ENTANGLED TIMES

THE MECHANICS ISSUE

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WHAT IS MECHANICS?

MECHANICS IS THE BRANCH OF PHYSICS THAT STUDIES HOW OBJECTS MOVE AND INTERACT WITH FORCES. IT HELPS US UNDERSTAND EVERYTHING FROM WHY A BALL ROLLS DOWN A HILL TO HOW ROCKETS LAUNCH INTO SPACE!

MECHANICS IS ALL AROUND US. WHEN YOU RIDE A BIKE, THROW A BALL, OR JUMP IN THE AIR, YOU ARE USING MECHANICS! IT EXPLAINS HOW THINGS SPEED UP, SLOW DOWN, TURN, OR STAY STILL.

WITHOUT MECHANICS, WE WOULDN'T UNDERSTAND HOW CARS DRIVE, PLANES FLY, OR EVEN HOW WE WALK! IT IS ONE OF THE MOST IMPORTANT SCIENCES THAT HELP US IN OUR DAILY LIVES.

NEWTONS LAWS OF MOTION

FIRST LAW (LAW OF INERTIA) – AN OBJECT STAYS AT REST OR IN MOTION UNLESS ACTED UPON BY A FORCE. THIS IS WHY SEATBELTS ARE IMPORTANT IN CARS—THEY STOP YOU FROM MOVING FORWARD IF THE CAR SUDDENLY BRAKES!

SECOND LAW (FORCE & ACCELERATION) – THE FORCE ON AN OBJECT IS EQUAL TO ITS MASS TIMES ITS ACCELERATION (F = MA). THIS MEANS HEAVIER OBJECTS NEED MORE FORCE TO MOVE THAN LIGHTER ONES.

THIRD LAW (ACTION & REACTION) – FOR EVERY ACTION, THERE IS AN EQUAL AND OPPOSITE REACTION. WHEN A ROCKET PUSHES DOWN ON THE GROUND, THE GROUND PUSHES THE ROCKET UPWARD!

TYPES OF MOTION

LINEAR MOTION

MOTION THAT MOVES IN A STRAIGHT LINE FROM ONE PLACE TO ANOTHER WITHOUT CHANGING DIRECTION. EXAMPLES INCLUDE A CAR DRIVING ON A ROAD, A SPRINTER RUNNING ON A TRACK, OR A FALLING APPLE.

ROTATIONAL MOTION

MOTION THAT OCCURS WHEN AN OBJECT SPINS AROUND AN AXIS. EXAMPLES INCLUDE A FERRIS WHEEL ROTATING, A SPINNING TOP, OR THE EARTH ROTATING ON ITS AXIS.

OSCILLATORY MOTION

MOTION THAT MOVES BACK AND FORTH IN A REPETITIVE PATTERN. EXAMPLES INCLUDE A SWINGING PENDULUM, A VIBRATING GUITAR STRING, OR A PLAYGROUND SWING MOVING UP AND DOWN.

WORK, ENERGY & POWER

WORK

WORK IS DONE WHEN A FORCE IS APPLIED TO AN OBJECT, CAUSING IT TO MOVE IN THE DIRECTION OF THE FORCE. IF NO MOVEMENT HAPPENS, NO WORK IS DONE, EVEN IF FORCE IS APPLIED! FOR EXAMPLE, PUSHING A SHOPPING CART, LIFTING A BOOK, OR PULLING A WAGON ALL INVOLVE DOING WORK. BUT PUSHING A WALL, DUE TO NO MOTION DOES NOT CONSTITUTE AS DOING WORK

ENERGY

ENERGY IS THE ABILITY TO DO WORK OR CAUSE CHANGE. EVERYTHING THAT MOVES OR FUNCTIONS NEEDS ENERGY. IT EXISTS IN MANY FORMS, SUCH AS MOTION, HEAT, AND SOUND. FOR EXAMPLE, WHEN YOU RUN, YOUR BODY USES ENERGY FROM FOOD. ENERGY CAN CHANGE FROM ONE FORM TO ANOTHER, BUT CAN NEVER BE CREATED

POWER

POWER IS THE RATE AT WHICH WORK IS DONE . IT TELLS US HOW QUICKLY SOMETHING CAN DO WORK. A POWERFUL CAR CAN ACCELERATE QUICKLY BECAUSE IT USES ENERGY FASTER. A PERSON RUNNING UP THE STAIRS QUICKLY NEEDS MORE POWER THAN SOMEONE WALKING UP SLOWLY. POWER IS IMPORTANT IN MACHINES, ENGINES AS IT DETERMINES HOW FAST SOMETHING CAN HAPPEN.

FORMULA-1

FORCES & MOTION:

F1 CARS MOVE BECAUSE THE ENGINE PUSHES THEM FORWARD, AND THE TIRES GRIP THE ROAD. THE FASTER A CAR GOES, THE HARDER IT IS TO STOP OR TURN!

AIR & SPEED

F1 CARS ARE SHAPED TO MOVE SMOOTHLY THROUGH AIR. A FORCE CALLED DOWNFORCE PUSHES THE CAR DOWN TO STOP IT FROM SLIDING, WHILE DRAG SLOWS IT DOWN BY RESISTING AIR.

TIRES & GRIP

TIRES ARE IMPORTANT. SOFT TIRES GRIP BETTER BUT WEAR OUT FAST, WHILE HARD TIRES LAST LONGER BUT HAVE LESS GRIP. THE RIGHT TIRES HELP THE CAR TURN SAFELY AT HIGH SPEEDS.

BRAKING & ENERGY

WHEN F1 CARS BRAKE, THEY DON'T JUST SLOW DOWN—THEY ALSO SAVE ENERGY! THIS ENERGY IS REUSED TO MAKE THE CAR GO FASTER AGAIN, HELPING DRIVERS MOVE AHEAD IN THE RACE.

EXPERIMENTS

BALLOON ROCKET: ATTACH A BALLOON TO A STRAW ON A STRING AND RELEASE THE AIR TO SEE NEWTON'S THIRD LAW IN ACTION!

ROLLING RACE: TAKE DIFFERENT-SIZED BALLS (SUCH AS A MARBLE, A TENNIS BALL, AND A SOCCER BALL) AND ROLL THEM DOWN A RAMP. OBSERVE HOW THEIR MASS AFFECTS HOW FAST THEY ACCELERATE AND HOW FAR THEY ROLL.

PENDULUM SWING: TIE A SMALL WEIGHT TO A STRING AND ATTACH IT TO A FIXED POINT. PULL THE WEIGHT BACK AND LET IT GO, OBSERVING HOW IT SWINGS BACK AND FORTH IN A REGULAR PATTERN.

QUIZ YOURSELF!

FILL IN THE BLANKS WITH THE CORRECT WORDS:
NEWTON'S FIRST LAW IS ALSO CALLED THE LAW OF _____.
THE FORCE ACTING ON AN OBJECT IS CALCULATED USING THE FORMULA _____.
DOWNFORCE HELPS F1 CARS STAY _____ ON THE TRACK.
WORK IS DONE WHEN A _____ MOVES AN OBJECT OVER A DISTANCE.
ACCELERATION IS HOW FAST AN OBJECT CHANGES ITS _____.

MATCH THE PAIRS:
LINEAR MOTION → (A) SWINGING PENDULUM
ROTATIONAL MOTION → (B) CAR MOVING ON A STRAIGHT ROAD
OSCILLATORY MOTION → (C) SPINNING WHEEL
DOWNFORCE → (D) HELPS F1 CARS STAY ON THE TRACK

TRUE OR FALSE?
DECIDE IF THE STATEMENTS BELOW ARE TRUE OR FALSE:
A CAR CAN ACCELERATE WITHOUT ANY FORCE ACTING ON IT. (TRUE / FALSE)
AIR RESISTANCE ALWAYS HELPS A MOVING CAR. (TRUE / FALSE)
KINETIC ENERGY IS ENERGY IN MOTION. (TRUE / FALSE)
A ROCKET TAKES OFF DUE TO NEWTON'S THIRD LAW. (TRUE / FALSE)
THE HEAVIER AN OBJECT, THE LESS FORCE IT NEEDS TO MOVE. (TRUE / FALSE)

ABOUT THE AUTHORS

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MY NAME IS ISHAAN KAPOOR AND I'M AN IBDP GRADE 11 STUDENT WITH A PASSION FOR PHYSICS. I SPECIFICALLY ENJOY THE STUDY OF ELECTRICITY AND WAVES. IN MY FREE TIME I ENJOY WATCHING FORMULA 1 AND CONDUCTING EXPERIMENTS

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HI, MY NAME IS RISHA AND I'M AN IBDP GRADE 11 STUDENT WITH A PASSION FOR PHYSICS AND ITS APPLICATIONS. I ENJOY READING, WRITING, FORMULA-1 AND PLAYING WITH LEGOS IN MY FREE TIME!