**2020 Sec 3 Physics Work, Energy, Power Assignment 6**

**Answers**

**Note:**

- When applying the principle of conservation of energy, use this approach:
  1. write down the word equation (including types of energy & change of energy)
  2. write down the corresponding equations using symbols
  3. simplify the equation before substitution of numerical values
  4. evaluate the answer (units, s.f., magnitude, sign)

**1.** **(a)** Gain in GPE = mgh = 500 x 10 x 12 = **60 000 J**

**(b)** Power developed = Work done by crane/ time taken
= 60 000 J / 60 s
= 1000 W

**(c)**

$$\text{Efficiency} = \frac{\text{energy gained by load (output)}}{\text{energy supplied to crane (input)}} \times 100\ \%$$

$$\text{Energy supplied} = \frac{100\ \%}{60\ \%} \times 60\,000\ \text{J}$$

$$= 100\,000\ \text{J}$$

2. (a)

$v = u + at = 2.0\ (4.0) = 8.0\ m\ s^{-1}$

work done by car = gain in K.E. + gain in G.P.E.
= $(\frac{1}{2}\ mv^2 - 0) + mgh$
= 16 000 J + 60 000 J
= 76 000 J(2sf)

(b) Work done by car = Work done by thrust force
= (thrust force) x distance travelled by car = F x d

Distance travelled by car, $d = ut + \frac{1}{2}\ at^2 = \frac{1}{2}\ (2)\ (4.0)^2 = 16$ m
Therefore, 76 000 = (thrust force) (16)
Thrust force = 4800 N (2sf)

**Note**: cannot apply F = ma, where F is net force!

3. (a) Work done by resistive force against bullet = loss in KE of bullet

$F \times d = \frac{1}{2}\ mv^2$

$F \times 0.23 = \frac{1}{2}\ (0.015)\ 410^2$

Average force, F = 5500 N (2sf)

(b) Thermal energy = 85% x $\frac{1}{2}$ (0.015) $410^2$
= 1100 J (2sf)

4. (a)

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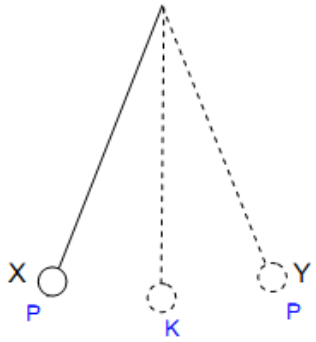


(b) X' is at a <u>greater height</u> compared to X, which means that the <u>pendulum starts with greater GPE</u>, which will all be <u>converted to KE</u> at the lowest point.

Thus, the <u>maximum KE attained increases</u>.

(c) Position M. When the pendulum is at a **vertical** height midway between X' and the lowest point of the pendulum, its KE is equal to its PE.

(d)There is negligible energy loss to the surroundings.

The End