Name: _____ Class: _____ Date: _____

Exercise 3A Effects of Balanced and Unbalanced Forces on a Body

1. Complete these sentences.

(a) When there is no resultant force acting on a body, the body is either _____ or moving with _____.

(b) When there is a resultant force acting on a body, the body will move with _____.

(c) Newton's first law of motion states that an object _____ will remain _____ and an object _____ will continue _____ at constant _____ in the absence of a _____ acting on it.

(d) Newton's second law of motion states that the resultant force acting upon an object is equal to the product of the _____ and the _____ of the object; the direction of the force is the _____ as that of the object's acceleration.

(e) The SI unit for force is the _____.

(f) One newton is defined as the force which produces an acceleration of _____ when it is applied to a mass of _____.

2. Name an instrument in the laboratory which is used to measure force. _____

3. What are the changes that may occur to the motion of a body when a force is applied?

_____

_____

_____

_____

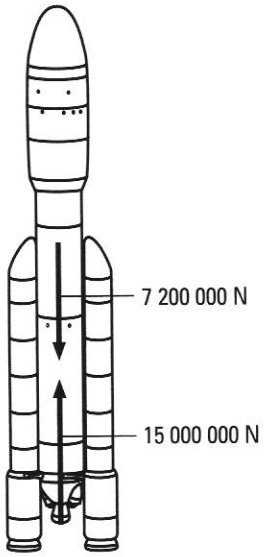
_____

4. Complete the following table to find the force, mass or acceleration of a body.

Mass	Acceleration	Force
5 kg	3.0 m s^{-2}	
4 kg		10 N
	2.0 m s^{-2}	20 N

10. A spacecraft of mass 720 000 kg is launched from the Earth to the Moon.

At lift-off from the Earth, the spacecraft has a weight of 7 200 000 N. The thrust from the engines is 15 000 000 N.



(a) Calculate the magnitude of the resultant force acting on the spacecraft.

(b) Calculate the magnitude of the initial acceleration of the spacecraft.

(c) As the spacecraft moves upwards, its thrust remains constant but the fuel is continually burnt.

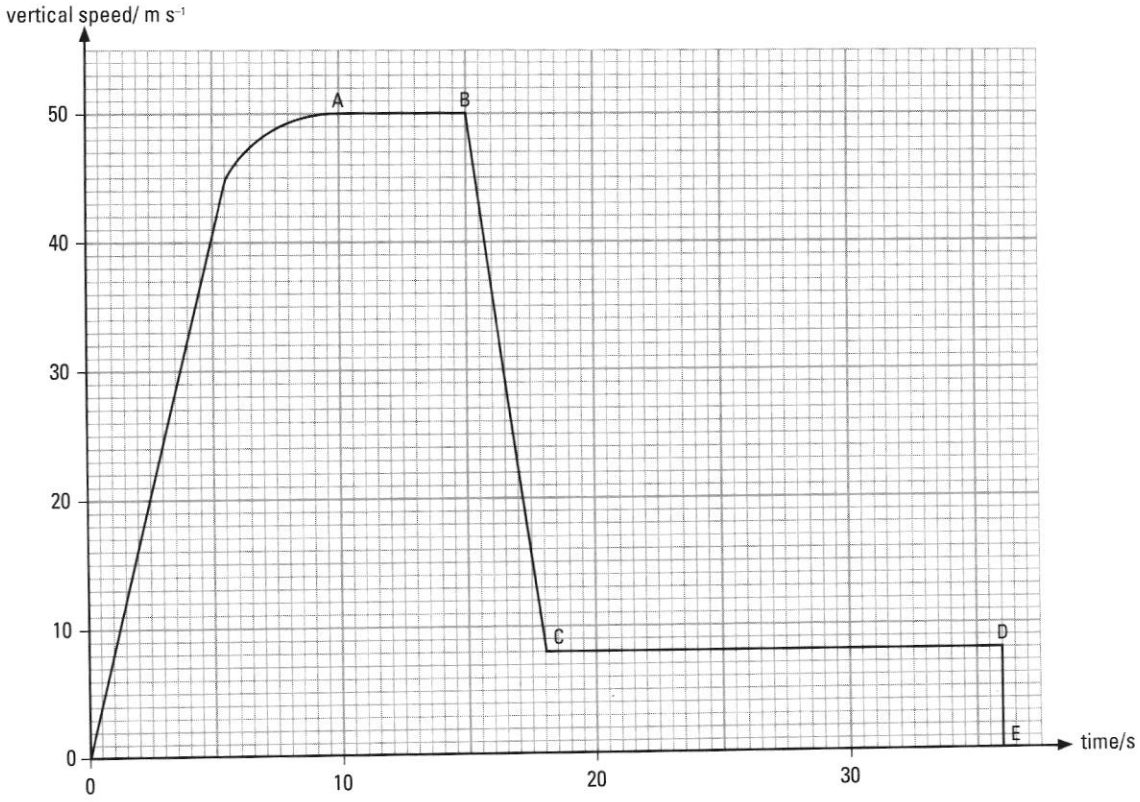
(i) What happens to the mass and weight of the spacecraft?

_____

(ii) What happens to the acceleration of the spacecraft?

_____

11. The graph below shows how the vertical speed of a parachutist falling from an aircraft varies with time until he reaches the ground.



(a) Calculate

(i) the average speed of the parachutist during the first five seconds.

(ii) the acceleration of the parachutist during this period.

(b) During the period AB, the speed of the parachutist is constant even though his parachute has not opened. Why is this so?

(c) The parachute opens at B. Given that the mass of the parachutist is 70 kg, calculate the average force slowing him down during the period BC.

Name: _____ **Class:** _____ **Date:** _____

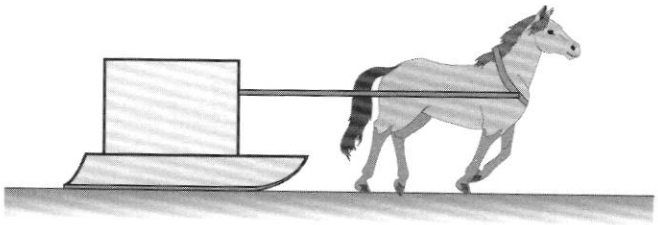
Exercise 3B Free Body Diagram

1. Complete these sentences.

(a) To every action there is an _____.

(b) Action and reaction forces act on _____.

2. The drawing below shows a horse pulling a sledge.



The pairs of action and reaction forces are listed below:

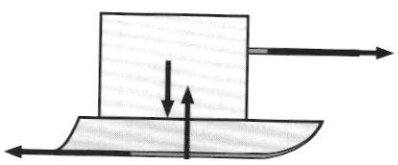
(a) Vertical forces

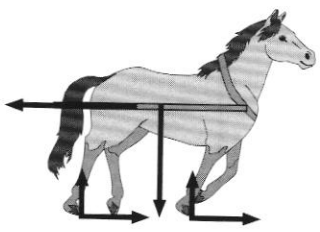
A	The gravitational force exerted by Earth on horse The gravitational force exerted by horse on Earth
B	The gravitational force exerted by Earth on sledge The gravitational force exerted by sledge on Earth
C	The contact force exerted by Earth on horse The contact force exerted by horse on Earth
D	The contact force exerted by Earth on sledge The contact force exerted by sledge on Earth

(b) Horizontal forces

E	The pulling force exerted by horse on sledge The pulling force exerted by sledge on horse
F	The frictional force exerted by horse's hooves on Earth's surface The frictional force exerted by Earth's surface on horse's hooves
G	The frictional force exerted by sledge runners on Earth's surface The frictional force exerted by Earth's surface on sledge's runners

The diagram below shows the free body diagram for the horse and the sledge. Label the forces with A, B, C, D, E, F and G.





Name: _____ Class: _____ Date: _____

Exercise 3C Friction

1. What do you understand by the term 'friction'?

_____

2. Name three examples where friction is put to good use.

_____

_____

_____

3. The presence of friction may be a nuisance. Explain.

_____

_____

_____

4. Name four ways of reducing friction.

_____

_____

_____

_____

5. A man pushes a packing case, which has a total mass of 50 kg, across the floor at a constant velocity of 0.4 m s^{-1} by exerting a horizontal force of 100 N.

   (a) What is the resultant force on the case?

   _____

   (b) What is the frictional force acting on the case?

   _____

   (c) If the force exerted by the man is increased to 120 N, what will the magnitude of the acceleration be?

BLANK