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. An 4.0 kg body is accelerated from 21 m/s to 29 m/s by a net force of 16 N. The net force is applied for:
   (a) 0.5 s (b) 1.0 s
   (c) 2.0 s (d) 4.0 s

2. A 60 kg skydiver is falling through the air (parachute opened). The force of wind resistance on the skydiver is 400 N[up]. If g = 9.8 m/s^2[down] on Earth, the net vertical force on the skydiver is:
   (a) 188 N[down] (b) 388 N[down]
   (c) 588 N[down] (d) 788 N[down]

3. An experimenter uses a bathroom scale to measure his weight while riding in an elevator. How will the reading on the bathroom scale compare to the normal reading for the following sequence of motion:
   ① elevator starts to ascend
   ② elevator ascends at a constant velocity
   ③ elevator stops
   (a) lighter, lighter, heavier
   (b) heavier, heavier, lighter
   (c) lighter, normal, heavier
   (d) heavier, normal, lighter

4. The mass of an object:
   (a) is numerically equal to its weight.
   (b) has the same units as weight.
   (c) depends on its location.
   (d) is a measure of its inertia.

5. The gravitational constant G = 6.67 × 10^{-11} N·m^2/kg^2 was experimentally measured by:
   (a) Kepler (b) Newton
   (c) Cavendish (d) Einstein

The following table lists the gravitational force fields of several planets. Use the table to answer questions 6, 7 and 8.

Planet	*g(N/kg)*
Earth	*9.81*
Mercury	*3.60*
Jupiter	*26.40*
Venus	*8.60*

6. An astronaut leaves Earth and lands on Jupiter. The astronaut has a mass of 50.0 kg on Earth. What is the mass of the astronaut on Jupiter?
   (a) 50.0 kg (b) 76.4 kg
   (c) 491 N (d) 1.32 × 10^3 N

7. If you stand on the same spring scale on all of the planets, on which planet will your weight be the smallest?
   (a) Earth (b) Mercury
   (c) Jupiter (d) Venus

8. Calculate the mass of an object on Earth if it has a weight of 29.3 N[d] on Earth. {Use g = 9.81 m/s^2[d].}
   (a) 2.99 kg (b) 3.00 kg
   (c) 0.333 kg (d) 0.334 kg

9. The force of gravity on a spacecraft some distance from the Earth is 600 N. What would that force be if its distance to the Earth's centre were half as great?
   (a) 150 N (b) 300 N
   (c) 1200 N (d) 2400 N

10. Max exerts a constant force of 1.5 N to pull a 2.0 kg object at constant velocity along a level surface on the moon (g = 1.6 N/kg [down]). The coefficient of kinetic friction for this situation is:
    (a) 0.077 (b) 0.47
    (c) 0.75 (d) 1.3

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. Branch of mechanics that describes the motion of an object by considering the forces causing the motion.
2. Ratio of the magnitude of friction to the magnitude of the normal force.
3. The quantity of matter in an object.
4. The force that tends to prevent a stationary object from starting to move.
5. The amount of force per unit mass acting on objects in the gravitational field.

A) acceleration
B) coefficient of friction
C) dynamics
D) force of gravity
E) gravitational field strength
F) kinematics
G) kinetic friction
H) mass
I) static friction
J) weight

SPH3U-2 FORCES: Fg & FRICTION QUIZ#2

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.

{5} 1. The force of gravitational attraction between two objects is F_G. By what factor (ie x2, x½, ...) does F_G change if the following occur:

(a) The mass of one of the objects is doubled? _____

(b) The distance between their centres is tripled? _____

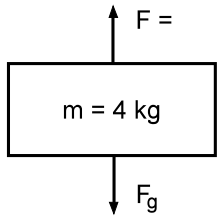
(c) The mass of both objects are halved? _____

(d) The distance between their centres is halved? _____

(e) Both (a) and (b) occur. _____

{15} 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. **{Use g = 10 m/s^2}**

1)



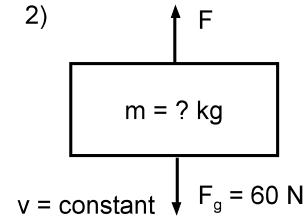
a = 2.0 m/s^2[d]

F_{net} = _____

F_g = _____

F = _____

2)



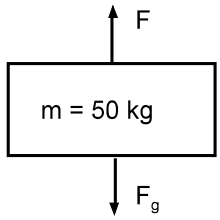
a = _____

F_{net} = _____

F = _____

m = _____

3)



v_1 = 4 m/s[d]

v_2 = 4 m/s[u]

Δt = 2.0 s

a = _____

F_{net} = _____

F_g = _____

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.

Use g = 9.8 m/s^2[down] where necessary.

~~{3} 1. Find the force of attraction between the Earth and the Moon, using the following data~~

- ~~m_{moon} = 7.35 × 10^{22} kg~~
- ~~m_{earth} = 5.98 × 10^{24} kg~~
- ~~average distance between centres = 3.84 × 10^5 km~~

2. An astronaut on the surface of Mars finds that a rock accelerates at 3.7 m/s^2 when it is dropped. The astronaut also finds that a force scale reads 260 N when the astronaut steps on it.

{3} (a) What is the astronaut's mass as determined on the surface of Mars?

{3} (b) What would the force scale read if the astronaut stepped on it on Earth?

3. A store clerk pushes a parcel along a counter with a force of 7.6 N[W]. The parcel has a mass of 2.5 kg. The kinetic friction acting on the parcel is 6.5 N[E].

{4} (a) Draw a FBD of the parcel as it is being pushed. Be sure to label your forces appropriately and to include values.

{2} (b) Calculate the net force acting on the parcel.

{2} (c) Calculate the acceleration of the parcel.

{3} (d) Determine the coefficient of kinetic friction between the parcel and the counter.