Kuwait University
Physics Department

Physics 101

First Midterm
Summer Semester
Thursday, July 7, 2005
8:00 a.m. – 9:30 p.m.

Student's Name: .....

Student's Number: .....

Choose your Instructor's Name :

Dr. Hassan Raafat
Dr. Adnan Al-Yaseen
Dr. Abdulnasser Burezq
Dr. Yaccob Makdisi
Dr.Hala Khalid Al Jassar

Grads:

Grades	Q1	Q2	Q3	Q4	P1	P2	P3	P4	P5	P6	P7	P8	Total
Points													

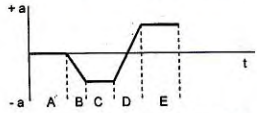
Important Notes:

1. Answer all questions.
2. Each question will be assigned 2 points.
3. The solution should be given explicitly for each problem.
4. No solution = no points.
5. Check the correct answer for each question.
6. Take $g = 10\ m/s^2$
7. Mobiles and Pagers are not allowed during the exam.
8. Programmable calculators which can store equations are not allowed.

GOOD LUCK

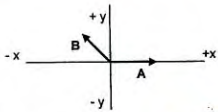
Part I - Choose the Correct Answer:

1. In which of the following periods does the car move with constant speed ?



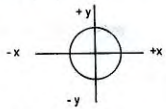
a) B & C b) C & E c) A&C&E (d) A

2. In the figure shown, what are the signs of the x and y component of **A - B**:



(a) (+, +) (b) (-,-) (c) (+, -) (d) (-,+)

3. An object moves at constant speed along a circular path in a horizontal xy plane, with the centre at the origin. When the object is at x = -2 m, its velocity is -4 (m/s) **j**. then the objects centripetal acceleration when it is at y = 2m is:



a) -4 (m/s) **i** (b) 4 (m/s) **j** (c) 8 (m/s) **i** (d) -8 (m/s) **j**

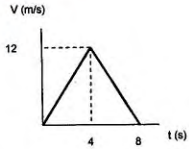
4. A net force F accelerates a mass m with an acceleration a. If the same net force is applied to a mass of 2m, then the acceleration will be:

(a) 4a (b) 2a (c) a/2 (d) a/4

Part II - Solve the Following Problems:
(Solutions should be given explicitly for each problem)

1. In the figure what is the average velocity in m/s from 0 to 8 s? Consider that the particle started from origin.

a) 0 b) 24 c) 3 (d) 6 e) 12



$d = \frac{1}{2}(8)(12) = 48\ m$

$\overline{V} = \frac{x_2 - x_1}{\Delta t}$

$= \frac{48 - 0}{8} = 6\ m/s$

2. A particle is dropped from a building. It is found that it takes 1 s to travel the last 10 m. What is the height (in m) of the building?

a) 20.5 (b) 11.25 c) 24 d) 16.6 e) Others

$\Delta y = V_{y_0} - \frac{1}{2} g t^2$

$-10 = V_{y_0} - 5 \Rightarrow V_{y_0} = -5$ m/s

$V_y^2 = V_{y_0}^2 - 2g\Delta y$

$\Delta y = V_y^2/2g = \frac{(-5)^2}{-2(10)} = -1.25$ m

$h = 10 + 1.25$

$= 11.25$ m

3. Vector **A** = **i** + **k** and vector **B** = **j** - **k**. What is the vector which is perpendicular to both of these?

a) **i** - **j** + **k** b) **i** + **j** - **k** (c) - **i** + **j** + **k** d) **i** - **j** - **k** e) Others

$\vec{C} = \vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ 1 & 0 & 1 \\ 0 & 1 & -1 \end{vmatrix} = -\hat{i} - (-\hat{j}) + \hat{k}$

$= -\hat{i} + \hat{j} + \hat{k}$

4. A particle is initially at the position 4**i** m moves with initial velocity of 3**i** +4**j** m/s What must be the acceleration of the particle in order that its final position is 4**j** after 2 s (in m/s^2)?

a) -2**i** -2**j** (b) -5**i** -2**j** c) -5**i** + 5**j** d) -2**i** + 2**j** e) Others

$r = r_0 + v_0 t + \frac{1}{2} a t^2$

$4\hat{j} = 4\hat{i} + (3\hat{i} + 4\hat{j})(2) + \frac{1}{2}\vec{a}(2)^2$

$\vec{a} = 4\hat{j} - 2\hat{i} - 3\hat{i} - 4\hat{j}$

$= -5\hat{i} - 2\hat{j}$

5. Two cars A and B are moving in two perpendicular directions. Their velocities are –80 **i** km/h and –60 **j** km/h respectively. What is the velocity of B as observed by A in (km/h) ?

a) 80 **i** + 60 **j** b) – 80 **i** – 60 **j** c) – 80 **i** + 60 **j** (d) 80 **i** – 60 **j** e) Others

$\vec{V}_{BA} = \vec{V}_{Bg} + \vec{V}_{gA}$

$= \vec{V}_{Bg} - \vec{V}_{Ag}$

$= -60\hat{j} - (-80\hat{i}) = 80\hat{i} - 60\hat{j}$

6. A plane flies horizontally at a height of h = 2 km with speed of 900 km/h (250 m/s). The pilot saw the target at the ground level 8 km away from his location. What distance d (in km) does the pilot have to fly before dropping the shell in order to hit the target?

a) 1 b) 2 c) 3 d) 5 e) 8

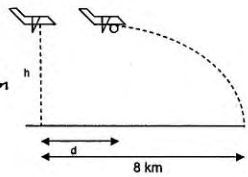
$\Delta y = V_{y_0} t - \frac{1}{2} g t^2$

$-2000 = 0 - 5 t^2$

$t = 20$ s

$x = V_{x_0} t = (250)(20) = 5$ km

$d = 8 - 5 = 3$ km



7. A ball of mass 12 kg is hung as shown in figure. The angle between the string and the wall is 30°. What is the normal force (in N) from the wall on the ball?

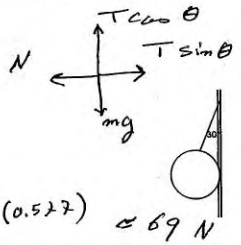
a) 60 b) 69 c) 104 d) 20 e) Others

$T \cos\theta = mg$

$T \sin\theta = N$

$\frac{N}{mg} = \frac{T \sin\theta}{T \cos\theta}$

$N = mg \tan\theta = 12(10)(0.577) \approx 69$ N



8. A man stands in an elevator on the ground floor. When the elevator starts to move up, the apparent weight of the man is found to be 900 N. Just before the stop of the elevator at the 5th floor (15 m from the ground) the apparent weight reads 600 N. What is the mass (in kg) of the man?

a) 75 b) 60 c) 80 d) 70 e) others

$W_1 = m(g + a)$

$W_2 = m(g - a)$

$W_1 + W_2 = 2mg$

$m = \frac{900 + 600}{2(10)} = 75$ kg