Physics (New Book) - 9th Class Physics Chapter 3 Long Question Preparation

Q1. Write differences between mass and weight

Ans 1: Mass: Mass o a body is the quantity of matter possessed by the bodyits a scaler quantityit is measured by using a common balance(beam balance)it remains same everywherethe SI unit of mas is kilogram(kg)it is a base quantity

Ans 2: Weight: weight of a body is the force of gravity acting on itit is a vector quantityit is measured by using a spring balanceit varies depending upon the value of acceleration due to gravity gthe SI unit of weight is newton(N)it is a derived quantity

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Q2. Explain Centripetal force and Drive $F_c = mv^2/r$.

Ans 1: A force that keeps a bodyto move in a circle is known as centripetal force.
Explanation:
Consider a body tied at the end of a string moving with uniform speed in a circular path. A body has the tendency to move in a straight line due to inertia. The string to which body is tied keeps it to move in a circle by pulling the body towards the center of the circle. The sting pulls the center of the circle .the string pulls the body perpendicular to its motion. The pulling force continuously changesthe direction of motion and remains towards the center seeking force is called the centripetal force.
Equation:
Fc = ma,
So ma,+ mv^2/r
$a,=v^2/r$

Q3. Define rolling friction. Also explain why rolling friction is less than sliding friction

Ans 1: Rolling friction: force of friction between body and surface when a body rolls over a surface e.g. when a wheel rolls on ground

Ans 2: Sliding friction: force of friction between body and surface when a body slides over a surface. when a wooden block moves over asurface of table then the force friction between block and surface of table is sliding friction

Ans 3: Comparison of rolling and sliding friction: rolling friction is less than sliding friction because in rolling friction a body rolls without rupturing the cold welds , while in sliding friction a body slides' by rupturing the cold welds so sliding friction is more than rolling friction

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Q4. State the Newton's first law of motion & Second law of motion.

Ans 1: Newton first law:
A body continues in its state of rest or of uniform motion in a straight line provided no net force acts on it.
Explanation for rest:
Similarly Newton's first law of motion deals with bodies which are either at rest or moving with uniform speed in straight lineAccording to first law of motion, a body at rest remains at rest provided no net force on it .thispart of the law is true as we observe that objects do not move by themselves unless some moves it.
Explanation for motion:
Similarly a moving object does not stop moving by itself. A ball rolled on a rough ground stops earlier than that rolled on smoothground. It is because rough surface offer greater friction. If there would be no force of oppose the motion of the body would

never stop
Newton's Second Law of Motion:
When a net force acts upon a body, it produces as acceleration in the body in the direction of force and the magnitude of acceleration is directlyproportional to the net force and is inversely proportional to the mass of the body.
Mathematical From:
If the force f is acting on the body of mass m then we can write this in the mathematical form is as
a x f _____>(1)
a x 1/m _____> (2)
From (1) and (2) we have
a x F/m
a = Constant x F/m
a = k x F/m
In the above equation according to the international system units if m= 1kg
a = 1ms-²,F= 1N then the value of k will be 1. So the equation can be written as
a=1x F/m
F= ma

Q5. A force of 20 N moves a body with an acceleration of 2ms-² What is the mass.

Ans 1: F = 20 N
a= 2ms-²
m=?
Solution:
F=ma
So m= 20/2
m = 10 kg

Q6. Derive tension and acceleration when one body move vertically and other body move horizontally

Ans 1: Consider two bodies A and B of masses m1 and m2 respectively attached to the ends of an inextensible string. Let the body A moves downward with an acceleration a. Since string is inextensible , therefore, body B also moves over the horizontal surface with the the same acceleration. As the pulley is frictionless, hence tension T will be the same throughout the string.

Ans 2: Body A : since body A moves downward, therefore, its weight m11g is greater than the tension T in the string. Net force acting on body A =m1g-TF=m1aby comparing both we getm1g-T= m1a

Ans 3: Body B: the force acting on body B are:weight m2g of the body B acting downward.Reaction R of the horizontal surface acting on body B in the upward directionTension T in the string pulling the body B horizontally over the smooth surfaceas body B has no vertical motion, hence resultant of vertical forces(m2g and R) must be zero.Thus, the net force acting on body B is TAccording to Newtons second law of motionT=m2aby addingm1g-T+T= m1a+m2am1g=m1a+m2am1g=a(m1+m2)a+m1g/m1+m2by putting the value of a in equation to get tension TT= m2(m1g/m1+m2)T=m1m2g/m1+m2

Q7. Derive relation for tension and acceleration when two bodies moving along vertically

Ans 1: Consider two bodies A and B of masses m1 and m2 respectively. Let m1 is greater than m2. The bodies are attached to the opposite ends of an inextensible string. The string passes over a frictionless pulley. The body A being heavier must be moving downward with some acceleration. Let this acceleration be a. At the same time, the body B attached to the other end of the string moves up with the same acceleration a. As the pulley is frictionless, hence tension will be the same throughout the string. Let the tension in the string be T.

Q8. Explain Newtons first law of motion

Ans 1: Statement: A body continues its state of rest or of uniform motion in a straight line provided no net force acts on it.

Ans 2: Explanation: first law of motion deals with bodies which are either at rest or moving with uniform speed in a straight line. According to Newtons first law of motion, a body at rest remains at rest provided no net force acts on it.

Ans 3: At rest: this part of the law is true as we observe that object do no move by themselves unless someone move them. For example a book lying on a table remains at rest as long as no force acts on it

Ans 4: At uniform speed: similarly a moving object does not stop move by itself. A ball rolled on a rough ground stops earlier than that rolled on a smooth ground. It is because rough surfaces offer greater friction. If there would be no force to oppose the motion of a body then the body would never stop

Ans 5: Law of inertia: Since Newtons first law of motion deals with the inertial property of matter , therefore , Newtons first law of motions is also known as law of inertia
Example: We have observed that the passengers standing in a buss fall forward when its driver applied breaks suddenly. it is because the upper parts of their bodied tend to continue their motion , while lower parts o their bodies in contact with the bus stop with it. Hence they fall forward

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Q9. Explain braking and skidding

Ans 1: The wheels of moving vehicles have two velocity componentsmotion of wheels along the roadrotation of wheels about their axisto move a vehicle on the road as well as to stop a moving vehicle requires friction between its tyres and the road. For example, if the road is slippery or the tyre are worn out then the typre instead of rolling, slip over the road,The vehicle will not move if the wheels starts slipping at the same point on the slipper ty road. Thus for the wheels to roll, the force of friction9gripping force 0 between the tyres and the road must be enough that prevents them from slipping.if we want to stop a car quickly, a large force of friction between the tyres and the road is needed. But there is a limit to this force of friction that tyres can provide. If the breaks are applied too strongly, The wheels of th car will lock up (stop turning) and the car will skid due to its large momentum. If we want t o reduce the skidding, it is necessary not to apply breaks too hard that lock up their rolling motion. It is unsafe to derive a vehicles wit worn out tyres .

Q10. Explain law of conservation of momentum? Also drive its formula?

Ans 1: The momentum of an isolated system of two or more than two or more than two interacting bodies remain constant.
An isolated system is a group of interacting bodies on which no external force is acting . IF no unbalanced on net force acts on a system then its momentum remains constant.
Consider a system of gun and a bullet. Before firing, the Velocity of the bullets as well as that of gunwas zero. therefore the total momentum of both the objects was also zero.
we can write it as,
Total momentum of gun and bullet before fixing =0
When the gun is fired bullet shoots out of guns and acquire momentum.To converse momentum the qunrecoils backward. Now according to the law of conversation of momentum, the total momentum of the gun and bullet will also be zero after the gun is fired. let m be the mass of the bullet and v be its velocity on firing the gun; M be the mass of the gun and V is the Velocity with which it recoids. thus the total momentum of the gun is fired will be: The momentum of the gun and the bullet after the gun is fired = Mv+ mv
According to the law of conversation of momentum.
Total momentum before firing = Total momentum after firing
MV + mv=0
Mv =-mv
or v=-m/M v
