CLASS 9 (CBSE) CT-4S DT: 24/1/18

SOLUTIONS — PHYSICS

SECTION A

3. A stretched bow possesses potential energy due to the change in its shape. To shoot an arrow, the bow is released. The potential energy of the bow is converted into the kinetic energy of the arrow.

6. (a) By moving his hands backwards, the cricket player increases the time of catching the ball. As a result, the rate of change of momentum is small and the force exerted on his hand is less. So he is less likely to be hurt.

(b) $m = 150g = 0.15kg$

$u = 30m/s$

$v = 0m/s$

$t = 0.05s$

$$F = m\left(\frac{v-u}{t}\right)$$

$$\Rightarrow F = (0.15)\left(\frac{0-30}{0.05}\right)$$

$$= -\frac{15 \times 30}{5}$$

$$= -90N$$

$\therefore$ Force is 90N in opposite direction

8.(a) Inertia is the natural tendency of a body to resist any change in its state of rest or of uniform motion in a straight line.

(b) The different types of inertia are:

(i) Inertia of rest

(ii) Inertia of motion

(iii) Inertia of direction

(c) The mass of a body is the measure of its inertia. Greater the mass of the body, greater is its inertia.

eg:- If we kick a football, it flies a long way. But if we kick a stone of the same size, it hardly moves. The stone resists a change in its motion better than the football because of its greater mass. Thus the stone has more inertia than the football.

9.(a) No, the acceleration due to gravity 'g' of earth is not constant. It varies with:

(i) Latitude – Since the radius of the earth at the poles is minimum, the value of 'g' is maximum at the poles. And since the radius of the earth at the equator is maximum, the value of 'g' is minimum at the equator.

(ii) Altitude – As we go up from the surface of the earth, the distance from the centre of the earth increases, and hence the value of 'g' decreases. The value of 'g' is maximum on the surface of the earth and decreases on going above the surface of the earth.

(b) $u = 15 m/s$, $v = 0$, $g = 9.8 m/s^2$, $h = ?$

$$v^2 - u^2 = 2gh$$

$$\Rightarrow 0 - (15)^2 = -2 \times 9.8 \times h$$

$$\Rightarrow h = \frac{15 \times 15}{2 \times 9.8}$$

$$\Rightarrow h = 11.48 m$$

10.(a) If a body moves with uniform speed along a circular path, it is said to be in uniform circular motion.

eg:- (i) A cyclist moving along a circular track at constant speed

(ii) Motion of motion around the Earth.

(b) $r = 10.5 cm$ $\quad \pi = \frac{22}{7}$ $\quad t = 60 s$

$= 0.105 m$

$$v = \frac{2\pi r}{t}$$

$$\Rightarrow v = 2 \times \frac{22}{7} \times \frac{0.105}{60} = \frac{2 \times 22 \times 105}{7 \times 60 \times 1000}$$

$$= \frac{11}{1000} = 0.011 m/s$$

13. (a) Energy is the ability or capacity of a body to do work.

SI unit of energy is 'Joule'.

(b) The energy possessed by a body by virtue of its motion is called kinetic energy.

Consider a body of mass 'm' moving with a uniform velocity 'u'. It is displaced through a distance 's' when a constant force 'F' acts on it in the direction of displacement

Work done $W = Fs$ ——(i)

This work done causes a change in its velocity from 'u' to 'v' and 'a' is the acceleration produced.

We know that, $v^2 - u^2 = 2as$

$$\Rightarrow s = \frac{v^2 - u^2}{2a} \quad \text{——(ii)}$$

We also know that, $F = ma$ ——(iii)

Using (ii) & (iii) in eq.(i) we get,

$$W = (ma)\left(\frac{v^2 - u^2}{2a}\right)$$

$$\Rightarrow W = \frac{1}{2}m(v^2 - u^2)$$

If the object is starting from rest, the $u = 0$., then

$$W = \frac{1}{2}mv^2$$