

Name:  
Student Number:  
Bamfield Number:

**Science One Physics Midterm #1**  
October 10, 2013

Questions 1-8: Multiple Choice: 2 points each

Questions 9: 2 points

Questions 10-12: Explain your work: 16 points total

Multiple choice answers:

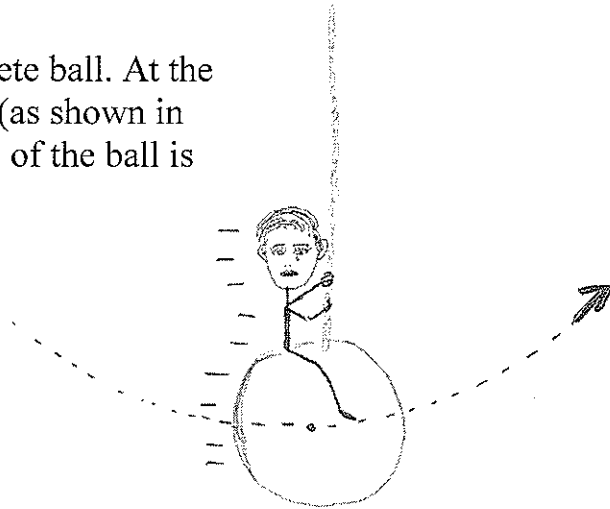
#1	
#2	
#3	
#4	
#5	
#6	
#7	
#8	

→ Carefully!

Formula sheet at the back (you can remove it)

**Question 1:** Miley swings on a large concrete ball. At the time when the ball reaches its lowest point (as shown in the figure), we can say that the acceleration of the ball is

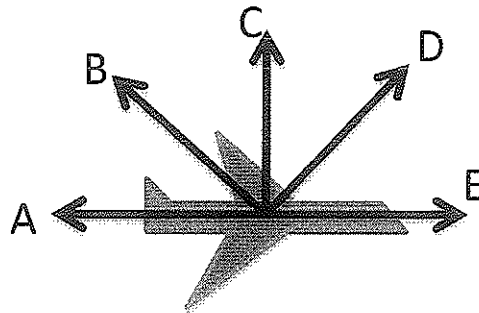
- A) zero
- B) upwards
- C) downwards
- D) to the right
- E) in some other direction



*Ignore air drag and Miley for this question.*

**Question 2:** Which statement most accurately describes Conservation of Momentum in a collision of two objects in outer space?

- A) Momentum of each object is separately conserved in any collision.
- B) Total momentum is conserved during any collision.
- C) Total momentum is conserved, but only if the objects don't heat up during the collision.
- D) Total momentum is conserved before and after but not during the collision



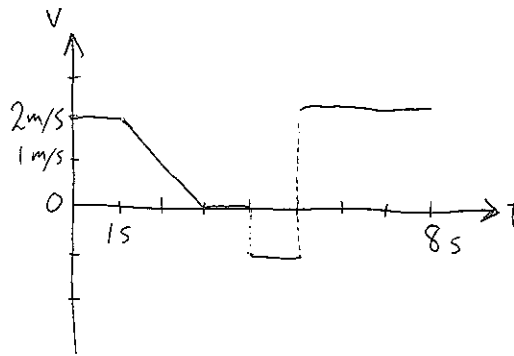
**Question 3:** A jet plane flies at a constant velocity of 900 km/hr. Which of the arrows best represents the net force on the plane?

Choose A, B, C, D, E, or: F) none of the above



**Question 4:** Confused Carl has lost his i-Phone. Helpless without it, he wanders around aimlessly trying to find it. If the picture above shows  $t=0$  and if Carl's  $x$ -velocity versus time is shown in the graph below, when does Carl find his phone?

- A) 3s
- B) 4s
- C) 5s
- D) 6s
- E) 7s
- F)  $> 7\text{s}$

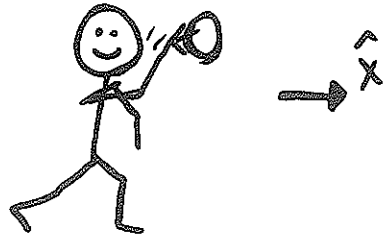


**Question 5:** An object's acceleration vs time data is provided in the table below. If the object's velocity at time  $t=0.02\text{s}$  is  $v=3\text{m/s}$ , the velocity at  $t=0.03\text{s}$  is closest to

- A)  $3.01\text{m/s}$
- B)  $3.1\text{m/s}$
- C)  $3.2\text{ m/s}$
- D)  $3.3\text{m/s}$
- E)  $43\text{m/s}$

Time (s)	Acceleration ( $\text{m/s}^2$ )
0.00	10.0
0.01	9.9
0.02	9.7
0.03	9.3
0.04	9.6

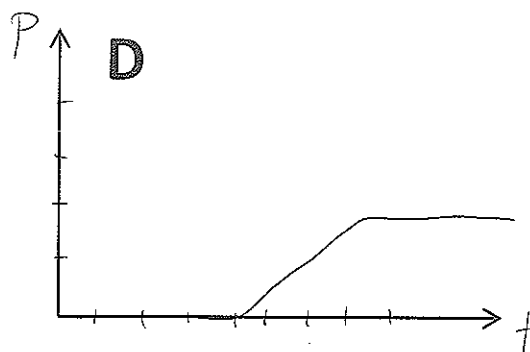
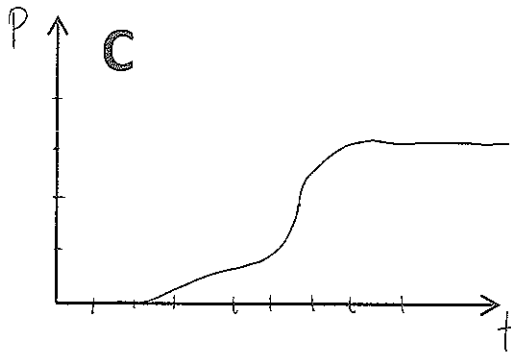
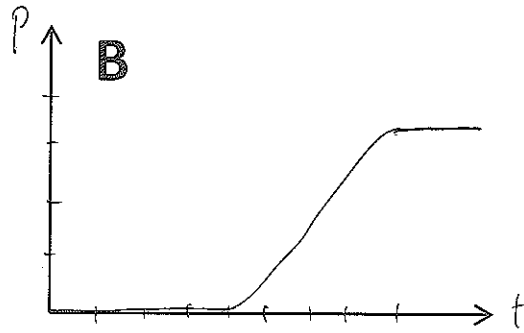
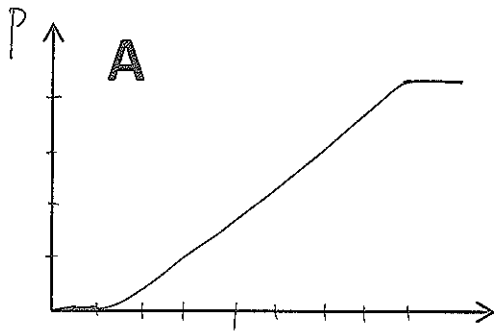
*(assume the acceleration is changing smoothly during the times shown)*

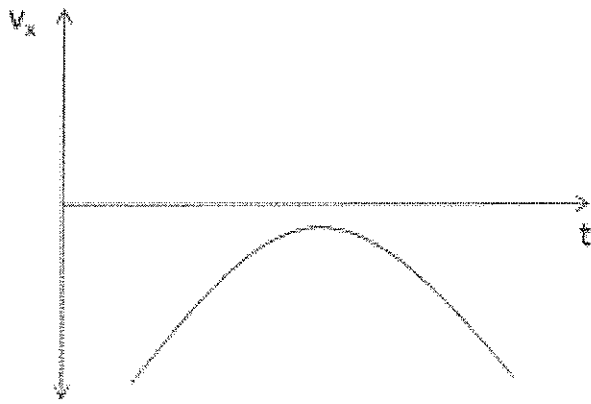


**Question 6:** James throws a ball. During the throw, we can say that

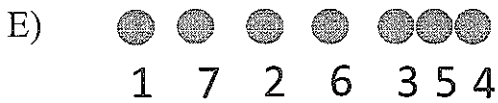
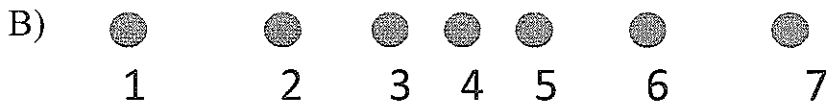
- A) There is a force on James from the ball. Its magnitude is greater than the magnitude of the force that James exerts on the ball.
- B) There is a force on James from the ball. Its magnitude is less than the magnitude of the force that James exerts on the ball.
- C) There is a force on James from the ball. Its magnitude is the same as the magnitude of the force that James exerts on the ball.
- D) There is no force on James from the ball.

**Question 7:** The momentum of the ball vs time is graphed for four different throws below. During which throw did James achieve his maximum force exerted on the ball? The scales on each graph are the same.

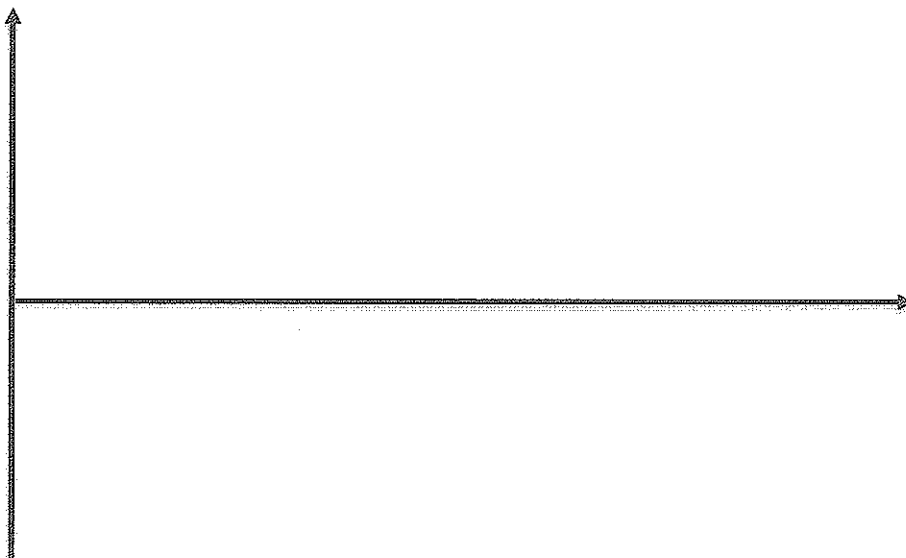




**Question 8:** The graph above shows the velocity vs time for an object. Which of the following motion diagrams could this graph be referring to?



**Question 9:** On the axes below, sketch the acceleration vs time for this object.  
(2 points)

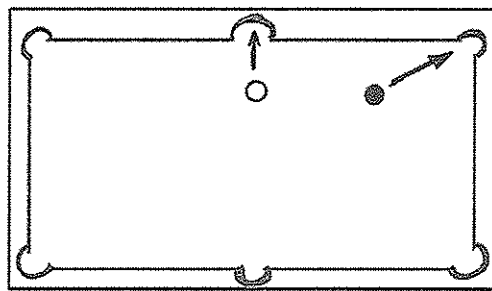
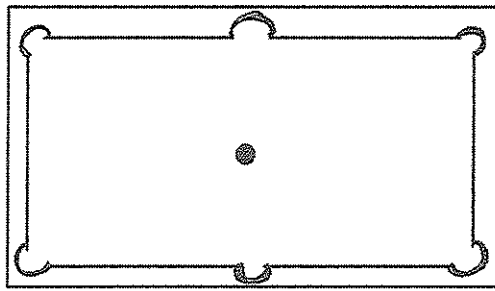




**Question 10:** In a standard pea shooter, a 1 gram pea accelerates through a tube, propelled by a puff of air. The tube is 10cm long and the force of the air increases as

$$F(t) = (0.1 \text{ N/s}) t$$

until the pea leaves the tube. At what speed does the pea leave the tube?  
(6 points)



**Question 11:** A black ball sits in the middle of a standard 1.2m by 2.4m pool table. To impress your friends, you casually wander up to the table, place a white ball somewhere along the edge, and then hit it towards the black ball just right so that after the balls collide, the black ball goes in the corner pocket and the white ball goes in the side pocket, as shown in the picture to the right. If the two balls each have a mass of 100g and each reach the pockets at exactly the same time, 0.6s after the collision, what was the velocity of the white ball before the collision? *(You may ignore the size of the balls, and assume that the balls roll perfectly without losing speed. However, the collision is an inelastic collision where energy is NOT conserved.)* (6 points)

### Question 12:

The y-velocity of a piece of space junk falling vertically downward through the air towards the Earth is given for several times by the following chart (negative velocity means downward motion):

Time (seconds)	y-velocity (m/s)
0.000	-50.000
0.001	-49.760
0.002	-49.522
0.003	-49.287

Eventually, the space junk reaches terminal velocity (i.e. its downward velocity becomes constant). Using the information provided, estimate this terminal velocity. (4 points)

*extra space next page*



## FORMULA SHEET

$$p \approx mv \quad (\text{if } v \ll c) \quad v = dx/dt \quad a = dv/dt$$

$$F = dp/dt$$

$$|F| = C v^2, \quad |F| = \mu N, \quad |F| = mg, \quad |F| = kx$$