Some vital suggestions to help you sail through the Class XII Physics Board examination

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SCIENCE FOR THE CLASS XII BOARDS

Boards 2007: Look out for tips that will help you ace the Class XII Board exams in our issue of 21st February

HT HORIZONS

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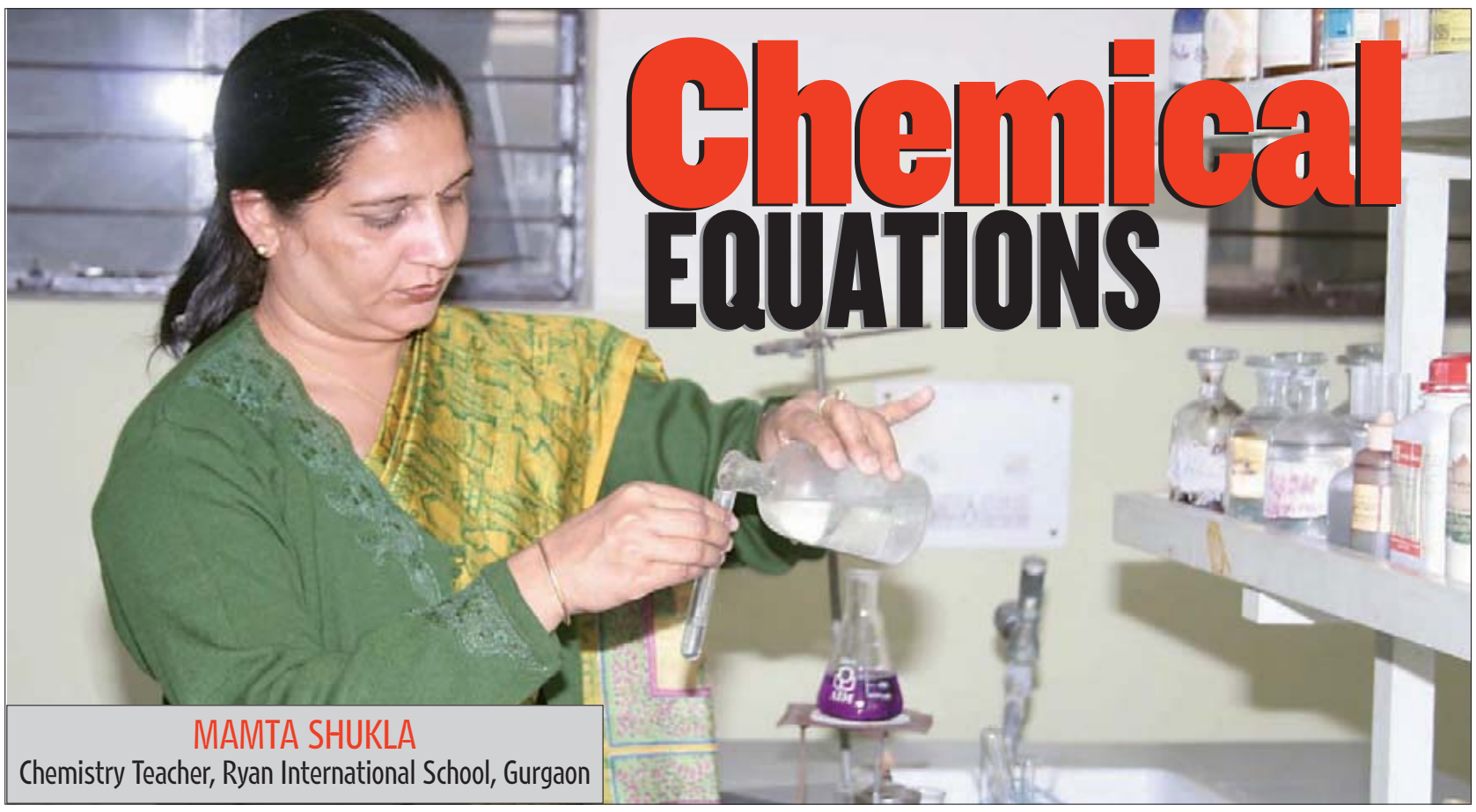

Chemical EQUATIONS

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PHOTO: S.P. CHOPRA, COURTESY: RYAN INTERNATIONAL SCHOOL

If studied in an organised manner, using lists and summaries, the average student should not find Chemistry difficult to score well in, says Mamta Shukla

A. The most likely questions asked out of a total of 18 are based on numericals, formula verifications, derivations etc. from the following units:

1. Atomic structure and chemical bonding — 5 marks
2. The solid state — 4 marks
3. Solutions — 4 marks
4. Thermodynamics — 5 marks
5. Chemical Kinetics — 4 marks
6. Electrochemistry — 5 marks
7. Nuclear chemistry — 3 marks

a. Prepare a separate list containing all the formulas from each unit. For example, a list of formulas from the unit Solutions is as given in Annexure I.

ANNEXURE I

Formulas from the unit Solutions:

1. $\%\ \text{by wt} = \frac{\text{wt of the solute in g}}{\text{wt of the solution in g}} \times 100$

2. Mole fraction of solute in solution

$$x_2 = \frac{n_2}{n_1 + n_2} = \frac{w_2 / m_2}{w_1 / m_1 + w_2 / m_2}$$

Mole fraction of solvent in solution

$$x_1 = \frac{n_1}{n_1 + n_2} = \frac{w_1 / m_1}{w_1 / m_1 + w_2 / m_2}$$

Where w1, m1 are mass and molecular mass of solvent and w2, m2 are mass and molecular mass of solute in general for a solution containing many components (ABC……..), mole fraction of A

$$x_1 = \frac{nA}{nA + nB + nC} + \ldots\ldots\ldots\ldots$$

xA + xB + ---------- = 1

3. Mass fraction of component A (xA) = $\frac{WA}{WA + WB}$

Mass fraction of component B (xB) = $\frac{WA}{WA + WB}$

4. Parts per million (ppm) of substance A

$$= \frac{\text{Mass of A}}{\text{Mass of Solution}} \times 10^6 \text{ or } \frac{\text{Volume of A}}{\text{Volume of Solution}} \times 10^6$$

5. According to Raoult's law, for a solution containing volatile components A and B,

$P_A = P^0_A X_A$ and $P_B = P^0_B X_B$

$P_{total} = P_A + P_B = P^0_A X_A + P^0_B X_B$

$= (1-X_B) P^0_A + X_B P^0_B = (P^0_B - P^0_A) X_B + P^0_A$

Mole fraction of A in vapour phase

$$= \frac{P_A}{P_A + P_B}$$

6. Raoult's law for non volatile solutes: (If it is a dilute solution)

$$\frac{P_O - P_S}{P_O} = \frac{n_2}{n_1 + n_2} = X_B$$

$$\frac{W_2 / M_2}{W_1 / M_1 + W_2 / M_2} = \frac{W_2 / M_2}{W_1 / M_1}$$

7. Osmotic Pressure P = CRT
Also P = n/v RT or PV = nRT or PV = W/M RT or M = WRT/PV

8. Elevation in boiling point
$\Delta T_b = K_b m$ where K_b = molal elevation constant and m — molality of the solution unit of K_b is KKg/ mol

$$M_2 = \frac{1000 K_1 W_2}{W_1 \Delta T_1}$$

where M2 = molar mass of solute

9. Depression in freezing point
$\Delta T_f = K_f m$ where K_f = moral depression constant and m — morality of the solution unit of K_f is K kg/ mol

M2 $\frac{1000 K_b W_2}{W_1 \Delta T_b}$

10. Van't Hoff factor (i)

$$i = \frac{\text{Observed value of colligative property}}{\text{Calculated value of colligative property}} = \frac{\text{Calculated mol mass}}{\text{Observed moll mass}} = \frac{MC}{M0}$$

11. For solutes undergoing dissociation/ association $\Delta T_b = i K_b m$, $\Delta T_f = i K_f m$, $p = i\ n/v\ RT$

12. Fovan electrolyte AxBy undergoing dissociation with degree of dissociation L

$$A_x B_y \rightleftharpoons X A^{+} + y B^{-}$$

Betorediss - 1 mole		0	6
After diss	1-L	XL	YL

Total 1 - L + XL + YL = L(X + Y-1) + 1
i = L (X+Y-1) + 1 or

$$L = \frac{i - 1}{x + y - 1}$$

13. For a solute undergoing association
$nA \rightleftharpoons A_n$
Initial 1 mole
After association 1 - L (L/n)
Total 1 -L + L/n, i = 1 - L + L/n or $L = \frac{i - 1}{n - 1}$

b. Memorise these lists.
c. Pin up the lists at a place where you are likely to glance at them very often. This will help when you revise a given list at any time.

B. Suggested steps to solve a numerical problem:

1. When you read the numerical given in the question paper, try to find the related 'unit' in your book. For example, if the question is to calculate the value of standard change in entropy for the following reaction at 400K,

$$2\,NOCl\,(g) = 2NO\,(g) + Cl_2\,(g)$$

If the value of the equilibrium constant is 1.958×10^{-4} and the standard change in enthalpy is 77.2 KJ/ mole, R = 8.314 J/ K'
The numerical is from 'Thermodynamics'.

2. One of the variables is going to be your answer. Therefore, write down all the possible formulas containing this variable.
In the above numerical, the 'Standard change in entropy' (ΔS^0) is the variable and you have to find your way to calculate the value of the same. The possible formulas are

(i) $\Delta S^0 = \Sigma \Delta S^0_p - \Sigma \Delta S^0_r$ .....(1)
(ii) $\Delta G^0 = \Delta H^0 - T \Delta S^0$ .....(2)

3. Now make a list of all variables present in these formulas. Write their values next to them. You will find that the value of some of these variables is clearly given in the question, while other values are unknown.
Put a '?' in front of the unknown variables.

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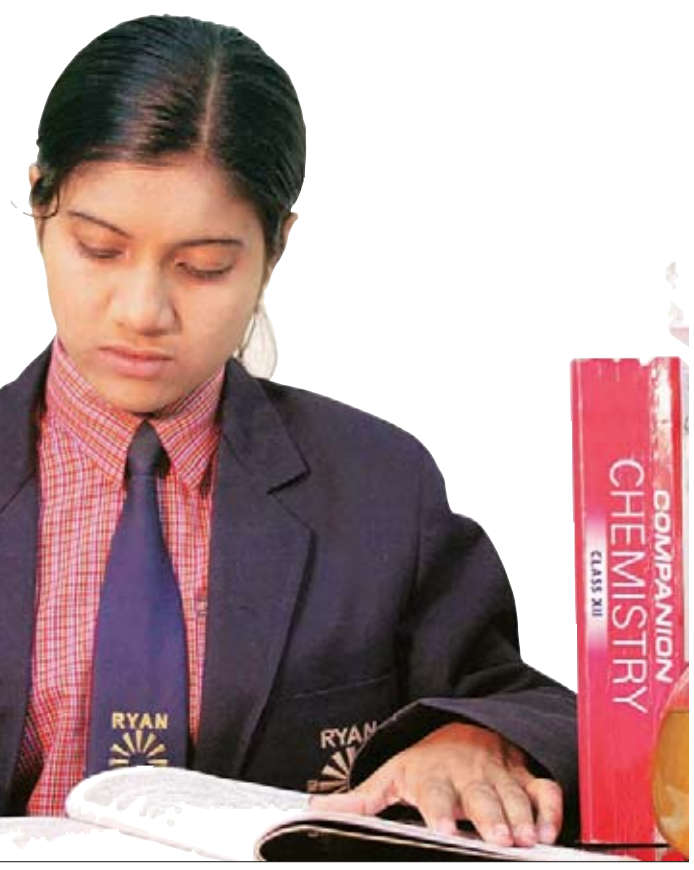

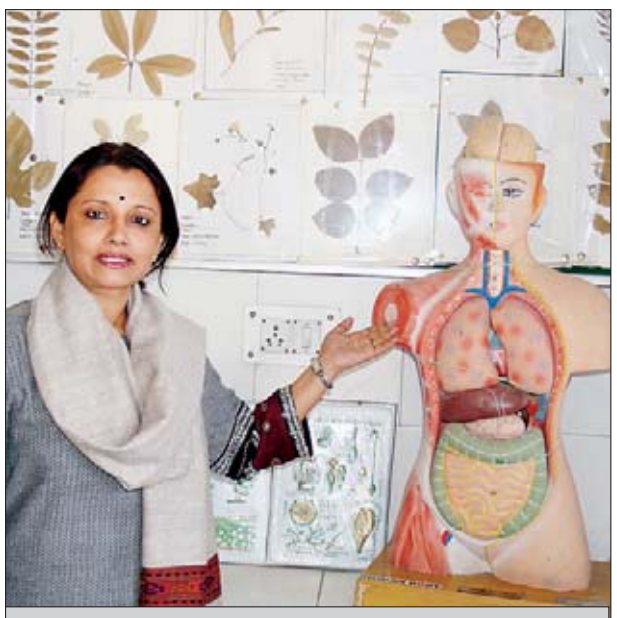

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ACTION REPORT

Bio scope

Easy remedies, for Biology topics that students hesitate to tackle, from Anita Khosla

Hormonal action in animals and diagrams of the human ear and brain are areas that students shy away from. Here are strategies to attack the issues listed by students in their feedback to *HT Horizons*.

Problem area: hormones

Hormones act according to their chemical nature. For example, proteinaceous hormones (insulin, glucagons, hypothalamic hormones) are not lipid soluble. So, they cannot enter a target cell. On the contrary, steroidal hormones are lipid soluble and, thus, can enter the cell directly and bind to intracellular receptors.

Insulin action is explained below.

Binding to the receptor: Insulin binds to the a-sub unit to cause conformational change in the b-sub unit of a receptor, which is actually an enzyme, Tyrosine kinase — this adds more phosphate groups to Tyrosine residues.

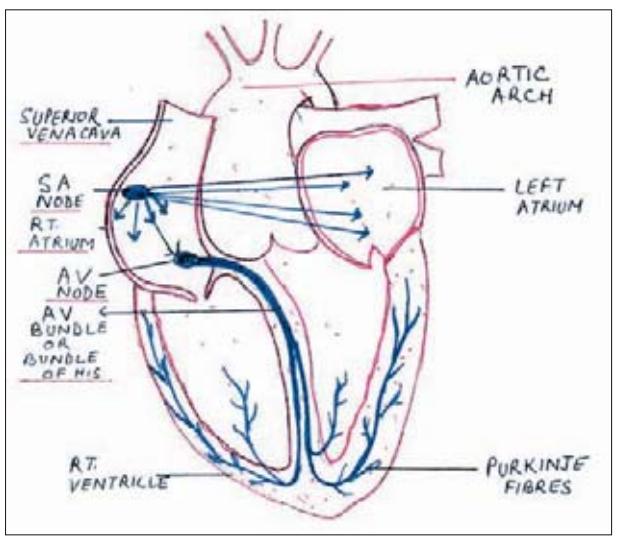
Cytoplasmic messengers (second messenger): The G-protein present on the inner side of the membrane activates enzyme Phosphodiesterase, which changes PIP2 into two mediators — IP3 (inositol triphosphate) and DG (Diacylglycerol).

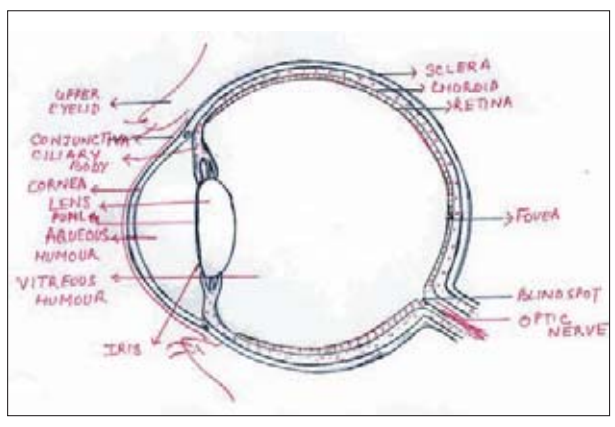
IP3, being water-soluble, enters the cytoplasm and stimulates the release of Ca^{2+}, activating various cellular processes.

DG remains along the membrane and activates enzyme PKC (Protein kinase), which further activates enzymes like Pyruvate dehydrogenase.

Amplification of signal: The mediators amplify the signal, say, IP3-submit activates many DG molecules. Each PKC activates many other enzyme molecules. Some hormones also use other second messenger like cAMP. The enzyme adenyl cyclase converts ATP into cAMP. A single adenyl cyclase can produce about a hundred molecules of cAMP.

Steroidal hormones, after binding to intracellular receptor, enter into the nucleus, bind to a specific regulatory site on a chromosome, altering the pattern of gene expression.





Conducting system in human heart (top), and a cut section of an eye ball (above)

Problem area: diagrams

Many students find the diagrams of the ear and brain difficult to learn. I have tried to draw simple diagrams showing the structures.

Problem area: ecology

This is a rather easy portion in the Biology syllabus. The best way to retain the contents in your memory is to carefully read the chapter and prepare a list of important points. Make handouts.

Revise each chapter at least five times. Average students can omit the table of ecology as questions are usually not asked from these.

Try to enhance your memory and retention power by techniques like association and analogy. ■

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