SUVAT Past Paper Questions

Jan 2002 to Jan 2009

Q7 Jun 2002

7 (a) An egg of mass 5.8×10^{-2} kg is dropped from a height of 1.5 m onto a floor. Assuming air resistance is negligible, calculate for the egg

(i) the loss of potential energy,

.....

.....

(ii) the kinetic energy just before impact,

.....

(iii) the speed just before impact,

.....

.....

(iv) the momentum just before impact.

.....

(7 marks)

(b) On hitting the floor, the egg is brought to rest in a time of 0.010 s. Calculate the magnitude of the average decelerating force on the egg.

.....

.....

.....

(2 marks)

(c) The egg is now placed in a container that crumples on impact. Explain why this type of container makes it far less likely that the egg will break.

.....

.....

.....

.....

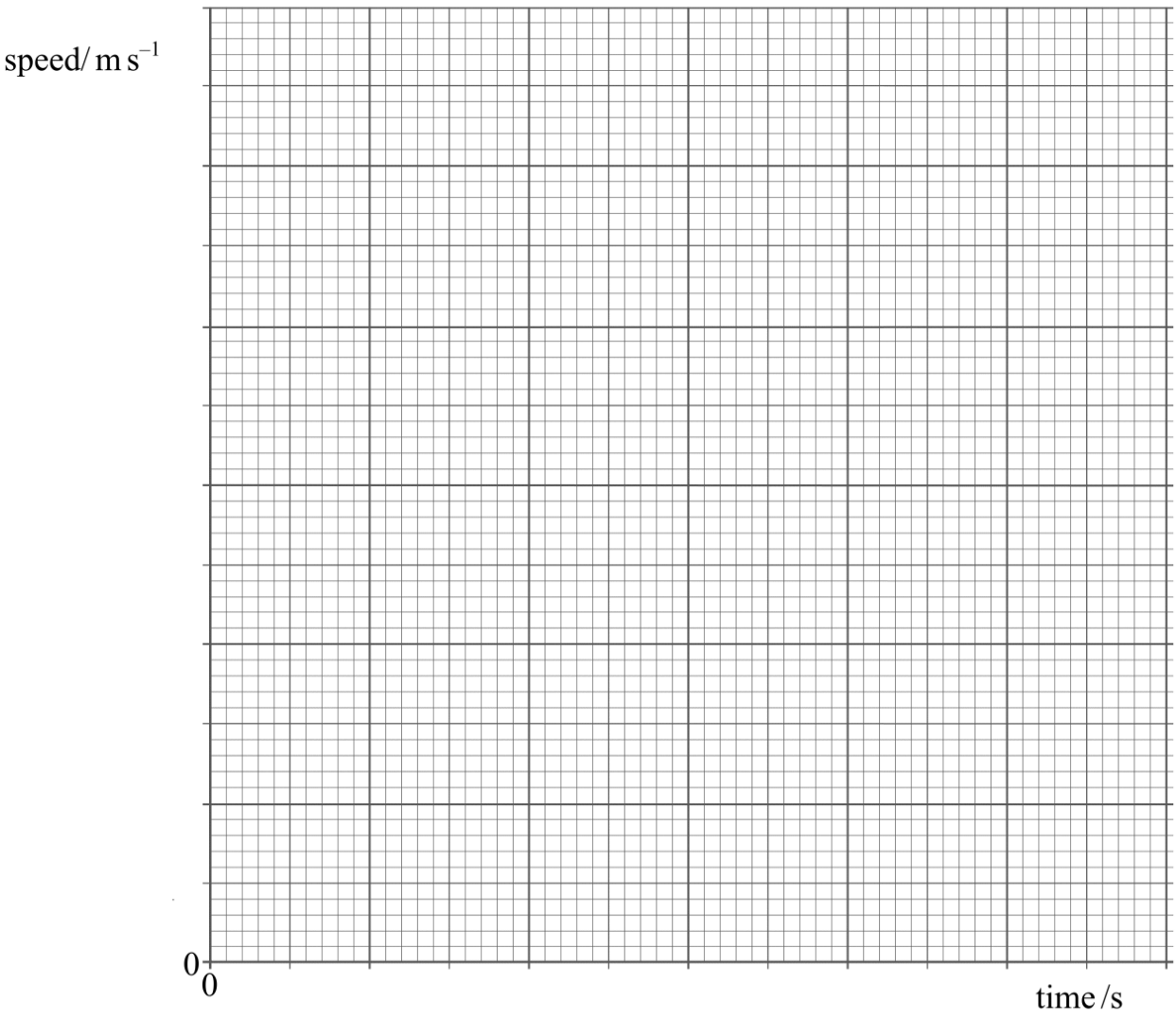
(2 marks)

1 A car accelerates from rest to a speed of 26 m s^{-1}. The table shows how the speed of the car varies over the first 30 seconds of motion.

Q1 Jan 2006

time/ s	0	5.0	10.0	15.0	20.0	25.0	30.0
speed/ m s^{-1}	0	16.5	22.5	24.5	25.5	26.0	26.0

(a) Draw a graph of speed against time on the grid provided.



(3 marks)

(b) Calculate the average acceleration of the car over the first 25 s.

.....

.....

(2 marks)

(c) Use your graph to estimate the distance travelled by the car in the first 25 s.

.....

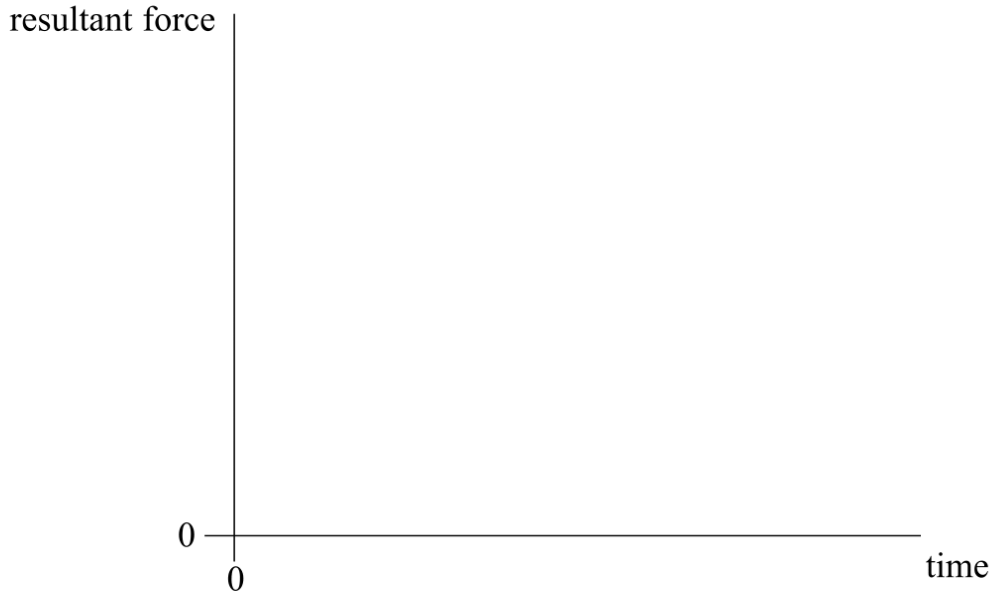
.....

.....

.....

(2 marks)

(d) Using the axes below, sketch a graph to show how the resultant force acting on the car varies over the first 30 s of motion.



(2 marks)

(e) Explain the shape of the graph you have sketched in part (d), with reference to the graph you plotted in part (a).

.....

.....

.....

.....

(2 marks)

6 A supertanker of mass 4.0×10^8 kg, cruising at an initial speed of $4.5\ \text{m s}^{-1}$, takes one hour to come to rest.

Q6 Jun 2006

(a) Assuming that the force slowing the tanker down is constant, calculate

(i) the deceleration of the tanker,

.....

.....

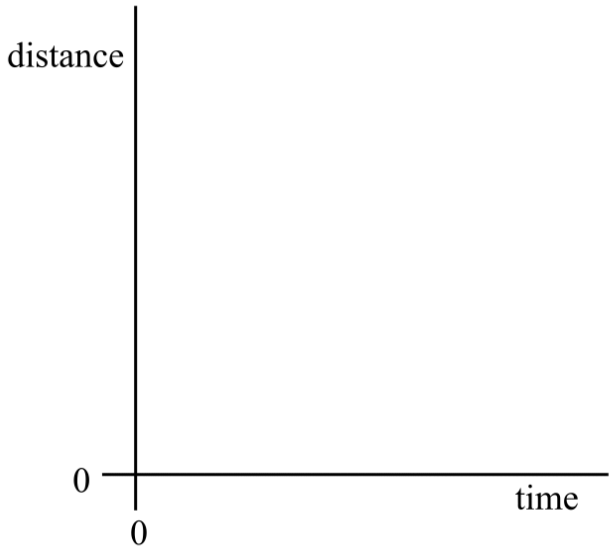
(ii) the distance travelled by the tanker while slowing to a stop.

.....

.....

(4 marks)

(b) Sketch, using the axes below, a distance-time graph representing the motion of the tanker until it stops.



(2 marks)

(c) Explain the shape of the graph you have sketched in part (b).

.....

.....

.....

.....

(2 marks)

Q2 Jan 2007

2 (a) A cheetah accelerating uniformly from rest reaches a speed of 29 m s^{-1} in 2.0 s and then maintains this speed for 15 s. Calculate

(i) its acceleration,

.....

.....

(ii) the distance it travels while accelerating,

.....

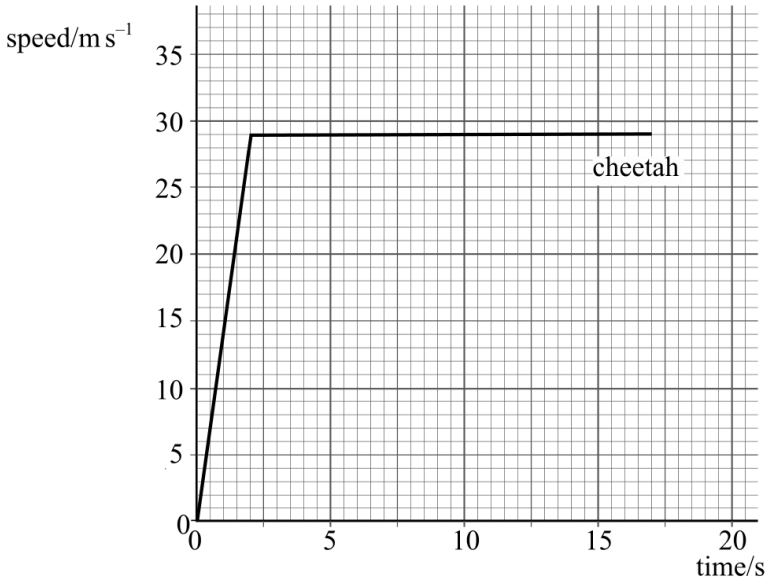
.....

(iii) the distance it travels while it is moving at constant speed.

.....

(4 marks)

(b) The cheetah and an antelope are both at rest and 100 m apart. The cheetah starts to chase the antelope. The antelope takes 0.50 s to react. It then accelerates uniformly for 2.0 s to a speed of 25 m s^{-1} and then maintains this speed. The graph shows the speed-time graph for the cheetah.



(i) Using the same axes plot the speed-time graph for the antelope during the chase.

(ii) Calculate the distance covered by the antelope in the 17 s after the cheetah started to run.

.....

.....

.....

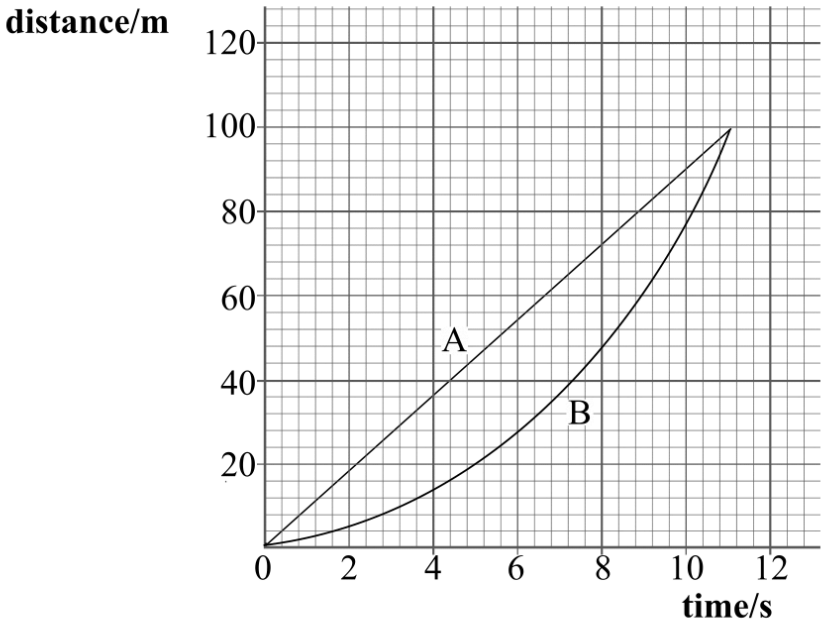
(iii) How far apart are the cheetah and the antelope after 17 s?

.....

.....

(6 marks)

1 The distance-time graphs for two runners, A and B, in a 100 m race are shown.



Q1 Jun 2007

(a) Explain how the graph shows that athlete B accelerates throughout the race.

.....

.....

(1 mark)

(b) Estimate the maximum distance between the athletes.

.....

(1 mark)

(c) Calculate the speed of athlete A during the race.

.....

(1 mark)

(d) The acceleration of athlete B is uniform for the duration of the race.

(i) State what is meant by uniform acceleration.

.....

(ii) Calculate the acceleration of athlete B.

.....

.....

(3 marks)

5 An aircraft accelerates horizontally from rest and takes off when its speed is $82\,\text{m}\,\text{s}^{-1}$. The mass of the aircraft is $5.6 \times 10^4\,\text{kg}$ and its engines provide a constant thrust of $1.9 \times 10^5\,\text{N}$.

Q5 Jan 2008

(a) Calculate

(i) the initial acceleration of the aircraft,

.....

.....

(ii) the minimum length of runway required, assuming the acceleration is constant.

.....

.....

.....

(3 marks)

(b) In practice, the acceleration is unlikely to be constant. State a reason for this and explain what effect this will have on the minimum length of runway required.

.....

.....

.....

.....

(2 marks)

(c) After taking off, the aircraft climbs at an angle of 22° to the ground. The thrust from the engines remains at $1.9 \times 10^5\,\text{N}$. Calculate

(i) the horizontal component of the thrust,

.....

.....

(ii) the vertical component of the thrust.

.....

.....

(2 marks)