Name:

Physics 12
M. Lam

Graphical Analysis

Block:

For each scenario described below, use the data to:

a) Plot the data points. Clearly scale and label all axes, including units as appropriate. Draw a curve that best represents the data.
b) Record any quantities that should be graphed to yield a straight line.
c) Plot the straight line data points. Clearly scale and label all axes, including units as appropriate. Draw a straight line that best represents the data.
d) State the relationship between the variables. Write an equation for your straight line.
e) Determine the slope of your straight line (include units).
f) Determine the meaning of the slope of your straight line. If possible, determine the theoretical value (include units).

1. A car is travelling at 50 km/h. At various times, the total distance the car has travelled is recorded.

Time (s)	0	5.0	10.0	15.0	20.0	25.0
Distance (m)	0	70	136	202	284	360

2. A bucket, filled each time with a different amount of water, is pushed across a horizontal frictionless surface with a constant 4.0 N force. Each time the bucket is pushed, the total mass and acceleration are recorded.

Mass (kg)	1.0	2.0	3.0	4.0	5.0	6.0
Acceleration (m/s^2)	4.2	1.9	1.3	1.0	0.8	0.7

3. A bucket is filled with water so it has a total mass of 5.0 kg. The bucket pushed across a horizontal frictionless surface with a constant 4.0 N force. At various times, the total displacement of the car is recorded.

Time (s)	0	1.0	2.0	3.0	4.0	5.0
Displacement (m)	0	0.40	1.54	3.76	6.26	9.83

4. Six different ideal machines are used to lift a 10 kg object to a height of 5.0 m. For each machine, the power output of the machine and the time taken to lift the object are recorded.

Power (W)	60	100	120	175	200	250
Time (s)	8.3	4.8	4.2	2.9	2.5	2.0

5. A constant 0.50 N net force is exerted on various objects initially at rest. After 10 seconds, the velocity of each object is recorded.

Mass (kg)	2.0	4.0	6.0	8.0	10.0	12.0
Velocity (m/s)	2.5	1.2	0.8	0.7	0.5	0.5

6. Various spherical containers are filled with water. For each sphere, the radius and volume of water are recorded.

Radius (cm)	5	8	10	12	15	16
Volume (cm^3)	500	2100	4100	7300	13900	17200

7. A 40 kg object is pushed with varying forces from rest until it reaches a speed of 1.0 m/s. In each test, the net force and time are recorded

Net force (N)	5.0	7.4	9.7	16.5	27.4	29.0
Time (s)	8.4	5.3	4.0	2.4	1.5	1.4

8. A pendulum is constructed by attaching a small mass to a string. The mass is lifted so the string makes an angle of 5º with the vertical. When the mass is released, the period is recorded. This is repeated for various lengths of string.

Length (m)	0.20	0.40	0.60	0.80	1.00	1.20
Period (s)	0.92	1.30	1.55	1.84	2.10	2.23

9. A simple circuit is constructed using a 120 V power source and a single resistor. For each resistor, the current through the resistor is recorded.

Resistance (Ω)	1000	2700	4000	4700	6700	10000
Current (mA)	117	44	29	25	18	12

10. Conductive dough is shaped into six cylinders, each with a different length but the same radius of 1.0 cm. Each cylindrical sample of Play-Doh is connected in a circuit and the resistance of the dough is measured. *Can you determine the resistivity of the dough?*

Length (cm)	2.0	4.0	6.0	8.0	10.0	12.0
Resistance (Ω)	1900	3900	5600	7700	9600	11900

11. A small 100 g block attached to a string is whirled in a circle on a frictionless horizontal surface. The tension is kept constant while the the length of the string is varied to change the radius circle. For each radius, the tangential velocity of the block is measured. *Can you determine the tension in the string?*

Radius (m)	0.10	0.20	0.30	0.40	0.50	0.60
Tangential velocity (m/s)	2.1	2.8	3.5	3.9	4.4	5.0

12. An 70 kg astronaut leaves Earth for a mission. The gravitational force he experiences is measured at various distances from the centre of Earth.

Distance (× 10^6 m)	8	10	12	16	20	25
Gravitational force, F_g (N)	440	280	190	110	70	40