EMANUEL SCHOOL

Physics

Year 10 Exam

7th Dec 2001
1 hour
2.00 to 3.00 p.m.

Set by JHW **Return to JHW**

Name	
Set	

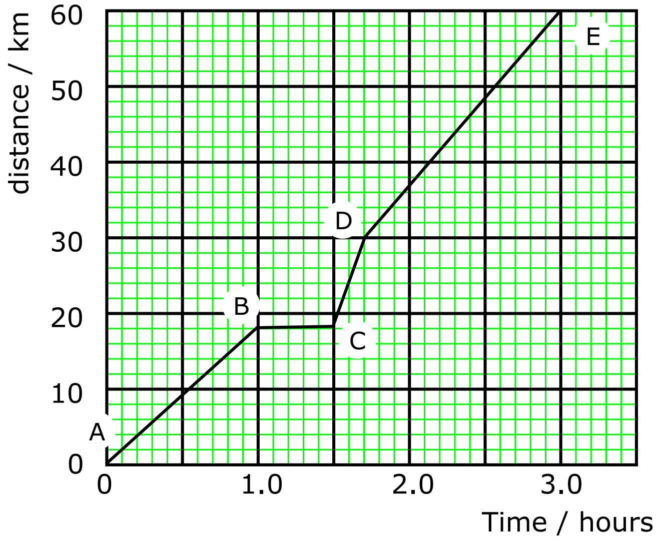
Instructions

1. Write your name and set in the spaces above.
2. Answer **all** the questions.
3. Do all rough work in this booklet.
4. Cross through any work you do not want marked.

Information

5. The time allowed for this exam is 1 hour
6. No additional materials are required.
7. Mark allocations are shown in brackets.
8. Use a calculator if necessary
9. The maximum mark available for this paper is **80**.

1 A cyclist goes on a long ride. The graph shows how the distance travelled changes with time during the ride



(i) Between what two points was the cyclist travelling at the fastest speed?

____ [1]

(ii) How long did the cyclist stop and rest?

____ [1]

(iii) Write down the equation which links speed, distance and time.

____ [1]

(iv) Calculate the average speed of the cyclist over the entire journey in km/hr.

____

____ [2]

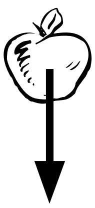
2 (i) Draw force diagrams for each of the following situations. The first diagram has been partially completed for you. [5]

(ii) Name the each of the forces. [4]

Apple hangs from a tree

Apple falls through the air

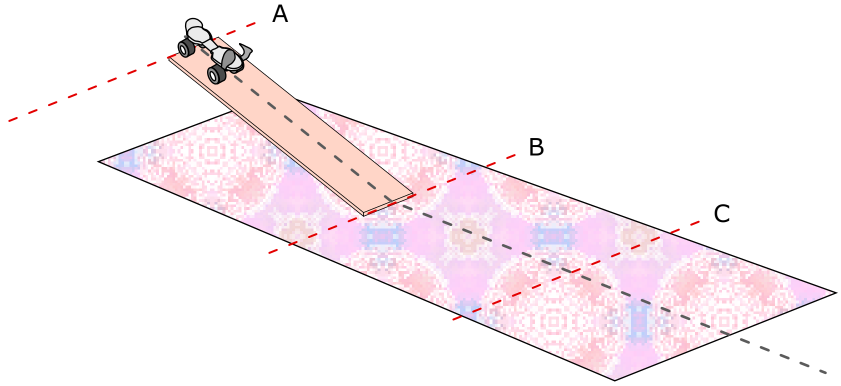
Apple resting on the ground

1 

2 

3 

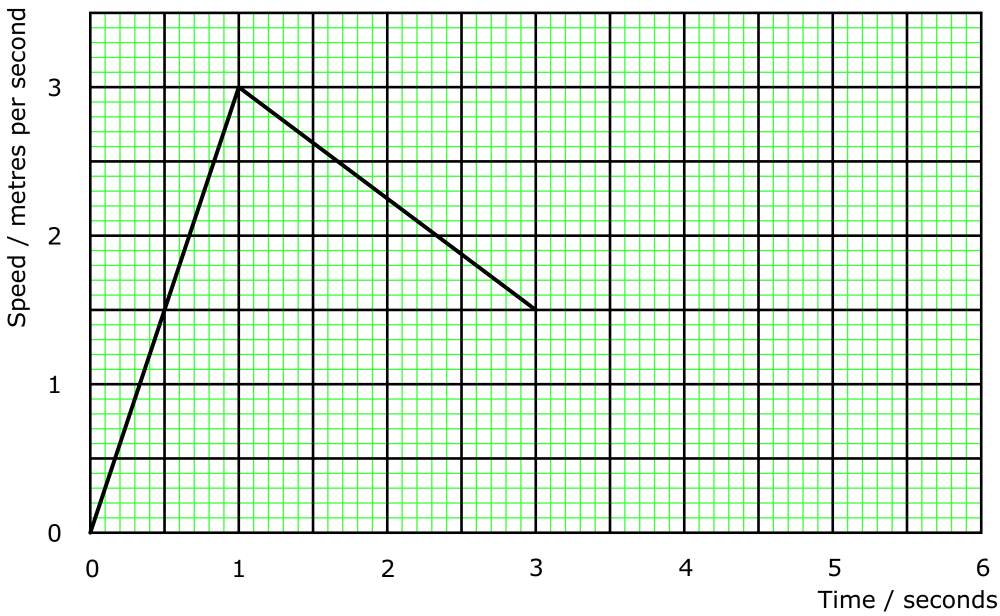
3 A roller skate is allowed to run down a ramp AB, gathering speed as it does so. When it reaches the end of the ramp it rolls along a carped floor until it finally comes to rest at some distance from the end of the ramp.



Information about the motion of the roller skate was obtained using a ticker tape timer. With this information, a speed- time graph of the motion of the roller skate was drawn.

Unfortunately the tape was not long enough and ran out when the roller skate reached C.

The mass of the skate was 0.8 kg.



(a) Using the letters on the diagram label the following points *on the graph*

(i) the point A where the skate is stationary at the top of the ramp. [1]

(ii) the point B where the skate just reaches the bottom of the ramp. [1]

(iii) the point C at which the tape runs out. [1]

(b) Using the graph find out

(i) how much time was spent moving between A & B? ______________________ [1]

(ii) how much time was spent moving between B & C? ______________________ [1]

(iii) the speed of the roller skate at A .... ______________________ [1]

(iv) the speed of the roller skate at B? .... ______________________ [1]

(v) the speed of the roller skate at C? ______________________ [1]

(vi) the change in speed between B & A? ______________________________ [1]

(vi) the change in speed between B & C? ______________________________ [1]

(c) Write down the equation that links acceleration, change in velocity and time

____ [2]

Use this equation to calculate
(i) the acceleration of the roller skate between A & B

____

____ [2]

(ii) the acceleration of the roller skate between B & C

____

____ [2]

(d) Write down the equation that links force, acceleration and mass.

____ [2]

Use this equation to calculate the force on the skate
(i) as it rolls down the ramp between A & B

____ [1]

(ii) as it rolls along the carpet between B & C

____ [1]

(e) Name the force

(i) that makes the skate roll down the ramp ____________________________________ [1]

(ii) that slows the skate as it roll along the carpet ______________________________ [1]

(f) Use the graph to calculate the
(i) distance travelled by the roller skate between A & B

____ [2]

(ii) distance travelled by the roller skate between B & C

____

____ [3]

(g) The skate ran out of tape at C, but continued moving along the floor until it stopped.
(i) Complete the graph to find the total time for which the skate was moving.

____ [2]

(ii) How far did the skate roll *after* it had reached the end of the ramp?

____

____ [2]

(iii) What was the total distance travelled by the roller skate.

____ [1]

4

Bronco skydives and parachutes from a stationary balloon. Various stages of fall are shown in positions *a* through *f*:

(i) Using Newton's 2nd law,

$$a = \frac{F_{NET}}{m} = \frac{W - R}{m}$$

find Bronco's acceleration at each position (answer in the blanks to the right of each diagram).

Bronco's mass m is 100 kg so his weight is a constant 1000 N. Air resistance R varies with speed and cross-sectional area as shown in the diagrams.

[2 marks per calculation = 12]

Circle the correct answers.

(ii) When Bronco's speed is least, his acceleration is (*least*) (*most*). [1]

(iii) In which position(s) does Bronco experience a downward acceleration?
(*a*) (*b*) (*c*) (*d*) (*e*) (*f*) [2]

(iv) In which position(s) does Bronco experience an upward acceleration?
(*a*) (*b*) (*c*) (*d*) (*e*) (*f*) [2]

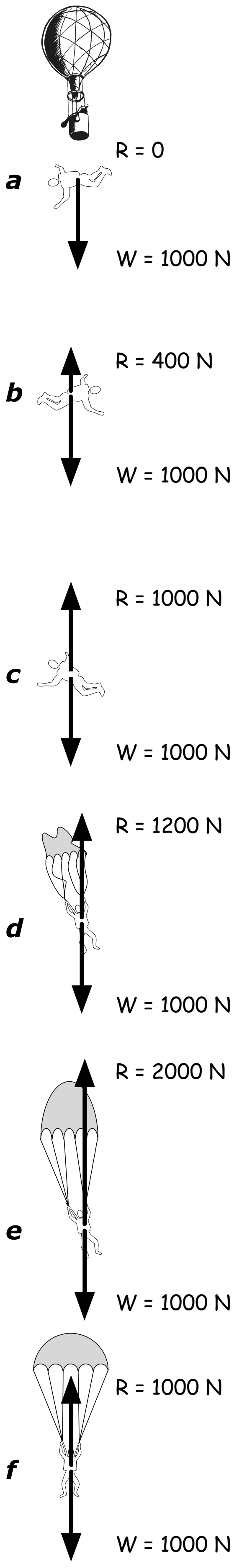
(v) When Bronco experiences an upward acceleration, his velocity is
(*still downward*) (*upward also*). [1]

(vi) In which position(s) is Bronco's velocity constant?
(*a*) (*b*) (*c*) (*d*) (*e*) (*f*) [2]

(vii) In which position(s) does Bronco experience terminal velocity!
(*a*) (*b*) (*c*) (*d*) (*e*) (*f*) [2]

(viii) In which position(s) is terminal velocity greatest?
(*a*) (*b*) (*c*) (*d*) (*e*) (*f*) [1]

(ix) If Bronco were heavier, his terminal velocity would be
(*greater*) (*less*) (*the same*) [1]



a

a =

b

a =

c

a =

d

a =

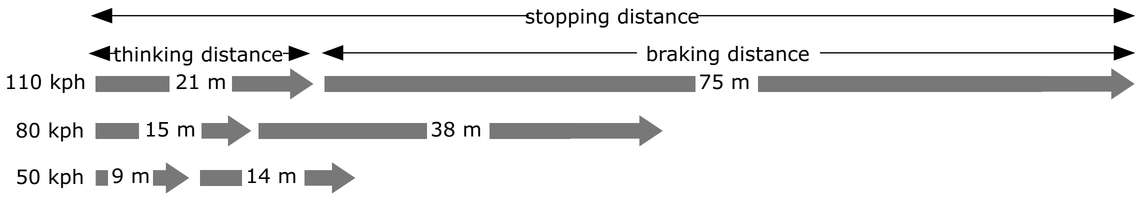
e

a =

f

a =

5 The Highway code has information of the shortest stopping distances for cars travelling at various speeds. An example is given below.



(a) (i) What factor, apart from speed, determines the thinking distance?

____ [1]

(ii) why isn't thinking distance the same for all three speeds?

____

____ [2]

(b) Write down two factors other than speed that would increase the thinking distance.

____

____ [2]

(c) What would happen to the braking distance if
(i) the road surface was wet

____

____ [2]

(ii) the car was full of people

____

____ [2]

A cliff railway links the villages of Lynton and Lynmouth in Devon. The railway has two cars which run on parallel tracks. The cars are joined by a continuous cable which runs around two large pulley wheels one pulley wheel is at the top of the cliff and the other is at the bottom.

Each car has a large tank that holds water. As water runs out of the tank in the lower car, the upper car descends pulling the lower car up the cliff.

The diagram shows both cars stationary.

(a) The brakes of both cars are released. At first neither car moves.

What is the size of the force B?

(b) Water is gradually released from the tank in the lower car.

What happens to the size of the force A?

Explain why the cars begin to move.

After a short while during which the cars gather speed, they move at a steady speed.

How does force A compare with force B as the car moves up the cliff at a steady speed?