1. Nature of physical quantities

Conceptal Questions:-

1. Why is it convenient to express the distance of stars interms of light year (or) parsec rather than km?

As the distance of the star are extraordinarily large, so it is convenient to express than in light year and parsec rather than in km.

2. Show that a screw gauge of pitch 1mm and 100 divisions is more precise than a vernier caliper with 20 divisions on the sliding scale?

Precision depends on least count of the instrument. Smaller the least count more precise the measurement. Since least count of the screw gauge (0.001cm) is less than the least count of the vernier caliper (0.01cm). It is proved.

3. If humans were to settle on other planets which of the fundamental quantities will be in trouble? Why

Time is not running at the same rate everywhere. Einstein's theory show that time given by a clock depends on the clock relative speed with respect to an observer. As a result there is an gravity time dilation.

5. Why dimensional methods are applicable only upto three quantities?

Because on equating the power of M, L, T on either side of the dimensional quantities we can obtain 3 equations from which only 3 unknown dimensions can be calculated.

4. Having all units in atomic standards is more useful. Explain.

It became neccessary to redefine units in atomic standard because the prototype offered the following difficulties.

(i) It is difficult to preserve the prototype.
(ii) It is difficult to reproduce replica.
(iii) The techniques used are not of high accuracy.

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3. Law Of Motion.

1. why it is not possible to push a car from inside?

Push on the car by the person and force exerted by the car on the person are thrush equal and opposite they are internal forces. An object cannot move under the influence of Internal force.

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2. There is a limit beyond which the polishing of a surface increase frictional resistance rathan than decreasing why?

when surfaces are highly polished, area of contact between them increases. As a result of large number of atoms and molecules lying on the both the surfaces. There is a strong force of attraction on each other. Therefore frictional force increases.

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3. Can a single isolated force exist in nature? Explain your answer?

No, According to Newton's III Law, forces always exist in pairs.

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4. why does parachute descend slowly?

Because it attains terminal velocity. weight of the parachute and its content and is balanced by viscous drag and force of buoyancy.

5. When walking on ice one should take short steps. why?

When we take big steps the angle of our leg with vertical increases. Hence normal reaction component increases, which promotes slipping. So it is advisable to take small step to avoid slipping.

6. When a person walks on surface, the frictional force exerted by the surface on the person is opposite to the ~~motion~~ direction of motion. True or false?

False. Because when the person walk he pushes the ground in the backward direction with his foot and force of friction acts in the forward direction. (ie) In the direction in which man walks.

7. Can the coefficient of friction be more than one?

Yes. The coefficient of friction is less than one for normal surfaces. when surfaces are irregular, they have cavities and minute projection on them. So, coefficient of friction may ~~exceeded~~ unity.

8. Can we predict the direction of motion of a body from the direction of force on it?

It is possible to predict the direction of motion with the help of resultant force of various forces acting on the body

9. The momentum of a system of particles is always conserved. True or false?

True, when the system is isolated and no external force acts on it.

4. Work, Energy and Power.

1. A Gardener pushes a lawn roller through a distance of 20m. If he applies a force of 20kgwt in a direction inclined at 60° to the grounds, find the workdone by him. Take $g = 9.8\ ms^{-2}$

Ans: Here, $F = 20kgwt = 20 \times 9.8\ N$

$S = 20m, \quad \theta = 60°$

$W = Fs\cos\theta = 20 \times 9.8 \times 20 \times \cos 60°$

$= 20 \times 9.8 \times 20 \times 0.5 = 1960J.$

2. Can a body have energy without momentum?

Yes, there is an internal energy in a body due to the thermal agitation of the particles of the body, while the vector sum of the momenta of the moving particles may be zero.

3. When is the exchange of energy maximum during an elastic collision?

Energy exchange will be maximum if the two colliding bodies are of equal masses.

4. Is whole of the kinetic energy lost in any perfectly inelastic collision?

No, only that much amount of kinetic energy is lost as is necessary for the conservation of momentum.

5. A spark is produced, when two stones are struck against each other. Why?

The work done in striking the two stones against each other gets converted into heat. This appears as a spark.

6. Why a metal ball rebounds better than a rubber ball?

When a rubber ball hits a massive object, say earth the ball is destroyed. A large amount of heat is generated in the ball by the rubbing of the rubber molecules against each other. This effect is essentially absent in a hard material. So a metal ball would often loss less energy upon collision than would a rubber ball.

7. If energy is neither created nor destroyed what happens to the so much energy spent against friction?

The energy is dissipated in the form of heat. The heat energy so produced is not available for work.

8. The earth moving around the sun in a circular orbit is acted upon by a force and hence work must be done on the earth. Do you agree this statement?

The statement is wrong. The earth revolves around the sun under the force of attraction of the sun. This force (centripetal) is always perpendicular to the motion of the earth. Therefore $\theta = 90^\circ$ and $W = FS\cos 90^\circ = 0$. Hence, sun does to work on the earth.

5. Motion of System of particles and Bodies.

1. when a tree is cut, the cut is made on the side facing the direction in which the tree is required to fall? why?

Because, the side on which the cut is made is no longer supported by the normal force from the bottom, therefore torque acts on the tree such that it falls on the side as anticipated

2. why does a porter bend forward while carrying a sack of rice on his back?

when a porter carries a sack of rice, CG shifts from the body's line of gravity. However, once the porter bends, the CG realigns with body's line of gravity and making the porter balanced

3. Why is it much easier to balance a meter scale on your finger tip than balancing on a match stick?

A metre scale CG is much above its base. on the other hand. The match stick has its CG much lower as compare to a metre scale. Higher the CG easier it is to balanced.

4. Two identical water bottles one empty and the other filled with water are allowed to roll down an inclined plane. which one of them reaches the bottom first? Explain your answer?

Watter filled bottled reaches the bottom first than the empty bottle. Because water filled bottle are much more massive than the empty bottle, so reaches the bottom quickly.

5. Give an example to show that the following statement is false. "any two forces acting on a body can be combined into single force that would have same effect."

consider force to the left on the top of a wheel, and an equal force to the right on the bottom of a wheel. The resultant force by vector addition is zero. But the effect on the plane is not zero.

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