A. Multiple Choice – Enter the correct answer on the SCANTRON card [15 Marks]

1. The forces on an object are all balanced. The object is
a) not moving   b) moving at constant speed   c) accelerating   d) either (A) or (B)   e) none of the above

2. The mass of an object is the_____ the object
a) force of gravity of   b) weight of   c) amount of matter in   d) g force acting on

3. "For every action there is an equal but opposite reaction". This statement is Newton's_____
a) First Law   b) Second Law   c) Third Law   d) Law of Universal Gravitation

4. If the mass of an object is doubled and the force is kept constant, its acceleration will be_____
a) the same   b) half   c) double   d) triple

5. Hunters are trained to handle guns properly to avoid recoil when they fire. This is an example of Newton's_____
a) First Law   b) Second Law   c) Third Law   d) Law of Universal Gravitation

6. If the acceleration of an object is doubled and the mass is kept constant, its Force will be_____
a) the same   b) half   c) double   d) triple

7. The force of friction depends on these three factors:
a) mass, type of surface, force of gravity   b) surface area , type of surface, force of gravity
c) weight, type of surface, force of gravity   d) mass , type of surface, presence of lubricant

8. When you wear seat belts in a car you are obeying the Traffic Act and Newton's_____
a) First Law   b) Second Law   c) Third Law   d) Law of Universal Gravitation

9. The accepted unit of force in the metric system is the
a) Newton   b) Foot-Pound   c) kilogram   d) Kgm/s^2

10. The easiest way to lose weight is to
a) jog 10 Km a day   b) go on a diet   c) climb a mountain   d) all of the above   e) none of the above

11. The value of the coefficient of friction indicates if a surface is
a) rough   b) smooth   c) lubricated   d) (A) & (B) only   e) none of the above

12. If a surface has a high coefficient of friction it will be
a) rough   b) smooth   c) lubricated   d) (A) & (B) only   e) none of the above

13. Streamlining an airplane wing or a car profile for aerodynamics is done to _____
a) increase air resistance   b) reduce turbulence   c) increase fuel consumption d) reduce air resistance   e) (A) & (D) only

14. A book resting on a table has _____ acting on it.
a) gravity and friction   b) gravity and a net force   c) friction and a normal force d) gravity and a normal force

15. The coefficient of sliding friction on a ramp (or inclined plane) is the slope of the ramp (Rise/Run)
a) True   b) False

B. Problems – Answer in the space provided and **SHOW FULL SOLUTIONS**

1. While roller skating with a friend, she gives you a big push (100 N). If your mass is 65 Kg, What is your acceleration.

2. The force of gravity action on a brick is 19N. What is the mass of the brick?

3. The coefficient of friction on a cement floor is 0.2. A 300 Kg crate needs to be pulled a distance of 20 m by a fork lift. The fork lift has a maximum force of 1000N. Will the fork lift be able to pull the crate?

4. Determine the coefficient of friction when the force between a bicycle and the road is 10 000N and the force of friction as the bicycle comes to a stop is 3000 N. Also calculate the mass of the bicycle.

5. An experiment to study friction was performed. Several objects of different masses were pulled with the minimum force required to make the move a fixed distance along two different surfaces.

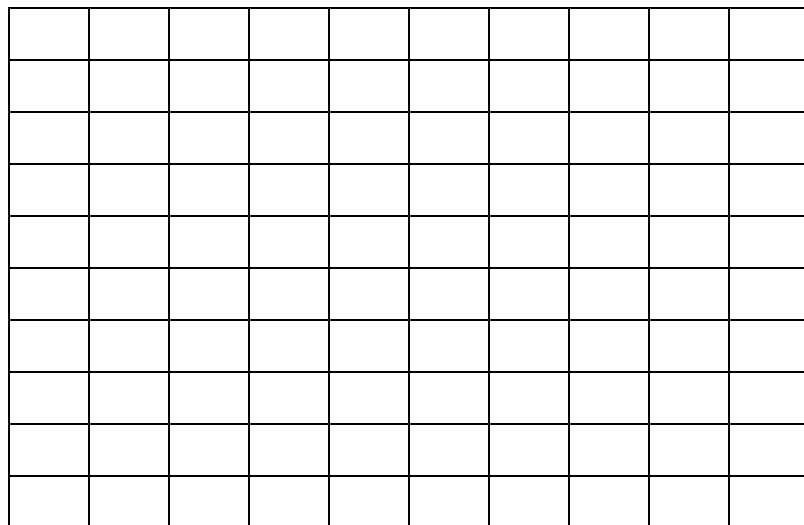The results are reported below in table A and table B.

SURFACE A

Mass (Kg)	Friction Force (N)	Force of Gravity (N)
0.5	2.5	
1.0	5.0	
1.5	7.5	

SURFACE B

Mass (Kg)	Friction Force (N)	Force of Gravity (N)
0.5	4.0	
1.0	8.0	
1.5	12.0	

A) Plot the above results on the graph paper below.
Force of friction of the Y-axis, Force of gravity on the X-Axis

B) Calculate the coefficient of friction for each surface

μ Surface A	μ Surface B

C) Which surface is rougher _____. Why?

_____

_____

D) If you were given one ramp and different types of object (with different surfaces), describe how you would calculate the coefficient of friction for each object.

E. Why does friction cause heat? _____

_____

F. Sketch the profile of a rough surface as seen under the microscope.