FATIMA MATA NATIONAL COLLEGE

Autonomous

DEPARTMENT OF PHYSICS

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CYGNUS

FATIMA MATA NATIONAL COLLEGE
(AUTONOMOUS), KOLLAM

CYGNUS

DEPARTMENT MAGAZINE

DEPARTMENT OF PHYSICS
FATIMA MATA NATIONAL COLLEGE KOLLAM

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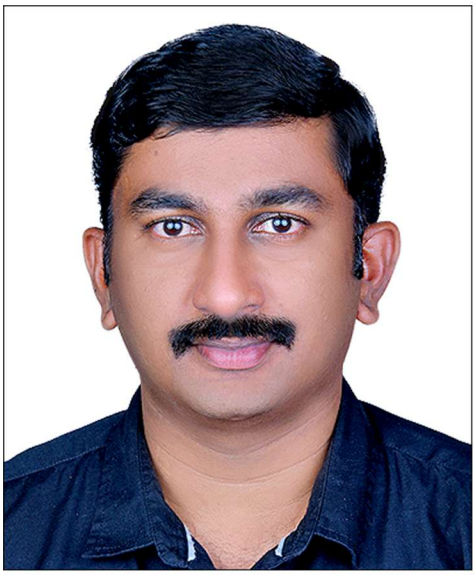


MAGAZINE EDITOR
Dr Benzon K. B.

CO -EDITOR
Dr Shyma Mary

FACULTY

EDITORIAL BOARD

It gives me immense pleasure to announce that the students of our department is launching a biannual magazine *CYGNUS*. I believe that this magazine provides an excellent platform for our students to showcase their creative and innovative works. We offer academic programmes to mould the students so as to develop their personality in intellectual, physical, social, moral and spiritual dimensions. The efforts of the Editorial board are praiseworthy which helped to make the magazine a memorable document. I convey my fondest regards to all members of the Physics family and wish them an absolutely fantastic growth in the future endeavours.

Head of the department

Ms Vimala V

"Nothing happens until something moves" by Albert Einstein

It is with great pride and fulfilment that we present before the esteemed readers the first edition of CYGNUS. Cygnus is a northern constellation lying on the plane of the Milky Way, deriving its name from the Latinized Greek word for swan. Cygnus is one of the most recognizable constellations of the northern summer and autumn, and it features a prominent asterism known as the Northern Cross.

It is a vessel which endows information. It is a great pleasure to introduce CYGNUS the first issue of the biannual students' magazine from the Department of Physics, Fatima Mata National College.

We are really proud and exuberant to ascertain that the Department of Physics is ready with all new hopes and hues to bring out the first issue, which is going to unfold the unraveled world of the most memorable and precious moments of our department. The magazine is to be viewed as a launch pad for the student's creative urges to blossom naturally. As the saying goes, "*mind, like a parachute, works best when opened*". This humble initiative is to set the budding minds free allowing them to roam in the realm of imagination and experience, to create a new world.

Presentation, inspiration and motivation have always played a key role in the success of any venture. We take this opportunity to express my deep gratitude towards those who have guided and supported us to make our efforts bear fruit. We are thankful to our respected Principal Dr Vincent B. Netto for providing us all the facilities required for the successful completion of our work. We express our sincere gratitude to Ms Vimala V, Head of the Department, Physics, for her valuable suggestions, elevating inspiration and encouraging guidance. It is a great pleasure to acknowledge our deepest thanks and sincere appreciation to Dr P. J.Jojo, Associate Professor, for his encouragement, creative input and comprehensive advice. We also express our sincere gratitude towards Mr Stancilaus S. and Ms Jaya Sunny for dedicating their valuable time for the language edition.

We would like to take this opportunity to thank the members of the Editorial Board, especially the co-editor Dr Shyma Mary for the dedicated service to the journal and for all the cooperation and enthusiastic involvement in this blooming endeavour.

We would also like to thank all the faculty members, and the students of our department for their moral support and help. Above all, we humbly remember the grace and blessings that Almighty God bestowed on us, without which our attempt would not have been a success.

Magazine Editor
Dr Benzon K B

ENERGY SOURCES OF THE FUTURE

In this article, I wish to deviate from a path most authors would prefer to go through. Here the article tries to present outrageous ideas that could one day be a common fact or a common method for the production of energy. The energy sources discussed in this article are uncommon and strange, but these ideas are brought into the limelight to make the intuitive motivated.

"Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution."

- Albert Einstein

{Sources of information are credited at the end of the discussion of each idea, Enthusiasts / Nerds can go check it out}

► *BLACK HOLES AS AN ENERGY SOURCE*

Black holes as an energy source holds the number one spot in our outrageous energy source list of the future.

Going on par with Einstein's timeless equation,

$$E = m c^2$$

We can imagine the amount of energy an immensely massive black hole has to offer. Given the fact that a black hole won't even let light come out, how are we going to harvest the energy from it?

A book that I read recently by ***Igor Novikov***, sowed the idea of choosing this topic. In ***Black holes and the Universe***, Igor tells us how professor *Zeldovich* devised a method to harvest energy using *super radiance**.

Using this principle of super radiance, we can make the black hole an amplification device.

**super radiance: is a radiation replacement effect applicable to quantum mechanics, astrophysics*

There are mainly two types of black holes. The primitive *Shwarzschild Black holes* which are non-rotating and *Kerr Black holes* which are rotating. Now the black hole we could use as an energy source are the Kerr Black holes. They, as stated, are rotating black holes and hence we can employ the principle of rotational super radiance.
At the outeset we had made it clear that the black hole behaves as an amplification device. Now we have to give an energy source that needs to be amplified. Suppose we give a radiation, say electromagnetic waves, then due to super radiance, the given radiation feeds *(gains energy*) from the rotational energy from the black hole and thus it is amplified *(resulting in a decrease in the mass of the black hole).*

***NB**: The condition for super radiance to occur is that the frequency of the electromagnetic waves should be less than the frequency of rotation of black hole.*
Now we have established that we can amplify, by what per cent is the question that remains! The amplification factor is different for different radiations.
For *e.g.* The amplification factor for electromagnetic radiation is a minimal 44% as for gravitational waves it is a gigantic 138%. So all we have to do now is find a way to produce gravitational wave, amplify it and convert all in the hopes that the net energy is positive!

NB: *Finding a black hole in this vast universe is tough. What if we can make our own mini black holes?*
The answer is just a 'google' away!

***Reference**: Black holes & the Universe, Igor Novikov, Chapter-03*

► *SOLAR POWER*

I had promised you that I would follow unconventional paths and now you might be wondering why I have chosen the well-known and widely discussed concept of solar power. In this part we explore ingenious methods on exploiting solar energy. The Sun is the largest and nearest such energy source for us. Not utilising this unlimited potential wouldbe a shame. The first idea presented is one that you are familiar with solar panels! But the only change is that they are in space.

► ***SOLAR PANELS IN SPACE***

What if we can make a solar array floating above the planet! Replenishing the energy needs of our ailing mother earth from the benevolent sun. The advantages are,

♦ No need to take up valuable real estate from earth
♦ Fluctuation in weather will not be a problem

Now the question is, how will we transmit the energy produced in the photovoltaic cells?

A small portion of the electricity produced can be used to power up a microwave laser which can then be sent to earth in the form of microwaves and converted back to electricity.

Simple in theory, practical? Let's wait and watch! While we are on the subject, let's talk about solar wind as an energy source.

► ***SOLAR WIND***

The solar wind consists of an enormous number of charged particles emitted by the sun at very high speeds (*cosmic rays*). In principle these particles can be used to generate electricity using a solar sail and a charged wire, which generates energy from the solar wind passing through it. According to preliminary studies by the University of Washington, the amount of power you can generate is limitless, constrained only by the size of the solar sail you deploy. The idea has been already practicalized by Japan's ***IKAROS Solar Sail*** If we succeed in harvesting the power of solar winds, the energy crisis of our planet will be history. Moreover, we can use the light weighted solar sails to explore the unknown parts of our galaxy, as the solar sail is powered up by the momentum imparted by the solar wind.

NB*: Check out Dyson's sphere a similar technique to convert solar energy.*

Reference*: Wikipedia*

Now let us conclude this article after skimming through some other crazy ideas that could possibly be one day a method for producing energy.

► *COLD FUSION ARC REACTOR*

The theoretical analogue of Tony Stark's *(also known as Ironman)* arc reactor uses the principle of cold fusion. Usually fusion occurs at high temperatures as in the case of star, but the process can occur at room temperatures as well, all we have to do is replace the *electron* in *hydrogen* with *Muons*. *Muons* are elementary particles similar to that of electron having a greater mass. When electrons are replaced with muons the greater mass makes the interatomic distance small and thus enables the process of occurrence of fusion highly likely.

Now the catch is that muons are hard to get by. And they have a very small life period before they disintegrate. So it means if we create a way to produce *muons* the energy required to produce them is greater than the energy produced by fusion.
The solution would be to find an alternative way to produce *muons*. Then we could have our own portable power house in our backyard!

► *SUGAR AS AN ENERGY SOURCE*

Now let's take a break from fancy words such as *muons*, *Kerr black holes* and *all*. There are possibilities of an energy source lying all around us. It's just that we usually don't pay attention to it. Sugar or C_{12} H_{22} O_{11} is one such example. It is a gold mine of hydrogen, the cleanest and the most dangerous fuel mankind knows about. This hydrogen extracted can be used to make hydrogen fuel cells.

A plethora of other fascinating ways remain hidden, like what if we can make *Bacteria(s)* as an energy source?
For the intuitive such bizarre ideas will always be fascinating and these scientifically imaginative thoughts or ideas are what keep our hearts close to Physics!

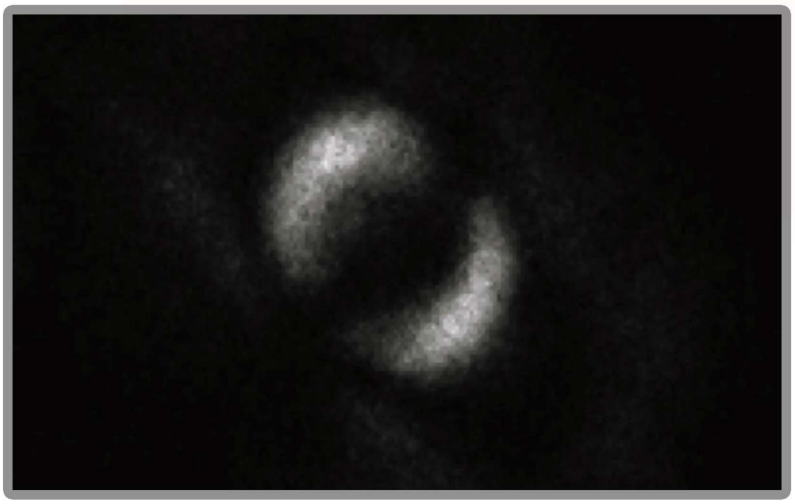
HARIRAM
I PG PHYSICS

QUANTUM ENTANGLEMENT

Quantum Entanglement is simply *love* at the quantum level. When two particles are *entangled*, whatever happens to one will instantaneously affect the other irrespective of how far they are!

If you've seen the movie ***Hellboy II: The Golden Army***, you would definitely know the **bond** between the invincible villain *Prince Nuada* and his twin sister *Princess Nuala*. Every aspect of their life is shared! Her muscles ache when he trains extensively. In the end she stabs right through her breast just to kill her brother, and thus saving the protagonist.

This is the kind of bond we are discussing here. It is indeed true except for the fact that it is found only in the ***quantum realm***. i.e. particles like photons, electrons exhibit this phenomenon. Not that they go on stabbing themselves to kill themselves and their counterparts but certain physical quantities like position, spin, momentum and polarization remain correlated for them, and the quantum state of one cannot be defined independently with respect to the other, even at large distances.



For example, if a pair of particles are entangled and one of them has a clockwise spin, then the other particle would exhibit the counter clockwise spin of the same magnitude provided they are measured on the same direction and axis. Quantum Entanglement was discovered by ***Albert Einstein*** and it existed only in papers until decades later ***John Bell*** came up with an experiment for it.Although the math made sense, the genius refused to accept it and referred it to as *"spooky action at a distance!".* Another recent breakthrough is that a group of genius scientists released the very first image of quantum entanglement (between a couple of photons) a few weeks ago.

Quantum teleportation is some sort of an application of this phenomenon. The quantum state (information) of a photon can be transferred to another one which may be miles apart. If science can get weirder than you can ever imagine, then that is what we physicists call ***Quantum Mechanics***.

JITHIN JOHNSON
III DC PHYSICS

INTERESTING FACTS ABOUT PHYSICS

THE MEANING OF PHYSICS

It's interesting to know that the literal meaning of physics is taken from the Greek saying knowledge of nature. It is one of the oldest fields of science which dates back to 650 BC and was discovered by the Greeks.

GPS WORKS ON PHYSICS FORMULAS

The modern day applications like GPS which literally shows us the right path of life is based on a physics formula of

$$E = m\,c^2$$

The satellite navigation systems are related to geostationary satellites to pinpoint the locations and data exchange using radio waves. So, the theory of relativity helps in the proper working of GPS.

THE SCIENCE OF DEAD SEA

Nature's way of proving that physics is cool is shown in a way of Dead Sea, which is one such marvel known for its density. Because of the presence of salt in this sea, a person can easily float in the water without drowning. So you don't have to be a swimmer to enjoy a swim in the Dead Sea.

BLACK HOLES ARE NOT BLACK IN COLOUR

Another interesting fact about physics is that black holes are not actually black in colour as their name literally suggests. The famous physicist *Stephen Hawking* discovered the fact that black holes do radiate and this *Hawking radiation* which they emit makes them glow and gives off light across the entire spectrum.

THE TOUCH SCREEN OF YOUR SMARTPHONE IS BASED ON YOU

Don't get so surprised! Physics has all the answers. Based on the formula of resistance, body's electrons repel the objects, similarly when we touch the screen of the phone, the current circuit is broken and the potential drop at the point you touch is sensed by a sensor, implementing the required action.

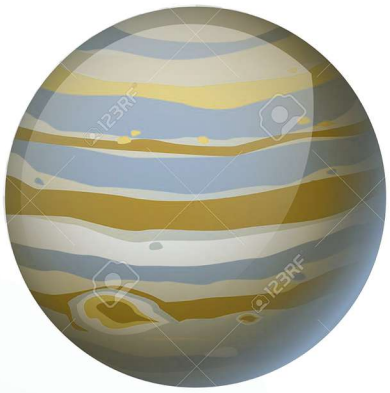
TIME IS RELATIVE

You would be amazed to know that the passage of time is different for people moving at different velocities. Everyone has their own sense of time. This is one of the astounding physics facts you would come across.

AMEENA
III DC PHYSICS

WHY IS JUPITER HOT AND COLD AT THE SAME TIME ?

Jupiter is the fifth planet from Sun, and the largest in the solar system. It is a gas giant along with Saturn. It is colder than Antarctica. The surface temperature of Jupiter is 1500 degree Celsius. Surface of Jupiter is a thick mass of ice that never melts as it receives hardly any heat from the Sun. Jupiter is five times farther away from the Sun when compared to earth. Jupiter was called a *Gas giant*. Also it was not possible to find out whether a solid layer existed below the ice. The surface of Jupiter is made of ice, but hot molten material exists inside. The hot molten material was discovered in recent years by astronomers with radio telescopes. What lies in between the two layers is a mystery. Some scientists believe that an insulating material separates the two. Others believe that water separates the two layers.



SANDRINE JESS JOHNSON
II DC PHYSICS

RAINS ON DIFFERENT PLANETS

Earth	–	*Water*
Venus	–	*Sulphuric acid*
Neptune	–	*Diamonds*
Jupiter	–	*Diamonds*
Titan	–	*Methane*
Saturn	–	*Diamonds*

Difference between asteroids, comets and meteors?

Asteroids are small heavenly bodies which move around the sun like the planets. Thus, they are also called planetoids. Most of them go around the sun in the asteroid belt (space between orbits of Mars & Jupiter). Even comets like Halley's which has been sighted many times in the sky are small heavenly bodies. They are characterised by different orbit and a bright glowing tail. ***Meteorites*** are cosmic chunks of rocks, whose impact pressure upon entering the atmosphere causes the body to heat up and emit light, thus forming a fireball, also known as meteor or shooting/falling star. They may occur very frequently.

NITHYA S THOMAS
II DC PHYSICS

SCIENCE DAILY

TWO HUNDRED TIMES FASTER THAN EVER BEFORE : THE SPEEDIEST QUANTUM OPERATION YET

A group of physicists at ***UNSW Sydney*** has built a super-fast version of the central building block of a quantum computer. The research is the milestone result of a vision first outlined by scientists 20 years ago. A group of scientists led by professor *Michelle Simons*, who won the award *Australian of the Year, 2018,* has achieved the first *two-qubit gate* between atom qubits in silicon- a major milestone on team's quest to build an *atom- scale quantum computer*. This pivotal piece of research was published on July 17, 2019 in the journal *Nature*. A *two-qubit gate* is the central building block of any quantum computer and UNSW's version of it is the fastest that is ever been demonstrated in silicon, completing an operation in 0.8 nanoseconds, which is approximately equal to 200 times faster than other existing spin based two-qubit gates. In the Simmons group approach, a two-qubit gate is an operation between two electron spins-comparable to the role that classical logic gates play in conventional electronics. This two qubit gate by placing two atom qubits closer together than ever before, and them - in real time – controllably observing and measuring their spin states.

The team's unique approach to quantum computing requires not only the placement of individual atom qubits in silicon but also associated circuitry to initialize, control and read - out the qubits at the nano scale - a concept that requires such exquisite precision, that it was long thought to be impossible. But with this major milestone, the team is now positioned to translate their technology into scalable processors. Professor *Simmons*, says the past decade of previous results perfectly set the team up to shift boundaries of what is thought *humanly possible*.

ALEENA JOSEPH
II DC PHYSICS

TEN EXAMPLES OF PHYSICS IN EVERYDAY LIFE

On this 'living' planet that we call Earth, there are lots of events that take place. These events are around us, which we see, do or experience regularly. At some point in time, your curiosity would have pushed you to ask about what's going on? How does that happen? Well,leaving all the miracles apart, the answer to all these questions is 'Physics'. In fact, physics governs our everyday life in one way or the other. Let's have ten examples of physics in everyday life.

► *ALARM CLOCK*

Physics gets involved in your daily life right from your waking up in the morning. The buzzing of an alarm clock helps you wake up as per your schedule. Sound is something that you can't see, but can hear or experience. ***Acoustic Physics*** deals with the origin, propagation and properties of sound.

► *STEAM IRON*

Right after you wake up in the morning and start preparing for your college/office, you need ironed clothes, and that's where physics comes into play. The steam iron is such a machine that uses a lot of physics to make it work. The foremost principle of physics used in the steam iron is *'Heat'*. Heat in ***thermodynamics***, is a type of energy transfer from a warmer substance to a colder one. Ironing works by having a heated metal base – the *soleplate*.

► *WALKING*

Now when you get ready for your college/office, you certainly have to walk up to a certain distance. Physics lets you walk easily. While walking you get a good grip because of a sort of roughness or resistance between the soles of your shoes and the surface of the road. This resistance is called ***friction*** or ***traction***.

► ***BALL POINT PEN***

Whether you are at your workplace or college, a ball point pen is your weapon. Had physics not been there, you would not have been able to write with a ball point pen. In this case the concept of gravity comes into play. As your pen moves across the paper, the ball turns and gravity forces the ink down onto the top of the ball where it is transferred onto the paper.

► ***HEADPHONES / EARPHONES***

The concept of magnetism and sound waves are involved in science of your headphone. When you plug your headphone into an electrical source, the magnet in your headphone creates an electromagnetic field, which ultimately results in sound waves.

► ***CAR SEAT BELT***

When you tighten your car's seatbelt, it works on the concept of *inertia*. Inertia is willingness or laziness of a body to change its state of rest or motion. In case of a car collision, your seatbelt helps prevent your body from moving in a forward direction, as your body resists being stopped because of inertia of motion.

► ***CAMERA LENS***

The phenomenon of *selfie* has engulfed people of every age group. The lens used in a camera works on the principle of optics. The set of convex lenses provide the camera with an image outside of the camera.

► ***CELL PHONES***

Cell phones work on the principle of electricity and electromagnetic spectrum undulating patterns of electricity and magnetism.

► *BATTERIES*

Whether in cell phones, cars, torches or any other appliances, batteries act as sources of electricity. Batteries work on the principle of capacitance. Since the late eighteenth century, capacitors have been used to store electrical energy.

► *DOPPLER RADAR*

To check the over speeding of vehicles, police often use *Doppler Radars*. They work on the principle of Doppler effect. The Doppler effect is nothing but a change in the pitch of a sound when the source of the sound is moving relative to the listener. It is because the frequency of the sound changes as the source of sound moves closer to or farther from the listener.

LAKSHMI ANIL
III DC PHYSICS

THE PHYSICS OF CRICKET

Cricket is a subtle game requiring a great amount of patience as well as skill. It takes five days to complete a Test match so the grass needs to be mown and the pitch needs to be rolled as the game progresses. Some people choose to play this game, while others love it and get addicted to it.

HEAVY V/S LIGHT BAT

The crowd loves a batsman who can hit sixes. If you want to hit the ball as fast and far as possible, should you use a light or a heavy bat? That's an age old question with plenty of answers, but which is the correct answer? Light bats can swing faster than heavy bats, but only about 10% faster than heavy bats. If a light bat was swung at the same speed as a heavy bat and both hit the same ball, the heavy bat would pack more power since it has more energy and momentum. Light bats can swing 10% faster. If a bat is swung 10% faster, the ball comes off the bat about 7.5% faster. That almost makes up for the fact that light bats are basically less powerful when swung at the same speed as heavy bats. The end result is that heavy bats are about 1% more powerful than light bats. Heavy for a ten year old might be light for a 100 kg cricketer, so the real answer for the raw power is to use a bat that is as heavy as feels comfortable to swing

THE SWEET SPOT

Every batsman knows that there is a special spot on a bat where the shot feels best. It sometimes feels so good that there is almost no sensation at all that the bat hit the ball. It is the same with a baseball bat or a tennis racquet or a golf club, so that there is nothing special in this respect about cricket bat. Two special points on a bat are good candidates for the sweet spot. Technically, they are known as *fundamental vibration node* and the *center of percussion*.

The node point is concerned with vibrations. Most impact points on a bat will cause the whole bat to vibrate, including the handle. Those vibrations persist after the ball well, has left the bat, and they tell you whether you hit the ball cleanly. The biggest vibrations result when the ball strikes the tip of the bat. However, there is a spot about 150 mm from the tip where an impact causes no vibration at all. That is the node point. As the impact point moves closer to the node point, bat vibrations get weak and the shot feels nicer.

VERTICAL BOUNCE OF A CRICKET BALL

Almost every type of ball used in a sporting event must bounce according to the rules of the game. If the ball bounces too high or too low, the players will complain that something is wrong with it. The standard test for bounce is to drop a ball from a certain height onto a hard surface, such as a slab of concrete and then measure how high it bounces. When a tennis ball is dropped from a height of 100 inches (2.54 m), it must bounce to a height between 53 inches (1.35 m) and 58 inches (1.47 m). For official use, tennis ball should be properly tested and approved, and also there are some official rules. There is no such official rule for a cricket ball. There is simply a tradition that is monitored by the umpires, and one that is an industry standard. When a cricket ball is dropped from a height of 2.0 meter onto a heavy steel plate, it bounces to a height somewhere between 0.56 m and 0.76 m. Cricket balls are a lot less bouncy than tennis balls and the permitted range of possible bounce height is larger. A useful way of specifying the bounce is to take the ratio of the bounce speed to the incident speed. When a ball is dropped from a height of 2.0 m it lands at speed of 6.26 meter per second regardless of the type or weight of the ball. A cricket ball bounces to about one third of that height in which case it rebounds at a speed of 3.61 meter per second. The ratio of these two speeds is 0.58 and is called *the coefficient of restitution (COR).* The *COR* determines not only the bounce height but also the speed at which a ball comes off the bat. The batted ball's speed also depends on the speed of the bat.

BATTED BALL SPEED

Suppose a cricket ball is bowled at 100 kilometers per hour, the batsman swings at 60 km per hour, and hits the ball straight back over the bowler's head. How fast does the ball come off the bat? This is a simple question but the answer is not so simple since it depends on which part of the bat is moving at 60 kilometers per hour and it depends on where the ball makes contact with the bat. Suppose that the ball strikes the middle of the bat rather than near an edge and suppose that 60 km per hour is the speed of the impact point on the bat rather than the speed of the tip or the handle. We also need to know the mass of the bat, or better still we need to know how fast the ball comes off the bat when the bat is not swung at all. Suppose that the bat is used just to block the ball and the ball bounces off the bat at 20 kilometers per hour. If E is equal to the ratio of bounce speed to incident speed, equal to 0.2 then the speed of the ball when the bat is swung at speed V is 20+(1 + E) V = 20+1.2 x 60 = 20+72 = 92 km per hour. For most bats, E varies from about 0.1 near the tip to about 0.3 halfway up the bat. E is smallest near the tip of the bat but V is biggest there when the batsman swings hard at the ball.

FORCE ON A CRICKET BALL

Drop a cricket ball on a cricket pitch and the ball bounces up off the pitch. How long does the ball remain in contact with the pitch and how big is the force on the ball? Cricket balls are relatively stiff compared to, say a tennis ball, and the contact time is shorter. A tennis ball spends 0.005 seconds in contact with the court or the strings of a racket. A cricket ball spends about 0.001 seconds in contact with the pitch or in contact with a bat. The force on the ball has to slow it down to take a complete stop and then accelerate it back in the other direction, all in the space of 0.001 seconds. Suppose that a 0.16 kg cricket ball hit a bat at hundred kilometers per hour and then comes off the bat at hundred kilometers per hour in the reverse direction. The average force on the ball is 8800 Newton, enough to lift a mass of 880 kilogram of the ground. The peak force on the ball is about double that, enough to lift a 1.76 ton car of the ground. That is why it hurts to get struck on head or anywhere else with a cricket ball.

TRAVEL TO THE FUTURE – BLACK HOLES

Black holes are some of the most mysterious and interesting objects in outer space. They are so dense with large gravitational pull that even light cannot escape its pull if it comes very close to a black hole.There have been many interpretations that you can travel to the future if you get sucked inside a black hole. Well, that is almost true. When you reach the outer edge or the event horizon of a black hole as it is called, time actually slows down for you. If you watch the outside world as you fall into a black hole, you will see that everything grows faster there. Strange things happen to you when you are on the event horizon. An outside observer who watches you will see that you slow down and freeze in time. But as you get closer to the centre *(singularity)* of the black hole, you will gradually fade away into darkness. No one knows what actually happens there. The time dilation can be explained with Einstein's general theory of relativity.

According to this, time slows down near a massive object due to its gravity. This effect occurs a bit for every massive object, even in the case of Earth. It is very true in the case of a black hole due to its immense gravitational pull. So when you look at someone far away as you are falling into a black hole, their time travels at a very faster rate. And if there is any possibility that you can somehow travel back from the event horizon *(which is practically impossible)* you will see that the minutes or hours you spent there were years here.

But the problem with this is that you can't just remain at the event horizon. Due to strong gravitational pull, you will be pulled very quickly towards the centre of the black hole.As you travel you will get stretched *(spaghettified)* due to the immense gravitational pull and then ripped apart. You won't be able to see whatever is happening on the outside as light from the outside world will not have time to reach you.So the more you are on the event horizon, the more you can witness the future.

DEEPTHI KENPHINE KENNY
III DC PHYSICS

FORCE AND MOTION

ACROSS:

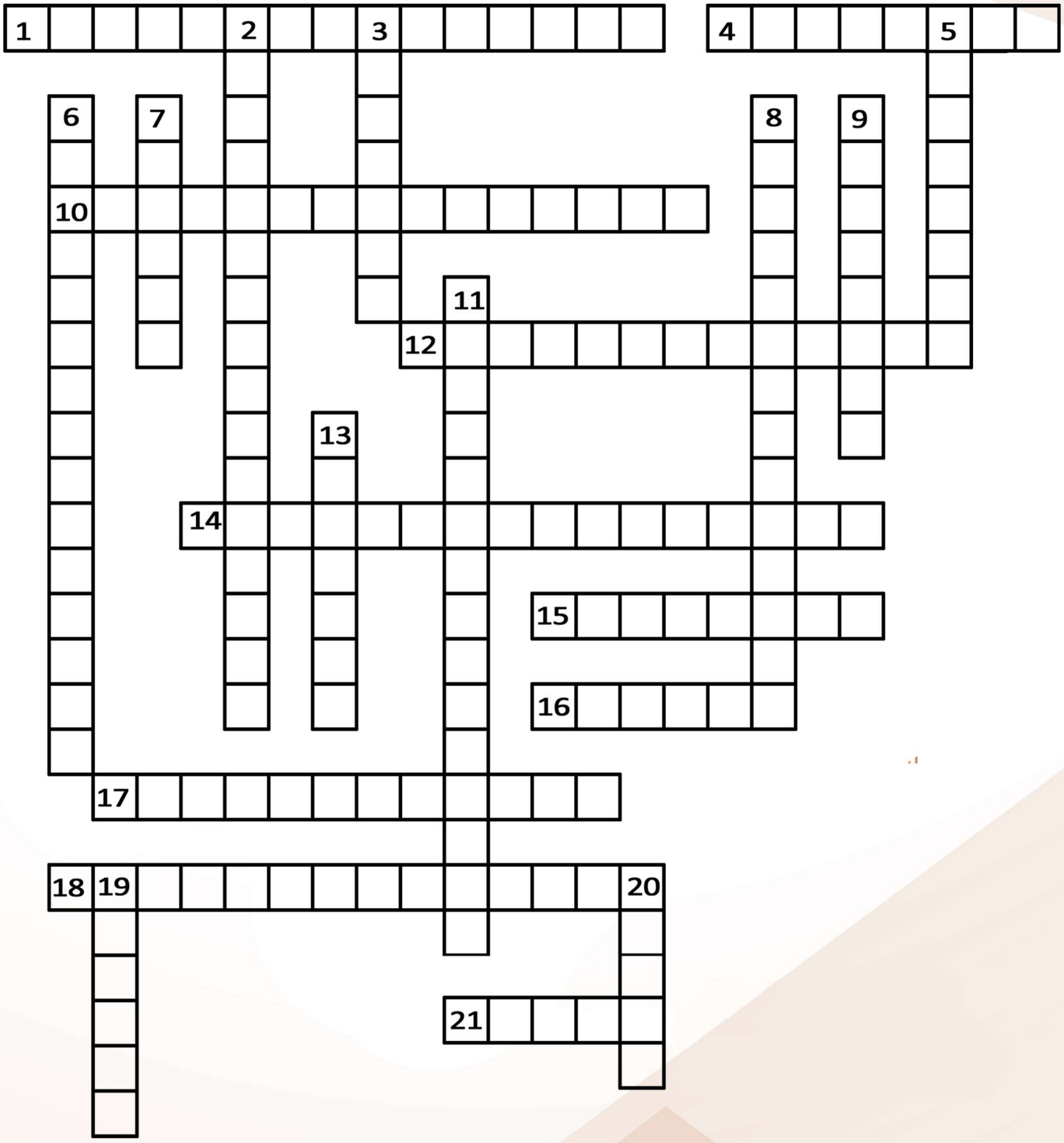
1. An object at rest will stay at rest; an object in motion will stay in motion; unless acted by an outside force.
4. The combination of all forces acting on an object.
10. For every action there is an equal and opposite reaction.
12. Friction that occurs as an object that moves through a fluid.
14. Forces that do not cancel each other out when acting together on a single object

15. The speed and direction of a moving object.
16. An object's change in position relative to a reference point.
17. A change in velocity.
18. Forces that cancel each other out when acting together on a single object.
21. A push or pull that act on an object.

DOWN:

2. Force is mass times acceleration; an objects acceleration depends on the mass of the object and the size and direction of the force acting upon it.
3. The tendency of an object responds to an action as in Newton's third law of motion.
5. The force with which an object responds to an action as in Newton's third law of motion.
6. Friction between moving surfaces.
7. The SI unit of force.
8. Friction between among moving surfaces.
9. Opposes the motion of one object moving past another.
11. Friction that occurs when one solid surfaces slide over another.
13. The force of attraction between all mases in the universe.
19. The force one object applies to a second as in Newton's third law of motion.
20 . How fast an object's position is changing with time at any moment.

CROSSWORD



Oldage Home Visit by III DC Students

NCC Navel Cadet ***Kiran K S*** participated in ***Special National Integration Camp*** Ledakh (27th June - 8th July 2019)

Nikhil Santhosh, Arun Baby, Adithya Prasad (IIDC students) participated in the ***"Vimukthi – Kollam Monsoon Marathon June 2019"*** organized by Kerala Vimukthi Mission, at Cantonment Maidan Kollam.

NCC Navel Cadet ***Tijoy M*** of III DC Physics participated in the ***Republic Day Camp 2019*** held at Delhi and bagged bronze medal in ***Ship Modelling.***

FATIMA MATA NATIONAL COLLEGE

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