

## Build up a reading habit

Let us go back to last week's question: 'A group of 630 children is arranged in rows for a group photograph session. Each row contains three fewer children than the row in front of it. What number of rows is not possible?' The given options were 3, 4, 5, 6 and 7 in that order.

Obviously, 630 should be the sum of a decreasing AP, with common difference 3. If we keep the first term 'a' as unknown, and then put different values of 'n' as given in the options, we have to remember that 'a' should be an integer. We see that if we put n=6, then the expression becomes  $6a - 45 = 630$ . This will not lead to an integral value of 'a'. So, '6' should be the answer.

Now, you know the importance of a sound knowledge of fundamentals and strong hold on applications. So, start working towards these.

Have you read the novel Jonathan Livingston Seagull by Richard Bach? It is about a legendary bird, who, with his untiring efforts, transcends all barriers, overcomes constraints that everyone believed can never be surmounted. In your approach to CAT 07, become like Jonathan.

What is being referred to here is your reading habit. What do you read on an average day? Newspaper, textbook or class-notes; maybe the scrollers on news channels or advertisements on the screen. Instead, pick up a book. Reading not only familiarizes you with various subjects, but also enhances your vocabulary and reading speed. This is an important aspect of being successful in management entrance examinations. Think of the volumes of reports you will have to read as a responsible corporate manager!

Have you heard of Hume's Psychological Theory and his association with 'dogmatic attitude'?

Watch out for this space next week to know about Hume's theory. ADVT

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## SUCCESS MANTRAS

# Physics fundamentals

Here are some vital suggestions from Nandini Chatterjee to help you sail through the Class XII Physics Board examination

A systematic approach to the subject can help students secure a good percentage in the Class XII Board examination. Here are a few tips for the average students to tackle the difficult concepts and the problems in Physics.

- Chapter-wise weightage**
- Optics — 10 marks
  - Electrostatics — 8 marks
  - Current Electricity — 8 marks
  - Magnetic Effect of Current and Magnetism — 8 marks
  - Electromagnetic Induction and Alternating Current — 8 marks
  - Solids and Semiconductor Devices — 8 marks

If a student is thorough with these chapters, then 70 per cent of the syllabus is covered. The next two important chapters are Principles of Communication and Atomic Nucleus.

### Optics

Learn the following four derivations by heart:

- Refraction formula
- Lens maker's formula
- Lens formula and formula for fringe width
- Conditions for bright and dark fringes in interference.

Prepare them as five-mark questions. Answers for all questions in Optics should be accompanied by neat pencil-drawn, well-labelled diagrams, showing proper direction of light rays and formation of image.

All the steps should be shown under each derivation as marks are allotted for each step. So even if your final answer is incorrect, marks will be given for your correct steps.

For two marks, mostly conceptual questions are asked. A brief answer, highlighting key words, will help



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in getting full marks. For example, consider the case of change in fringe width in Young's double-slit experiment when the apparatus is placed in water. Here the key words are, "Change in wavelength of light in water will change the fringe width." Numericals on diffraction, on prism formula and interference are important. Here is an example of conceptual questions from optical instruments:

**Question:** You are given three lenses of power P and aperture A as follows:  $P_1=6D, A_1=3cm; P_2=3D, A_2=15 cm; P_3=12D, A_3=1.5 cm$ . Which of these two will be suitable to construct a telescope? Justify.

**Solution:** For constructing the telescope, the objective should have large aperture, so lens 2 will be preferred. Since the eyepiece

should have small focal length, so lens 3 will be suitable as well.

Often students make mistakes in identifying lenses with proper reasoning. Understand why in a large apparatus, convex lens is necessary for the construction of the objective of a telescope. The reason is that light is coming from a distant object, intensity of light is low; more light should be intercepted by the lens to produce a sufficiently bright image.

### Electrostatics

Here, it is rudimentary to visualise the concepts in order to grasp the theory. Gauss's theorem and its application to calculate electric field due to a charged rod, a hollow sphere and an infinite sheet of charge are a few basic derivations students

must understand clearly.

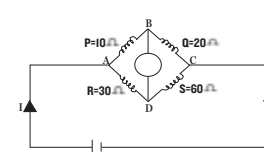
In the application of Gauss's theorem, the most common mistake made is in identifying the type of charge distribution due to which the field is calculated. For example, a charged rod has linear charge distribution, whereas a hollow sphere and a sheet have surface charge distribution. Also be careful of the Gaussian surface, which is another grey area.

Derivation of electric field due to a dipole at an axial point and an equatorial point, torque and potential energy of the dipole and capacitance of a parallel plate capacitor and its energy are also imperative.

### Current electricity

Comparatively easy to understand, circuit diagrams with directions of current are a must for questions related to potentiometer and metre bridge. Pay attention to conceptual questions and numericals from this chapter. Often, students commit mistake in circuit symbols of different components and their connections.

**Question:** The following figure shows a network of resistances. Name the circuit formed. What is the current flowing in the arm BD of this circuit? Calculate the current in different branches of this circuit and also state the two laws used to find the current.



**Solution:** The circuit is called wheat-stone bridge circuit. Here the bridge is balanced as  $P/Q = R/S \Rightarrow 10/20 = 30/60$

So no current flows through the arm BD. The two Kirchhoff's Laws are used to find current in different branches of the circuit. So, statements of both the laws should be given. Different books state different sign conventions of Kirchhoff's law. Though all ultimately lead to the answer, follow a particular one in all related problems.

### Magnetic effect of current and magnetism

Be thorough with Biot Savart's law and its three application, namely, to find magnetic field due to a circular coil at its centre, at a point on its axis and magnetic field due to an infinitely long current carrying conductor. In these derivations, students often forget to mention the direction of the magnetic field. Separate marks are allotted for this.

There is always confusion in finding the direction in three-dimension. Clear understanding of Fleming's left hand rule will be helpful. In problems related to force on a current carrying conductor, the magnetic field condition or the orientation of the conductor in the magnetic field for which maximum and minimum force is the key point in solving the conceptual questions.

Cyclotron is very important this year. Moving coil galvanometer and numericals from the conversion of galvanometer into voltmeter and ammeter are the other important topics in this chapter.

Self-induction, mutual induction, transformer and electric (AC) generator are important topics from electromagnetic induction. L-C-R circuit, average power in AC and resonance condition have to be understood carefully as most questions are based on these conditions.

Students, while solving the numericals of LCR circuit, use the general formula of impedance without considering the clauses of resonance condition, which are often mentioned in the question as 'the circuit admits maximum current, impedance is least' or 'the circuit behaves as a resistance circuit.' As a result, the calculation becomes lengthy and most of the time the correct answer is not deduced. Remember to put  $Z=R, v=1/2\pi v(LC)$  for resonance circuit.

### Solids, semi-conductor devices

Solids and semiconductor devices include scoring topics like distinguish between metal, semiconductor and insulator in terms of their energy bands, diode as a full wave and half wave rectifier, transistor as an oscillator and as an amplifier is common emitter configuration.

Here, students find difficulties in remembering the circuit diagrams related to transistors. Therefore, a few ground rules:

- The emitter base junction should always be forward biased and the collector base n-p-n and p-n-p type transistors.
- The collector biasing voltage should be more than the base-biasing voltage in CE configuration.
- The width of the base is less than emitter and collector.

The chapter on Princi-

ples of Communication includes many descriptive type questions and diagrams (both digital and analogue) and optical fibre are critical. Remember the following key points:

- The three reasons why an optical fibre is an important communication medium: large bandwidth, signal security and less energy loss as light is propagated by total internal reflection.
- In structure of optical fibre, one should mention that there are two concentric glass tubes — inner one is called core and the outer one is called cladding layer.
- The refractive index of the core material should be slightly greater than that of the cladding for the total internal reflection to take place.
- Names and characteristics of light sources and detector used in optical fibre and the block diagrams of the communication systems.
- In atoms and nucleus, pay attention to binding energy and radioactivity. Here is an example question from radioactivity.

**Question:** The half-life of a radioactivity substance is 10 years. Five grams of the substance is taken. How much will be left after 50 years?

**Solution:** Do not put the data into the basic formula and calculate. You have to calculate how many half-lives have passed. In each half-life, the amount of the radioactive substance becomes half of its initial amount. So, in 50 years, five half-lives will be passed. So amount disintegrated will be  $1/2^5$ , i.e.  $1/32$  of its initial amount.

### General tips

- Solve the previous year's question papers in the stipulated time-frame.
- For numericals, prepare a list of all the formulae from different chapters.
- While solving numericals, find out which formula is applicable.
- All the best for the examination!

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## IN BRIEF

### IBM-ISB's initiative



IBM and the Indian School of Business (ISB), Hyderabad, signed a memorandum of understanding for joint research to develop a first-of-its-kind "Research on Service Science, Management and Engineering" (SSME) in India. As part of the initiative, ISB and IBM plan to create cutting edge research and develop case studies to streamline service processes and replicate them across industries. "The aim of this agreement is to support ISB to offer the SSME programme with the help of IBM so that the discipline of service science can be developed and lead to nurturing specialised human resources," said Dr. Daniel M. Dias, Director, IBM India Research Laboratory.

### Aptech in Mongolia

Global learning solutions giant, Aptech, has inaugurated a state-of-the-art training centre in Ulaanbaatar in Mongolia. Present at the inauguration were Yogeshwar Varma, Ambassador of India to Mongolia; Bat-Erdene, Director, Mongolia's Department of High-

er and Vocational Education, Ministry of Education, Science and Technology, and prospective students. Aptech will offer Aptech Certified Computer Professional programme and also short-term courses to meet the requirements of professionals and skill-based programmes to those looking for a fast track to an information technology career in Mongolia.



### ICAI seeks waiver

The Delhi-based Institute of Chartered Accountants of India (ICAI) has asked the Ministry of Human Resource Development to make commerce a part of the curriculum from Class VIII. ICAI is also negotiating with the Indira Gandhi National Open University (IGNOU) to exempt PE-II/PCE-pass students from taking certain papers in the latter's commerce programme. The institute is in talks, seeking the waiver, with other universities as well. Many universities already consider the CA qualification as equivalent to a postgraduate qualification to do a doctoral programme.

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# Chemical EQUATIONS

In the above numerical the variables are:  
 $\Delta G^0 = ?$        $\Delta H^0 = 77.2 \text{ KJ / mole}$   
 $T = 400 \text{ K}$        $\Delta S^0 = ?$  to be calculated  
 $\Delta S^0_p = ?$        $\Delta S^0_r = ?$

- One of the formulas will have a minimum number of unknown values. Consider that formula first. In this case 'Formula 2' is what we select because Formula 1 requires standard values of products and reactants, which are constants, and hence cannot be calculated.
- In the selected formula, values of one variable  $\Delta G^0$  are not known. In order to find out the value, we write down all the possible formulas containing  $\Delta G^0$ .  
 (iii)  $\Delta G^0 = \Sigma \Delta G^0_p - \Sigma \Delta G^0_r$  .....(3)  
 (iv)  $\Delta G^0 = -2.303RT \log K$  .....(4)
- We repeat the exercise. Make a list of all variables present in these formulas. Put their values alongside. The value of some of the variables is clearly given in the question, while other values are unknown. If it is unknown, put a '?' in front of them.  
 $\Delta G^0 = ?$  to be calculated  
 $R = 8.314 \text{ J / K / mole}$   
 $T = 400 \text{ K}, K = 1.958 \times 10^{-4}$   
 $\Delta G^0_p = ?, \Delta G^0_r = ?$
- One of the formulas will have a minimum number of unknown values. Consider that formula first. In this case, Formula 4 is used. Again, Formula 3 cannot be used because it requires standard values of products and reactants, which are constants, and hence cannot be calculated.
- Substitute the 'known values' given in step 6, in Formula 4, but do not carry out any calculation at this stage.  
 $\Delta G^0 = -2.303 \times 8.314 \times 400 \log 1.958 \times 10^{-4}$



- Substitute all known values given in step 3 and step 8 in Formula 2, given in step 2  
 $-2.303 \times 8.314 \times 400 \log 1.958 \times 10^{-4} = 77.2 - 400 \times \Delta S^0$   
 Now calculate the standard change in entropy  $\Delta S^0$ , by using a log table to get the final answer.  
 B. Questions are most likely from the following units  
 Surface Chemistry      3 marks  
 The block elements      7 marks  
 The d and f block elements      5 marks

Questions may be about molecular structures, their hybridisation, extraction of different elements and compounds. Some of them could be based on reasoning (explain why?)

- The contents of these units are not very easy to comprehend; hence you should prepare notes on reasoning based questions and memorise the answers to all the questions given in the NCERT book and the sample papers prescribed by the CBSE.  
 Note: Referring to too many books for these topics can create confusion.
- Find out the hybridisation:  
 Formula method, i.e.  $H = 1/2 [V + M - C + A]$   
 Where H = number of hybridised shells  
 V = number of valance electrons in central atom  
 M = number of monovalent group — H, Na, K, Ca, Cs, Cl, Br, I, F etc.

C = number of positive charge  
 A = number of negative charge  
 Memorise this. So, to know the hybridisation of  $\text{XeOF}_4$ :  
 Xe being the central atom,  $V = 8, M = 4, C = 0, A = 0$   
 Therefore,  $H = 6$ , so the hybridisation is  $sp^3d^2$

Now use the table no. 4.6, 4.7, 4.8 on page 110, 111, 112 of NCERT book of Class XI to identify the geometry, shape of the molecule. You can now draw it as well.

Carefully read and memorise the above mentioned tables.

- Prepare the extraction of the following elements and compounds in brief:  
 a. Potassium permanganate  
 b. Potassium dichromate  
 c. Silver  
 d. Lead  
 e. Zinc  
 f. Aluminium  
 g. Copper  
 h. Iron  
 i. Mercury
- C. Preparing for Organic Chemistry**  
 It is always advisable to prepare for this after you have prepared all the other topics. The most likely questions asked from the following units are name reactions, conversions,

complete the reactions, what happens..., and distinguish between type, etc. Selective study is recommended.

- Organic compounds with functional group containing oxygen-I (2 marks)
- Organic compounds with functional group containing oxygen-II (4 marks)
- Organic compounds with functional group containing Nitrogen 4 (4 marks)

For name reaction:  
 Compile all the name reactions in a tabular form, e.g.

Name of reaction	Material required	Reagent and other condition	Products
Cannizzaro reaction	Aldehyde not having alpha Hydrogen atom.	Aqueous alkali. e.g. Alcoholic KOH	Alcohol + acid or salt of acid
	formaldehyde and benzaldehyde		NaOH

Chemical equation is:  
 $2 \text{HCHO} + \text{KOH} = \text{CH}_3\text{OH} + \text{HCOOK}$   
 (conc.)

**D. The following units are important — easy to score in.**  
 Biomolecules      5 marks  
 Chemistry in every day life      3 marks  
 Polymers      2 marks

Hence do not skip them for any reason. Expected questions from these units are of a general nature, e.g. differences between DNA and RNA, denatured and renatured proteins, low density and high density polythene, daily life applications of substances like drugs, dyes, propellants, carbohydrates, proteins; fats, vitamins etc.

**E. Tips for preparation of following units:**  
 Coordination compounds and organometallics (3 marks)  
 Stereochemistry (2 marks)  
 Memorise all the definitions and basic terms; rules of nomenclature to make names of coordinate compound. Learn to construct 2D structure of isomers using Fischer projection formula and steps as given in the NCERT book.

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