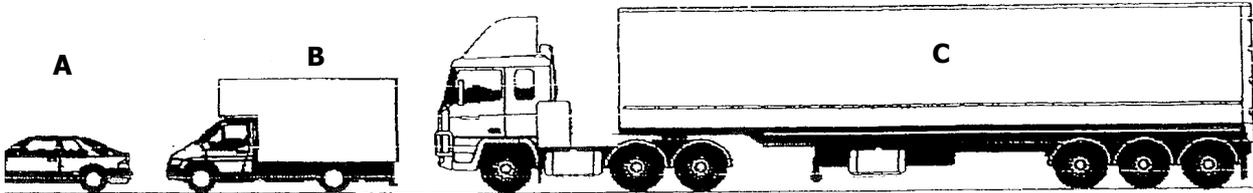
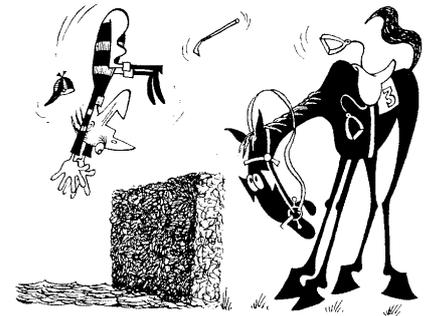


## Forces assignment ( 57 marks )

1. a) Which of the vehicles below (A, B or C) do you think has the most mass?  
 b) All these vehicles are stopped at a red traffic light.  
 When it changes to green explain what must happen for all of them to move off and accelerate.  
 c) Which do you think is likely to have the highest acceleration and why?  
 You should refer to Newton's Laws of motion in your answer. [5]



- 2) The horse and rider below were both moving along at a steady speed as they approached a hedge. The horse became nervous and decided that it didn't want to jump over the hedge after all and suddenly stopped.



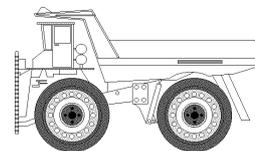
Explain what the horse would have to do to stop its motion and why the rider is being 'thrown' over the hedge. You should refer to Newton's Laws of motion in your answer. [3]

- 3) What is the acceleration caused by a 40N force applied to a 0.5kg mass? [2]
- 4) If an object accelerates at  $2.5 \text{ m/s}^2$  when a net force of 125N is applied what is its mass? [2]
- 5) A rocket propelled man of total mass 150 kg is accelerated at  $15 \text{ km/hr/s}$ . What is the thrust force of his rocket? **HINT:** convert km/h per sec to  $\text{m/s}^2$  first. [3]

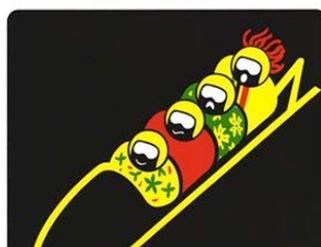


- 6) If a 3.5kg body accelerates from rest to  $20 \text{ m/s}$  in 5 seconds. Calculate its acceleration and the net force required. [4]

- 7) A truck of mass 3000 Kg accelerates at a rate of  $3 \text{ m/s}^2$
- ( a.) What force is needed from the engine to do this ? [ 2 ]
- ( b.) The truck is now loaded with an extra 3000 Kg. What will be its new acceleration? [ 2 ]
- ( c.) What force would now be needed for the loaded truck to achieve an acceleration of  $3 \text{ m/s}^2$  ? [ 1 ]



- 8) At the start of a race the Jamaican team pushes their 600kg bobsleigh with a combined force of 1900 N.[2]  
 What will their acceleration be if the friction from the ice is 100N?



9) An archer fires an arrow of mass 250g from his bow with a force of 200 N. What is its acceleration? [2]



10) A car of mass 1.2 tonnes travelling at 20 m/s stops at a set of traffic lights in 4 s. [4]

- Calculate the acceleration.
- Why should this acceleration have a negative value?
- Calculate the force required from the brakes.

11) A car of mass 1000 kg moving at 15 m/s hits a barrier and stops in a time of 0.1 s. [2]

- Calculate its deceleration. [2]
- What force would the car experience? [2]
- Today cars are built with 'crumple zones' for safety.

Explain how they act to decrease the injuries to passengers. [2]

- With reference to Newton's Laws explain how a seat belt works. [2]



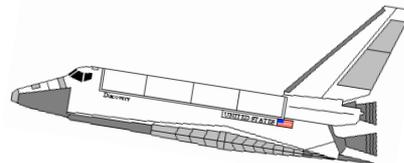
12) A parachutist of mass 60 Kg lands at 8 m/s and stops in 0.5 s. [3]

- What force will he experience?
- Explain how he could easily reduce this force?



13) The part of the space shuttle which returns to Earth has a mass of 78 000 Kg and lands at a speed of 100 m/s. After touching down it takes 1 minute to decelerate and stop. [3]

- Calculate the deceleration of the shuttle.
- Calculate the net force needed to bring it to a halt.



14) When a 55 kg high jumper lands on the large foam mats, she comes to rest in about 0.5 sec.

- If she hits the mat at 10 m/s, what force would she experience?
- If she hit the ground at the same speed, what force would she experience if she came to rest in 0.1 sec?



15) Marvin the Martian (an alien from Mars) has a mass of 50 kg. The acceleration due to gravity at home on Mars is 3.8 N/kg. He decides to go on a trip to Earth travelling through space in between where there is effectively no gravity. The acceleration due to gravity on Earth is 10 N/kg. On the way home Marvin decides to visit the moon where he weighs 80 N. [2]

- What is Marvin's mass and weight at home on Mars? [2]
- What is Marvin's mass and weight in space? [2]
- What is Marvin's mass and weight on Earth? [2]
- What is the acceleration due to gravity on the moon? [1]

