UNIVERSITY OF MANITOBA

October 22, 2015
(7:00 pm – 9:00 pm)

MID-TERM TEST
(+ Formula Sheet)

PAPER NO.: **C**

DEPARTMENT & COURSE NO.: PHYS 1050

TIME: 2 hours

EXAMINATION: Physics 1: Mechanics

EXAMINERS: J. Sirker, F. Lin, C.-M. Hu

All questions are of equal value. Answer all questions. No marks are subtracted for wrong answers. Scrap paper is provided for your rough work.

Record all answers on the computer score sheet provided. **USE PENCIL ONLY! Mark only <u>one</u> answer for each question!** Select the answer, after appropriate rounding, that is closest to yours.

A formula sheet is provided for your use; you may **not** use your own formula sheet or any other materials or notes. Calculators of any type are allowed, but not devices that store text or that can communicate with other such devices.

Be sure your name and student number are printed on the score sheet and the student number correctly coded in the box at the top right-hand side of the sheet.

This is paper **C**. Questions are numbered 81 to 98. Mark the correct answers in rows 81-98 of the ***third*** column of the accompanying IBM sheet in pencil. Also write "Paper **C**" next to your name on the IBM sheet.

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81. A ball is released on top of a hill with an initial velocity of v_0=1 m/s. After rolling down the hill for 50m its velocity has increased to v=9 m/s. How large is the acceleration (assumed to be constant)?

(a) 3.2 m/s^2
(b) 4 m/s^2
(c) 1.6 m/s^2
(d) 2.4 m/s^2
(e) 0.8 m/s^2

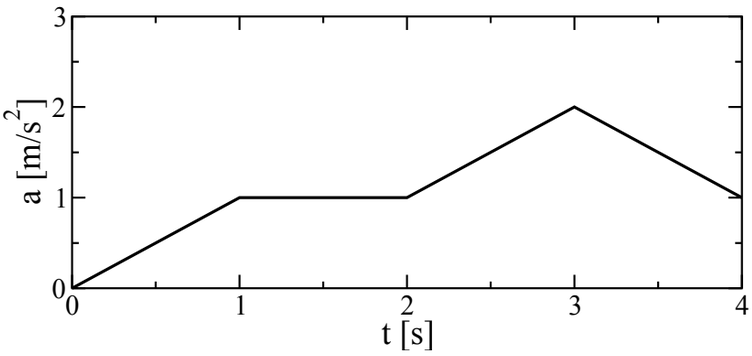
82. A vector $\vec{a}$ of magnitude 4 pointing in the negative x-direction is added to the vector $\vec{b} = 2\hat{i} + 4\hat{j} + 8\hat{k}$. The resulting vector $\vec{s}$ is

(a) $\vec{s} = 2\hat{i} + 0\hat{j} + 8\hat{k}$
(b) $\vec{s} = 2\hat{i} + 8\hat{j} + 8\hat{k}$
(c) $\vec{s} = -2\hat{i} + 4\hat{j} + 8\hat{k}$
(d) $\vec{s} = 6\hat{i} + 4\hat{j} + 8\hat{k}$
(e) $\vec{s} = 2\hat{i} + 4\hat{j} + 4\hat{k}$

83. The position of a particle is given by $\vec{r}(t) = 2t^2\hat{i} - t^3\hat{j} + t\hat{k}$. At time t = 4s the angle the acceleration of the particle makes with the positive x-axis is given by

(a) 190.5
(b) 80.5
(c) 279.5
(d) 60
(e) 45.5

84. A particle moving along the x-axis has an initial velocity v_0=1 m/s at time t =0 s. Its acceleration is shown in the figure below.



What is the velocity of the particle at time t =4 s?

(a) 6.5 m/s (b) 7 m/s (c) 6 m/s (d) 4.5 m/s (e) 5.5 m/s

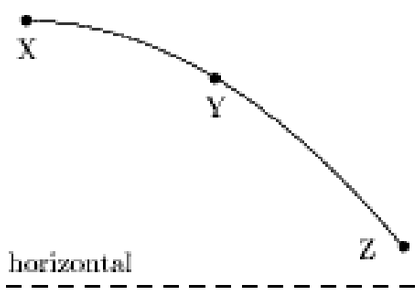
85. A jogger runs 5 km west before heading north for 2 km. When he finishes his run how far away is he from the place where he started?

(a) 5.0 km (b) 5.4 km (c) 6.4 km (d) 3.0 km (e) 7.0 km

86. The position of a particle is given by $x(t) = t^4 - t^3 + t^2$. What is its average acceleration over the time interval t=1s to t=2s?

(a) 21 m/s^2 (b) 8 m/s^2 (c) 30 m/s^2 (d) 24 m/s^2 (e) 38 m/s^2

87. A stone is thrown horizontally and follows the path XYZ shown. The direction of the acceleration of the stone at point Y is:



(a) ↘ (b) ↓ (c) ↗ (d) ↑ (e) ↙

88. An object moves from x = –2.1 m, y = 3.7 m to x = 3.3 m, y = –1.1 m in a time of 5.3 s. What is its average velocity?

(a) 4.9 m/s, 76° below the positive x-axis
(b) 7.2 m/s, 32° below the positive x-axis
(c) 2.5 m/s, 48° below the positive x-axis
(d) 1.4 m/s, 42° below the positive x-axis
(e) 0.92 m/s, 14° below the positive x-axis

89. A projectile is fired over level ground with an initial velocity that has an upwards vertical component of 30 m/s and a horizontal component of 40 m/s. The distance from launching to landing points is approximately:

(a) 80 m (b) 125 m (c) 245 m (d) 60 m (e) 40 m

90. An airplane is flying along a circle at a constant speed of 200 m/s. Its takes 40 seconds to complete a full circle. The magnitude of the acceleration of the plane is approximately:

(a) 5 m/s^2 (b) 0 m/s^2 (c) 20 m/s^2 (d) 31 m/s^2 (e) 14 m/s^2

91. A motor boat can travel at 20 km/h in still water. A river flows at 5 km/h west. A boater wishes to cross from the south bank to a point directly opposite on the north bank. At approximately what angle must the boat be headed?

(a) 30° E of N
(b) 60° E of N
(c) depends on the width of the river
(d) 14° E of N
(e) 27° E of N

92. A boat is traveling toward the east at 14 mph with respect to a river that is flowing toward the west at 6 mph with respect to the ground. The speed of the boat with respect to the ground is:

(a) 20 mph toward the west
(b) 8 mph toward the west
(c) 20 mph toward the east
(d) 16 mph toward the east
(e) 8 mph toward the east

93. A 50 kg steel ball is suspended by a cord below from a 20 kg wood. The entire system is dropped through the air. Neglecting air resistance, the tension in the cord is:

(a) 30 kg (b) 196 N (c) zero (d) 294 N (e) 490 N

94. A constant force of 8.0 N is exerted for 2.0 s on a 16 kg object initially at rest. The change in speed of this object will be:

(a) 32 m/s (b) 2 m/s (c) 8 m/s (d) 1 m/s (e) 4 m/s

95. A 5 kg block is suspended by a rope from the ceiling of an elevator as the elevator accelerates downward at 5.0m/s^2. The tension force of the rope on the block is:

(a) 24 N, up
(b) 49 N, up
(c) 74 N, up
(d) 24 N, down
(e) 74 N, down

96. A 98-N force, parallel to the incline, is required to push a certain crate at constant velocity of 1 m/s up a frictionless incline that is 30° above the horizontal. The mass of the crate is:

(a) 10 kg (b) 5 kg (c) 20 kg (d) 11.5 kg (e) 98 kg

97. A horizontal force of 12 N pushes a 0.5 kg book against a vertical wall. The book is initially at rest. If $\mu_s = 0.6$ and $\mu_k = 0.8$, the magnitude of the acceleration of the book is:

(a) 4.9 m/s^2 (b) 9.4 m/s^2 (c) 0 m/s^2 (d) 4.6 m/s^2 (e) 19.2 m/s^2

98. A 0.2 kg stone is attached to a string and swung in a circle of radius 1.2 m on a horizontal and frictionless surface. If the stone makes 150 revolutions per minute, the tension force of the string on the stone is:

(a) 39 N (b) 49 N (c) 0 N (d) 59 N (e) 19 N