Mechanics & Energy Test

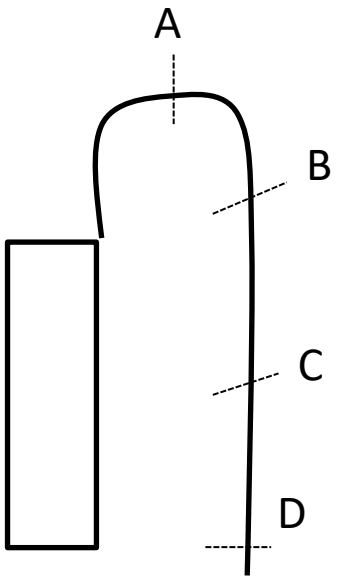
INFORMATION SHEET AND FORMULAS

- $F_g = mg$ (g = 9,8m.s^{-2} Gravitational acceleration)
- $V_f^2 = V_i^2 + 2a\Delta x$
- $V_f^2 = V_i^2 + 2a\Delta y$
- $\Delta x = V_i\Delta t + \frac{1}{2}\, a\Delta t^2$
- $\Delta y = V_i\Delta t + \frac{1}{2}\, a\Delta t^2$
- $V_f = V_i + a\Delta t$
- $\Delta x = (\frac{V_f + V_i}{2})\Delta t$
- $\Delta y = (\frac{V_f + V_i}{2})\Delta t$
- $E_k = \frac{1}{2}\, mv^2$
- $E_p = mgh$

THERE ARE 4 POSSIBLE ANSWERS FOR THE FOLLOWING QUESTIONS. CHOOSE ONLY (A, B, C OR D).

QUESTION 1:

1.1) A boy is standing on a building. He throws a ball up into the air and lets the ball drop to the ground. Ignore air resistance. At which point on the diagram is the ball's potential energy at its highest? The sketch indicates the movement of the ball.



A.) Point A.
B.) Point B.
C.) Point C.
D.) Point D. (2)

1.2) A truck (mass x-kg) departs from a stationary position. The truck's velocity increases and is now 50m.s^{-1}. What will the truck's change in kinetic energy be in terms of x?

A.) 2305 x Joule.
B.) 1250 x Joule.
C.) 0 x Joule.
D.) None of the above. (2)

1.3) If 2 stones are thrown into the air, the potential energy value of the first stone is 3 times the value of the second stone. What is the mass of the second stone if the two stones are thrown into the air at the same height?

A.) 5 m kg.
B.) 3 m kg.
C.) 0 m kg.
D.) 6 m kg. (2)

1.4) Which option is a scalar amount?

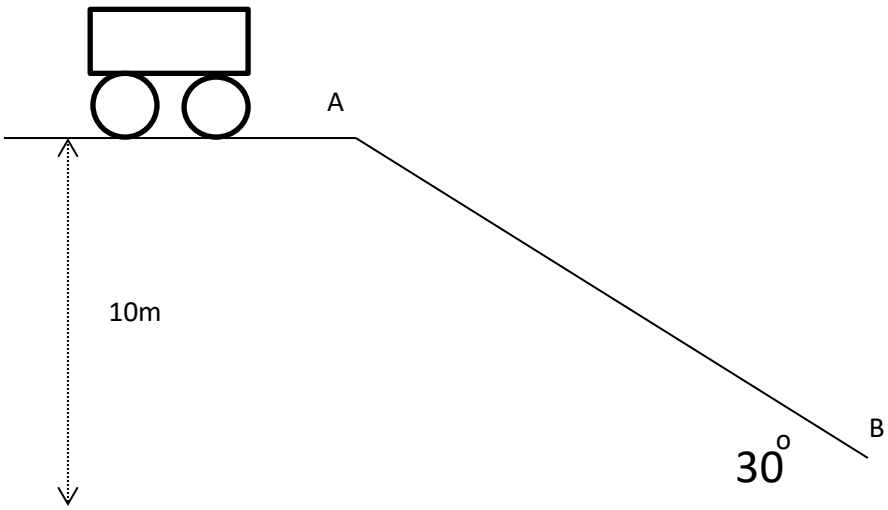
A.) 30 N East.
B.) 60 $m.s^{-1}$ west.
C.) 500 m.
D.) A and B. (2)

1.5) A man walks 40m east then 30m west then 20m east then 10m west. What is the man's resulting vector if east is the movement direction?

A.) 20 m east.
B.) 30 m west.
C.) 30 m east.
D.) 20 m west. (2)

QUESTION 2:

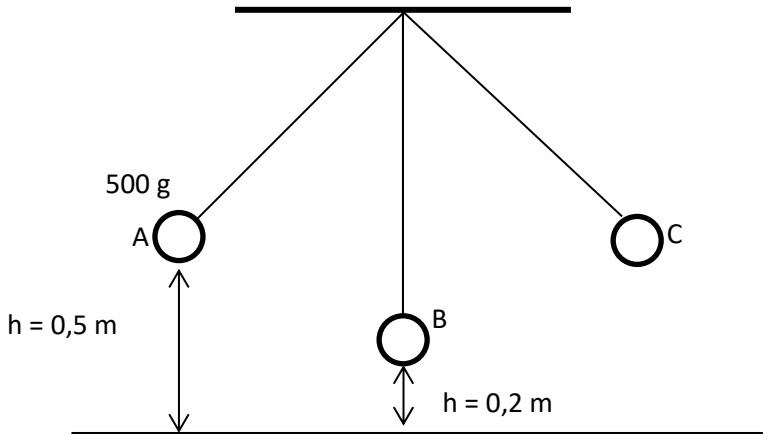
A trolley filled with ore has a mass of 250 kg. The mass of the ore is 50 kg. The trolley departs from a stationary position at point A and moves downwards along AB to point B. Ignore the effect of friction.



2.1) What is the distance of AB? (2)
2.2) What is the trolley's potential energy at point A? (4)
2.3) Calculate the velocity of the trolley at point B in $km.h^{-1}$ by using energy principles. (5)
2.4) Does the Mechanical Energy remain intact during the total movement of the trolley? (1)

QUESTION 3:

3.1) Define the term Potential Energy. (2)
3.2) Consider the following pendulum and the values provided.



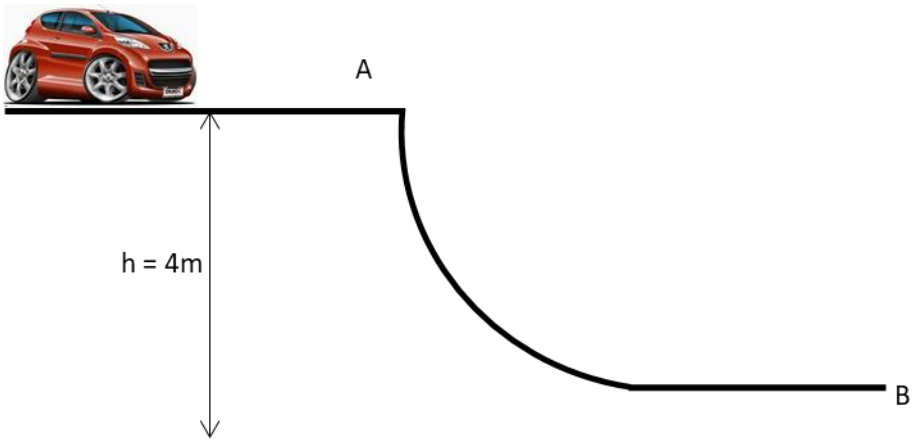
3.2.1) The ball is dropped at 4 $m.s^{-1}$ at point A. What is the velocity at point B? (5)

QUESTION 4:

4.1) A man is on a boat. He sails 50km east and then 40km west. He then decides to sail a further 60km west.
4.1.1) Define the term Resulting Vector. (2)
4.2) Determine the resulting vector by using a tail to head method and a scale where 10 km = 1cm. (4)

QUESTION 5:

The following diagram indicates how a toy car moves from point A to point B on a frictionless surface. The car departs from a stationary position at point B and moves downwards along AB. The car's mass can be written as $\frac{2E_k}{V^2}$. The vertical height from the ground to point A is 4m.



5.1) Define the term Kinetic Energy. (2)
5.2) Use the Law of Conservation of Mechanical Energy to calculate the velocity at point B. (6)
5.3) What will happen to the value of the velocity at point B if the vertical height was 7m? Only write increase, decrease or remain the same. (1)

QUESTION 6:

6.1) A ball is dropped from a height and hits the ground. Explain what happens to the ball's potential energy and kinetic energy. Furthermore, make a conclusion about the ball's mechanical energy as it falls. Ignore air resistance. (4)

6.2) Study the following table. It indicates how Potential Energy changes when a ball is being thrown into the air.

Potential Energy (Joule)	Mass of ball (kg)	Height ball reaches (m)
19.6	0,5	4
14.7	0,5	3
9.8	0,5	2
4.9	0,5	1

6.2.1) Why is the value of the ball's potential energy at its highest 4m from the ground? (2)
6.2.2) Determine the gravitational acceleration of the ball. (3)