के संदर्भ में

समीर लाल 'समीर'

अमरीका में रहना अलग बात है और भारत में रहना अलग. अमरीका जैसे देशों में रहना एक विज्ञान है , यहाँ रहने के अपने घोषित और स्थापित तरीके है , जो सीखे जा सकते हैं ठीक उसी तरह जैसे कि विज्ञान की कोई सी भी अन्य बातें- किताबों से या ज्ञानियों से जानकर. कैसे उठना है, कैसे बैठना है , कैसे सोना है , कैसे बिजली का स्विच उल्टा ऑन करना है, कब क्या करना है, सड़क पर किस तरफ चलना है- सब तय है.

मगर भारत में रहना- ओह!! यह एक कला है. इस हेतु आपका कलाकार होना आवश्यक है. और कलाकार बनते नहीं, पैदा होते हैं.

भारत में रह पाना, वो भी हर हाल में खुशी खुशी- इस कला को कोई सिखा नहीं सकता- इसे कोई सीख नहीं सकता. यह जन्मजात गुण है- वरदान है.

बिजली अगर चली जाये तो- दुनिया के किसी भी देश के वाशिंदे बिजली के दफ्तर में फोन करके पता करते हैं कि क्या समस्या है?....बस भारत एक ऐसा देश है जहाँ..घर से निकल कर ये देखते हैं कि पड़ोसी के घर भी गई है या नहीं? अगर पड़ोसी की भी गई है तो सब सही- जब उनकी आयेगी तो अपनी भी आ जायेगी..इसमें चिन्ता क्या करना!! फोन तो पड़ोसी करेगा ही बिजली के दफ्तर में.

ऐसी मानसिकता पैदा नहीं की जा सकती सिखा कर- यह बस पैदाईशी ही हो सकती है!!

भारत में हम सभी पैदा एककलाकार हुए हैं.अभ्यास से कला को मात्र तराशा जा सकता है. गुरु अभ्यास करा सकता है मगर कला का बीज यदि आपके भीतर जन्मजात नहीं है तो गुरु लाख सर पटक ले , कुछ नहीं हासिल होगा. यूँ भी

सभी अपने आप में गुरु हैं तो कोई दूसरा गुरु कौन और क्या सिखायेगा?

होनहार बिरवान के, होत चीकने पात...

कितनी सटीक बैठती है हम कलाकारों पर..भारत में रहने की कला हर वहाँ पैदा होने वाले बच्चे के चेहरे पर देखी जा सकती है – बिल्कुल चीकने पात सा चेहरा. पैदा होते ही फिट- धूल, मिट्टी, गरमी, पसीना, मच्छर, बारिश, कीचड़, हार्न भौंपूं की आवाजें, भीड़ भड़क्का, डाक्टर के यहाँ मारा मारी और इन सबके बीच चल निकलती है जीवन की गाड़ी मुस्कराते हुए. हँसते खेलते हर विषमताओं के बीच प्रसन्न , मस्त मना- एक भारतीय.

फिर तो दुश्वारियों की एक लम्बी फेहरिस्त है –नित प्रति दिन-स्कूल के एडमीशन से लेकर कालेज में रिजर्वेशन तक , नौकरी में रिकमन्डेशन से लेकर विभागीय प्रमोशन तक , अपनी सुलझे किसी तरह तो उसी ट्रेक में फिर अगली पुश्त खड़ी नजर आये और फिर उसे उसी तरह सुलझाओ जैसे कभी आपके माँ बाप ने आपके लिए सुलझाया था- चैन मिनट भर को नहीं फिर भी प्रसन्न. हँसते मुस्कराते , चाय पीते, समोसा- पान खाते, सामने वाले की खिल्ली उड़ाते हम. ऐसे कलाकार कि भगवान भी भारतीयों को देखकर सोचता होगा- अरे, ये मैंने क्या बना दिया?

आप खुद सोच कर देखें कि कला और कलाकारी की चरमावस्था- जो मेहनत कर पढ़ लिख कर तैयार होते हैं वो सरकारी नौकरी करते हैं और जो बिना पढ़े लिखे किसी काबिल नहीं वो उन पर राज करते हैं . यही पढ़े लिखे लोग उन्हें चुन कर अपना नेता बनाते हैं और बात बात में उनसे

मुँह की खाते हैं फिर भी हे हे कर मुस्कराते हुए उनकी ही जी हुज़ूरी बजाते हैं.

इस कलाकारी को मानने मनवाने के चक्कर में विज्ञान तो न जाने कहाँ रह गया बातचीत में. तभी शायद कहा गया होगा कि एक कलाकार को तो वैज्ञानिक बनाया जा सकता है, पढ़ा लिखा कर , सिखा कर- बनाया क्या जा सक ता है, बनाया जा ही रहा है हर दिन- भर भर हवाई जहाज भारत से आकर अमरीका में सफलतापूर्वक बस ही रहे हैं. मगर

एक वैज्ञानिक को जिसमें कला के बीज जन्मजात न हो , कलाकार नहीं बनाया जा सकता . कहाँ दिखता है अमरीका का जन्मा गोरा बन्दा भारत जाकर बसते?

आज कहीं मंच से किसी को किसी संदर्भ में कहते सुना- पछुआ हवा...

सोचता हूं कि कहीं यहीं तो नहीं अनेक प्रकार की हवाओं में से एक..पछुआ हवा!!

लोकप्रिय चिट्ठाकार समीर लाल व्यवसाय से चार्टर्ड एकाउंटैंट हैं। आजकल वे कैनेडा में रहते हैं। उन्होंने कहानी लिखना पाँचवीं कक्षा में ही शुरू कर दिया था। आप कविता, ग़ज़ल, 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। इन्हे अनेक सम्मानों से नवाजा जा चुका हैप्रकाशन : काव्य संग्रह - बिखरे मोती, उपन्यासिका - देख लूँ तो चलूँ, प्रकाशन में - कथा संग्रह: द साईड मिरर।

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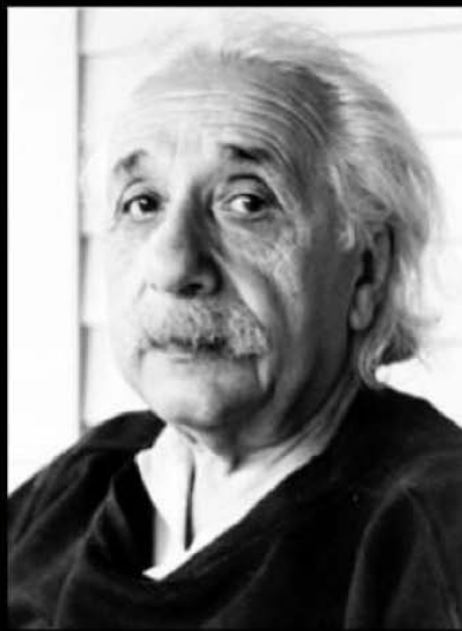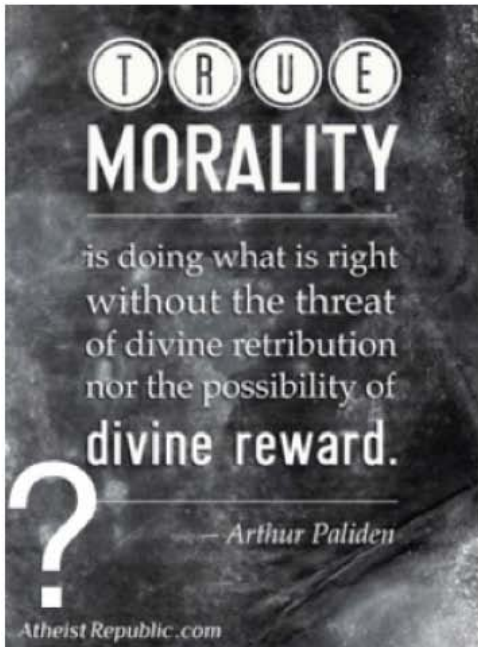
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Vidyamandira, Belur: An Inspiration

Vidyamandir, Belur, a college in serene environment of RamkrishnaMission, Howrah, has been adjudged 9th inamong the nation's top 10 colleges. This raking has been by Ministry of Human Resource Development It is the only college from West Bengal securing position among the first ten colleges.It is a 76 years old institution. It has established traditions and academic culture which has grown under the aegis of a feat of monks putting in their relentless efforts bringing in spiritual serenity withinthe campus.

The accomplishment of the college is attributed to an atmosphere that encourages students to come forth straight if they feel anything is wrong. Its whole focus is on academics, discipline and overall thought process.

 Swami Shastrajnananda, the Principal Vidyamandira, mentioned that they never consider problem of any student as complaint, rather it is examined seriously to determine where things went wrong, and immediate remedial actions are taken. Any advisory or corrective action by students is the last in it.

The principal further said that "For us, the monks, this institution is a temple. Students are our gods. If they fail, it's our failure. So any student can walk in with a grievance and speak to any one of us at any point of time. It's our duty to give him patient hearing." He added that "At Vidyamandira, we don't believe that those who didn't make it to the list are anyway lesser. There is a lesson or two to be learnt from all these"

Before admission every candidate and his parents are counseled about ethics of college and there is no space for political activities. Hostel life, on the campus, is serene involving basic food, sharing rooms with others and attending early-morning prayers.It was further informed that "If a student appears to be skipping classes because he is unable to follow lectures, he is immediately sent to a referral tutorial system, where individual care is taken to ensure that his shortcomings are addressed." It is informed that at college "There is a mentoring system and teachers are accountable for the performance of the students."

Vidyamandira was started as an Intermediate Arts College in 1941 in keeping with Swami Vivekananda's idea of comprehensive education and was upgraded to a three-year-degree college in 1960. It was granted autonomy in 2010. With 670 students on its rolls, the residential college offers undergraduate courses in 14 subjects, postgraduate courses in five subjects and PhD in five subjects. The teacher-student ratio is 1:11.

Senior monks from the Ramakrishna Math and Mission, take responsibility of academic culture and quality of learning of students of Vidyamandira.

Students, for instance, are not allowed to carry smart-phones to the college. Internet kiosks inside the college are open from 7am to 9 pm. A software tracks attendance of each student and frequent absentees are asked to explain their conduct to Vice-principal Swami Ekachittananda.

Results are published within a month of the exams. Before the publication, the standing committee of the academic council reviews result of each student. It hold an open house every alternate month. It is an opportunity for students to interact with teacher and voice their grievances unambiguously.

The students of Vidyamandira are attending online classes of experienced Professors from abroad through VIVEKDISHA, an ICT-based Network of Ramakrishna Mission Vivekananda Educational and Research Institute.

Ref: **Belur:** Vidyamandira's secret of success - Telegraph India, KinsukBasu 5thApr'2018 , and https://vivekdisha.in/

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Small Place Big Thoughts: Stepping Ahead

Porsa is a small town in MP, situated at centre of a triangle formed by Morena District (MP), Bhind District (MP) and Dholpur District (Rajasthan). Main occupation of the residents is agriculture and trading. Despite, it had greater awareness for education. It has 68% literacy rate higher than the national average 59.5% (200 Census). Porsa is also known for Naga ji Dham. There are many establishments in the.

Till seventies it had only Two Higher Secondary Schools catering to the need of large number of villages nearby. Dr Prem Chandra Gupta and Prof. Hari Om Gupta two were the first Two alumni of the Nagaji Higher Secondary School(1967) who pursued professional studies to become Medical Doctor and Engineer, respectively. Prof. H.O. Gupta pursued his professional studies and retired as Dean, IIT Roorkee. While, Dr P.K. Gupta continued to extend his medical services to the residents of village and engaged in social welfare and reforms. These Two sons of the soil were followed by many students from this small village taking higher education and attainining high positions in national and international arena.

Land for Cremation Ground shown in the collage was acquired by Lion's Club of local residents in 1994. It was a barren land with a small tree maintained and nurtured by residents as legacy tree (8) in the pic.

Now the burial is a lust green campus right from entrance (1) with fountain(5), children's park (2), CCTV surveillance (5) with state-if-the–art conveniences needed for those who come for creation and maintain the it clean. Right from head shaving i.e. Mundan (3), last bath (6) to cremation both conventional and gas based (9) are maintained with CCTV monitoring. It has become an outing spot and people can be seen taking snacks (7).

The residents carry out cremation of unclaimed bodies and poor persons with full rituals and respect and their mortal remains are immersed in Triveni Sangam, which has been highly applauded.

It does not stop at that. Prof. Gupta has started on 15rh April'2018, Interactive Online Mentoring Sessions (IOMS) with a sense of Personal Social Responsibility (PSR) which is totally free at his newly created residence on Ambah Road. This being on outskirts of Porsa, Shri Sandeep Upadhayay has offered facility at his Pt. Putto Ram Memorial Higher Secondary School, being located at central place for convenience of students to attend IOMS, which shall be conducted outside school hours to groom competence to compete among local students.

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माँ - भुलाये ना भूले

मुकेश आनंद

एक शहर का अजनबी हो जाना

बहुत दिनों बाद अपने पुश्तैनी घर जाने को लेकर आनंद बहुत उत्साहित था । बड़े शहर के शोर शराबे से दूर अपने शहर में एक सुकून मिलता है। पुराने दोस्तो की यादें और जानी पहचानी गलियों में घूमना ऐसा लगता सारा शहर अपना घर हो। बहुत दिन बीतने के कारण इनका असर कुछ कम तो हुआ पर खत्म नहीं हुआ।

पहले जब मम्मी पापा हुआ करते थे तब चलने से पहले और रास्ते में दसियों फोन आ जाते थे। कब की ट्रन है, कितने बजे चलेगी, कब पहुँचेगी, क्या खाना बनाऊँ, बहु और बच्चों को क्या खाना पसँद है वगैरह वगैरह। लेकिन अब पहले तैयारी रखनी पड़ती है। खाने का, चाय की, सोने की, सफाई की। हालाँकी रिश्तेदार, पड़ोसी सब हैं वहाँ पर किसी के यहाँ खाने का मन नही करता। मम्मी कही खाने ही.नही देती थी सो बाहर किसी के यहाँ खाने की आदत ही नहीं पड़ी। माँ कभी खाना बनाने से रूठी हो ये याद नहीं हमें नाही हमें ये याद की कभी हमें खाने से रूठने दिया।

इन्हीं यादों में डूबते उतराते हम स्टेशन पर उतरे। ट्रेन हमेशा की तरह 10-12 घँटे लेट थी। रात काफी हो गई और इतनी रात यहाँ कोई सवारी नहीं मिलती। लेकिन हमें स्टेशन के पीछे का रास्ता मालूम था , ये छोटा रास्ता था। सामान लादे हम घर पहुँच गए। धूल भरे पर्दे को हटाकर हमने गँदा ताला खोला। अंदर जाले लगे थे। पर हमने अपना उत्साह कम नहीं होने और जालों को हटाते हुए बाथरूम का दरवाजा खोला ओर सारे सामान को सुव्यवस्थित किया। ये बाथरूम पिताजी का था, उनके समय मे हमारा यहाँ आना वर्जित था लेकिन अब यह हमारे हिस्से में था। सच बताऊँ तो अभी भी डर लगता था

कि माँ देख लें तो डाँटें कि इस बाथरूम में क्या कर रहे हो। जैसे तैसे करके हम सो ग ए।

सुबह उठे तो खाने के इन्तजाम में लगे। किचन की सफाई कर खाना बना तो लगा लोगों से मिल लिया जाए। बाहर लगे पौधे बेजान हो रहे थे। माँ रहती थी तो इनको सजा के रखती थी। बाहर निकला तो पता चला हमारा दोस्त भी हमारी तरह गरमी की छुट्टी मनाने गया है किसी ठंढी जगह पे । अगल बगल के घरों में अजनबी लोग निकल रहे थे। लोग आपनी औपचारिकता पूरी कर रहे थे। हमने सोचा चले चौक पर चाय ही पी आएँ। वहाँ पहुँचने पर पता चला बहुत बूढा होने के कारण अब चाय नहीं बना पाता। कितनी बाते बताता सारे मोहल्ले के बारे में। उसका लड़का बड़ा रिजर्व सा था। उससे क्या बात करते। मै चुपचाप वापस आ गया। मन भारी सा होने लगा।

शाम होने के बाद इस शहर में समय काटना मुश्किल हो जाता है। अँधेरे और मच्छर जीना मुहाल कर देते थे। उपले का धुआँ ही इनका इलाज है पर अब इस वक्त कहाँ से आए। पत्नी बच्चे असहज ही नहीं नाराज हो रहे थे। मम्मी रहती तो कुछ करती जरूर।

शहर के जरुरी काम कर के अब वापस जाने का समय आ गया । अपना सामान पैक करने लगे। शहर अब अजनबी सा लगने लगा। माँ की तरह आँख मे आँसू भरकर विदाई की तैयारी करने वाला कोई नहीं था। खाना भी ट्रेन में खाने का प्रोग्राम बना। ताला बंद कर हम स्टेशन की ओर बढे। आदतन हमने चौराहे से पीछे मुड़कर देखा। गेट के बाहर माँ खड़ी नहीं थी। वाकई ये शहर पूरा अजनबी हो गया। यहाँ हमे विदा करने वाला अपने पुराने घर के अलावा कोई भी नहीं।

Author is a Lawyer by profession and a social thinker. Serving humanity is his passion. Writing stories is his passion. His compilarblication.

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परमाणु

मृणालिनी घुळे

परमाणु है एक शस्त्र, अजस्त्र
जो नष्ट कर दे विश्व समस्त
पर उसका है एक अन्य रूप
कल्याण कारी, ऊर्जा का स्रोत

मानवजाति का संरक्षक
असीम शक्ति का परिचायक
प्रियदर्शिनी, कलाम व अटल के अटल प्रयत्न
बना रहे भारत को शक्तिसंपन्न

सात परमाणु ऊर्जा केंद्र आज
भारत को बना रहे सरताज
अटल रहेगा भारत का यह स्थान

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

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राष्ट्रीय प्रौद्योगिकी दिवस : एक पेरोडी

*साइंस बनाने वाले, क्या तेरे मन में समा ♪ई ♪♪|
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ ई ♪♪|अंतरा |*

काहे बनाये तूने, न्यूटन-एडिसन,
दिए उन्होंने हमको, ढेरों समी♪करन,
अब ना रुकेगा देखो, मैक्सवेल इक्वे♪शन,
और उनकी मेहनत लायी, आ ♪ रा ♪ मी जीवन |
    - गुप-चुप तमाशा देखे, वाह रे तेरी खुदा ♪ई ♪♪,
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ई ♪♪ |1|

*साइंस बनाने वाले, क्या तेरे मन में समा ♪ई ♪♪|
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ ई ♪♪|अंतरा |*

ना होते भास्कर ना, पूर्व♪ फिलॉसफर,
होता ना सोक्रेट्स ना, ओ ♪पे ♪न है ♪मर,
जंगल में रहकर, हम घि♪स♪ते♪ पत्थर ,
तुझसे ना हम बदले, हम रहते म♪♪ इर |
    - काहे को करता मेहनत, और हमारी रगड़ा ♪ई ♪♪,
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ई ♪♪|2|

*साइंस बनाने वाले, क्या तेरे मन में समा ♪ ई ♪♪|
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ ई ♪♪|अंतरा |*

साइंस बनाके तूने, जीना सिखाया,
जियो-और-जी♪ने♪ दो, हमको रसाया,
जीना है हक से हमको, नेचर को रखके,
वार्ना कहेंगे बच्चे, हमसे अकड़के |
    - पैदा किया क्यों हमको ? दया जरासी ना आ ♪ई,
काहे को साइंस पढा ♪ई ♪♪,
वाह रे, काहे को, साइंस बना ♪ई ♪ |3|

*दुनियाँ बनाने वाले, क्या तेरे मन में समा ♪ यी ♪♪,
काहे को साइंस बनाई तूने, काहे को साइंस बना ♪ई ♪,
तूने काहे को साइंस बना ♪ई | Stop|*

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Students' Section

CHILD LABOUR

Kamlesh

Not all children in India are lucky to enjoy their childhood. Many of them are forced to work under inhuman conditions where their miseries know no end. Though there are laws banning child labour, still children continue to be exploited as cheap labour. It is because the authorities are unable to implement the laws meant to protect children from being engaged as labourers.

Unfortunately, the actual number of child labourers in India goes un-detected. Children are forced to work is completely unregulated condition without adequate food, proper wages, and rest. They are subjected to physical and emotional abuse.

Causes of Child Labour:Factors such as poverty, lack of social security, the increasing gap between the rich and the poor have adversely affected children more than any other group. We have failed to provide universal education, which results in children dropping out of school and entering the labour force.

Loss of jobs of parents in a slowdown, farmers' suicide, armed conflicts and high costs of healthcare are other factors contributing to child labour.

A widespread problem:Due to high poverty and poor schooling opportunities, child labour is quite prevalent in India. Child labour is found in rural as well as urban areas. The 2001 census found an increase in the number of child labourers from 11.28 million in 1991 to 12.59 million.

Children comprise 40% of the labour in the precious stone cutting sector. They are also employed in other industries such as mining, zari and embroidery, dhabas, tea stalls and restaurants and in homes as domestic labour.

Conclusion:Government authorities and civil
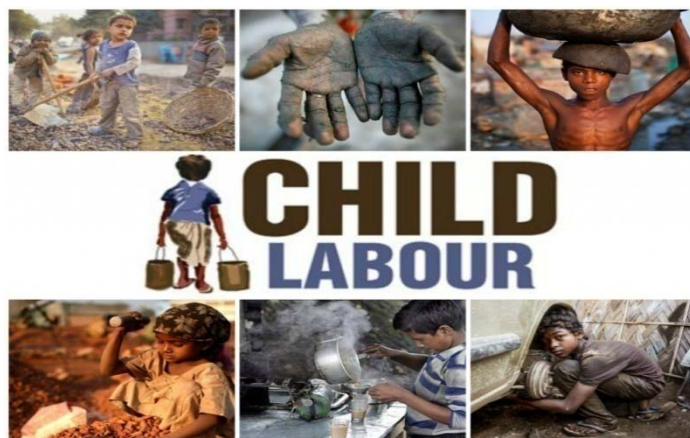
society organizations need to work in tandem to free children engaged in labour under abysmal conditions. They need to be rescued from exploitative working conditions and supported with adequate education. Above all, there is a need to mobilize public opinion with an aim to bring about an effective policy initiative to abolish child labour in all its forms.

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GROWING WITH CONCEPTS - Mathematics

MATHEMATICAL SYMBOLS

Prof. SB DHAR

Mathematical concepts sometime need to be expressed in symbols though the concepts are independent of the symbols chosen to represent them.

Symbols are usually treated as synonyms of the concepts. In general, symbols are conventional. Occasionally, they become the language and generate discipline for learning.

Some of the important symbols are listed below:

Symbol	Name	Meaning
$+$	Plus	Addition 4+3=7
$\sum$	Sigma	Addition; 1+2+3+4=10
$\sum\limits_{i=0}^{n} r_i$	sigma	Summation of terms r with its values varying sequentially from i=0 to i=n
$-$	Minus	difference4-3=2
$-$	Difference	In set theory A-B means elements that are in set A but not in set B A={1,2,3} B={1,2} ; A-B={3}
$-$	Horizontal line	Fraction like $\dfrac{2}{3}$
$*$	asterisx	Multiplication 4*5=20
$\times$	Multiplication	Product4x3=12
$\times$	Cartesian Product of sets	A={1.2} B={a} then AxB={(1,a),(2,a)}
$\times$	Cross or Vector product	Vector product of two parallel vectors is zero$\hat{i} \times \hat{i} = 0$
$\prod$	product	Continued product 1x2x3x4=24
$\div$	Division Sign	Quotient 10÷2=5
$/$	Slash	Division 10/5=2
$\sqrt[n]{}$	Radical sign	n$^{\text{th}}$ root
$\sqrt{}$	Radical sign with vinculum	Square root $\sqrt{16} = 4$
$(\ldots)$	Parentheses	Numbers between(1,4)={2,3}
$\{\ldots\}$	Braces or curly brackets	Contains elements of set

Symbol	Name	Example
$[\ldots]$	Brackets	Matrix notation $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$
$\|\ldots\|$	Matrix notation	$\begin{Vmatrix} 1 & 3 \\ 2 & 4 \end{Vmatrix}$
$|\ldots|$	Determinant	$\begin{vmatrix} 1 & 2 \\ 3 & 6 \end{vmatrix}$
$|\ldots|$	absolute value	$|-4|=4$
$|\ldots|$	Distance between 0 and a number	In vector $|\mathbf{x}|$ means the (Euclidean) length of vector **x**.
$[x]$	Integral part	$\left[4\dfrac{1}{7}\right]=4$ and $\left[-4\dfrac{1}{7}\right]=-5$
( ]	Hybrid brackets	Open-closed $(1,5]=2,3,4,5$
[ )	Hybrid brackets	Closed-open $[1,5)=1,2,3,4$
$=$	Equals sign	$5=5$
$\approx$	approximate	$4=3.999999\ldots$
$\sim$	similarity	$\triangle ABC \sim \triangle DEF$ means triangle ABC is similar to (has the same shape) triangle DEF.
$\sim$	Not a logic	If p is true then $\sim$ p is not true
$\equiv$	congruence	$x \equiv y$ means x is defined to be another name for y, under certain assumptions taken in context.
$\cong$	congruence	$\triangle ABC \cong \triangle DEF$ means triangle ABC is congruent to (has the same measurements as) triangle DEF.
$\neq$	Inequality	$5 \neq 4$ means 5 is not equal to 4
$\pm$	Plus-minus sign	$x=\pm 4$ means $x=4$ and $x=-4$
$:$	Ratio	$5:25=1:5$
$:$	Such that	In set-builder form {x:x is a natural number}
$\vert$	Such that	{x| x is an integer}
$\parallel$	Parallel	$x \parallel y$ means x is parallel to y.
$\perp$	perpendicular	X $\perp$ y means x is perpendicular to y
$::$	proportion	$1:2::2:4$
$\propto$	proportionality	Length$\propto$ width

Symbol	Name	Description
$<$	Strict inequality less than	4<5
$>$	Greater than	4>3
$\leq$	Unstrict inequality less than or equal to	Combination of two inequalities
$\geq$	Greater than or equal to	Combination of two inequalities
x^y	superscript	Exponentiation 2^3=2x2x2=8
$\wedge$	Carot	To the power of 2^3=2^3
%	Percent	25% means 1/4
∞	Lemniscates / infinity	$Lim_{x \to 0} \dfrac{1}{x} = \infty$ It is an assumption
$\int$	Indefinite integration	Anti $-$ derivative
mod	modulo	Calculation of remainder; 8 mod 3=2
$\iint$	Double integral	Integration of expression in two variables
$\iiint$	Triple integral	Integration of expression in three variables
$\oint$	Line integral	
$\oiint$	Surface Integral	
$\oiiint$	Volume Integral	
$\cdot$	Middle dot	Multiplication 4·5=20
$\cdot$	Dot or scalar product	Scalar product of two perpendicular vectors is zero $\hat{i}.\hat{j} = 0$
x'	Prime	differentiation
!	Factorial	4!=4x3x2x1
$\subset$	Proper Subset	A={1,2,3}, B={1,2,3,4,5} then A $\subset$ B
$\subseteq$	Improper subset	A⊆A
$\supset$	Superset	A={1,2,3}, B={1,2,3,4,5} then B⊃A
$\cap$	intersection	A={1,2,3}, B={1,2,3,4,5} then A $\cap$ B={1,2,3}
$\cup$	Union	A={1,2,3}, B={1,2,3,4,5} then A $\cup$ B={1,2,3,4,5}
$\in$	Element of a set	A={1,2,3},then 1 $\in$ A
$\notin$	Not an element of	A={1,2,3},then 4 $\notin$ A

∃	There exists	Between 4 and 6 , ∃ 5
ℕ	Natural numbers set	{ 1,2,3,4,5,……}
ℤ	Integers set	{., −3, −2, −1, 0, 1, 2, 3, …}
ℤ⁺	Set of positive integers	{1, 2, 3, …}
ℚ	Rational numbers set	Number like $\dfrac{p}{q}, q \neq 0$; p,q are Integers
ℂ	Complex numbers set	Number like x+iy; where $\sqrt{-1} = i$
∨	Logical disjunction	A∨ B means A or B
∀	For all	$\forall\, n \in \mathbb{N},\ n^2 \geq n.$
→	Arrow	A={1,2}, B={a}, AxB={(1,a),(2,a)}, R={(1,a)} means R:A→ B or 1Ra
P(A)	Power set of A	All possible subsets of A
Aᶜ	Complement of A	Difference of universal set and set A
A'	Complement of A	The members that are in set U but not in set A
π	Pie	Ratio of circumference and diameter of a circle
φ	Golden ratio	$\dfrac{a}{b} = \dfrac{a+b}{a} = 1.618033988749...$
e	Euler's constant	Approximately 2·718
$\dfrac{d}{dx}(f(x))$	Differentiation of f(x) with respect to x	
$\displaystyle\int_{x=a}^{x=b} f(x)dx$	Definite integral	
$\overline{AB}$	Line segment AB	
$\overleftrightarrow{AB}$	Line AB	
$\overrightarrow{AB}$	Ray from AB	
∠ABC	Angle B	
ΔABC	Triangle ABC	
Δ	A very small change	
Δ	Symmetric difference	(A-B)∪ (B-A) Set of elements in exactly one of *A* or *B*.

$P(A)$	Probability of A	$P(A) = \dfrac{n(A)}{n(S)}$
$P(A/B)$	Conditional Probability of A when B has already occurred	$P(A/B) = \dfrac{P(A \cap B)}{P(B)}$
$\overline{x}$	Mean of x	$\overline{x} = \dfrac{2+4+6}{3} = 4$
$\wedge$	A$\wedge$B	Proposition A and proposition B
$\vee$	A$\vee$B	Proposition A or proposition B
$\Leftrightarrow$	A$\Leftrightarrow$B	A follows B and vice versa
$\rightarrow$	A$\rightarrow$B	From A, B follows f: A $\rightarrow$BY means the function f maps the set A into the set B
$\Rightarrow$	Implies	A$\Rightarrow$B means if A is true B is true
$\overline{}$	$\overline{A}$	Not proposition A
$\because$	Since	since 13 is a prime hence it has no factors
$\therefore$	therefore	$\because$ x=5, $\therefore$ x+3=8
$\emptyset$	Empty set	{ } or {$n \in \mathbb{N} : 1 < n^2 < 4$}
$\circ$	Degree of an angle	45^0 , 45 degrees angle
c	Radian	$180^0 = \pi^c$, 180 degrees is equal to π radians
.	Decimal point	10 .123 means ten point one two three
,	Thousand separator	123,234,567 in International Number System

Dr S.B. Dhar, is Editor of this Quarrterly e-Bulletin. He is an eminent mentor, analyst and connoisseur of Mathematics from IIT for preparing aspirants of Competitive Examinations for Services & Admissions to different streams of study at Undergraduate and Graduate levels using formal methods of teaching shared with technological aids to keep learning at par with escalating standards of scholars and learners. He has authored numerous books of excellence.
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Answers to Science Quiz : April'18

Kumud Bala

ANSWERS: 1. (i)   2. (i)   3. (ii)   4. (i)   5. (i)   6. (ii)   7. (ii)   8. (i)   9. (ii)   10. (ii)   11. (iv)   12. (iii)   13. (i)   14. (i)   15. (i)   16. (iii)   17. (ii)   18. (ii)   19. (ii)   20. (ii)   21. (iii)   22. (i)   23. (i)

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ANSWER: CROSSWORD PUZZLE April'18: Stephen Hawking

Prof. S.B. Dhar

Crossword solution grid (cells as printed, by clue number):

Across
- 3M / 2E: M O T O R N E U R O N D I S E A S E
- 5R: R O G E R P E N R O S E
- 6L: L U C Y H A W K I N G
- 12G: G A L I L E O
- 13A: A B R I E F H I S T O R Y O F T I M E
- 14M: M Y T H
- 10J: J A N E W I L D E
- 16G: G R E A T E S T B R I T O N S
- 15O: O X F O R D

Down
- 1W: W A L T (E R …)
- 2E: E N G L A N D
- 4T: T H E R E I S N O B L A C K H O L E S
- 7C: C O S M O L O G Y
- 8A: A D A M S P R I Z E
- 9A: A L I E N S E X I S T
- 11E: E Q U A L I Z E

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INVITATION FOR CONTRIBUTION OF ARTICLES

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

We will be pleased have your association in taking forward path our plans as under-
> ➢ **With the start of Second year of operation, we have reached to 7th Quarterly e-Bulletin Gyan-Vigyan Sarita: शिक्षा . We shall brought out its Secondt Supplement on 1st June'18.**
> ➢ **Theme of the 2nd Supplement to 7th Quarterly e-Bulletin dt 1st June is National Statistics Day celebrated on 29th June to commemorate birth anniversary of the Late Prof. Prasanta Chandra Mhalanobis.**
> ➢ **And this cycle of monthly supplement sandwitching consecutive Quarterly e-Bulletin Gyan-Vigyan Sarita: शिक्षा is aimed to continue endlessly**

We believe that this monthly supplements to quarterly periodicity of e-Bulletins shall make it possible for our esteemed contributors to make contribution rich in content, diversity and based on their ground level work and/or experiences.

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CROSSWORD PUZZLE: Mathematical Symbols

Prof. SB Dhar

ACROSS

1 [x] is used for

4 ≈   is used for

8 $\overline{AB}$ is used for

10 ∝   is used for

11 /   is called

12 − is used for

13 ∀ means

14 * is called

15 Z is used for

DOWN

2 A×B is called

3 ≅   is used for

4 |x| is used for

5 || is used between the lines for

6 φ is used in set theory for

7 ⊃ is used for which set

9 + is called

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Growing with Concepts : Physics

Practicing Problem Solving

Growing with concepts has two parts, First is assimilation of concepts and Second is practicing concepts in problem solving. Second part is essential in carving proficiency in use of concepts, the essence of learning. Therefore, First Part of concepts through a series of articles in this column has been completed in April'18 and is being integrated in Mentor's Manual, as a free web-resource.

The Second Part endeavour is being started in May'18 issue of the e-Bulletin. In this issue assorted questions on Units, Dimensions and Measurement, the First steppingstone in Physics is taken with a spectrum of typical question involving single choice, multiple choice, fill up the blank and matching the choices. These questions are drawn from various sources viz. text books, study materials, examinations, and moderation has been made to the possible extent.

*These questions shall also be put in sequential levels such that: **Level –I** questions shall use bare concept on the topic titled. Students are advised to solve these questions after learning of each chapter. **Level-II** questions shall be involving integration of concepts learned earlier, and, therefore, students are advised that before attempting these questions they revise previous learning. **Level-III** questions are for testing proficiency in learning of physics upto 12ᵗʰ standard and, therefore, involve integration of complete learning of the subject. **Students are advised to take these practice tests under examination conditions.***

*Answers to each question shall be separately listed in the respective e-Bulletin, for verification. Students are advised to retry each question/problem, where answer is not matching, at least twice before referring to illustrations that shall also be incorporated in respective bulletin separately. This is being done with a consideration that monthly frequency of e-Bulletin may not be affordable to students, to maintain required pace, in case they encounter difficulty in solving. Students, are welcome to seek clarification to the solutions or referring fresh problems (image thereof with figures if any) by writing through **CONTACT US**.*

Going forward these questions shall be organized by clustering each type of questions for intra-level practice by students. It is our endeavour to automate the practice tests. This will require students to register, free-of-cost, to avail facility of practice tests, self-evaluation and refer to detailed solutions in case of any doubt or difficulty.

*Students, teachers and parents are welcome to enrich and diversify this question bank by flowing-in questions with its source. We respectfully take these inputs in enriching the free-web-resource for benefit of all students in general, in particular those unprivileged children who are economically, sociologically, geographically of for that matter any other reason disconnected from the main stream. Your pro-action with a sense of Personal Social Responsibility (PSR) in facilitating use of the web-enabled platform that is available to us. We shall acknowledge it with a sense of gratitude most appropriately expressed by Albert Einstein "**A hundred** times a day I remind myself **that my inner and outer life depend on the labors** of **other men, living and dead, and that I must exert myself in order to give in the measure as I have received and am still receiving**"*

Physics Objective Questions – Typical

{Each question is tagged with Level and Type SC (Single Choice) or MC Multiple Choice)}

No of Question: 51]   [Time Allotted: 90 Mimutes

(All questions are compulsory)

1. Dimension of Surface Tension expressed by $S = \frac{\rho g r h}{2}$ is
   (a) $\mathrm{LMT^{-2}}$ (b) $\mathrm{MT^{-2}}$ (c) $\mathrm{LT^{-2}}$ (d) LM

2. Dimension of Thermal Conductivity (k) in formula $Q = k\frac{A(\theta_2 - \theta_1)t}{d}$ is –
   (a) $\mathrm{LMT^{-2}}$ (b) $\mathrm{MT^{-2}}$

   (b) (c) $\mathrm{MLT^{-3}K^{-1}}$ (d) $\mathrm{MLT^{-2}K^{-1}}$

3. Dimension of Capacitance (C) $Q = CV$ is –
   (a) $\mathrm{M^{-1}L^{-2}T^4I^2}$ (b) $\mathrm{ML^{-2}T^4I^2}$

   (c) $\mathrm{M^{-1}L^{-1}T^4I^2}$ (d) $\mathrm{M^{-1}L^{-2}T^4I^1}$

4. Conversion factor for unit of Young's Modulus in SI is $(\mathrm{N/m^2})$ into CGS $(\mathrm{dynes/cm^2})$ is –
   (a) 10^9 (b) 10^3 (c) 10^6 (d) 10

5. Distance covered by a particle expressed as $y = ax + bt + ct^2$, where y is distance along Y-axis, x is distance along X-axis, a, b and c are coefficients and t is time elapsed. Then dimensions of $a, b,$ and c are –
   (a) $[a]$ is dimensionless , $[b] = \mathrm{LT^{-1}}, [c] = \mathrm{LT^{-2}}$

   (b) $[a] = \mathrm{L},\ [b] = \mathrm{LT^{-1}}, [c] = \mathrm{LT^{-2}}$

   (c) $[a] = \mathrm{LT},\ [b] = \mathrm{LT^{-2}}, [c] = \mathrm{LT^{-3}}$

   (d) $[a] = \mathrm{L},\ [b] = \mathrm{LT},\ \ [c] = \mathrm{LT^{-1}}$

6. Electric current through a wire produces heat (H) which is a function of current (I) through it, resistance of wire (R) and time (t) for which current

is passed the wire. This function is expressed as $= kI^a R^b t^c$, here k is dimensionless proportionality constant. Then , values of indices are –
   (a) $a = 2, b = 1, c = 1$
   (b) $a = 2, b = 2, c = 1$
   (c) $a = 1, b = 2, c = 1$
   (d) $a = 1, b = 1, c = 2$

7. In expression $\int \frac{dx}{\sqrt{ax - x^2}} = k \sin^{-1}\left(\frac{x}{a} - 1\right)$, on R.H.S. k is dimensionless, dimension $[a]$ is –
   (a) Dimensionless   (b) L (c) $\mathrm{L^2}$ (d) $\mathrm{L^{-1}}$

8. Dimensionally $\mathrm{ML^{-1}T^{-2}}$ is –
   (a) Linear momentum
   (b) Work done by a force
   (c) Energy per unit area
   (d) Pressure

9. Identify correct statements –
   (a) In dimensional analysis each quantity in expression is in terms of base quantities,
   (b) Every base quantity is independent of other base quantities
   (c) Two base cannot be related
   (d) Dimension of a derived quantity may be zero

10. Duration of journey from Noida to Gurgaon is 90 minutes.   If $1\,\mathrm{milli - century} = 10^{-3}\mathrm{Century}$, express duration of travel in $\mathrm{milli - century}$
   (a) $28.538\mathrm{E} - 05\ \mathrm{milli - centuries}$
   (b) $28.5\mathrm{E} - 05\ \mathrm{milli - centuries}$
   (c) $28\mathrm{E} - 05\ \mathrm{milli - centuries}$
   (d) $28.53\mathrm{E} - 05\ \mathrm{milli - centuries}$

11. Period of oscillation of a simple pendulum is $T = 2\pi\sqrt{\frac{l}{g}}$. Measured value of $l = 20.0 \pm 0.1$ cm and time for 100 oscillations is $t = 90 \pm 1$ sec. Accuracy of the value of g determined so is –

(a) 2%   (b) 3%   (c) 1%   (d) 2.5%

12. Unit of heat is Calorie is equal 4.2 J. In a another system of unit mass is $= x$ kg, unit length is $= y$ m and time is $= z$ s. Then One Calorie equivalent to new unit of Energy (U)-

(a) $\frac{1}{4.2} xy^2z^{-2}$ (b) $4.2x^1y^2z^{-2}$

(c) $4.2x^{-1}y^2z^2$ (d) $4.2x^{-1}y^{-2}z^2$

13. In electrical circuit dimension of $\left[\frac{L}{C}\right]$ is-

(a) $\left[\frac{1}{R}\right]^2$ (b) $[R]^2$

(c) Dimensionless   (d) $[R]$

14. Dimension $\left[\frac{h}{e}\right]$, where, h is Planck's Constant and e is charge of an electron, is –

(a) Electric Flux   (b) Electric Field
(c) Magnetic Field   (d) Magnetic Flux

15. Dimension $\left[\frac{E^2}{\mu_o}\right]$, where E is electric field and μ_o is permeability of free space is –

(a) MLT^{-4} (b) $M^2L^{-3}T^2A$
(c) $M^2L^{-3}T^2A^2$ (d) ML^3T^{-2}

16. When L is angular momentum and μ is magnetic moment then $\left[\frac{L}{\mu}\right]$ is -
(a) $MLT^{-1}I^{-1}$ (b) $ML^{-1}T^{-1}I^{-1}$
(c) $MT^{-1}I^{-1}$ (d) $T^{-1}I^{-1}$

17. When, e is charge of an electro, ε_0 is permittivity of free space, h is Planck's Constant and c is velocity of light then dimensionally $\left[\frac{e^2}{\varepsilon_o hc}\right]$ is –

(a) $MT^{-1}I^{-1}$ (b) Dimensionless
(c) ML^2I^{-1} (d) $MLT^{-1}I^{-1}$

18. Dimension $[\sigma b^4]$, where σ is Stephen's constant and b is Wein's is –

(a) Dimensionless   (b) ML^2T^{-3}
(c) ML^4T^{-1} (d) ML^4T^{-3}

19. Dimensionally $\left[\frac{CV}{\rho\varepsilon_o}\right]$, where C is capacitance, V is potential difference, ρ is specific resistivity and ε_o is permeability of free space, is –

(a) I (b) $MT^{-1}I^{-1}$
(c) $MLT^{-1}I^{-1}$ (d) $MLT^{-1}I$

20. Dimensionally $[\hbar c]$ is-
(a) MLT^{-2} (b) ML^3T^{-1}
(c) ML^3T^{-2} (d) ML^2T^{-2}

21. A 2m long wire of diameter 0.4 ± 0.01 mm suspends a mass of 1 kg, wire. The elongation in wire is measured to be 0.8 ± 0.05. Young's Modulus of elasticity calculated with these observations is –

(a) $(0.2 \pm 0.03) \times 10^{11}$ N/m²
(b) $(0.2 \pm 0.022) \times 10^{11}$ N/m²
(c) $(0.2 \pm 0.02) \times 10^{11}$ N/m²
(d) $(0.2 \pm 0.0224) \times 10^{11}$ N/m²

22. In a meter bridge determination of value of an unknown resistance X is obtained by adjusting R in resistance box to values R_1, R_2, R_3 and R_4, arranged in an incremental order. In the process position of Galvanometer contact is kep unchanged. The most accurate approximation of value of X using any Two values is –

    (a) $R_2 \, \Omega$ (b) $R_3 \, \Omega$
    (c) $\frac{R_2 + R_3}{2} \, \Omega$ (d) $\frac{R_1 + R_2 + R_3 + R_4}{4} \, \Omega$

23. A screw gauge with 100 divisions on circular scale has a pitch of 1 mm. Diameter of a wire is measured to be 2 mm and 49th division of circular scale on reference line. If length of wire is 6.5 cm its surface area of the curved surface is -
    (a) 51 cm²   (b) 50.8 cm²
    (c) 50.83 cm²   (d) 50.829 cm²

24. Identify a pair of physical quantity among those given below which are dimensionally different (i) Torque and work, (ii) Momentum and Planck's Constant, (iii) Stress and Young's Modulus and (iv) $\varepsilon_o \mu_o$ and $\frac{1}{\text{Speed}}$

    (a) Torque and work
    (b) Momentum and Planck's
    (c) Stress and Young's Modulus
    (d) $\varepsilon_o \mu_o$ and $\frac{1}{\text{Speed}^2}$

25. Significant digits in numbers 23000, 23.000, 02030.0 are -

    (a) 5, 6,6   (b) 6, 2,3

    (c) 2, 5, 5   (d) 2, 6, 4

26. Absolute of permittivity of free space (ε_o) has unit in SI -

    (a) Farad per meter   (b) Farad-meter

    (c) Farad   (d) Farad-meter-square

27. Unit of gravitational constant is -

    (a) kg-m/s   (b) kg-m/s²

    (c) kg-m/s²   (d) N-m²/kg²

28. In $x(t) = \frac{v_0}{\alpha}(1 - e^{-\alpha t})$, position of a particle is $x(t)$, a function of (t), then dimensions of v_0 and α are -

    (a) LT^{-1}, T^{-1} (b) LT^2, T
    (c) LT, T^2 (d) LT^2, T^2

29. In diffusion process number of particles crossing per unit area and per unit time in Y-Z plane is $= -D \frac{n_2 - n_1}{x_2 - x_1}$. Here, n_1 and n_2 are number of diffusing molecules per unit volume at points x_1 and x_2 along X-axis. Then dimension of diffusion constant D is -

    (a) T^{-1} (b) $L^3 T^{-1}$

    (c) LT^{-1} (d) $L^2 T^{-1}$

30. In a physical quantity $P = \frac{B^2 l^2}{m}$, where B is magnetic induction, l is length and m is mass, then dimension of P is -

    (a) $MLT^{-3}A^{-2}$ (b) $ML^2T^{-3}A^{-2}$

    (c) $MLT^{-2}A^{-2}$ (d) $MLT^{-2}A^{-1}$

31. Taking Velocity of light (c), gravitational constant (G) and Planck's constant (h) as fundamental units, then dimension of mass in new system is -

    (a) $c^{-\frac{1}{2}} G^{-\frac{1}{2}} h^{\frac{1}{2}}$ (b) $c^{\frac{1}{2}} G^{-\frac{1}{2}} h^{\frac{1}{2}}$
    (c) $c^{\frac{1}{2}} G^{-\frac{1}{2}} h^{-\frac{1}{2}}$ (d) $c^{-\frac{1}{2}} G^{\frac{1}{2}} h^{-\frac{1}{2}}$

32. A body weighs is air (5.00 ± 0.5) N and in water (4.00 ± 0.5) N. What is the percentage error in relative density of body -

    (a) 9%   (b)   10%
    (c) 5%   (d)   11%

33. A box weighing 5.2 kg is containing three balls each weighing 200 gm, 330.5 gm and 75 gm. Total mass of the box with three balls is -

    (a) 5.9   (b) 5.950
    (c) 6.0   (d)   6

34. Potential difference across a resistance of 15.479 Ω, when 3.56 Amps current flows through it would be -

    (a) 44.10 V   (b)   55.1 V
    (c)   55 V   (d)   55.105 V

35. If each of parameter in a physical quantity is measured to 1% accuracy then maximum error caused in a physical quantity $X = \dfrac{P^{\frac{2}{3}}Q^2}{RS^{\frac{5}{2}}}$ is due to −

    (a) P   (b) S   (c) Q   (d) R

36. Number of base or fundamental SI units is -

    (a) 4   (b) 7   (c) 3   (d)   5

37. The unit of Planck's constant is -

    (a) *Joule*   (b) *Joule*/s
    (c) *Joule/m*   (d) *Joule- s*

38. The unit of reactance is –

    (a) *Ohm*   (b) *Volt*   (c) *Mho* (d)   *Newton*

39. The dimension of $\dfrac{R}{L}$ are –

    (a) T^2 (b) T   (c) T^{-1} (d) T^{-2}

40. Dimensions of potential energy are –

    (a) MLT^{-1} (b) ML^2T^{-2}

    (c) $ML^{-1}T^{-2}$ (d) $ML^{-1}T^{-1}$

41. The dimensions of electric potential are –

    (a) $ML^2T^{-2}Q^{-1}$ (b) $ML^2T^{-2}Q^{-1}$
    (c) $ML^2T^{-1}Q$ (d) $ML^2T^{-2}Q$

42. The dimensional formula for Boltzmann's constant in Kinetic Theory of Gases is -

    (a) $ML^2T^{-2}\theta^{-1}$ (b) ML^2T^{-2}
    (c) $ML^0T^{-2}\theta^{-1}$ (d) $ML^2T^{-2}\theta^{-1}$

43. Which of the following quantities is dimensionless -

    (a) Gravitational constant   (b) Planck's constant
    (c) Power of a convex lens   (d)   None of these

44. Which of the two have same dimensions -
    (a) Force and strain
    (b) Force and stress
    (c) Angular velocity and frequency
    (d) Energy and strain

45. The dimensions of pressure is equal to -
    (a) Force per unit volume
    (b) Energy per unit volume
    (c) Force
    (d) Energy

46. Identify the pair whose dimensions are equal
    (a) Torque and work   (b) Stress and energy
    (c) Force and stress   (d) Force and work

47. A physical quantity x depends on quantities y and z as follows: $x = Ay + B \tan Cz$, where A, B and C are constants. Which of the following do not have the same dimensions
    (a) x and B (b) C and z^{-1}
    (c) y and B/A (d) x and A

48. $ML^3T^{-1}Q^{-2}$ is dimension of

    (a) Resistivity   (b) Conductivity

    (c) Resistance   (d) None of these

49. Two quantities A and B have different dimensions. Which mathematical operation given below is physically meaningful -

    (a) A/B (b) $A + B$

    (c) $A - B$ (d) None of these

50. Let $[\varepsilon_0]$ denotes the dimensional formula of the permittivity of the vacuum and $[\mu_0]$ that of the permeability of the vacuum. If M = mass, L= length, T= time and I= electric current, then

    (a) $[\varepsilon_0] = M^{-1}L^{-3}T^2I$ (b) $[\varepsilon_0] = M^{-1}L^{-3}T^4I^2$

    (c) $[\mu_0] = MLT^{-2}I^{-2}$ (d) $[\mu_0] = ML^2T^{-1}I$

51. The dimension of quantity (L/RCV) is -

    (a) A   (b) A^2 (c) A^{-1} (d) None of these

(Answers of these Practice Question are on Page 33)

Any quarry may be sent to the coordinator of this initiative Gyan Vigyan Sarita. e-Mail ID: subhashjoshi2107@gmail.com

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GROWING WITH CONCEPTS

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

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

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

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

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

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

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Code: Phy/UDM/O/001

Answers: Questions Physics – Units, Dimensions and Measurements

(May'18- e-Bulletin)

1	2	3	4	5	6	7	8	9	10
b	c	a	d	a	a	b	c & d	All	c
Lvl. I	Lvl. I	Lvl. III	Lvl. II	Lvl. I	Lvl. I	Lvl. I	Lvl. I	Lvl. I	Lvl. I

11	12	13	14	15	16	17	18	19	20
b	d	b	d	a	c	b	d	a	c
Lvl. I	Lvl. I	Lvl. II	Lvl. III	Lvl. III	Lvl. II	Lvl. III	Lvl. III	Lvl. III	Lvl. II

21	22	23	24	25	26	27	28	29	30
c	c	a	d	c	c	d	c	c	b
Lvl. I	Lvl. II	Lvl. I	Lvl. II	Lvl. I	Lvl. III	Lvl. II	Lvl. I	Lvl. II	Lvl. I

31	32	33	34	35	36	37	38	39	40
b	d	c	b	b	b	d	a	c	b
Lvl. II	Lvl. I	Lvl. I	Lvl. II	Lvl. I	Lvl. I	Lvl. II	Lvl. I	Lvl. III	Lvl. I

41	42	43	44	45	46	47	48	49	50
b	d	d	c	b	a	d	a	a	b & c
Lvl. III	Lvl. II	Lvl. I	Lvl. II	Lvl. I	Lvl. I	Lvl. I	Lvl. II	Lvl. I	Lvl. III

51
c
Lvl. III

(Illustrations of these answers are on Page 42-49)

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Growing with Concepts: Chemistry

HYBRIDIZATION

Kumud Bala

Hybridization is a phenomenon of intermixing of the atomic orbitals belonging to the same atom with slightly different energies resulting in the formation of new set of orbitals of equal energy and identical shape. The new orbitals formed as a result of hybridization are called hybrid or hybridized orbitals.

The important characteristics of hybridization are:

1. The number of hybridized orbitals formed is equal to the number of orbitals that get hybridized.
2. The hybridized orbitals are always equivalent in energy and shape.
3. The hybrid orbitals are more effective in forming stable bonds than the pure atomic orbitals.
4. The hybrid orbitals are directed in space in some preferred directions to have stable arrangements. Therefore, the type of hybridization gives the geometry of the molecules.

Conditions for hybridization:

1. Only the orbitals present in the valence shell of the atom are hybridized.
2. The orbitals undergoing hybridization should have only a small difference in energy. The orbitals which differ largely in energy cannot take part in hybridization.
3. Promotion is not essential condition prior to hybridization.
4. It is not essential that only half filled orbitals participate in hybridization. In certain cases, even filled orbitals of valence shell participate in hybridization.

Types of hybridization:-

1. **sp-hybridization**:- In sp-hybridization, one s- and one p-orbital belonging to the same main shell of an atom mix together to form two new equivalent orbitals. The new orbitals formed are called sp-hybrid orbitals. They are collinear with an angle of 180°. Each sp-hybrid orbital has 50% s-character and 50% p-character. These two sp-hybrid orbitals point in opposite direction along the z-axis with bigger positive lobes and very small negative lobes. The remaining two p-orbitals which do not participate in hybridization remain as such. If these are half-filled, they may form bonds with other atoms having half-filled atomic orbitals.
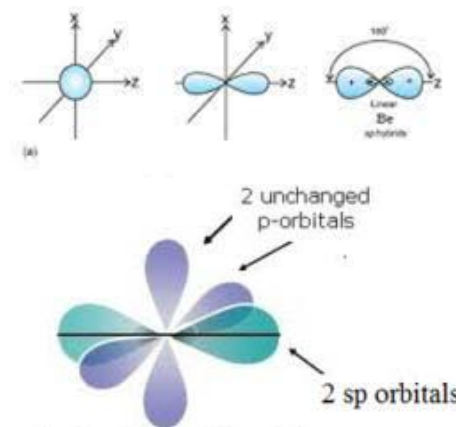
For example: sp-hybridization can be illustrated with the help of acetylene or ethyne ($CH \equiv CH$). In the formation of ethyne both the carbon atoms undergo sp-hybridization leaving two unhybridised orbitals ($2p_y$ and $2p_x$) on each. One sp-hybrid orbital of one carbon atom overlaps axially with sp-hybrid orbital of the second carbon atom to form C-C sigma (σ) bond. The remaining hybridized orbital of each carbon overlaps with half-filled orbital of hydrogen forming σ-bonds. Each of the two unhybridised orbitals of one carbon atom overlaps sidewise with similar orbitals of the second carbon atom to form two π-bonds, the triple bond between two

carbon atoms is made up of one sigma and two π-bonds. If one π-bond is pictured as lying above and below the inter nuclear axis representing σ-bond then the other π-cloud lies in front and in back as shown in figure below. However, there is over lapping between the π-clouds so that the four lobes of two π-bonds merge to form a single cylindrical electron cloud about the inter nuclear axis. The various bond parameters of acetylene molecule are as follows: (i) C≡C bond length=120pm (ii) C-H bond length =108pm (iii) H-C-C bond angle= 180° (iv) C≡C bond dissociation energy = 811 kJmol^{-1}
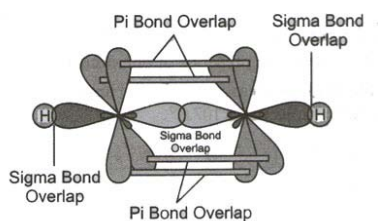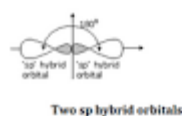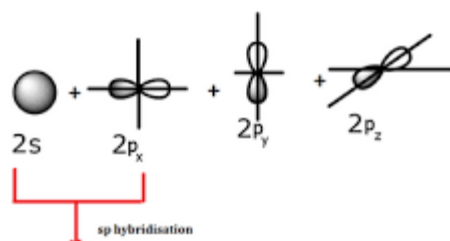

Formation of C_2H_2 molecule by *sp* hybridisation

Sigma and Pi Bonding
• Ethyne (Acetylene) (C_2H_2)

2. **sp²-hybridization**: In this type, one s and two p-orbitals of same shell of an atom mix to form three new equivalent orbitals. All the three
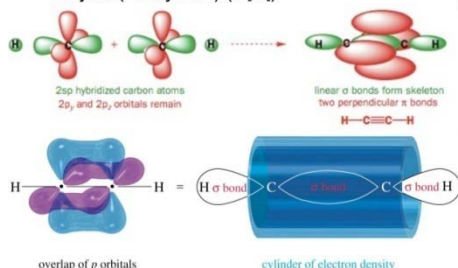
hybrid orbitals remain in the same plane making an angle of 120° with one another. The hybridization is, therefore known as trigonal hybridization. Each sp² hybrid orbital has one-third s-character and two-third p-character. The unhybridised $2p_y$ orbital of carbon is oriented in a plane at right angles to plane containing three hybridized orbitals.
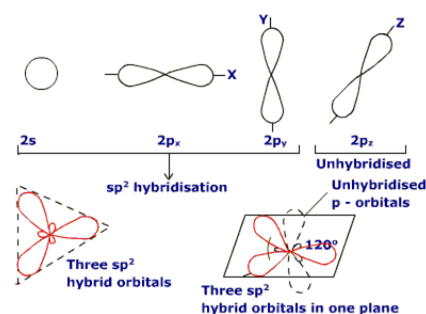
Let us illustrate sp² hybridization with the help of ethylene or ethene ($CH_2=CH_2$) molecule.
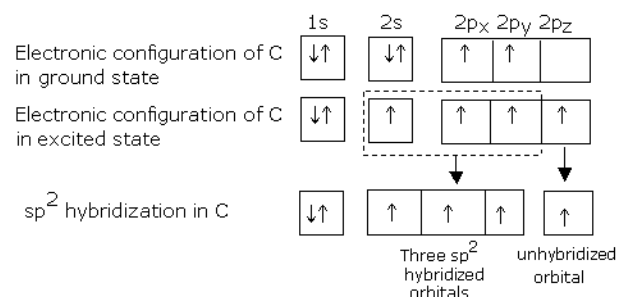
Carbon atom has four unpaired electrons in the valence shell in the excited state. In the formation of ethylene, each C-atom undergoes sp² hybridization, leaving $2p_z$ orbital unhybridised. The three sp² hybrid orbitals of each C-atom are planar and are inclined to each other at an angle of 120°. One sp² hybrid orbital of the first C-atom overlaps with one sp² hybrid orbital of the second C-atom along the inter nuclear axis there by forming one sigma bond between them. The other two sp² hybrid orbital of each C-atom overlap with the half- filled 1s-orbitals of H-atoms along their respective inter nuclear axis forming σ-bonds. The unhybridised $2p_z$ orbital of the first C-atom undergoes sideways overlapping with the unhybridised $2p_z$

orbital of the second C-atom, there by forming a weak π-bond between the two C-atoms. The π-bond consists of two equal electron clouds distributed above and below the plane of other atoms. Thus, in ethylene all the six atoms (forming σ-bonds) lie in one plane and π-bond is at a plane perpendicular to the plane of six atoms. In ethene molecule, (i) C=C bond length = 134pm (ii) C–H bond length = 108pm (iii) H-C-H bond angle or H-C-C = 120° (iv) C=C bond dissociation energy = 614kJmol^{-1}.

3. **sp³-hybridization**:- In sp³ hybridization, one s and three p-orbitals hybridize to form sp³ hybrid orbitals. The four sp³ hybrid orbitals will be directed towards the four corners of a regular tetrahedral and make an angle of 109.5°. Each sp³ hybrid has one-fourth (25%) s-character and three-fourth (75%) p-character.
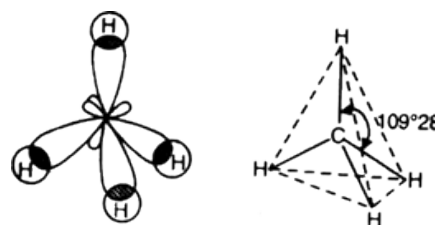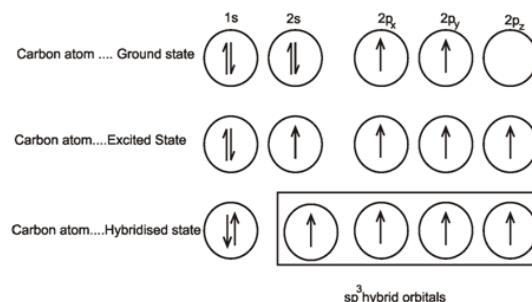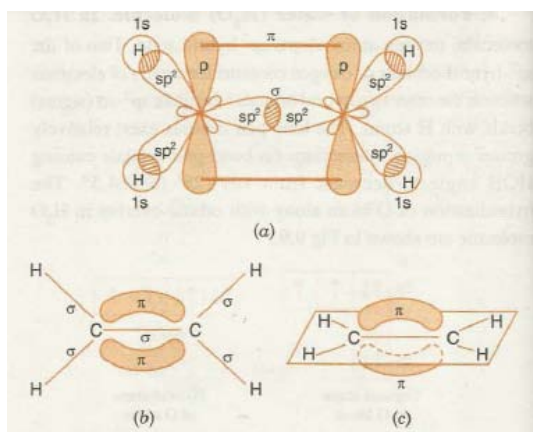
Example:- In methane molecule, the central atom carbon has the ground state electronic to configuration $1s^2\ 2s^2\ 2p_x^1 2p_y^1$. It has only two unpaired electrons. To account for tetravalency, one of the 2s-electrons is promoted to vacant 2p-orbital. Therefore, the excited state carbon has four unpaired electrons. These four orbitals (one 2s and three 2p) hybridize to form four sp³ hybrid orbitals, which are oriented in tetrahedral arrangement. Each of these hybrid orbital overlaps with 1s orbital of hydrogen atom to form four C-H bonds. Thus, methane molecule has tetrahedral geometry with each H-C-H bond angle of 109.5°.

Other examples- H_2O, NH_3

Trigonal pyramidal structure of ammonia molecule

Hybridization in elements involving d-orbital:-
The elements of third period contain d-orbitals also in addition to s and p-orbitals. The 3d-orbitals are comparable in energy to the 3s and 3p- orbitals. These d-orbitals are also involved in the hybridization to explain the geometries of molecules of elements of third period. This result in covalencies of 5,6 and 7, which are not known amongst the compounds of second period elements. Due to the availability of d-orbitals, P and S elements can exhibit covalency of 5 and 6 respectvely whereas the corresponding elements of same group N and O of second period can not expand their octet.

Common examples of molecules of third period**:-**

1. **sp³d-hybridization**: This hybridization involves the mixing of one s, three p and one d-orbitals.These five orbitals hybridize to form five sp³d hybrid orbitals. These hybrid orbitals point towards the corner of a trigonal bipyramidal geometry.In this case, three orbitals forming a plane are directed towards the corners of an equilateral triangle while the other twobare perpendicular to the plane of the triangle lying above and below it.
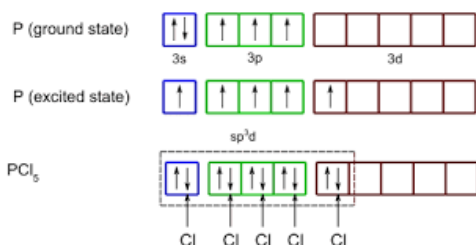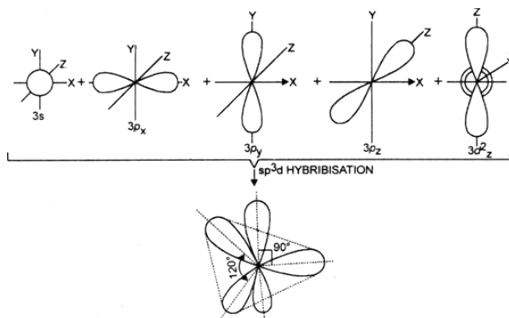
For example:- PCl_5: In the outer electroic configuration of phosphorus (Z=15), the central atom

is $3s^2\ 3p_x^1\ 3p_y^1\ 3p_z^1$. For pentavalency of phosphorus in PCl_5, one of the electrons in 3s-orbital is promoted to higher 3d- orbital so that it has unpaired electrons (Excited state) .These five orbitals hybridize to form five sp³d hybrid orbitals which adopt trigonal bipyramidal arrangement.Each of sp³d hybrid orbital overlaps with 3p-orbital of chlorine forming five P-F bonds. PCl_5 molecule has trigonal bipyramidal geometry. All the bond angles in trigonal bipyramidal geometry are not equivalent. Three bonds lie in one plane at an angle of 120° to one another. These bonds are termed as equatorial bonds. Remaining two bonds, one lies above and the other below the equtorial plane both making an angle of 90° with the plane. These bonds are called axial bonds. Geometry is not symmetrical. The axial bonds have been found to be larger than equatorial bonds. Each P-Cl axial bond = 219pm and each P-Cl equatorial bond= 204pm.

Trigonal bipyramidal structure of PCl_5
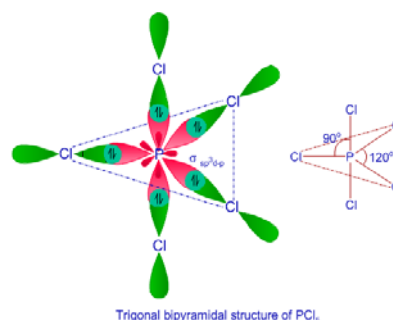
Axial bond is larger than equatorial because of greater repulsion from other bonds in axial position. Therefore, the axial bonds are slightly elongated and hence slightly weaker than equatorial bonds. Therefore, PCl_5 is quite reactive.

2. **Sp³d²-hybridization**- In this case, one s, three p and two d-orbitals get hybridized to form six sp³d² hybrid orbitals. Adopt octahedral arrangement.
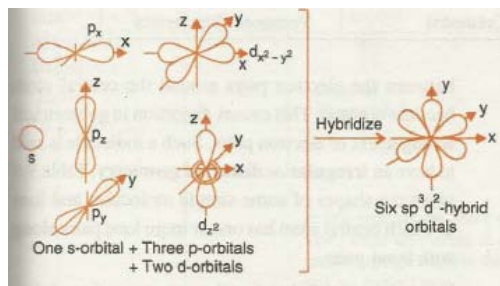
For example- SF_6: The central sulphur atom has ground state configuration $3s^2$ $3p^4$. For hexavalency in SF_6 one electron from 3s and one form 3p orbital are promoted to 3d- orbitals. These six orbitals get hybridized to form six sp^3d^2 hybrid orbitals. Each of these sp^3d^2 hybrid orbitals overlaps with 2p- orbital of fluorine to form S-F bond. SF_6 molecule has octahedral structure.
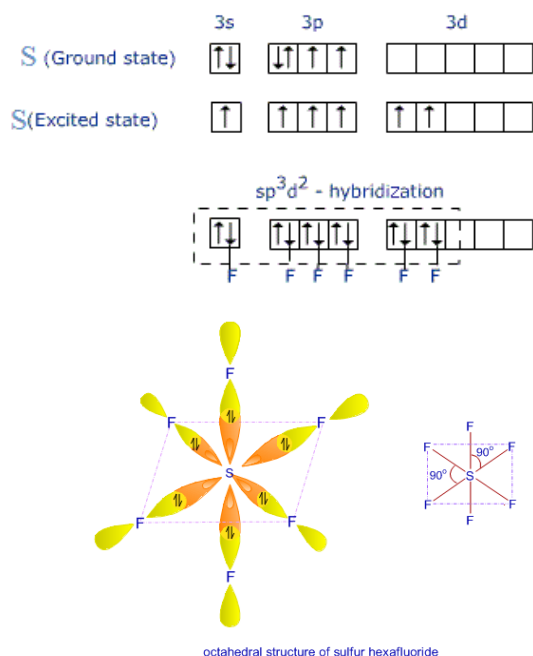
3. **sp^3d^3-hybridization:**- This hybridization involves the mixing of one s, three p and three d-orbitals forming seven sp^3d^3- hybrid orbitals adopting pentagonal bi-pyramidal geometry as shown below in IF_7 compound.

Formation of IF₇ molecule involving sp3d3 hybridization

Pentagonal bipyramidal geometry of IF7 molecule
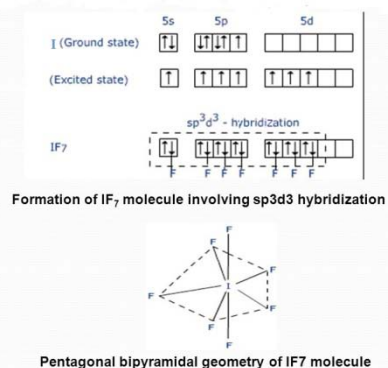
Outer electronic configuration of iodine atom is $5s^2$ $5p^5$. To make seven bonds, one s and two p-orbitals are promoted to the higher vacant 5d-orbitals. These seven orbitals are then hybridized to give seven sp^3d^3- hybrid orbitals. Each of these sp^3d^3- hybrid orbital overlaps with 2p- orbitals of fluorine to form IF_7 molecule having pentagonal bi-pyramidal structure. In this geometry, all the bond angles are not equal. Five F-atoms directed towards the vertices of a regular pentagon making an angle of 72°. The other two F-atoms are at right angles (90°) to the plane. Due to different bond angles, the bonds are different in length. The axial bonds are larger than equatorial bond.

ASSIGNMENT:

1. Which one of the following compounds has sp^2 hybridization?
   (a) CO_2 (b) SO_2 (c) N_2O (d) CO.

2. The geometry and the type of hybrid orbitals present about the central atom in BF_3 is:
   (a) linear, sp   (b) trigonal, sp^2
   (c) tetrahedral, sp^3 (d) pyramidal, sp^3.

3. Atomic orbitals of carbon in carbon dioxide are –
   (a) sp- hybridized   (b) sp^3d- hybridized
   (c) sp^2- hybridized   (d) sp^3- hybridized.

4. In which of the following species is the underlined carbon having sp^3-hybridization?
   (a) CH_3–C_OOH   (b) CH_3C_H_2OH
   (c) CH_3 –C_O–CH_3 (d) CH_2=C_H–CH_3.

5. The correct order regarding the electronegativity of hybrid orbitals of carbon is –
   (a) $sp < sp^2 > sp^3$ (b) $sp < sp^2 < sp^3$
   (c) $sp > sp^2 < sp^3$ (d) $sp > sp^2 < sp^3$.

6. Shape and hybridization of IF_5 respectively are -
   (a) trigonal bi-pyramidal, sp^3d
   (b) see-saw, sp^3d
   (c) square pyramidal, sp^3d^2
   (d) pentagonal pyramidal, sp^3d^3 .

7. The hybridization of carbon in diamond, graphite and acetylene is respectively:
   (a) sp^3, sp^2, sp (b) sp, sp^3, sp^2
   (c) sp^2 , sp, sp^3 (d) sp, sp^2, sp^3 .

8. The geometry of SF_6 involves the hybridization:
    (a) sp^3d (b) dsp^2 (c) sp^3d^2 (d) sp^3.

9. Which of the following molecules does not involve sp^3 hybridization-
    (a) NH_3 (b) CCl_4 (c) SF_4 (d) H_2O.

10. The hybridization of carbon atoms in $C–C$ single bond in $HC \equiv C– CH = CH_2$ is –

    (a) $sp^3 – sp^3$ (b) $sp^2 - sp^3$
    (c) $sp – sp^2$ (d) $sp^3 - sp$.

11. A molecule in which sp^2 hybrid orbital are used by the central atom in forming covalent bonds is -
    (a) PCl_5 (b) NH_3 (c) SO_2 (d) XeF_2.

12. Which of the following hybrid orbitals has highest s- character?
    (a) sp^2 (b) sp^3d (c) dsp^2 (d) sp^3.

13. The hybridization possessed by oxygen atom in OF_2 molecule is
     (a) sp (b) sp^2 (c) sp^3 (d) none of these .

14. The geometry of H_2S and its dipole moment are –
    (a) angular and non zero   (b) angular and zero
    (c) linear and nonzero   (d) linear and zero.

15. The hybridization of atomic orbitals of nitrogen in NO_2^+ , NO_3^- and NH_4^+ are –
    (a) sp, sp^3 and sp^2 respectively (b) sp , sp^2 and sp^3 respectively
    (c) sp^2, sp and sp^3 respectively (d) sp^2 , sp^3 and sp respectively.

ANSWERS: 1. (b)   2. (b)   3. (a)   4. (b)   5. (d)   6. (c)   7. (a)   8. (c)

9. (c)   10. (c)   11. (c)   12. (a)   13. (c)   14. (a)   15. (b)

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In the end, inly three things matter; how much you loved. How gently you lived, and how gracefully you let go off things not meant for you

-   Buddha

SCIENCE QUIZ-May'18: National Technology Day

Kumud Bala

1. When was the first National Technology Day of India celebrated?
   (a) 11 May 1998   (b) 11May 1999
   (c) 11 May 1997   (d) 11 May 2000

2. Who has signed the declaration of the officially celebrating the 11 May as National Technology Day in India?
   (a) Atal Bihari Vajpai
   (b) Pranab Mukherjee
   (c) Dr. A P J Abdul Kalam
   (d) Dr. Manmohan Singh

3. What is the theme for 2018's National Technology Day in India?
   (a) Technology for inclusive and sustainable growth
   (b) Science and technology for a sustainable future
   (c) Technology enablers of startup India
   (d) Technology for better quality for life

4. On what day was the nuclear test held in Pokhran Tech Area?
   (a) 11 May 1998   (b) 13 May 1998
   (c) 1 May 1998   (d) 12 May 1998

5. How many nuclear weapons were test-fired in May 1998?
   (a) 2   (b) 3   (c) 5   (d) 1

6. Who had led an operation shakti-1 initiative?
   (a) Dr. APJ Abdul Kalam
   (b) Atal Bihari Vajpai
   (c) Dr. Man Mohan Singh

7. When was the first nuclear test conducted under the code- named 'Smiling Buddha"?
   (a) May 1974   (b) April 1974
   (c) June 1974   (d) Oct 1974

8. Apart from Pokhran nuclear test, on this day first indigenous aircraft .... was test flown at Bangalore.
   (a) Shanti-1   (b) Hansa-3   (c) Trishul

9. Which short range missile made in India was also done on the same day (11 May 1998)?   (a) Trishul   (b) Hansa-3
   (c) Shakti-1   (d) atom bomb

10. How many detonations were happened on May 11, 1998?
    (a) 1   (b) 2   (c) 5   (d) 3

11. How many detonations were   happened on May 11, 1998?
    (a) 3   (b) 4   (c) 5   (d) 2

12. Who were the chief coordinators of Pokhran-II ?
    (a) Abdul Kalam and R. chidambaran
    (b) Atal Bihari Vajpai and R. chidambaran
    (c) Abdul Kalam and Atal Bihari Vajpai

13. What was the rank of India in the World after conducted five series of nuclear test to join the nuclear club?
    (a) 4ᵗʰ   (b) 6ᵗʰ   (c) 11ᵗʰ   (d) 5ᵗʰ

14. What was the theme for 2017's National Technology Day?
    (a) technology enablers of startup India
    (b) technology for inclusive and sustainable growth
    (c) inclusive innovation for India
    (d) innovation-making a difference

15. Which organization has developed a short range missile 'Trishul'?
    (a) DRDO   (b) ISRO (c) CSIR   (d) TDB

(Answers to this Science Quiz May'18 shall be provided in

2ⁿᵈ Supplement dt 1ˢᵗ June'18 to 7ᵗʰ Quarterly e-Bulletin)

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Education is one of the great things of life. Education is an attempt to touch the evil at its source, and reform the wrong ways of living as well as one's outlook towards life.

- Plato

Growing with Concepts: English Grammar

Unit-2: Object (Direct)

S. Swarnalatha

When the verb in the predicate is a <u>Transitive verb</u>, it requires an object to complete its sense.

> ➤ What is a <u>Transitive Verb</u>?
>   A verb that requires an object to complete its meaning is called a <u>Transitive Verb</u>.
>   A direct object is an answer to <u>'what'</u> after the verb.
>   An indirect object is an answer to the question <u>'whom'</u> after the verb.

For example , if we say – ' Birds build', we do not make complete sense. You want to know what the birds <u>build</u>. The verb <u>build</u> requires an object, such as <u>nests</u>, to make complete sense.

Now examine the predicates in the following sentences:

Examples : 1. Cats catch <u>mice.</u>

2. He knows <u>her.</u>

3. The foolish crow tried to <u>sing.</u>

4. The rich people should help <u>the poor.</u>

5. I do not know <u>how to swim.</u>

6. The brave Rajputs loved <u>fighting</u>.

NO	SUBJECT		PREDICATE	
	Subject- word	Attribute	Verb	object
1.	Cats		catch	mice
2.	He		knows	her
3.	crow	The foolish	tried	to sing
4.	people	The rich	should help	the poor
5.	I		do not know	how to swim
6.	Rajputs	The brave	loved	fighting

> ➤ It will be noticed that –

In sentence 1 the Object is a <u>Noun</u> .   In sentence 2, the object is a <u>pronoun</u>.

In sentence 3, the object is a <u>Infinitive</u>.   In sentence 4, the object <u>is an Adjective</u> used <u>as a Noun.</u>

In sentence 5 the object is <u>a group of words doing the work of a Noun</u>.

In sentence 6, the objective is <u>a Gerund orverbal Noun</u> .

Attribute (verb) = regard as belonging to or caused by noun, a quality or feature.

Infinitive (noun) = the basic form of a verb , occurring in English with the word to.

Author is a teacher at Ramakrishna Mission School at Vishakhapattanam. She has volunteered to contribute a column Growing With Concepts – English Grammar. Sushri **Sarswathi Tenneti Madam**, A vetron senior teacher and mentor in English Language has kindly consented to make value addition for enriching this column.

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Ill.-Phy/UDM/O/001

Illustrations of Answers to Practice Questions on Physics

(Topic-Units, Dimensions and Measurements)

Illustration 1: Given formula is for measurement of approximate Surface Tension based on height of liquid in a capillary, where, density of liquid $[\rho] = ML^{-3}$, Acceleration due to Gravity $[g] = LT^{-2}$, radius of the capillary $[r.] = L$ and height of rise of liquid in the capillary $[h] = L$. In dimensional analysis, numerical coefficients are dimensionless and, therefore, $S = (ML^{-3})(LT^{-2})(L)(L) = ML^{-3+3}T^{-2} = MT^{-2}$. The final dimension is arrived at by applying Theory of Indices.

Illustration 2: . In question dimension of Temperature is used as K, instead of SI Units as θ, and hence used in solution. Given formula is measurement transfer of heat $[Q]$ through a solid whose cross-sectional area $[A] = L^2$, length $[d] = L$, across the length (*d*) temperature difference is $[\theta] = [\theta_2 - \theta_1] = K$ is and time for transfer of heat Q is $[t] = T$. Further, heat Q is energy and hence it is dimensionally $[Q] = ML^2T^{-2}$. Therefore, dimensionally $[k] = \frac{[Q][d]}{[A][\theta_2 - \theta_1][t]} = \frac{(ML^2T^{-2})(L)}{(L^2)(K)(T)} = MLT^{-3}K^{-1}$.

Illustration 3: In given formula $Q = \int i.dt$, therefore $[Q] = [i][t] = IT$; Moreover, Energy $E = VIt$, where V is the potential difference, I is current through V and t is time of flow of current. Therefore, dimensionally $[V] = \frac{[E]}{[I][t]} = \frac{ML^2T^{-2}}{IT} = ML^2T^{-3}I^{-1}$; dimension of current ($I$) is I. Further, dimensionally $[Q] = [C][V] \to [C] = \frac{[Q]}{[V]} = \frac{IT}{ML^2T^{-3}I^{-1}} = M^{-1}L^{-2}T^4I^2$.

Illustration 4: In SI $\underline{1\,N/m^2}$ factor for unit of Young's Modulus in MKS is (N/m^2) into CGS $(dynes/cm^2)$. And unit $1N = 1\,kg - m/s^2$, likewise, $1dyne = 1g - m/s^2$. Accordingly, converting individual units in SI into CGS $1\frac{N}{m^2} = \frac{1\,kg - m/s^2}{m^2} = \frac{((1000g)(100cm))/s^2}{(100cm)^2} = \frac{10^5\,dynes}{10^4\,cm^2} = 10\,dynes/cm^2$.

Illustration 5: In dimensional analysis, all addends must have same dimension as that of the quantity being equated. $[y]$, where y is distance has dimension L . Likewise, $[y] = L$. Therefore, $[ax] = [a].L = L$, hence $[a] = \frac{L}{L} = 1$, this is true when $[a]$ is dimensionless. Further, $[bt] = L = [b].T \to [b] = \frac{L}{T} = LT^{-1}$ and $[ct^2] = L = [c].T^2$, this leads to $[c] = \frac{L}{T^2}$.

Illustration 6: Heat is energy and therefore, $[H] = ML^2T^{-2}$. Therefore, dimensional equation comes out to be $[H] = [I]^a[R]^b[t]^c \to ML^2T^{-2} = I^a[R]^bT^c$. As per Ohms Law $[R] = \frac{[V]}{[I]}$; moreover electrical energy $E = VIt$, where V is the potential difference, I is current through V and t is time of flow of current. Therefore, dimensionally $[V] = \frac{[E]}{[I][t]} = \frac{ML^2T^{-2}}{IT} = ML^2T^{-3}I^{-1}$, and $[R] = \frac{ML^2T^{-3}I^{-1}}{I} = ML^2T^{-3}I^{-2}$. Accordingly, as per dimensional identity, $ML^2T^{-2} = I^a(ML^2T^{-3}I^{-2})^bT^c = M^bL^{2b}T^cI^{a-2b}$. Since, each dimension is independent and, therefore, corresponding indices on both sides must be equal. Thus, for dimension M, $\boldsymbol{b = 1}$; for dimension of L, $2b = 2$ and it corroborates values of b arrived earlier; for dimension of T, $-3b + c = -2 \to c = -2 + 3 \to \boldsymbol{c = 1}$; and for dimension of I, $0 = a - 2b = a - 2 \to \boldsymbol{a = 2}$.

Illustration 7: We know that $[\sin\theta] = y$ is also dimensionless, so also $\theta = \sin^{-1} y$ is also dimensionless, being ratio of length of arc and radius of arc. Therefore, $\left[\frac{x}{a} - 1\right] = \frac{L}{L}$ is dimensionless and hence $\left[\frac{x}{a}\right] = \frac{L}{L}$ is also

dimensionless or $[a] = [x] = L$. Now taking L.H.S. $\left[\frac{dx}{\sqrt{ax-x^2}}\right] = \frac{[dx]}{[\sqrt{ax-x^2}]} = \frac{L}{\sqrt{L^2}} = \frac{L}{L}$ is also dimensionless. Both sides of given equation ave dimensional equality where $[a] = L$

Illustration 8:   Linear Momentum $[\bar{p}] = [\bar{F} \times \bar{V}] = (MLT^{-2}).(LT^{-1}) = ML^2T^{-3} \neq ML^{-1}T^{-2}$, it is not the answer.

Work done by a force $[w] = [\bar{F}.\bar{D}] = (MLT^{-2}) \cdot (L) = ML^2T^{-2} \neq ML^{-1}T^{-2}$, it is not the answer.

Energy per unit volume $[e] = \frac{[E]}{[V]} = \frac{ML^2T^{-2}}{L^3} = ML^{-1}T^{-2} = ML^{-1}T^{-2}$, it is one of the correct choices

Pressure $[p] = \frac{[F]}{[A]} = \frac{MLT^{-2}}{L^2} = ML^{-1}T^{-2} = ML^{-1}T^{-2}$, it is one of the correct choices.

Note: In dimensional analysis vector and scalar quantities are treated equally.

Illustration 9:   Dimensional analysis is based on representation of physical quantities in terms of base quantities; hence answer (a) is true.

Answer (b) is true, as it is the fundamental premise on which dimensional analysis is built.

Answer (c) corollary of (b) and hence true.

Answer (d) is true since all quantities expressed as ratio of identical quantities are zero, e.g. strain, angle etc.

Illustration 10:   1 century = 100 years = 100×365 days = $100 \times 365 \times 24 \times 60 \times 60$ minutes. Therefore duration of journey 90 minutes $= \frac{90}{100 \times 365 \times 24 \times 60 \times 60}$ centuries

Or, 90 $minutes = 2.85388 \text{E} - 08$ centuries $= 2853.88\text{E} - 05$ milli $-$ centuries. In these calculations least number of significant digits is Two hence answer shall be written as $28\text{E} - 05$ milli $-$ centuries.

Logic: while rounding a result of a calculations involving multiplications answer is expressed in number of least significant digits, which is Two in this case. Therefore, result of calculation in Third digit from MSD shall have to be rounded to Second digit from MSD. The Third digit is 5, but if digit left to the one being rounded is even, in the instant case this digit is 8, an even number, and hence it shall remain unchanged in final answer.

Illustration 11: $[g] = \frac{[T^2]}{[l]}$, and accuracy of is $\frac{\Delta l}{l} \times 100 = \frac{0.1}{20} \times 100 = 0.5\%$ and $\frac{\Delta t}{t} \times 100 = \frac{1}{90} \times 100 = 1.1\%$. Therefore, $\frac{\Delta g}{g}\% = 2\frac{\Delta t}{t}\% + \frac{\Delta l}{l}\% = (2 \times 1.1)\% + 0.5\% = 2.7\% = 3\%$

Logic: Error is compared with respect to base value and can be (+)ve or (-)ve. Since, possibility of maximum error is considered and hence all errors are taken to be positive. Likewise, $[l]$ is in the denominator mathematically using method of partial derivative $\frac{\Delta g}{g} = 2\frac{\Delta t}{t} - \frac{\Delta l}{l}$. But, considering uncertainty in $\pm$ errpr all errors are taken to be (+)ve as worst case condition. Therefore, calculation of accuracy in this case shall be $\frac{\Delta g}{g}\% = 2\frac{\Delta t}{t}\% + \frac{\Delta l}{l}\%$.

Illustration 12: One Joule $= \left(1kg \times \frac{1m}{sec^2}\right) \times 1m$. Since, 1 calorie $= 4.2\,J = 4.2 \times \frac{1}{x} \times \left(\frac{1}{y}\right)^2 \times \left(\frac{1}{y}\right)^{-2}$ U. Therefore, 1 calorie $= 4.2x^{-1}y^{-2}z^2U$

Illustration 13: Energy through inductance is $E = \frac{1}{2}LI^2$ and hence dimensionally $[E] = [L][I]^2$. Likewise, energy through inductance is $E = \frac{1}{2}CV^2$ and hence dimensionally $[E] = [C][V]^2$. Equating R.H.S of two equations of dimension of energy $[L][I]^2 = [C][V]^2 \rightarrow \left[\frac{L}{C}\right] = \left[\frac{V}{I}\right]^2$. As per Ohm's Law dimensionally $\left[\frac{V}{I}\right] = [R] \rightarrow \left[\frac{L}{C}\right] = [R]^2$.

Illustration 14: As per Faraday's Law $V = \frac{d\phi}{dt}$. Energy gained by an electron in travelling through a potential difference V, is $[E] = [e][V]$. Moreover, energy of a photon is $[E] = [h][\nu]$. Thus equating RHS of these dimensional equations of energy $[h][\nu] = [e][V] \rightarrow \left[\frac{h}{e}\right] = \left[\frac{V}{\nu}\right]$. This is the dimension of magnetic flux.

Illustration 15: Energy per unit volume in dielectric is $\left[\frac{U}{V}\right] = [\varepsilon_0 E^2] = \frac{ML^2T^{-2}}{L^3} = ML^{-1}T^{-2}$. Further, $[\mu_0 \varepsilon_0] = \left[\frac{1}{c^2}\right] = \frac{1}{(LT^{-1})^2} = \frac{1}{L^2T^{-2}}$, here ε_0 is permittivity of free space and c is the velocity of light. Thus $\left[\frac{E^2}{\mu_0}\right] = \left[\frac{\varepsilon_0 E^2}{\mu_0 \varepsilon_0}\right] = \frac{ML^{-1}T^{-2}}{\frac{1}{L^2T^{-2}}} = (ML^{-1}T^{-2}).(L^2T^{-2}) = MLT^{-4}$

Illustration 16: Since $\vec{l} = \vec{r} \times \vec{p}$ hence $[l] = [r][p] = [r][mv] = (L)(MLT^{-1}) = ML^2T^{-1}$. Magnetic field is since coupled the current flowing in a loop hence $m = Ia$, where I is the current through a loop having cross-sectional area a. Therefore, $[\mu] = [Ia] = I.L^2$. Hence , $\left[\frac{L}{\mu}\right] = \frac{ML^2T^{-1}}{L^3I} = MT^{-1}I^{-1}$

Illustration 17: Force between Two charges $F = \frac{q_1 q_2}{4\pi\epsilon_0 r^2} \rightarrow MLT^{-2} = \left[\frac{q_1 q_2}{4\pi\epsilon_0 r^2}\right] = \left[\frac{q^2}{\epsilon_0}\right].\frac{1}{L^2} \rightarrow \left[\frac{q^2}{\epsilon_0}\right] = ML^3T^{-2}$. Further, $[hc] = \left[\frac{E}{\frac{1}{T}}\right](LT^{-1}) = (ML^2T^{-2})(T)(LT^{-1}) = ML^3T^{-2}$. Therefore, $\left[\frac{e^2}{\varepsilon_o hc}\right] = \left[\frac{q^2}{\epsilon_0}\right]\left[\frac{1}{hc}\right] = \frac{ML^3T^{-2}}{ML^3T^{-2}} = 1$, or it is dimensionless.

Illustration 18: As per Wein's Law $\lambda_m t = b$ where, λ_m is wavelength of radiation having maximum intensity, t is temperature and b is Wein's Constant. Therefore, dimensionally $[b] = [\lambda_m t]$. Also $v = \lambda f$, or $[\lambda] = \left[\frac{v}{f}\right] \rightarrow \frac{LT^{-1}}{T^{-1}} = L$. Further, as per Stephenan-Boltzmann Law heat energy radiated by a black body $= \sigma a t^4$, here, Q is heat energy dissipated per unit time, a is the surface area of the black body, t is temperature of the black body and σ is Stephen's Constant. Thus dimensionally $[\sigma] = \frac{\frac{[Q]}{T}}{[a][t^4]}$ Therefore, $[\sigma b^4] = [\sigma][b]^4$. Substituting dimensions of constituent quantities $[\sigma b^4] = \frac{\frac{[Q]}{T}}{[a][t^4]} \cdot [\lambda_m t]^4 = \frac{\frac{[Q]}{T}[\lambda_m]^4}{[a]}$. Since, Q is heat energy $[Q] = ML^3T^{-2}$. It leads to $[\sigma b^4] = \frac{(ML^2T^{-2})}{T} \cdot \left(\frac{1}{L^2}\right) \cdot L^4 = ML^4T^{-3}$.

Illustration 19: Dimensionally $[CV] = \left[\frac{\varepsilon_0 A}{d}\right][V] = [\varepsilon_0]\left[\frac{A}{d}\right][V] = [\varepsilon_0][V]\left(\frac{L^2}{L}\right) = [\varepsilon_0][V](L)$, likewise, $[\rho\varepsilon_o] = \left[\frac{RA}{l}\right][\varepsilon_o] = [R][\varepsilon_o]\left(\frac{L^2}{L}\right) = [R][\varepsilon_o](L)$. Therefore, $\left[\frac{CV}{\rho\varepsilon_o}\right] = \frac{[\varepsilon_0][V](L)}{[R][\varepsilon_o](L)} = \left[\frac{V}{R}\right] = [I] = I$

Illustration 20: We know that $E = h\nu = (\hbar)(2\pi\nu)$. Thus, $Ec = (\hbar c)(2\pi\nu) \rightarrow [\hbar c] = \left[\frac{Ec}{\nu}\right] = \frac{(ML^2T^{-2})(LT^{-1})}{T^{-1}}$. It leads to $[\hbar c] = ML^3T^{-2}$.

Illustration 21: Young's Modulus of of elasticity $Y = \frac{\frac{F}{A}}{\frac{\Delta l}{l}} = \frac{Fl}{A\Delta l} = \frac{(1 \times 10) \times 2}{\frac{\pi}{4} \times .(4 \times 10^{-4})^2 (84 \times 10^{-4})} = 1.989 \times 10^{11}$ N/m². Applying logic of significant digits $Y = 2.0 \times 10^{11}$, since minimum number of SGs in given data is One. Now error in calculation $\Delta Y = \left(2 \times \frac{\Delta d}{d} + \frac{\Delta(\Delta l)}{l}\right) Y = \left(2 \times \frac{0.01}{0.4} + \frac{0.05}{0.8}\right) \times 2.0 \times 10^{11}$. Thus error is $Y = (5 \times 10^{-2} + 6.25 \times 10^{-2}) \times 2.0 \times 10^{11} = 1.125 \times 10^{-2} \times 2.0 \times 10^{11} = 2.25 \times 10^9 = 2 \times 10^9$. Thus with the logic of maximum number of significant digits in addition $Y + \Delta Y = (2.0 + 0.02) \times 10^{11}$ N/m²

Illustration 22: When more than one value are available then best approximation is to be made using Two values of the resistance box, which are arranged in ascending or descending order. Since, number (n) of values is even then the values to be chosen are $\left(\frac{n}{2} - 1\right)^{th}$ and $\left(\frac{n}{2} + 1\right)^{th}$ and their average is taken. In the event of n being odd then $\left(\frac{n}{2} + 1\right)^{th}$ is best approximation.

Illustration 23: Diameter of wire is measured to be 2.49 mm . This is a case of multiplication of quantities with different SDs and hence answer will have SDs equal to quantity with minimum SDs. Accordingly, required surface area is $= \pi dl = 3.14 \times 2.49 \times 10^{-1} \times \mathbf{6.5} = 50.829 = 51$ cm²

Illustration 24: (a) $[Torque] = [Force][Distance]$ and $[Work] = [Force][Distance]$ nboth are dimensionally identical

(b) $[Momentum] = [Mass][Velocity] = (M)(LT^{-1}) = MLT^{-1}$ and

$[Planck'Constant] = [Energy][Wavelength] = ML^2T^{-2}$ both are dimensionally different

(c) $[Stress] = \left[\frac{Force}{Area}\right] = \frac{MLT^{-2}}{L^2} = ML^{-3}T^{-2}$ and $[Young's\,Moulus] = \left[\frac{Stress}{Strain}\right] = [Stress]$, since strain is dimensionless and both are dimensionally identical.

(d) We now that $\varepsilon_o \mu_o = \frac{1}{c^2}$, here c is speed of light, therefore dimensionally both $\varepsilon_o \mu_o$ and $\frac{1}{Speed^2}$ are identical.

Illustration 25: Number of significant digits are arrived at by using rules for SDs rules for. In 23000 SDs are 2 sincre trailing zero are neglected b'coz there is no decimal, in 23.000 all zeros trailing decimal are included and hence SDs are 5, and in 02030.0 leading zeros to the leftmost digit are excluded, while zero sandwiched between digits and trailing decimal point are included and accordingly SDs are 5

Illustration 26: Formula for a parallel plate capacitor is $C = \frac{\varepsilon_o \varepsilon_r A}{d}$, here unit of capacitance (C) is Farad, and unit of area (A) is meter-squre, unit of distance (d) between parallel plates is meter, and relative permittivity of the dielectric (ε_r) being a ratio is unit less and therefore $\varepsilon_o = \frac{Cd}{\varepsilon_r A}$ and thus it shall have unit $\frac{\text{Farad} - \text{meter}}{\text{meter} - \text{square}} = \frac{\text{Farad}}{\text{meter}}$

Illustration 27: Law of gravitation stipulates $F = G \frac{m_1 m_2}{r^2} \to G = \frac{Fr^2}{m_1 m_2}$ and hence unit of G is N-m²/kg²

Illustration 28: In expression $1 - e^{-\alpha t}$, the subtrahend $e^{-\alpha t}$ must also be dimensionless which implies $[\alpha t] = 1 \to [\alpha] = T^{-1}$. Further, $[x(t)] = L = \left[\frac{v_0}{\alpha}\right] = \frac{[v_0]}{T^{-1}} \to [v_0] = LT^{-1}$

Illustration 29: From the given equation $D = -\frac{n(x_2 - x_1)}{(n_2 - n_1)} \to [D] = \left[\frac{n(x_2 - x_1)}{(n_2 - n_1)}\right] = \frac{[n][x_2 - x_1]}{[n_2 - n_1]}$. Now by definition of variables, dimensions of $[n] = \frac{1}{L^3 T} = L^{-3}T^{-1}$, $[x_2 - x_1] = L$ and $[n_2 - n_1] == \frac{1}{L^3} = L^{-3}$. Accordingly, $[D] = \frac{(L^{-3}T^{-1}) \cdot L}{L^{-3}} = LT^{-1}$

Illustration 30: . In question dimension of current is taken as A instead of I as per SI Units, hence retained. From Ampere's Law, $F = Bil \to [F] = [B] \cdot [i] \cdot [l] \to \to [B] = \frac{MLT^{-2}}{AL} = MT^{-2}A^{-1}$. Therefore, $[P] = \frac{(MT^{-2}A^{-1})^2 \cdot L^2}{M} = ML^2T^{-3}A^{-2}$.

Illustration 31: Let $m \propto c^p G^q h^r \to m = Kc^p G^q h^r$, therefore, $[m] = [Kc^p G^q h^r]$ here K is dimensionless proportionality constant. Dimensionally, $[c] = LT^{-1}$, $[G] = \frac{[Fr^2]}{[m^2]} = \frac{(MLT^{-2}) \cdot L^2}{M^2} = ML^3T^{-2}$, and $[h] = \frac{[E]}{[v]} = \frac{ML^2T^{-2}}{T^{-1}} = ML^2T^{-1}$, then, $M = (LT^{-1})^p (M^{-1}L^3T^2)^q (ML^2T^{-1})^r = M^{-q+r}L^{p+3q+2r}T^{-p+2q-r}$. Therefore, as per theory of indices, $-q + r = 1, p + 3q + 2r = 0, -p - 2q - r = 0$. Solving these three simultaneous equations, we get, $p = \frac{1}{2}, q = -\frac{1}{2}$ and $r = \frac{1}{2}$. Therefore, $m \propto c^{\frac{1}{2}} G^{-\frac{1}{2}} h^{\frac{1}{2}}$

Illustration 32: Relative Density (RD) $= \frac{\text{Weight of body in air}}{\text{Weight loss in water}}$. During addition or subtraction of quantities error is added for worst case conditions. Thus $RD = \frac{(5.00 \pm 0.5)}{(1.00 \pm 0.1)} = \frac{\left(5.00 \pm \frac{0.05}{5.00} \sim \times 100\right)}{\left(1.00 \pm \frac{0.1}{4.00} \times 100\right)}$. This resolves into $RD = \frac{\left(5.00 \pm \frac{0.05}{5.00} \sim \times 100\right)}{\left(1.00 \pm \frac{0.1}{4.00} \times 100\right)} = 5.0 \pm \frac{0.05}{5.00} \times 100 \pm 5 \times \frac{0.10}{1.00} \times 100 = 5.0 \pm (1 + 10)\% = 5.0 \pm 11\%$. Here, $\left(\pm \frac{0.05}{5.00} \sim \times 100\right)\left(\pm \frac{0.1}{4.00} \times 100\right)$ is ignored being too small.

Illustration 33: Total weigh (= 5.3 + 0.200 + 0.375 +0.075 =5.950 = 6.0). In this least SDs are Two and so shall be answer. First LSD to the right of decimal shall decide LSD in the sum and all other digits right to it will be dropped. Since, next digit right to it is 5 , the LSD shall be rounded retaining SDs equal to Two..

Illustration 34: Since $V = I \times R = 3.56 \times 15.479 = 55.10524 = 55.1$. Since minimum SDs are Three, and taking Four SDs and rounding it Three SDs would be the answer.

Illustration 35: Principally $\Delta x = \frac{X}{100}\left(\frac{2}{3} \times \%P + 2 \times \%Q + 1 \times \%R + \frac{5}{2} \times S\right)$. It is seen that maximum contribution in error is caused by S

Illustration 36: Fundamental units are 1. Length-metre (m), 2. Mass- kilogram (kg), 3. Time- second (s), 4. Electric current- Ampere (A), 5. Thermodynamic Temperature – Kelvin (K), 6. Amount of substance – mole (mol), and 7. Luminous Intensity – Candela (cd).

Illustration 37: $E = hv \to Joule = h\left(\frac{1}{s}\right) \to h = Joule - s$.

Illustration 38: As per Ohm's Law in an inductive element $V = IX$ where X is reactance and has unit Ohm, same as that for resistance.

Illustration 39: It is known that energy in an inductor is $E = \frac{1}{2}I^2 L$ and hence dimensionally $[E] = I^2[L]$, and power absorbed in a resistor $P = I^2 R$, since Power by definition is rate of doing work and hence $[P] = \frac{[E]}{T} = I^2[R] \to [E] = TI^2[R]$. This equating dimensions of $[E] = I^2[L] = TI^2[R]$. Or, $\left[\frac{R}{L}\right] = \frac{I^2}{TI^2} = T^{-1}$.

Illustration 40: It is known that unit of energy and work are same and so also their dimensions Hence, $[E] = [F][D] = (MLT^{-2}) \cdot L = ML^2T^{-2}$.

Illustration 41: Electric potential is expressed as $V = I \cdot R \rightarrow [V] = I[R]$, and power consumed by a resistor is $P = \frac{dE}{dt} = I^2 R \rightarrow ML^2 T^{-3} = A^2 [R] \rightarrow [R] = ML^2 T^{-3} I^{-2}$. Substituting $[R]$ in dimensional equation of $[V]$, we get $[V] = I \cdot (ML^2 T^{-3} I^{-2}) = ML^2 T^{-3} I^{-1}$. Since in answer Q has been instead of A where $A = QT^{-1}$ i.e. rate of flow of charge and hence moderated answer shall be $[V] = I \cdot (ML^2 T^{-3} I^{-2}) = ML^2 T^{-3}(QT^{-1})^{-1} = ML^2 T^{-2} Q^{-1}$. Here, $I = QT^{-1}$ as required in question despite not as per SI Units.

Illustration 42: As per Kinetic Theory of Gases $PV = NkT$, here P is pressure of gas has dimension $(ML^{-1} T^{-2})$, V is volume of gas L^3, N is number of gas molecules is dimensionless, k is Boltzmann Constant, its dimension has to be determined and T is temperature of gas has dimension θ as per System of International Units and is retained. Thus dimensionally the equation is $(ML^{-1} T^{-2}) \cdot L^3 = [k] \cdot \theta \rightarrow [k] = ML^2 T^{-2} \theta^{-1}$,

Illustration 43: Dimensionally each of the given quantity is being analysed

(a) As per Newton's Law of Gravitation $F = G \frac{Mm}{r^2} \rightarrow [F] = MLT^{-2} = [G] M^2 L^{-2} \rightarrow [G] = \frac{MLT^{-2}}{M^2 L^{-2}}$ or $[G] = M^{-1} L^3 T^{-2}$; it is not dimensionless

(b) As per Planck-Einstein relation $E = h\nu \rightarrow ML^2 T^{-2} = [h] T^{-1} \rightarrow [h] = ML^2 T^{-1}$; it is not dimensionless

(c) Power of a lens is $P = \frac{1}{f}$, here P is power of a Lens having dimension $[P]$ and f is focal length having dimension $[L]$ and hence $[P] = \frac{1}{L} = L^{-1}$; it is not dimensionless

(d) Hence answer is (d)

Illustration 44: Dimensionally each of the given quantity is being analysed

(a) Dimensionally $[Force] = MLT^{-2}$ has dimension, whereas Strain $[Strain] = \frac{\Delta l}{L} = L^0$ is dimensionless

(b) Dimensionally $[Force] = MLT^{-2}$, and $[Stress] = \frac{MLT^{-2}}{L^2} = ML^{-1} T^{-2}$; both have different dimensions

(c) Angular velocity $[\omega] = \frac{[Angle]}{T} = T^{-1}$, here angle being ration of lengths of arc to radius of arc is dimensionless. Further, Frequency $[f] = \frac{[No\ of\ Cycles]}{T} = T^{-1}$, here also $[No\ of\ Cycles]$ is dimensionless. Hence, $[\omega]$ and $[f]$ have same dimensions.

(d) Dimensionally $[Energy] = [Work] = ML^2 T^{-2}$, while Strain $[Strain] = \frac{\Delta l}{L} = L^0$ is dimensionless.
    Hence, (c) is the answer.

Illustration 45: Dimensionally pressure (P) is Force Per unit area and hence $[P] = \frac{MLT^{-2}}{L^2} = ML^{-1} T^{-2}$. Analyzing each of the given quantity-

(a) Dimensionally $[Force\ per\ unit\ Volume] = \frac{MLT^{-2}}{L^3}$ has dimension different than that of $[P]$,

(b) Dimensionally Energy per unit volume is $\left[\frac{Energy}{Volume}\right] = \frac{ML^2 T^{-2}}{L^3} = ML^{-1} T^{-2}$, it is identical to that of pressure

(c) Dimensionally $[Force] = MLT^{-2}$ and is different from that of pressure.

(d) Dimensionally Energy is equal to work i.e. $[Energy] = ML^2 T^{-2}$, it is different from that of pressure
    Hence, (b) is the answer

Illustration 46: Dimensionally pressure

(a) $[Torque] = [Force] \cdot [Perp. Dist. From Fulcrum] = (MLT^{-2}) \cdot L = ML^2 T^{-2}$,   While, $[Worke] = [Force] \cdot [Disp. Along Force] = (MLT^{-2}) \cdot L = ML^2 T^{-2} s$, both are different both are same

(b) $[Stress] = \frac{[Force]}{[Area]} = \frac{\text{ML T}^{-2}}{\text{L}^2} = \text{ML}^{-1}\text{T}^{-2}$ and $[Energy] = [Force] \cdot [Disp.] = (\text{MLT}^{-2}) \cdot \text{L} = \text{ML}^2\text{T}^{-2}\text{s}$, both are different,

(c) $[Force] = \text{MLT}^{-2}$ and $[Stress] = \frac{[Force]}{[Area]} = \frac{\text{ML T}^{-2}}{\text{L}^2} = \text{ML}^{-1}\text{T}^{-2}$, both are different

(d) Dimensionally $[Force] = \text{MLT}^{-2}$ and $[Worke] = [Force] \cdot [Disp. Along\ Force] = (\text{MLT}^{-2}) \cdot \text{L} = \text{ML}^2\text{T}^{-2}$, both different from that of pressure.

Hence, (a) is the answer

Illustration 47: For dimensional equality of given Equation $[x] = [Ay] = [B \tan Cz]$, here $\tan Cz$ is dimension less and so also Cz. Therefore, $[x] = [B]$ and $C = z^{-1}$,. Likewise, $[x] = [B] = [Ay]$, hence $[y] = \left[\frac{B}{A}\right]$. Thus, y is not having dimension of x. **Hence, (d) is the answer**

Illustration 48: Taking dimensional analysis of each quantity -

(a) Dimension $[Resistivity] = \left[\frac{RA}{l}\right] = [R] \cdot \text{L}$. And power of resistance $P = I^2 R \to \text{ML}^2\text{T}^{-3} = I^2[R] \to [R] = \text{ML}^2\text{T}^{-3}\text{A}^{-2}$. Fundamental dimension for Current is (A) which in converted to $I = QT^{-1}$. Therefore, $I^{-2} = Q^{-2}T^2$ and thus substituting it $[R] = (\text{ML}^2\text{T}^{-3}) \cdot (Q^{-2}\text{T}^2) = \text{ML}^2\text{T}^{-1}Q^{-2}$. Thus , $[Resistivity] = \left[\frac{RA}{l}\right] = (\text{ML}^2\text{T}^{-1}Q^{-2}) \cdot \text{L} = \text{ML}^3\text{T}^{-1}Q^{-2}$. This is the given dimension, as required in question though not as per SI Unit.

(b) Dimensionally $[Conductivity] = \frac{1}{[Resistivity]} = \frac{1}{\text{ML}^3\text{T}^{-1}Q^{-2}} = \text{M}^{-1}\text{L}^{-3}\text{T}^1Q^2$. This is not the given dimension.

(c) Dimension of Resistance is $[R] = \text{ML}^2\text{T}^{-1}Q^{-2}$, it is not the given dimension.

(d) Since One of the above i.e. at (a) is matching with the given dimension and hence this choice is not applicable.

Hence, (a) is the answer

Illustration 49: Dimensional equality requirement has to be tested in the given option for Two unequal quantities

(a) Let $[A] = \text{M}^a\text{L}^b\text{T}^c$ and $[B] = \text{M}^d\text{L}^e\text{T}^f$ such that $a \neq d$, $b \neq e$ and $e \neq f$ as given. In that case, $\left[\frac{A}{B}\right] = \frac{\text{M}^a\text{L}^b\text{T}^c}{\text{M}^d\text{L}^e\text{T}^f} = \text{M}^{a-d}\text{L}^{b-e}\text{T}^{c-f}$. In this dimensional expression $a - d$, $b - e$ and $e - f$ exist as per given condition and hence the mathematical operation is meaningful.,

(b) Dimensionally unequal quantities, already given, can not be added

(c) Dimensionally unequal quantities, already given, cannot be subtracted.

(d) Since option (a) is true hence this Option shall nt be applicable.

Hence, (a) is the answer

Illustration 50: As per Coulomb's Law $[F] = \left[\frac{Q^2}{\varepsilon_0 L^2}\right] \to [\varepsilon_0] = \frac{[Q^2]}{(\text{ML T}^{-2}).L^2} = \frac{[Q^2]}{(\text{ML T}^{-2}).L^2} = \frac{I^2T^2}{\text{ML}^3\text{T}^{-2}} = \text{M}^{-1}\text{L}^{-3}\text{T}^4I^2$. Thus $[\varepsilon_0]$ matches with Option (b)

Now, from Maxwell's equation $c = \frac{1}{\sqrt{\mu_0\varepsilon_0}}$. Therefore, $c^2 = \frac{1}{\mu_0\varepsilon_0} \to [\mu_0] = \frac{1}{[c^2][\varepsilon_0]} = \frac{1}{(\text{LT}^{-1})^2 \cdot (\text{M}^{-1}\text{L}^{-3}\text{T}^4I^2)} = \frac{1}{\text{L}^2\text{T}^{-2} \cdot (\text{M}^{-1}\text{L}^{-3}\text{T}^4I^2)} = \frac{1}{\text{M}^{-1}\text{L}^{-1}\text{T}^2I^2} = \text{MLT}^{-2}I^{-2}$. Thus $[\mu_0]$ matches with Option (c)
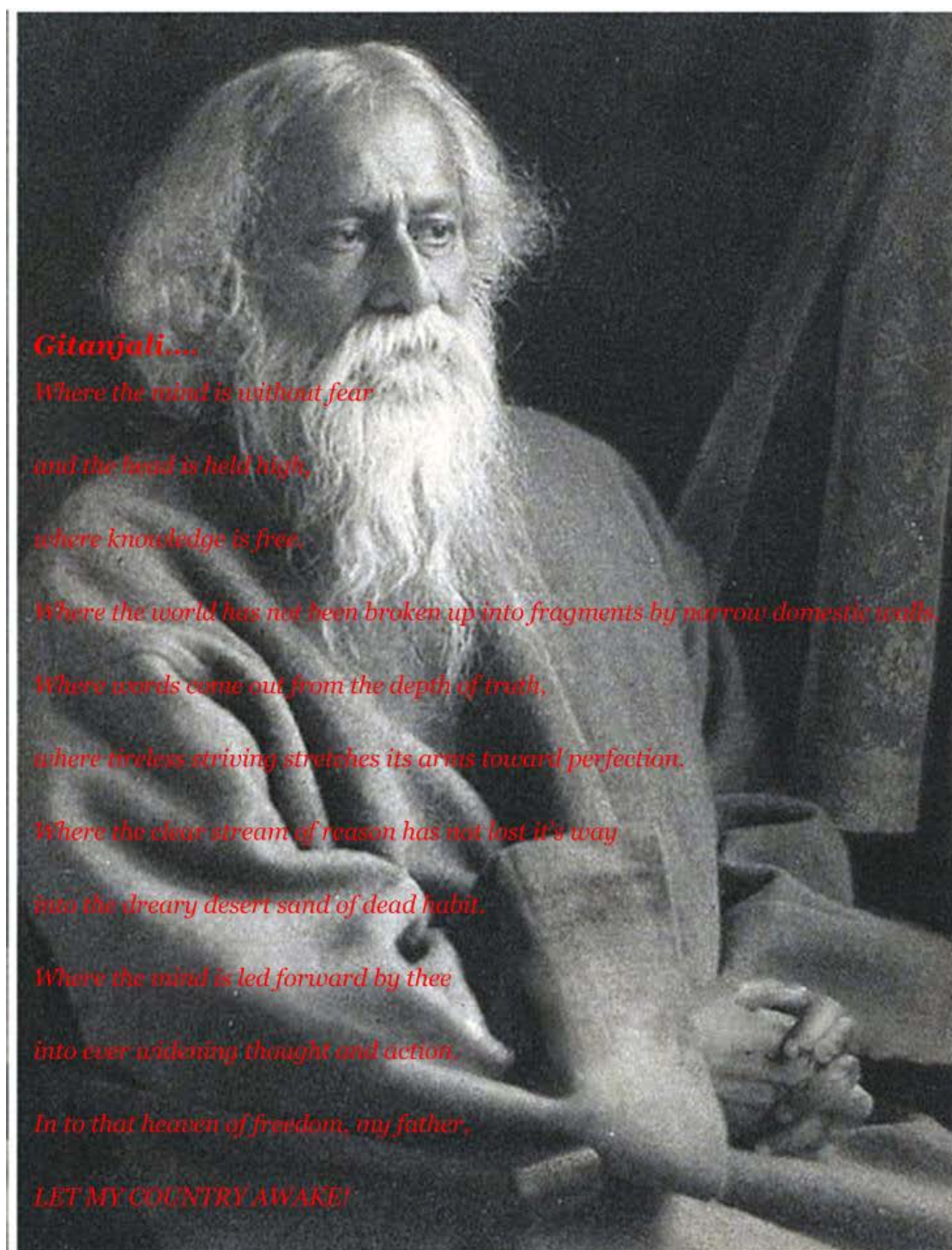
Illustration 51: In Question, dimension of current is used as A and not I, as per SI Units, and hence retained in illustration. Dimensionally energy stored in an inductor carrying current is $[E] = [L] \cdot A^2 = ML^2T^{-2}$, it leads to $[L] = ML^2T^{-2}A^{-2}$. Likewise, power of a resistor is $[P] = [R] \cdot A^2 = ML^2T^{-3} \rightarrow [R] = \frac{ML^2T^{-3}}{A^2} = ML^2T^{-3}A^{-2}$.

Further, from charge on a capacitor is dimensionally $[Q] = [CV] = AT$.

Combining all these in given expression $\left[\frac{L}{RCV}\right] = \frac{[L]}{[R]\cdot[CV]} = \frac{ML^2T^{-2}A^{-2}}{(ML^2T^{-3}A^{-2}).AT} = A^{-1}$; this matches with option (c).

 Hence, (c) is the answers

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Gitanjali....

Where the mind is without fear

and the head is held high,

where knowledge is free,

Where the world has not been broken up into fragments by narrow domestic walls,

Where words come out from the depth of truth,

where tireless striving stretches its arms toward perfection,

Where the clear stream of reason has not lost it's way

into the dreary desert sand of dead habit.

Where the mind is led forward by thee

into ever widening thought and action,

In to that heaven of freedom, my father,

LET MY COUNTRY AWAKE!

Theme Song :

PREMISE: *We are pleased to adopt a song*" इतनीशक्तिहमेंदेनादाता……" *from a old Hindi Movie Do Aankhen Barah Haath दोआँखेंबारहहाथof year 1957, directed by The Late V. Shantaram. The lyrics are by Shri Bharat Vyas, singer Melody Queen Sushri Lata Mangeshkar, and Music Direction by Vasant Desai. It has become a widely accepted inspirational song and/or prayer in many educational institutions and socially inspired initiatives engaged in mentoring of unprivileged children. This newly formed non-organizational initiative, being selflessly operated by a small set 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 …