University of Jordan – Department of Physics – PHY 101
Second Exam – December 13, 2014 – (9:30 – 10:30) am

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إسم الدكتور: السيد العزام ---- رقم الشعبة أو وقت المحاضرة: الأحد

Given: ($g = 9.8\ m/s^2$)

Circle the letter of the correct answer ضَعْ دائرةً حولَ حرْفِ الإجابةِ الصّحيحةِ

1.	A	B	C	D	E
2.	A	B	C	D	E
3.	A	B	C	D	E
4.	A	B	C	D	E
5.	A	B	C	D	E
6.	A	B	C	D	E
7.	A	B	C	D	E
8.	A	B	C	D	E
9.	A	B	C	XXX	XXX
10.	A	B	C	D	E
11.	A	B	C	D	E
12.	A	B	C	D	E

1.

A 1 kg particle undergoes a circular motion. At certain moment, the magnitude of the tangential and radial accelerations is 1.2 and 1.3 m/s^2 respectively.
The magnitude of the total acceleration (in m/s^2) for the particle at this moment is:

A) 1.8 B) 1.2 C) 2.5 D) 0.1 E) 1.3

2.

A spring is stretched 5.00 cm from its equilibrium position. If this stretching requires 30.0 J of work, the spring constant (in kN/m) is:

A) 24 B) 6 C) 12 D) 0.3 E) 1.3

3.

A 1.5 kg ball has a speed of 20 m/s when it is 15 m above the ground.
The total energy (in J) of the ball is:

A) 80 B) 300 C) 520 D) 220 E) 0

4.

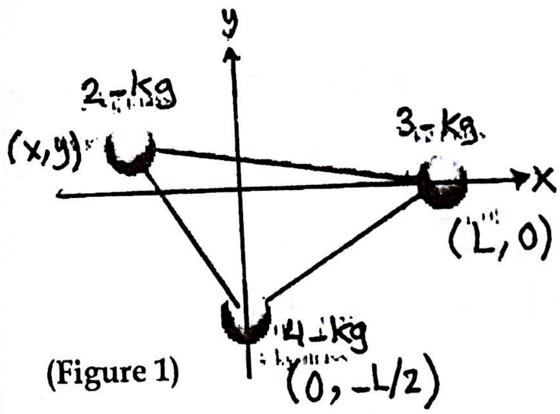
A 1500 kg car accelerates from 0 to 25 m/s in 7 s.
The average power delivered by the engine (1 hp = 746 W) is:

A) 60 hp B) 80 hp C) 90 hp D) 70 hp E) 180 hp

5.

The coordinates of the center of mass for the system shown in **Figure 1** are (L/4, -L/5).
The coordinates of the 2-kg mass is:

A) (-5L/8, 3L/10) B) (-11L/8, 9L/10)
C) (-5L/8, L/10) D) (-3L/8, L/10)
E) (-L/4, L/4)



(Figure 1)

6.

Consider a particle of mass m moving with linear momentum $\vec{p}$.

This particle is located at the vector position $\vec{r}$. The term $\left[\frac{d^2\vec{r}}{dt^2} \times \frac{d\vec{p}}{dt}\right]$ gives:

A) Force B) 0 C) Impulse D) Acceleration E) Velocity

7.

A 4 kg particle is subjected to a force acting in the x-direction, $F_x = (3+0.5x)$ N.
The work (in J) done by the force as the particle moves from x=0 to x=4 m is:

A) +20 B) -5 C) +16 D) 0 E) +5

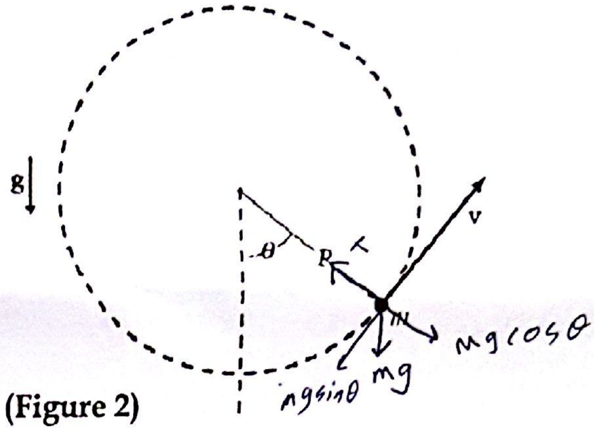
8 & 9

power unit

8.

A 0.30 kg mass attached to the end of a string swings in a vertical circle (R = 1.6 m), as shown in **Figure 2**. At an instant when $\theta = 50°$, the tension in the string is 8.0 N.
The magnitude of the resultant force (in N) on the mass at this instant is:

A) 5.6 B) 6.5 C) 6.1 D) 2.3 E) 5.1



(Figure 2)

9.

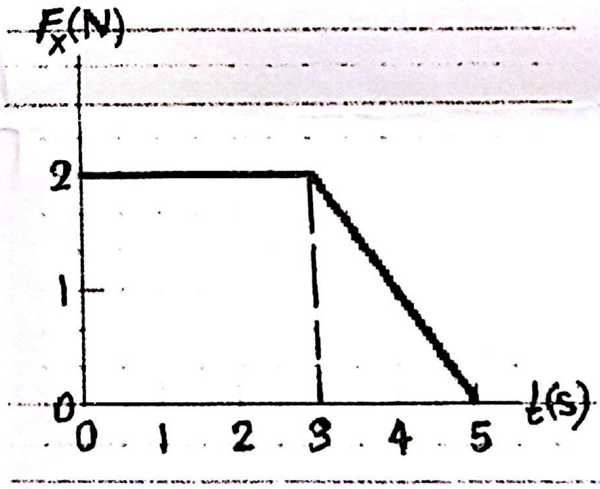
While the mass is passing the instant of the previous question ($\theta = 50°$) and moving forward, the speed when $\theta = 51°$ is:

A) Larger B) The same C) Smaller

10.

Figure 3 represents the magnitude of the net force (in N) exerted on a 3 kg mass. The magnitude of the impulse (in N.s) for the time interval between 2 and 5 s is:

A) 0 B) 2 C) 1
D) 8 E) 4



(Figure 3)

11.

A 10 kg object is dropped from rest. After falling a distance of 50 m, it has a speed of 26 m/s. The work (in kJ) done by the air resistive (friction) force on the object during this fall is:

A) -1.3 B) -1.5 C) -1.8 D) -2.0 E) -2.3

12.

A 0.28 kg ball has an elastic, head-on collision with a second ball that is initially at rest. The second ball moves off with half the original speed of the first ball.
The mass (in kg) of the second ball is:

A) 0.14 B) 0.84 C) 0.42 D) 0.56 E) 0.28

m = 1 kg

① $a_t = 1.2$

$a_c = 1.3$

$a_{total} = \vec{a_t} + \vec{a_c}$

$\sqrt{(1.2)^2 + (1.3)^2}$

$30 = \frac{Kx}{2}$

$W = 30$ J

①

K (KN/m)

$\frac{60}{x^2} = K = 24000$ N/m

m = 1 kg $a_t = 1.2$ $a_r = 1.3$

$a_t = \vec{a_t} + \vec{a_r}$

$= \sqrt{(1.2)^2 + (1.3)^2}$

x = 0.05 m

EPE = -30 J

$K = \frac{60}{x^2}$

$EPE = \frac{Kx^2}{2}$ $60 = Kx^2$

③ m = 1.5 Kg

speed = 20 m/s

h = 15 m

$W_f - W_f = \Delta KE + \Delta GPE$

mgy = 220.5

KE = 300

④ m = 1500 Kg

$P_{avg} = \frac{\Delta W}{\Delta t}$ 7

$W_f = \Delta KE$ 6

$= \frac{mv_f^2}{2} - \frac{mv_i^2}{2}$

66964.3 W → x

1 hp

87

⑤ (L/4, -L/5)

$\frac{3L + 0 + 2X}{3 + 4 + 2} = \frac{L}{4}$ 9

m = 1500 Kg

$U_i = 0 \rightarrow U_f = 25$] 7s

$P = \frac{\Delta W}{\Delta t}$

$W_e = \Delta KE = \frac{m}{2} U_f^2$

$2KX = \frac{L}{2}$

$\frac{3(0) + 2y + 2L}{9} = \frac{-L}{5}$

9L = 12L + 8X

8X = 9L - 12L $= \frac{-3}{8}L$

-9L = 10y - 10L

10y = L $y = \frac{L}{10}$

$\frac{dr}{dt}$ X F

$\vec{a} \times \vec{F}$

$\vec{F} = k\vec{a}$

θ = 0

⑥ $\frac{d^2r}{dt}$

$\vec{a} \times \vec{F} = |F||a|\sin\theta$ 0

$\vec{F} = m\vec{a}$

⑦ m = 4 Kg

$|F||a|\sin\theta$

$|F||a|\sin\theta = 0$

$W = \int_0^4 F_x \, dx$

$= \left(3X + \frac{0.5X^2}{2}\right)\Big]_0^4$

(12 + 4) - 0

m = 4 Kg

$F_x = 3 + 0.5X$

$W = \int_0^4 F_x \, dX$

$3X + \frac{0.5X^2}{2}\Big]_0^4$

12 + 4

m = 1.5 kg

speed 20 m/s

h = 15 m

W = ΔKE + GPE

$= \frac{mv^2}{2} + mgy$

= 300 + 220.5

= 520.5

θ = 0

$\vec{a} \otimes \vec{F}$

$\frac{L}{4} = \frac{3L + 2X}{9}$

9L = 12L + 8X

$8X = \frac{-3}{8}L$

$-\frac{L}{5} = \frac{-2L + 2y}{9}$

-9L = -10L + 10y

L = 10y

8) $m = 0.3\,kg$

$R = 1.6\,m$

$\theta = 50$

$T = 8N$

power unit

$T - mg\cos\theta = \frac{mv^2}{R} \rightarrow ① \Rightarrow F_c =$ ~~f.84~~ (6.1)

9f) (mg sin θ) $F_t = $ (2. 25)   (Fc) + (Fb) $mg\sin\theta \Rightarrow 2.3$

→ $T - mg\cos\theta = (6.1)$

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a) Smaller

10) $M = 3\,kg$

(2 – 5)

①

(2 – 3) (+) (3 – 5)

1×2 (+) $\frac{1}{2}(2)(2)$

2 (+) = 2 = 4

2 – 3 (+) 3 – 5

1×2 (+) $\frac{1}{2}(2)(2)$

2 (+) 2 = (4)

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11) $m = 10\,kg$, $v_i = 0$, $y = -50\,m$, $v_f = -26\,m/s$

~~W_f~~ $- W_f = \Delta KE + \Delta GPE$

$-W_f = \frac{mv_f^2}{2} + mgy$

$= 3380 - 4900$

$W_f = -1520$

$M = 10\,kg$, $v_i = 0$, $y = -50\,m$, $v_f = -26$

~~W_f~~ $- W_f = \Delta KE + \Delta GPE$

$W_f = \frac{mv^2}{2} - mgy$

$= 3380 - 4900$

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12) $m = 0.28\,kg$,

$v_{2i} = 0$, $v_{2f} = \frac{1}{2} v_{1i}$

(M_2)

$\vec{P_i} = P_f$

$0.28 v_{1i} + 0 = 0.28 v_{1f} + \frac{M_2 v_{1i}}{2}$

$0.28 v_{1i} = -\frac{0.28 v_{1i}}{2} + \frac{M_2 v_{1i}}{2}$

$\Delta v_i = -\Delta v_f$

$v_{1i} - 0 = v_{2f} - v_{1f}$

$v_{1i} = \frac{1}{2} v_{1i} - v_{1f}$

$v_{1f} = \frac{1}{2} v_{1i} - v_{1i}$

$v_{1f} = -\frac{1}{2} v_{1i}$

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