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THE TIMES OF INDIA

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TODAY'S EDITION

➤ Learn about the Earth's magnetism, and other laws of physics, explained in a simplified way by your teacher

PAGE 2

➤ Our yoga experts tell us why it is very important to do yoga regularly in these stressing times

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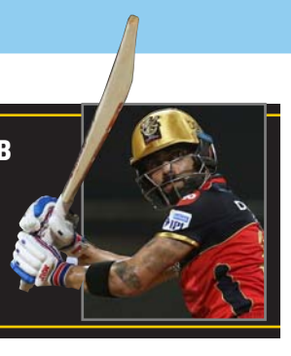
➤ IPL 2021: Can RCB manage to hold on their own?

PAGE 4



STUDENT EDITION

TUESDAY, APRIL 27, 2021

TIMES nie Newspaper in Education

WEB EDITION

CLICK HERE: PAGE 1 AND 2

A black hole dubbed 'the Unicorn' may be galaxy's smallest one

Scientists have discovered what may be the smallest-known black hole in the Milky Way galaxy and the closest one to the Earth found to date. Dubbed, 'the Unicorn' the black hole is roughly three times the mass of our sun. It appears to be a companion to a red giant star, which is how scientists were able to find it. Since black holes aren't visible, researchers were able to locate this one after analysing data, documenting certain changes in the companion star.

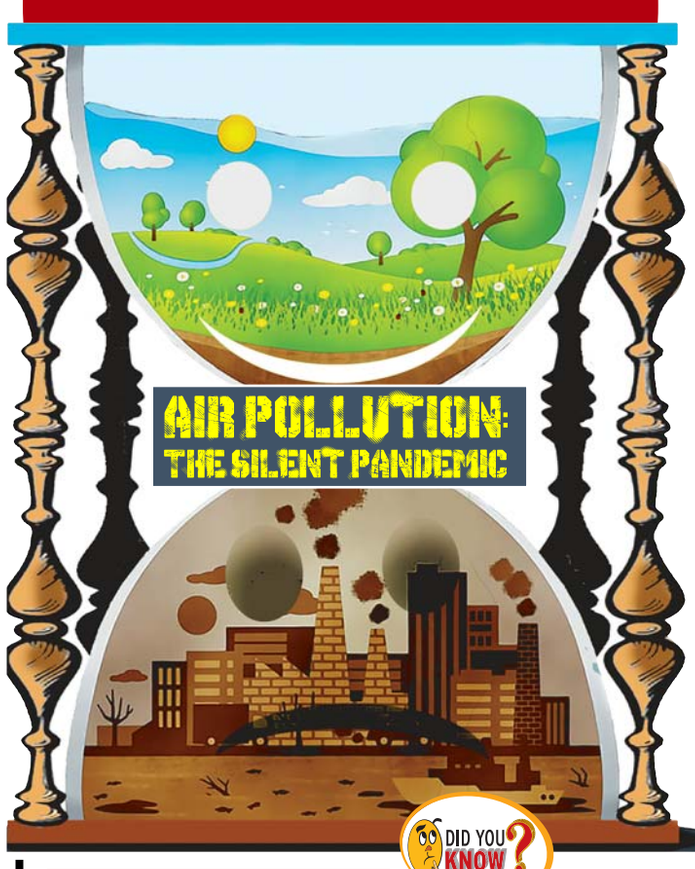
PIC: REPRESENTATIONAL

➤ A luminous star called a red giant orbits with the black hole in a so-called binary star system named V723 Mon

- The black hole is located about 1,500 light years — the distance light travels in a year, 9.5 trillion km — from the Earth. While it may be the closest one to us, it is still far away. By way of comparison, the closest star to our solar system, Proxima Centauri, is 4 light years away
- According to scientists, black holes like this one, form when massive stars die and their cores collapse
- The black hole was given the nickname 'unicorn' not only for being so rare but also because it was discovered in the constellation Monoceros, which means unicorn
- There are various categories of black holes. The smallest, like 'the unicorn,' are so-called stellar mass black holes, formed by the gravitational collapse of a single star. There are gargantuan 'supermassive' black holes like the one at our galaxy's centre, 26,000 light years from the Earth, which is four million times the sun's mass

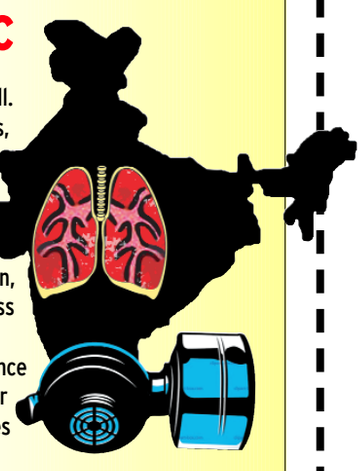
$95 BILLION

That's the loss Indian businesses have to bear every year, courtesy air pollution, claims a study. It is 3% of the country's gross domestic product, and cuts annual consumer spending by $22 billion, the report adds. In fact, it is 40% of the cost of tackling the Covid-19 pandemic, and is equivalent to 3% of India's GDP in 2019...



How it affects India Inc

Labour productivity takes the biggest toll. According to experts, **lost labour productivity costs Indian businesses $30billion**, courtesy air pollution, as businesses witness around 10%net decrease in attendance on days, when air pollution reaches hazardous zones



Similarly, it undermines the **consumer economy** by reducing consumer spending, costing around $22billion in 2019, as consumers avoid exposure to pollution, akin to what is being observed during Covid-19 pandemic. According to estimate, **apparel and food,** bear a negative 50% of the overall cost.

HOW IT AFFECTS HEALTH

Air pollution contributes to 18% of all the deaths in India, which translates to a loss of 3.8 mn workdays

DID YOU KNOW?

21 of the world's 30 cities with the worst air pollution are in India

Spotlight

'Nomadland' wins big at pandemic Oscars as Zhao makes history

US road movie 'Nomadland' emerged as the big winner at the Oscars on Sunday with three major prizes, including a history-making award for director Chloe Zhao, as Hollywood celebrated its most-glamourous night with a unique pandemic-era gala. Zhao's drama about marginalised Americans roaming the West in vans was honoured for the best picture, director and actress for Frances McDormand, who now is in elite company with her third Academy Award for performing.

No-show Anthony Hopkins pulled a surprise upset to win the best actor in the final award of the night

'Captain America 4' in the works; 'The Falcon and the Winter Soldier' writer Malcolm Spellman penning script

Entertainment

Captain America 4' is moving forward at the Marvel Studios, with 'The Falcon and the Winter Soldier' series writer Malcolm Spellman attached to pen the script. Spellman, who was the head writer and creator of the Disney+ and Marvel's series, will write the script with Dalan Musson, a staff writer on the same show, according to The Hollywood Reporter.

- Chris Evans played Captain America through his Steve Rogers' character in all the three films but at the end of the 'Avengers: Endgame', he retired and handed his shield to Anthony Mackie's Sam Wilson, whose story is mapped in the series, along with Sebastian Stan as Bucky Barnes/the Winter Soldier
- The fourth 'Captain America' is likely to continue with Wilson's story, though there is no official update on the casting

INGENUITY HELICOPTER SNAPS FIRST AERIAL COLOUR IMAGE OF MARS

NASA'S INGENUITY MARS HELICOPTER has captured the first colour image of the Martian surface. The Ingenuity Mars Helicopter captured it with its colour camera during its second successful flight test on April 22, the US space agency said. While capturing the image, Ingenuity was 17 feet above the surface, and pitching (moving the camera's field of view upward) so the helicopter could begin its 7-foot translation to the west, away from the rover. The image shows a closeup of a portion of the tracks the Perseverance Mars rover and Mars surface features, demonstrating the utility of scouting Martian terrain from an aerial perspective

Devdutt Pattanaik pens new book on culture, art & heritage for IAS aspirants

BOOK

Noted mythologist Devdutt Pattanaik's new book for civil services aspirants shows how amalgamation of culture, art and heritage have created, built and resurrected the Indian society from its inception. 'Indian Culture, Art and Heritage', available in both English and Hindi, is classified by themes, geography and history, and aims to help students understand the logic behind culture and what it encompasses.

- With more than 200 examination-based questions, the book covers many important illustrations for aspirants
- The 496-page book, priced at ₹ 695, is presently available for sale on online and offline stores

Chocolatiers in Spain recreate Pablo Picasso's 'Guernica' to celebrate their heritage

Photo: TIMES NOW

Chocolatiers hailing from the Basque Country in Spain have recreated the famous painting 'Guernica', which was created by renowned artist, Pablo Picasso. 'Euskal Gozogileak', a local association, made the tragic masterpiece, along with a group of chocolatiers, who recreated the painting with chocolate of different colours. This will be presented on the 85th anniversary of the bombing of the Basque town named Guernica, ahead the Second World War. The chocolatiers managed to complete it with 14 separate chocolate slabs.

➤ The famous Cubist painting was Pablo Picasso's response to the Nazi agenda, which was carried out in the form of bombings all across Europe by their warplanes in order to assist the fascist ruler of the country, General Francisco Franco, during the Spanish Civil War

➤ Showing the tortured and tormented human and animal figures, the painting depicts the plight of the Basque community during the bombing

IT'S MAGNETIC!

"Mariners at sea, when, through cloudy weather in the day which hides the sun, or through the darkness of night, they lose knowledge of the quarter of the world to which they are sailing, touch a needle with a magnet, which will turn round till, on its motion ceasing, its point will be directed towards the north."

CLASS: XII NCERT, CBSE
SUBJECT: PHYSICS
TOPIC: MAGNETISM AND MATTER

Johann Carl Friedrich Gauss
(1777-1855)
German mathematician and physicist.
He Discovered Gauss Theorem in 1813

The Undiscovered
- The origin of spin magnetic moment
- Monopoles.

S Aparna Raju,
Teacher, DPS,
Bangalore East

PERSISTENT MAGNETISM

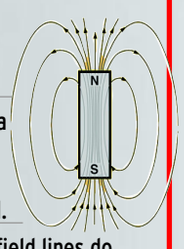
PROPERTIES AND BASIC LAW

1 Properties of Magnetic field lines:

i. They form continuous closed loops.

ii. Tangent at a point gives direction of magnetic field.

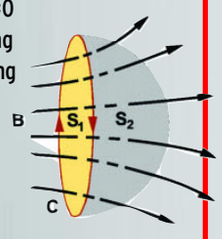
iii. Magnetic field lines do not cross each other.



2 More field lines/ unit area, means stronger magnetic field

3 **Gauss Law:** Net flux through any closed surface is zero.

$\phi_B = \sum B.\Delta S = 0$
Flux entering = flux leaving
$\rightarrow \phi_B = 0$



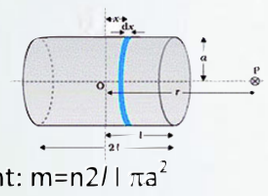
DERIVATIONS

1 Magnetic field intensity due to a magnetic dipole (solenoid/bar magnet) along its axis.

Magnetic field due to element dx at point P (magnetic field on axis of current carrying loop: chapter 4)

$$dB = \frac{\mu o n I a^2\, dx}{2\sqrt[3]{[(r^2-x^2)+a^2]}}$$

$$B = \int_{-l}^{+l} \frac{\mu o n I a^2\, dx}{2\sqrt[3]{[(r^2-x^2)+a^2]}}$$



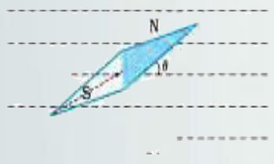
r>>l,x & r>>a

magnetic dipole moment: $m = n2l\,\pi a^2$

$$\therefore B = \frac{\mu o 2m}{4\pi r^3}$$

2 Torque on a magnetic dipole (bar magnet) in a uniform magnetic field

Restoring Torque on needle:



$\tau = m \times B$
$= mB \sin\theta$

Deflecting torque is $= I\frac{d^2\theta}{dt^2}$

I = moment of Inertia

In equilibrium

$$I\frac{d^2\theta}{dt^2} = -mB\sin\theta$$

$$\frac{d^2\theta}{dt^2} = -\frac{mB\theta}{I}$$

This represents simple harmonic motion:

$$\omega^2 = \frac{mB}{I}$$

$$\therefore T = 2\pi\sqrt{\frac{I}{mB}}$$

3 Potential Energy of Magnetic Dipole in Magnetic Field

Work done to rotate through $d\theta$:

$dW = \tau d\theta = mB\sin\theta d\theta$

$U = W = \int_{\theta 1}^{\theta 2} mB\sin\theta d\theta$

$= -mB(\cos\Theta_2 - \cos\Theta_1)$

$\Theta_1 = 90^o$, $\Theta_2 = \Theta$

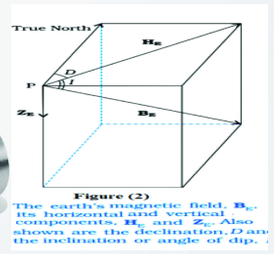
$U = -mB\cos\Theta$

Special cases:

a) $\Theta = 90^o$, $U = -mB\cos\Theta = 0$

b) $\Theta = 0$, $U = -mB\cos\Theta = -mB$ (minimum energy-stable)

c) $\Theta = 180^o$, $U = -mB\cos\Theta = mB$ (maximum energy-unstable)

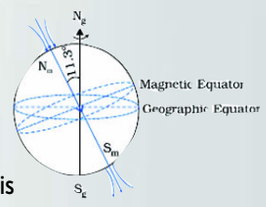


EARTH'S MAGNETISM

1 **Cause of earth's magnetic field:** The magnetic field is thought to arise due to electrical currents produced by convective motion of metallic fluids (consisting mostly of molten iron and nickel) in the outer core of the earth. This is known as the **dynamo effect.**

2 **Geographic axis:** is the line joining Earth's geographic north and south poles.

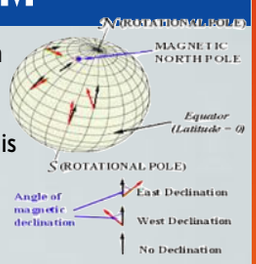
3 **Magnetic axis:** is the line joining the Earth's magnetic north and south poles. The angle between the geographic axis and magnetic axis is 11.3°.

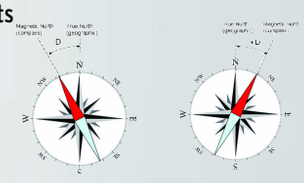


4 **Geographic Meridian [longitude]:** of a place is the vertical plane passing through the place and containing the Geographic axis.

5 **Magnetic Meridian:** of a place is the vertical plane passing through the place and containing the Magnetic axis.

6 **Declination D:** of a place is the angle between its geographic meridian and magnetic meridian or the angle between the true north (geographic north) and magnetic north at the place. Compass needle is used to measure D Declination increases with latitude.



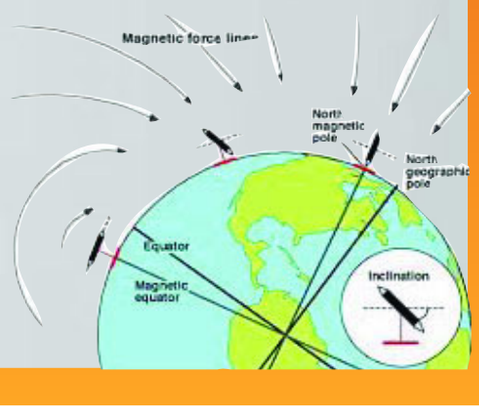


7 **Dip or Inclination I:** of a place is the angle between the Earth's total magnetic field [B_E] and its horizontal component [H_E]. Dip needle measures Dip or Inclination.

Compass needle is free to rotate in horizontal plane (having vertical axis of rotation) and aligns along H_E whereas dip needle is free to rotate in vertical plane(having horizontal axis of rotation) and aligns along B_E.

$Z_E = B_E \sin I$; $H_E = B_E \cos I$

$\tan I = Z_E/H_E$ (Z_E is the vertical component of earth's magnetic field)



How do I fight distractions?

Distraction, for most of us, happens right when we sit to study. Suddenly we realise that the pencil is not sharp enough or the highlighters are in the bag, etc., etc. But why do we get distracted, have you ever wondered? Generally we get distracted when we are not focused and gradually our interest shifts to other things. As students it is very common. So, how do we focus? It's pretty simple, do your work on or before time, in other words do your work on the same day without spilling over to the next. Now, doing doesn't mean just doing. Do it with a sense of excitement, in reading something new or solving a problem. Do not learn it, but understand it. Then there will be no reason to get distracted.

Rithika Devulapally, class X,
Vista School, Hyderabad

Tricks to remember

TRIGONOMETRIC RATIOS

Trigonometric ratios can be learnt by using:
Oscar Had A Heap Of Apples.
Oscar/Had = (sin) = opposite / hypotenuse
A/Heap = (cos) = adjacent/hypotenuse
Of/Apples = (tan) = opposite / adjacent

$$\sin\theta = \frac{\sqrt{\text{fingers above the assigned angle finger}}}{2}$$

$$\cos\theta = \frac{\sqrt{\text{fingers below the assigned angle finger}}}{2}$$

$$\tan\theta = \frac{\sqrt{\text{fingers above the assigned angle finger}}}{\text{fingers below the assigned angle finger}}$$

TRIGONOMETRY RATIOS OF STANDARD ANGLES

"ASSIGN" THE FOLLOWING VALUES TO YOUR FINGERS.

To find the trigonometry ratio :

For example:
sin 30 or cos 30
Hold down the finger assigned for that angle.
For **example:** Hold down your ring finger for 30

Know the following formulas.

Calculate the values for your trig expression using the appropriate formula.

For example: When you hold down your ring finger, there is 1 finger below your ring finger, and there are 3 fingers above your ring finger (your thumb, your index finger, and your middle finger.)

If you need sine, $\sin(\pi/6) = \sqrt{1}/2 = 1/2$.
$\cos(30) = \sqrt{3}/2$.
$\tan(30) = \sqrt{1}/\sqrt{3} = 1/\sqrt{3}$

Delhi Public School, Electronic City, Bengaluru

Tips to score in Accountancy

Accountancy has been found to be the toughest among all other core subjects of CBSE class XII commerce curriculums. A strong hold on the subject can bring the best result for students. Though the revised dates for the exam are still to be announced, I would advise students to remain focused and strategise accordingly.

PRIORITISE THE TOPICS
Questions on company accounts, cash flow statements and partnership carry 60 per cent weightage in the question paper. Pay special attention to these topics while studying. Also, don't miss out on the illustrations for ratio analysis.

REFER TO THE RIGHT BOOKS
The NCERT textbook for CBSE class XII Accountancy is your basic requirement. For a more detailed and thorough knowledge, Double Entry Book Keeping by C S Grewal or Accountancy for Class 12 by DK Goel can be good options.

FOCUS ON MCQs
If you want to score 100, always have in-depth knowledge of chapters - study the basics. Sometimes students ignore the small things but are important when it comes to MCQs, so read each topic thoroughly.

PRACTICE REGULARLY
Do not limit yourself to the exercises of the NCERT textbook and your reference books. Allot enough time to solve as many questions as possible, including sample and previous years' papers. (www.mycbseguide.in or www.learncbse.in)

FOCUS ON FORMATS
Providing proper formats, narrations and working notes are necessary to score high marks.

LEARN FORMULAE THE RIGHT WAY
Accountancy students need to go through a lot of formulae. Prep up a formula cheat-sheet for every chapter and go through it from time to time. This is an effective way to memorise them. However, before learning the formulae by heart, try to understand how and why it has been derived.

BE STRATEGIC IN FIRST 15 MINS
Utilise the first 15 minutes to read, analyse and understand the question. Reading the question paper will give you an idea about how to start the answers. Write those questions first which you are more certain of. And don't leave any question in the Board exam.

Meenu Taya,
PGT
Commerce, St Soldier School,
Panchkula

QUICK REVISION
MATHEMATICS (ISC) **CLASS:** XII
RAGHAVAN BADRINATH, Gitanjali School, Hyderabad

KEEP TRACK OF YOUR MATH SKILLS

Q1a. If $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$
Prove that $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$

b. Show that $\begin{vmatrix} 1-2a^2 & -a^2 & -a^2 \\ -a^2 & -1 & a^2-2a \\ -a^2 & a^2-2a & -1 \end{vmatrix} = \begin{vmatrix} 1 & a & a \\ a & 1 & a \\ a & a & 1 \end{vmatrix}^2$

(OR)

find the inverse of $\begin{bmatrix} 2 & -1 & 3 \\ 3 & 2 & 4 \\ 1 & -3 & 2 \end{bmatrix}$

c. A circular cone with semi vertical angle 45° is fixed with its axis vertical and its vertex downwards. Water is poured into the cone at the rate of $2cm^3$ per minute. Find the rate at which the depth of the water is increasing when the depth is 4cm.

d. If $y = \tan^{-1}\left(\frac{4x}{1+5x^2}\right) + \tan^{-1}\left(\frac{2+3x}{3-2x}\right)$ then find dy/dx

e. Prove that: $\int_0^{\pi/4} \log(1+\tan x)\,dx = \frac{\pi}{8}\log 2$

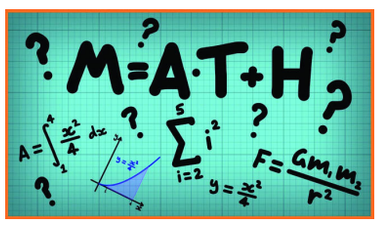
(OR)

Prove that: $\int_0^{\pi} \frac{x}{1+\sin x}\,dx = \pi$

f) Let $A = R - \{3\}$ & $B = R - \{1\}$, consider the function $f : A \rightarrow B$: $f(x) = \frac{x-2}{x-3}$. Show that f is one – one and onto Hence find f^{-1}. Also find x when $f^{-1}(x) = 4$

g) Solve the differential equation: Solve: $(1-x^2)\frac{dy}{dx} + xy = \sqrt{1-x^2}$

h) If the function defined as
$\frac{x^3-8}{x^2-3x+2}$ if $x \neq 2$
$f(x) = k$ if $x = 2$



i) A student takes his examination in four subjects A, B, C and D. He estimates his chance of passing in A as 4/5 in B as 3/4 in C as 5/6 and in D as 2/3 to qualify he must pass in A and at least two other subjects what is the probability that he qualifies.

Q2a. Evaluate as a limit of a sum:
$\int_1^4 (x^2 + 2x + e^{-x})\,dx$

(OR)

Evaluate: $\int_{\pi/4}^{\pi/2} \frac{\cos x\,dx}{(\cos\frac{x}{2} + \sin\frac{x}{2})^3}$

b) The probability of a windy day is 0.3. When a golfer makes a given shot, the Probability that a shot will land on the green is ¼ if it is a still day, and 1/8 if it is a windy day. **i)** Find the probability that a shot will land on the green. **ii)** If the ball has landed on green find the probability that it was a windy day.

c) The cost of fuel for running a bus is proportional to the square of the speed generated in km per hour. It costs Rs 48 per hour when the bus is moving at a speed of 20 km per hour what is the most economical speed if the fixed charges are Rs. 108 for an hour over and above the running charges.

d) Using matrix inversion solve: 2x+3y+z=10; x+3y–2z=4; 2x+y–3z= 4

These questions are meant for practice purpose only. Students are advised to check format, syllabus and marks for Board test papers with their teachers. Questions have been given by teachers and NIE is not responsible for them.