Benha University
1st Term Exam (January 2016) Final Exam
Class: 1st Year Students
Subject: Physics (I)

Faculty of computer & informatics
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Time: 3 Hs.
Examiners: Dr. Tarek Yousif & Dr. Salah Hamza

د طارق يوسف
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الفرقة: الأولي

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نموذج إجابة مادة الفيزياء

Q1) Choose the correct answer and shaded its circle in the answer sheet: [18 marks]

1. The equation $\eta = \frac{\pi PR^4}{8\upsilon\ell}$ where (η) the coefficient of viscosity (P) pressure, (R) radius, (υ) velocity, and (ℓ) length, is dimensionally
   (a) Correct (b) Incorrect (c) No answer

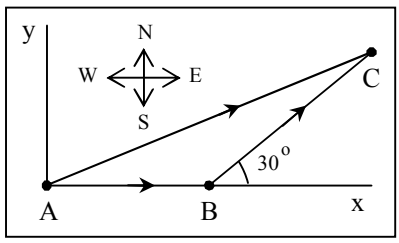
2. The slope of the velocity versus time graph gives:
   (a) acceleration (b) velocity (c) average velocity

3. Chose the correct answer:
   (a) $\upsilon = \upsilon_o t + \frac{1}{2}at^2$ (b) $\Delta x = \upsilon_o + at$ (c) $\Delta x = \frac{1}{2}(\upsilon_o + \upsilon)t$

4. If the position of a moving car fits the relation $x = (5 + 0.24t)t$, its acceleration is:
   (a) $0.48\,m/s^2$ (b) $0.24\,m/s^2$ (c) $5\,m/s^2$

5. Which of the following two particles has an acceleration? Particle P_1 moving in a straight line with constant speed or particle P_2 moving around a curve with constant speed?
   (a) P_1 (b) P_2 (c) non of the above

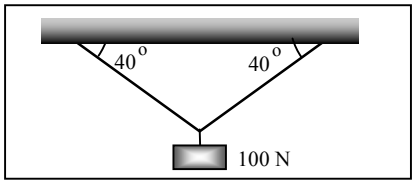
6. An airplane, see the figure, flies 200 Km due to east from city A to city B and then 300 km in the direction of 30^o north of east from city B to city C. How far city C from City A?
   (a) 609.88 km (b) 435.89 km (c) 483.72 km



7. Take three steps, turn 90^o, and then walk four steps. Now count the number of steps it takes to walks in a straight line back to your starting point.
   (a) 5 steps (b) 7 steps (c) 3.5 steps

8. A care of mass 1200 kg travels with constant speed of 20 m/s. The affected force on it is
   (a) 24000 N (b) zero (c) 24000 dyne

9. The tension in the two wires that support the 100 N object as in the figure is
   (a) 50 N (b) 77.79 N (c) 100 N



10. A $2000\,\text{kg}$ is slowed down from $20\,\text{m/s}$ to $5\,\text{m/s}$ in $4\,\text{s}$. The force affected on the car is

(a) $5700\,\text{N}$ (b) $7500\,\text{N}$ (c) $-7500\,\text{N}$

11. In U.S. system of units, the Newton is equivalent to

(a) $\text{N} \equiv \text{kg}\cdot\text{m}^{-2}\cdot\text{s}^{2}$ (b) $\text{N} \equiv \text{kg}\cdot\text{m}\cdot\text{s}^{-2}$ (c) $\text{N} \equiv \text{kg}\cdot\text{m}^{2}\cdot\text{s}^{-2}$

12. In general, the work-energy theorem states that

(a) $\Delta\text{K.E} + \Delta\text{P.E} = 0$ (b) $\text{W} = \Delta\text{K.E} - \Delta\text{P.E}$ (c) $\text{W} = \Delta\text{K.E} + \Delta\text{P.E}$

13. If dimensions of Young's modulus is given by:

(a) $\text{ML}^{-2}\text{T}^{2}$ (b) $\text{ML}^{-1}\text{T}^{-2}$ (c) $\text{ML}^{2}\text{T}^{-2}$

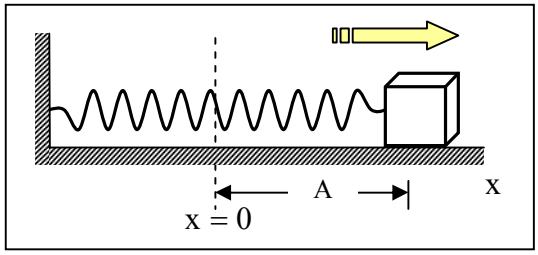
14. A vertical steel wire ($\text{Y} = 2\times10^{11}\,\text{Pa}$) of length $4\,\text{m}$ is under vertical pressure $0.75\times10^{7}\,\text{Pa}$. The distance the wire is compressed is

(a) $1.5\times10^{4}\,\text{m}$ (b) $1.5\times10^{-4}\,\text{m}$ (c) $15\times10^{-4}\,\text{m}$

15. The conservation of energy law in fluids is given by

(a) $\text{P} + \frac{1}{2}\rho\upsilon^{2} + \rho\text{gh} = \text{const.}$ (b) $\text{A}/\upsilon = \text{const.}$ (c) $\text{A}\upsilon = \text{const.}$

16. A block on the end of a spring (see the figure) is pulled to a position $\text{x} = \text{A}$ and released. Through what total distance does it travel in one full cycle of its motion? (note that the block is in equilibrium if it is at $\text{x} = 0$).



(a) 2A (b) 4A (c) A

17. If the velocity of simple pendulum fits the relation $\upsilon = -0.25\cos\left(\frac{\pi}{8}\text{t}\right)$, its angular frequency is:

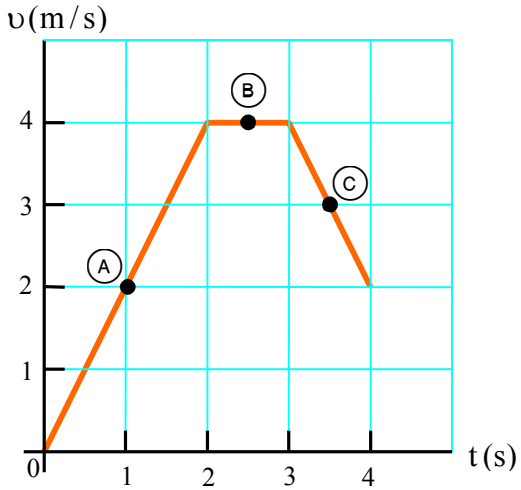
(a) $0.393\,\text{rad/s}$ (b) 0.25 (c) $0.25\pi/8$

18. Pendulum of length $0.171\,\text{m}$ gives period $0.833\,\text{s}$. What is the value of g in this location?

(a) $7.93\,\text{m/s}^{2}$ (b) $9.73\,\text{m/s}^{2}$ (c) $9.37\,\text{m/s}^{2}$

2. A baseball player moves in a straight line path in order to catch a fly ball hit to the out field. His velocity as a function of time is shown in the figure. Find his instantaneous acceleration at points Ⓐ, Ⓑ and Ⓒ.

[9 marks]



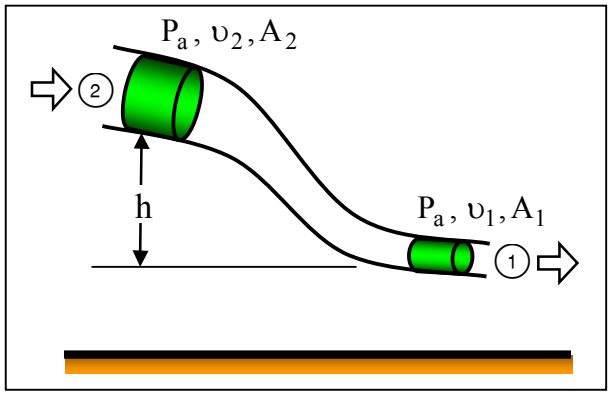
Answer

At Ⓐ $a = 2\,m/s^2$

At Ⓑ $a = 0\,m/s^2$

At Ⓒ $a = -2\,m/s^2$

3. A large pipe with cross sectional area of $1\,m^2$ descends $5\,m$ and narrows $0.5\,m^2$ Fig.(2). If the pressure at point ① and ② is atmospheric pressure, find the speed of the water leaving the pipe. **[9 marks]**



Answer

$$\upsilon = \sqrt{\frac{2gh}{(1 - A_1/A_2)^2}} = 11.4 \ \ m/s$$

3. A 1 200 kg car traveling initially with a speed of 25.0 m/s in an easterly direction crashes into the rear end of a 9 000 kg truck moving in the same direction at 20.0 m/s. The velocity of the car right after the collision is 18.0 m/s to the east. (a) What is the velocity of the truck right after the collision? (b) How much mechanical energy is lost in the collision? [9 marks]

---------- **Answer** ----------

M1 = 1200 kg M2 = 9000 Kg

V1i= 25 m/s V2i = 20 m/s

V1f = 18 m/s V2f = ?

M1 V1i + M2 V2i = M1 V1f + M2 V2f

1200 Kg * 25 m/s + 9000 kg* 20 m/s = 1200 kg * 18 m/s + 9000 kg * V2f

V2f = 21 m/s

4. A 0.40-kg object connected to a light spring with a force constant of 19.6 N/m oscillates on a frictionless horizontal surface. If the spring is compressed 4.0 cm and released from rest, determine (a) the maximum speed of the object, (b) the speed of the object when the spring is compressed 1.5 cm, and (c) For what value of x does the speed equal one-half the maximum speed?

---------- **Answer** ----------

M = 0.4 kg A = Xmax = 0.04 m K = 19.6 N/m

1/2 K x12 + 1/2 m V12 = 1/2 K x22 + 1/2 m V22

So 1/2 K xmax2 + 1/2 m Vmax2

So a) Vmax = √(K xmax2/m) = 0.28 m/s

b) 1/2 K xmax2 + 1/2 m V12 = 1/2 K x22 + 1/2 m V22

so V2 = √((K xmax2- K x22) /m)) = 0.26 m/s

C) V2 = √((K xmax2- mV22) /K)) = 0. 035 m

Definition

1. The instantaneous velocity.

2. Coefficient of friction u = Ff /N

Ff is the frictional force and N is the normal Force

3. The elastic and inelastic collision

In an elastic collision, both momentum and kinetic energy are conserved.

In an inelastic collision, momentum is conserved but kinetic energy is not.

4. periodic time

Q4) Answer the following questions [9 marks]

1. If the acceleration of an object is zero in some time interval, what can you say about the velocity of the object for that interval and the acting force on it?

The velocity is constant

2. Is it possible to add a vector quantity to a scalar quantity? Why?

No, because of the dimensions are different.

3. Can the magnitude of a vector have a negative value?

yes