Physics 218 Old Exam B

1) A getaway car going 150 km/hr is 1 km away from a police car which is overtaking it by going 160 km/hr. How much longer will it take for the police car to catch up with the criminal?

a) 10 min b) 16 min c) 60 min d) 0.4 min e) 20 min f) 1.5 min
g) 3 min h) 6 min i) 30 min j) 15 min

2) The police car in problem (1) took 12 seconds, starting from rest, to reach its final speed. What was its acceleration ?

a) 1.7 m/s^2 b) 2.7 m/s^2 c) 3.7 m/s^2 d) 4.7 m/s^2 e) 5.7 m/s^2 f) 6.7 m/s^2
g) 7.7 m/s^2 h) 8.7 m/s^2 i) 9.7 m/s^2 j) 10.7 m/s^2

3) A skier skids sideways, slowing from +25 m/s to + 5 m/s in a distance of 90 m. What is his acceleration?

a) -9.8 m/s^2 b) -8.7 m/s^2 c) -2.3 m/s^2 d) -3.3 m/s^2 e) -5.1 m/s^2 f) 13.1 m/s^2
g) -5.8 m/s^2 h) -1.3 m/s^2 i) -0.2 m/s^2 j) -6.8 m/s^2

4) In the above problem, how long does it take the skier to slow down? [Hint: you can use the result of problem 3, and/or use another equation NOT involving a. If you do both, you'll have a useful cross check.]

a) 6s b) 5s c) 4s d) 3s e) 2s f) 18s
g) 15s h) 12s i) 9s j) 7s

5) A bullet is fired straight upward with a velocity of 315 m/s. Neglecting air resistance, how long does it take the bullet to reach its maximum height? [Hint: what is the bullet's speed when it is at the highest point?]

a) 10s b) 16s c) 64s d) 25s e) 320s f) 45s
g) 95s h) 63s i) 32s j) 88s

6) An airplane descends at 15 m/s, and its ground speed (horizontal speed) is 30 m/s. What is its air speed (in 3-Dimensions, the vector magnitude)?

a) 45 m/s b) 22.5 m/s c) 450 m/s d) 33.5 m/s e) 28.3 m/s f) 15 m/s
g) 675 m/s h) 42 m/s i) 21.2 m/s j) 38.3 m/s

7) A train moves with velocity ~100 km/hr. A boy on the ground throws a rock parallel to the train with velocity 30 km/hr. What is the velocity of the rock as seen from (i.e. with respect to) the train?

a) -130 km/hr b) -70 km/hr c) +100 km/hr d) -30 km/hr e) +70 km/hr
f) +130 km/hr g) +30 km/hr h) -100 km/hr
i) no answers asked for 9^{th} or 10^{th} place.

8) A beetle crawls at 1 cm/s across a slideway 2m wide which is moving at 2 m/s. During the time the beetle crosses the entire slideway, how far is it carried along in the direction of the slideway motion?

a) 40m b) 200m c) 100m d) 80m e) 400m f) 800m
g) 20m h) 5m i) 50m j) 500m

9) A rock is dropped (from rest) down a 100 m deep hole. How long does it take for the rock to hit the bottom?
a) 10.5 b) 9.5s c) 8.5s d) 7.5s e) 6.5s f) 5.5s
g) 4.5s h) 3.5s i) 2.5s j) 1.5s

10) A skier skis off a cliff at Aspen going exactly horizontally at 15m/s. When she lands 12m below the cliff on a slope that exactly matches her velocity direction, how far is she (horizontally) from her launch point? [Hint: first deal with accelerated y motion, then deal with constant-velocity x motion.]

a) 15m b) 30.5m c) 33m d) 23.5m e) 11m f) 17.5m
g) 21m h) 38m i) 6.5m j) 1.6m

11) In problem (10), what is the angle of the slope the skier lands on (how many degrees below the horizontal)? [Hint: you know her x velocity. Calculate her y velocity using t from problem (10) and as a safety cross-check use the constant öa equation which does not involve t to get

v_y directly. They should agree.]

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a) 14.4^0 b) 28.8^0 c) 42.1^0 d) 22.5^0 e) 5.1^0 f) 35.8^0

g) 56.7^0 h) 13.8^0 i) 33.3^0 j) 45.0^0

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12) A trip 10 km East and then going North ends 18 km from the start. How far North has the traveler moved?

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a) 8km b) 28km c) 180km d) 9km e) 36km f) 15km

g) 13km h) 20km i) 30km j) 11km

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13) (4 points extra credit) A bear walks 1 mile South, one mile East, and then one mile North, at an average speed of 3 miles per hour and an average VELOCITY of zero (for the whole trip). What color is the bear? [Hint: What was the bearâs total displacement? Where on Earth can such a weird-sounding stroll be made?]

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a) brown b) white c) black d) red e) grey

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