Date:  /04/2009

Section A : Multiple Choice(12 marks)
There are 12 questions in the section. Answer ALL questions in the Multiple Choice Answer Sheet provided. Choose the best answer. Two or more answers will score No Mark.

For Questions 1 to 3
A stone is projected vertically upwards with an initial speed of 20 m s⁻¹. After 2 seconds, it reached its highest position.

1. What is the speed of the stone when it reached its highest position?
   A. 20 m s⁻¹
   B. 10 m s⁻¹
   C. 0 m s⁻¹
   D. -20 m s⁻¹

2. How high could this stone reach?
   A. 10 m
   B. 20 m
   C. 30 m
   D. 40 m

3. When the stone returns to its original level, what is its speed?
   A. 20 m s⁻¹
   B. 10 m s⁻¹
   C. 0 m s⁻¹
   D. -20 m s⁻¹

4. Which of the following descriptions is/are correct?
   (1) A negative slope of the velocity-time graph means that the object is moving backward.
   (2) When an object is not moving, its acceleration must be zero.
   (3) When an object is moving vertically upwards and its acceleration is negative, its speed is getting slower and slower.
   A. (1) only
   B. (3) only
   C. (2) and (3) only
   D. (1), (2) and (3)
5. When a 2kg object is moving upwards freely in the air with a speed of 2 m s\(^{-1}\). Its acceleration is
   A. 0 m s\(^{-2}\)
   B. 1 m s\(^{-2}\) upwards
   C. 2 m s\(^{-2}\) downwards
   D. 10 m s\(^{-2}\) downwards

For questions 6 to 8
A 5 kg object is being pushed by a force of 20N forward on a rough desktop. The friction between the object and the desktop is 5 N. After 2 seconds, the object is let go.

6. The net force acting on this object is
   A. 50 N downward
   B. 20 N forward
   C. 15 N forward
   D. 5 N backward

7. Which graph shown in the following figure correctly describes the displacement-time graph of the object after 2 seconds?

8. Which graph shown in the following figure correctly describes the velocity-time graph of the motion of the object?

9. Which of the following statement is/are correct?
   (1) A pulling force causes a larger acceleration than a pushing force.
   (2) Forces can either be attractive or repulsive.
   (3) The unit of weight is Newtons.
   A. (1) only
   B. (3) only
   C. (1) and (3) only
   D. (1), (2) and (3)

10. An egg is dropped from 45 metres above ground. Which of the followings is/are correct?
    (1) The egg accelerates at 10 m s\(^{-2}\) downwards
    (2) When the egg touches the ground level, its speed is 30 m s\(^{-1}\)
    (3) The egg takes 4.5 seconds to reach the ground.
    A. (1) only
11. Which of the following statements is/are correct.
   (1) If there is no force acting on an object, the object will slow down until it stops.
   (2) It takes a longer time to slow down on smooth surface because the air resistance is smaller on smooth surface.
   (3) The average velocity of running a 400m race is always the same as that of running a 800m race around a 400 m running track.

A. (1) only
B. (3) only
C. (1) and (3) only
D. (2) and (3) only

12. Which of the following descriptions is/are correct?
   (1) Displacement between two points will not be longer than the distance travelled between these two points.
   (2) The magnitude of the average velocity of an object is the same as the average speed of the same object if the object is moving along a straight line.
   (3) If an object is pushed by two forces, the acceleration of the object will be bigger.

A. (1) only
B. (3) only
C. (1) and (3) only
D. (2) and (3) only

Section B: Questions (24 marks)

1. A box of 5kg is placed at rest on a rough surface table initially. The friction between the box and the rough surface is 25N.

   Force
   O
   5 kg
   Rough surface table

(a) What is the minimum force applied to the box to make the box move? (1 mark)

A force of 35 N is then applied to the box for 3s as shown in the diagram.

(b) What is the net force on the box in this 3 s? (1 mark)
(c) What is the acceleration of the box in this 3 s? (1 mark)
(d) What is the velocity of the box after this 3 s? (2 marks)
(e) What is the displacement of the box in this 3 s? (2 marks)
(f) What is the acceleration of the box after this 3 s? (1 mark)
(g) How long can the box move after the first 3 s? (2 marks)
(h) What is the total displacement of the box? (3 marks)
2. The following is the velocity-time graph of a parachute falling from the 4th floor (14 metres above ground) of our school campus. Read the graph carefully and answer the questions.

(a) **Describe** and **explain** the motion of the parachute
(i) *between AB, (5 marks)
(ii) *between BC. (4 marks)

(b) The parachute takes 5 seconds to reach the ground. What is the distance travelled in the first one second. (2 marks)

- End of Paper -
1. (a) What is the minimum force applied to the box to make the box move? (1 mark)

(b) What is the net force on the box in this 3 s? (1 mark)

(c) What is the acceleration of the box in this 3 s? (1 mark)

(d) What is the velocity of the box after this 3 s? (2 marks)

(e) What is the displacement of the box in this 3 s? (2 marks)

(f) What is the acceleration of the box after this 3 s? (1 mark)

(g) How long can the box move after the first 3 s? (2 marks)
(h) What is the total displacement of the box? (3 marks)

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2. (a) Describe and explain the motion of the parachute

(i). *between AB, (5 marks)

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(ii). *between BC. (4 marks)

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(b) The parachute takes 5 seconds to reach the ground. What is the distance travelled in the first one second. (2 marks)

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- End of Paper-

- to be continued -
Section B (24 marks)

1. (a) What is the minimum force applied to the box to make the box move? more than 25N

(b) What is the net force on the box in this 3 s?
net force = 35N – 25N = 10N

(c) What is the acceleration of the box in this 3 s?
\[ a = \frac{F}{m} = \frac{10}{5} = 2 \text{ ms}^{-2} \]

(d) What is the velocity of the box after this 3 s?
\[ v = u + at \]
\[ v = 0 + 2 \times 3 = 6 \text{ ms}^{-1} \]

(e) What is the displacement of the box in this 3s?
\[ s = ut + \frac{at^2}{2} \]
\[ s = 0 + 2 \times 3^2 / 2 = 9 \text{ m} \]

(f) What is the acceleration of the box after this 3 s?
\[ a = \frac{F}{m} = \frac{-25}{5} = -5 \text{ ms}^{-2} \]

(g) How long can the box move after the first 3s?
\[ v = u + at \]
\[ 0 = 6 - 5t \]
\[ t = 1.2 \text{ s} \]

(h) What is the total displacement of the box?
\[ s = \frac{(u+v)t}{2} = \frac{(6 + 0)1.2}{2} = 3.6 \text{ m} \]
\[ \text{total displacement} = 3.6 + 9 = 12.6 \text{ m} \]

2. (a) **Describe** and **explain** the motion of the parachute

(iii). *between AB, (5 marks)*
The parachute getting faster and faster initially but the acceleration is not a constant. The acceleration decreases and becomes zero after one second. The
- to be continued -
parachute then falls with a constant speed. It is because the air friction increases with the speed.

(iv). *between BC. (4 marks)

When the air friction increase and is equal to the weight of the parachute, the two forces balance/two forces cancelled each other. *Net force is zero* and the acceleration becomes zero. The speed becomes constant.

(b) The parachute takes 5 seconds to reach the ground. What is the distance travelled in the first one second. (2 marks)

Displacement in the last 4 seconds, \( s = vt = 2.5 \times 4 = 10 \text{ m} \).

The distance travelled in the first one second is 14-10 m = 4 m

Section A:

1C  2B  3A  4B  5D  6C  7D  8C  9B  10C  11B  12A

End of Paper