Grade 10 Science
Forces, Energy and Motion Unit
End of Unit Test

TEST

Useful information

S.I. Units

length – metres (m)
mass – kilograms (kg)
time – seconds (s)
speed – metres per second (m/s)
acceleration – metres per second per second (m/s/s)
force – Newtons (N)
energy – Joules (J)

Formulae

$$Average\ Speed = \frac{Distance\ Travelled}{Time\ Taken} \text{ or } v = \frac{d}{t}$$

$$Average\ Velocity = \frac{Displacement}{Time\ Taken}$$

$$Average\ Acceleration = \frac{Change\ in\ speed}{Time\ Taken} \text{ or } a = \frac{\Delta v}{t}$$

Weight = mass x gravitational field strength or W = mg

On Earth $g = 9.8\ N/kg$

Net Force = mass x acceleration or $F = ma$

Gravitational Potential Energy = mass x *gravitational field strength* x *height* or $GPE = mgh$

Work = Force x *Distance* or $W = Fd$

$$Efficiency = \frac{useful\ energy\ output}{energy\ input} \times 100$$

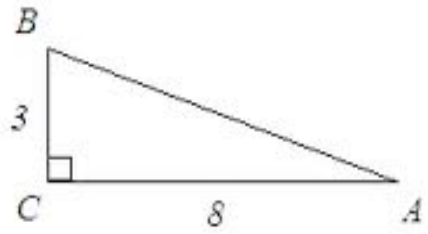
START OF TEST

1) John walks 4 km North and then 1km East. (Draw a diagram)

   a) What is the total distance that John travelled?

   b) Draw and label the displacement vector. Is its length greater or less than the total distance?

2)

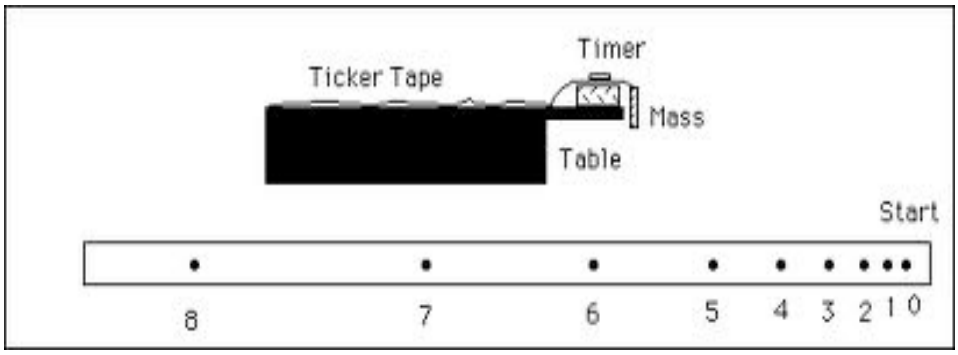


Margo starts her run a point A and finishes at point B. What is her total displacement? (Assume than North points up the page)

3) If a car travelling is moving at an average speed of 28m/s for 2 minutes what distance will it cover?

4) Determine the average speed of a platypus that swims 25m over a period of 29s.

5)



An experiment is run using a ticker timer. The motion of the tape is indicated by dots shown on the section of tape shown above. The results indicate which type of motion?

(circle the correct answer)

a) constant speed.

b) positive acceleration.

c) negative acceleration (deceleration).

6) A hiker travels 4km North and then 4km West over a period of 2hrs. What is the average velocity? (Draw a diagram)

7) Paul runs around a 400m oval in a time of 63s.

a) What is his average speed?

b) What is his average velocity?

8) What is the weight of a 5kg pot plant sitting on the Earth's surface?

9) Jenny measures a force of 112 N when weighing a bag of potatoes. What is the mass of the bag of potatoes?

10) State Newton's First Law?

11) Use Newton's first law to explain the forward motion of passengers in a car travelling at high speed that brakes suddenly?

12) Use your understanding of Newton's Third Law to draw two pairs of action-reaction forces. Assume that the car is not moving.

13) Which is greater, the thrust, the resistance forces (or neither) when a car is moving along a horizontal road with

a) increasing speed?

b) decreasing speed?

c) constant speed?

14) Which formula is an expression of Newton's Second Law?

15) A 1500kg car is accelerating at 6m/s/s.

a) What is the net force acting on the car?

b) If the frictional forces opposing the motion of the car have a total of 5000N how much total thrust must be provided by the car's engine to accelerate it at 6m/s/s?

c) If four passengers got into the car but the force applied remained the same how would this affect the car's acceleration?

16) Using one or more of Newton's Laws explain why is takes several fire fighters to hold a fire hose that produces a high powered jet of water.

17) What is kinetic energy?

18) How much work is done when a vacuum cleaner is pushed through a distance of 7m with a force of 180N?

19) How much work is done when an athlete pushes against a wall with a force of 210N for 38s. Assume that the wall does not move.

20) List two types of potential energy and give an example of each.

21) What is the Law of Conservation of Energy?

22) What is meant by the efficiency of a system?

23) 10000J or energy is input into a car's engine in the form of unleaded petrol. It produces 1020J of energy output in the form of motion. What is the car engine's efficiency as an energy converter?

END OF TEST