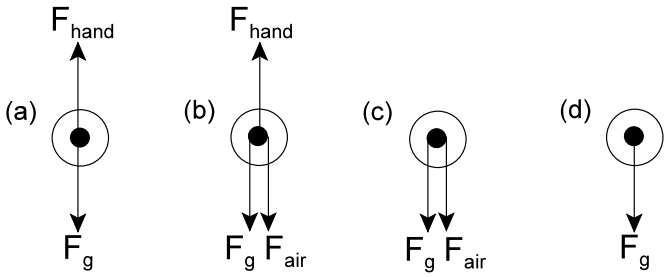
## PART A: MULTIPLE CHOICE (10 MARKS)

Choose the best response in each case and place your answer in the appropriate space on your answer sheet.

1. A force of 1.0 N is equivalent to:
   (a) 1.0 kg/s (b) 1.0 kg·m/s
   (c) 1.0 kg·$m^2$/s (d) 1.0 kg·$m/s^2$

2. You throw a tennis ball vertically upward. During the time the ball is in your hand, the correct FBD showing all the force(s) acting on the ball is:



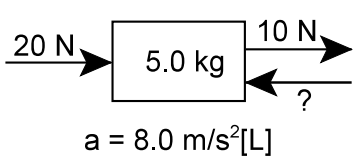

3. A child stomps their feet to remove snow from their boots. This fact illustrates Newton's:
   (a) first law (b) second law
   (c) third law (d) law of gravitation

4. An object, moving at constant velocity, must:
   (a) have a net force acting on it.
   (b) eventually stop due to the force of gravity.
   (c) have all forces acting on it balance each other.
   (d) not have a force of gravity acting on it.

5. Acceleration is always in the direction of the:
   (a) net force (b) initial velocity
   (c) final velocity (d) displacement

6. The following forces act on an object: 13.5 N[W], 21.2 N[E], 33.0 N[E], and 25.3 N[W]. Calculate the net force acting on the object.
   (a) 15.4 N[W] (b) 15.4 N[E]
   (c) 23.6 N[W] (d) 23.6 N[E]

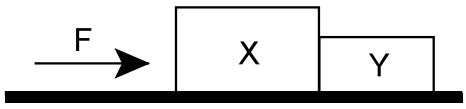
7. What is the missing force in the following diagram?
   (a) 10 N
   (b) 30 N
   (c) 50 N
   (d) 70 N




8. A net force of 58.0 N[W] is applied to a ball of mass $4.50 \times 10^2$ g. Calculate the ball's acceleration.
   (a) 0.129 $m/s^2$[W] (b) 0.13 $m/s^2$[W]
   (c) 129 $m/s^2$[W] (d) 130 $m/s^2$[W]

9. A child is standing on the floor. If the action force is the force of gravity of Earth pulling down on the child, then the reaction force is:
   (a) the force of the floor pushing up on the child.
   (b) the force of gravity of the child pulling up on the Earth.
   (c) the force of the child pushing down on the floor.
   (d) a net force causing the child to accelerate.

10. A constant force of 36 N is applied to a 20 kg mass (X) that is in contact with a 4.0 kg mass (Y) on a frictionless surface.




What is the magnitude of the force exerted by mass X on mass Y?
   (a) 6.0 N (b) 29 N
   (c) 30 N (d) 36 N

## PART B: MATCH (5 MARKS)

Match the definition from the 1st column to the best term in the 2nd column and place the matching letter in the appropriate space on your answer sheet.

1. Force of attraction between all objects in the universe.
2. Force that opposes the motion between two objects in contact.
3. Nuclear force that is responsible for interactions involving elementary particles such as electrons.
4. The force exerted by string, ropes, fibres, and cables.
5. Vector sum of all the forces acting on an object.

A) electromagnetic force
B) friction force
C) free-body diagram
D) gravitational force
E) inertia
F) net force
G) normal force
H) strong nuclear force
I) tension force
J) weak nuclear force

SPH3U-2 FORCES: FORCES & NEWTON'S LAWS QUIZ#1

## PART A: MULTIPLE CHOICE (10 MARKS)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |

## PART B: MATCH (5 MARKS)

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| | | | | |

## PART C: SHORT ANSWER (20 MARKS)

Answer the following questions in the space provided.

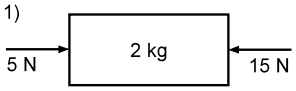
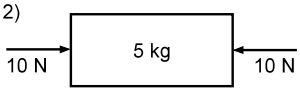
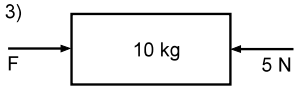
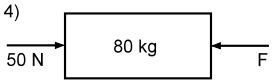
1. Draw a FBD for each underlined object. Use an arrow (like done in class) to indicate the object's direction of motion (if any). In each case be sure to (i) label the force(s) appropriately and (ii) indicate those forces that are equal.

{2} (a) A <u>ball</u> is rising vertically against air resistance.

{2} (b) A <u>person</u> is standing in an elevator that is moving upward at a constant speed.

{3} (c) A <u>crate</u> is being dragged along a floor by a rope that is horizontal.

{13} 2. Each of the following free body diagrams represents a different problem. Solve for the missing quantities and then place your answers in the space provided. Don't forget units, directions & sig.dig.

| 1)   | 2)   | 3)   | 4)   |
|---|---|---|---|
| $F_{net}$ = _____ | $F_{net}$ = _____ | a = 2.0 m/s$^2$[W] | $v_1$ = 4.0 m/s [E] |
| a = _____ | a = _____ | $F_{net}$ = _____ | $v_2$ = 4.0 m/s [W] |
| type of motion | $v_1$ = 3.0 m/s[E] | F = _____ | $\triangle t$ = 2.0 s |
| = _____ | $v_2$ = _____ | | a = _____ |
| | | | $F_{net}$ = _____ |
| | | | F = _____ |

## PART D: PROBLEMS (20 MARKS)

Answer the following questions on a separate sheet of paper. You may use the back of this sheet if you wish.

{4} 1. Two children are arguing over a toy. One pulls on the toy with a force of 34 N[N]. The other pulls with a force of 30 N[S]. If the toy has a mass of 300 g, what will be its resulting acceleration? Be sure to include a FBD of the situation.

{9} 2. A 2.0 kg mass is moving north at 32 m/s when a force of 16.0 N[W] acts on the mass for 4.0 seconds. What is the final velocity of the mass? Be sure to include directions in your calculations!

{7} 3. Assume that for each pulse, a human heart accelerates $2.1 \times 10^{-2}$ kg of blood from 0.18 m/s to 0.28 m/s during a time interval of 0.10 s. Calculate the magnitude of (a) the acceleration of the blood and (b) the net force needed to cause that acceleration.