Katalog

MECHANICS LABORATORY

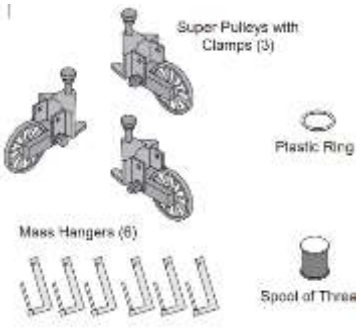
PHYSICS DEPARTMENT
FMNS UNIVERSITAS NEGERI SURABAYA

List of Experimental Mechanics Equipment

1. FORCE TABLE

Equipment: The PASCO Scientific Model ME-9447 Force Table

No	Component	Qny
1	Force Table Assembly with Center Post and three Detachable Legs	1
2	Three Super Pulley Clamps	3
3	Three Mass Hangers	1
4	Plastic Ring	1
5	Spool of Thread	1



Experiment Topics: Vector Addition

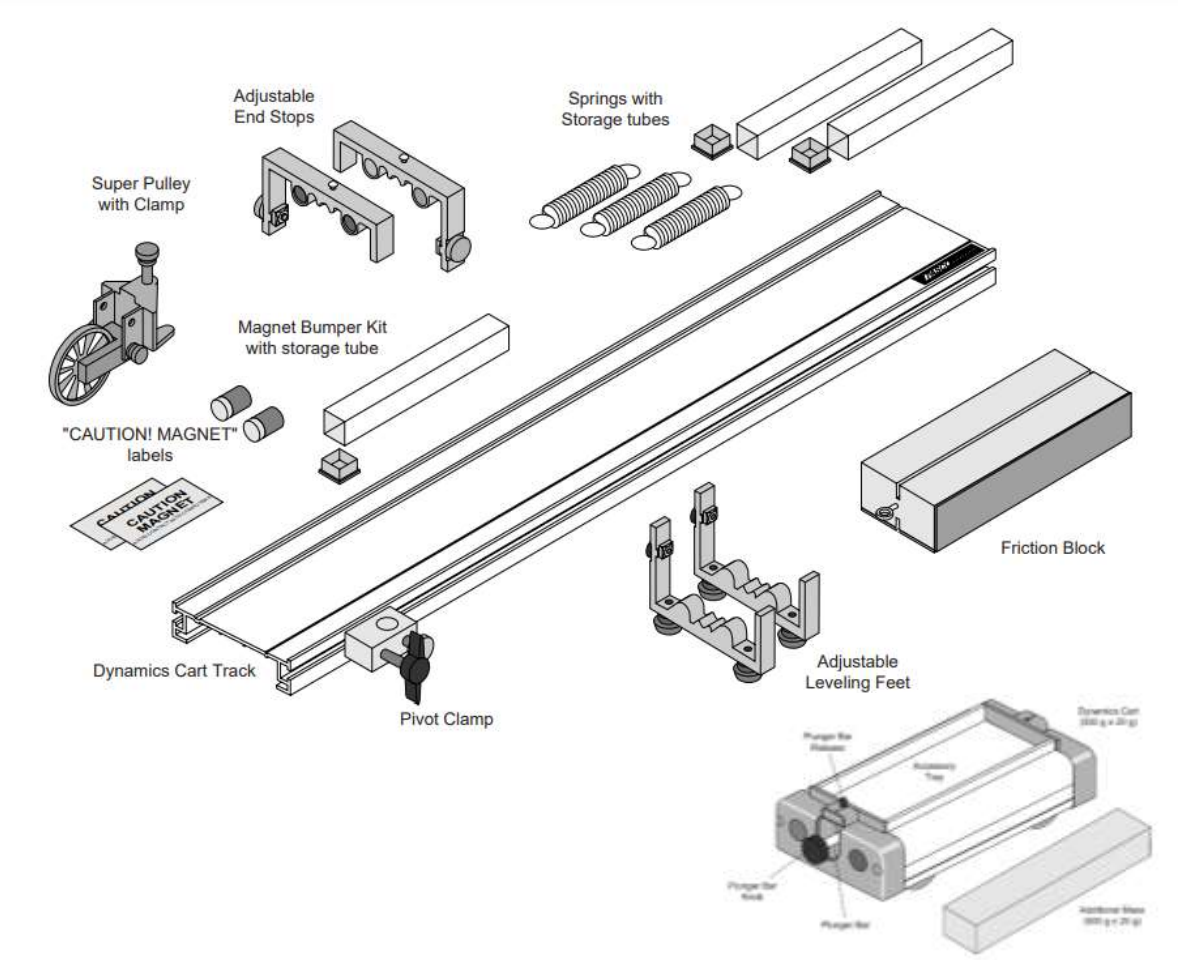
Equipment Setting:

2. DYNAMICS CART WITH MASS

Equipment:

a. The PASCO Scientific Model ME-9430 Dynamics Cart with Mass
b. The PASCO Model ME-9458 Dynamics Cart Accessory Track Set t (2.2m version)
c. Pivot Clamp for Use with the Base and Support Rod (ME-9355)

No	Component	Qny
1	Dynamics Cart	2
2	500g Additional Mass	2
3	Dynamics Cart Track	1
4	Super Pulley with Clamp	1
5	Springs for simple harmonic motion with storage tubes	3
6	Magnet Bumper Kit (includes 2 magnets) with storage tube	1
7	Adjustable End Stop sets	2



DYNAMICS CART WITH MASS…

Experiment Topics:

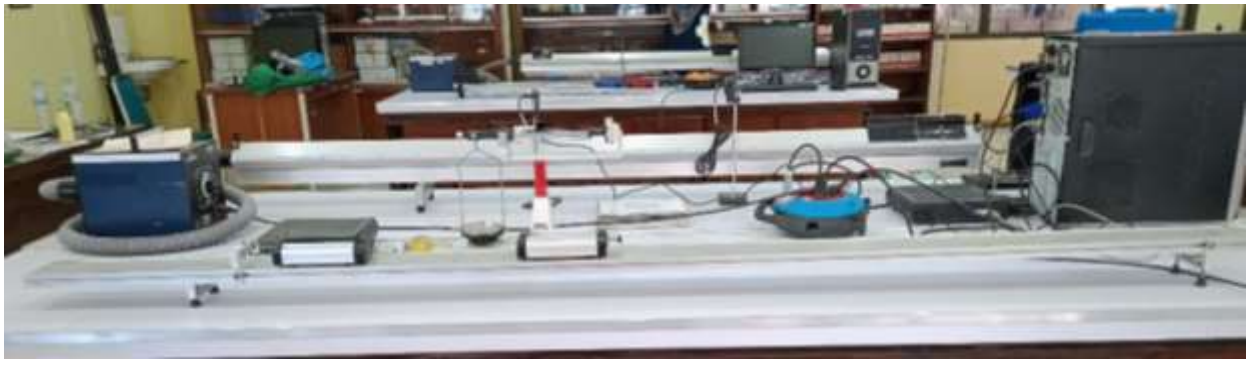
a. Model ME-9430 Dynamics Cart with Mass:

1. Experiment 1: Kinematics (Average vs. Instantaneous Velocities)
2. Experiment 2: Coefficient of Friction
3. Experiment 3: Newton's Second Law (Predicting Accelerations)
4. Experiment 4: Cart Calibration (Measuring the Spring Constant)
5. Experiment 5: Rackets, Bats and "Sweet Spots"
6. Experiment 6: Sliding Friction and Conservation of Energy

b. Model ME-9458 Dynamics Cart Accessory Track Set t (2.2m version):

1. Experiment 1: Conservation of Momentum in Explosions
2. Experiment 2: Conservation of Momentum in Collisions
3. Experiment 3: Simple Harmonic Oscillator
4. Experiment 4: Oscillations on an Incline
5. Experiment 5: Springs in Series and Parallel
6. Experiment 6: Newton's Second Law
7. Experiment 7: Newton's Second Law II
8. Experiment 8: Acceleration down an Incline
9. Experiment 9: Conservation of Energy

Equipment Setting:

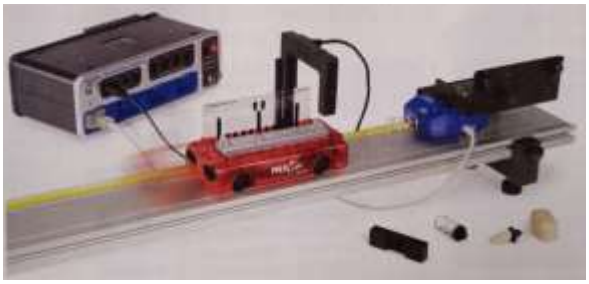


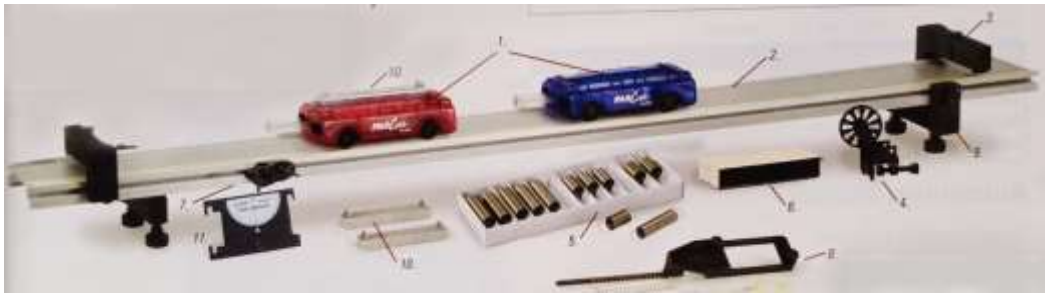
3. PASCAR DYNAMICS SYSTEM

Equipment: The PASCO scientific Model ME-9430 PAScar Dynamics System

No	Component	Code	Qny
1	1.2 Meter PAScar Track		1
2	Car Picket Fences	ME-9804	2
3	Force Accessory Bracket		1
4	Photogate Bracket	ME-9806	2
5	Photogate and Fence	ME-9471A	1
6	Photogate Head	ME-9498A	1
7	Supper Pulley with Screw	ME-9450A	1
8	Bumper Magnetic		1
9	Science Workshop 500 or 750 Interface		1

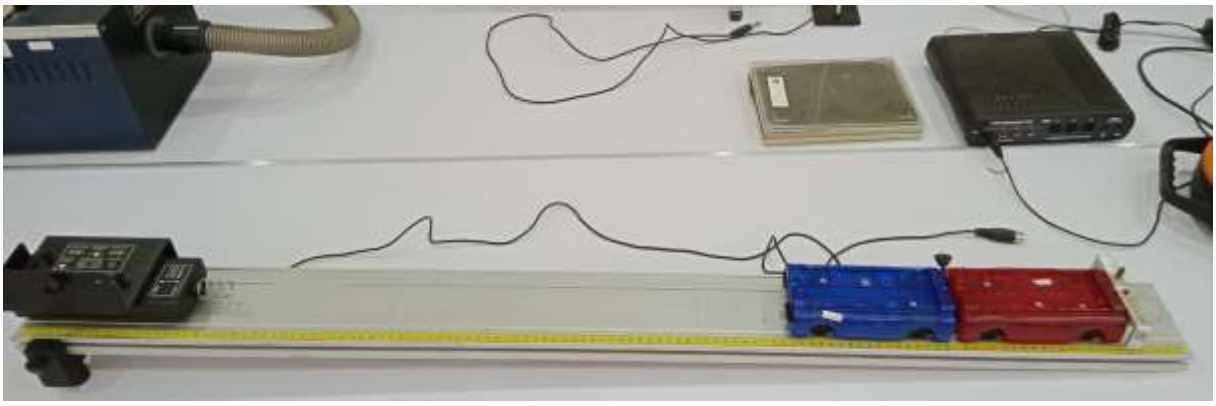
Experiment Topics: Impulse-momentum





PASCAR DYNAMICS SYSTEM 1.2 M...

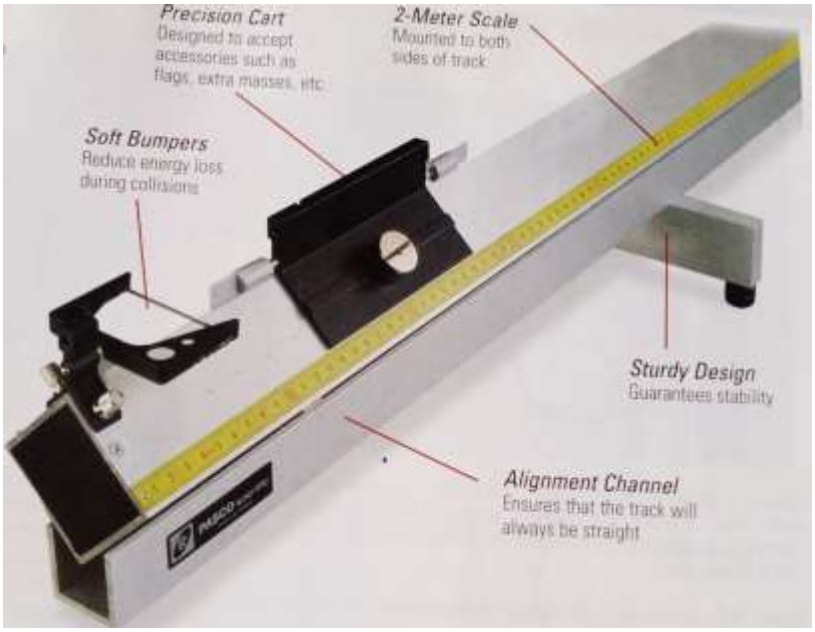
Equipment Setting:



4. AIR TRACK WITH PHOTOGATE TIMING SYSTEM

Equipment:

a. The PASCO scientific Model SF-9214 Air Track is 2.0 meters
b. The PASCO scientific Model SF-9216 Variable Output Air Supply
c. The PASCO scientific ME-9215B Photogate Timer

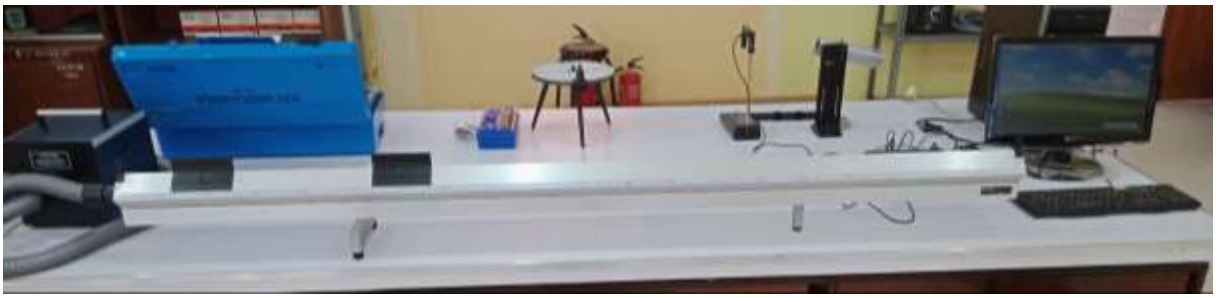


AIR TRACK WITH PHOTOGATE TIMING SYSTEM...

Experiment Topics:

1. Experiment 1: Instantaneous vs Average Velocity
2. Experiment 2: Kinematics on an Inclined Plane
3. Experiment 3: Speed of a Projectile
4. Experiment 4: Newton's Second Law
5. Experiment 5: The Force of Gravity
6. Experiment 6: Conservation of Momentum
7. Experiment 7: Kinetic Energy
8. Experiment 8: Conservation of Mechanical Energy
9. Experiment 9: Elastic-Kinetic Energy
10. Experiment 10: Pendulum Motion

Equipment Setting:



5. AIR TRACK WITH TIMING COUNTER

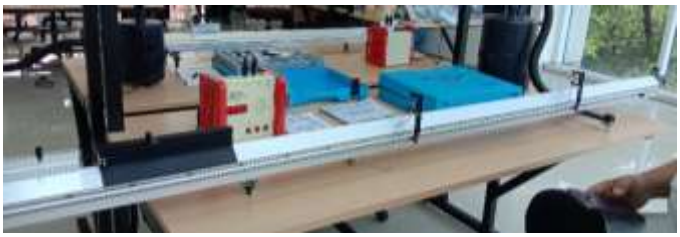
Equipment:

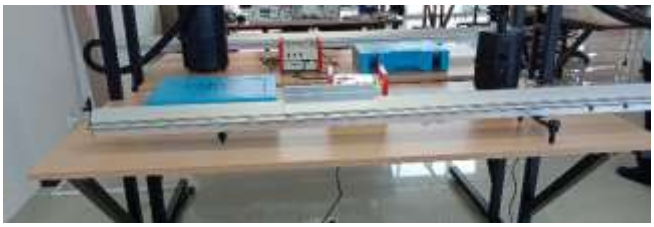
a. Air Track AT-02 or AT-1.5
b. Timer Counter and Photogate
c. Air Supply

Experiment Topics:

1. Basic Experiment
2. Linear Motion
3. Second's Newton Laws
4. Momentum Conservation Laws
5. Simple Harmonic Motion
6. Mechanics Energy Conservation Laws

Equipment Setting:



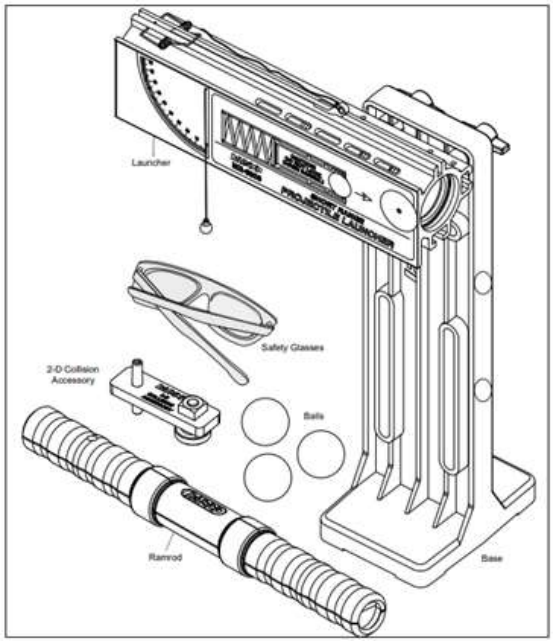


6. PROJECTILE LAUNCHER

Equipment:

No	Component	Code	Qny
1	Short Range Projectile Launcher	ME-6800	1
2	Projectile Launcher and Base (assembled)	ME-6800, ME-6801	2
3	Plastic Balls, 25 mm diameter (3)	ME-6802	1
4	2-D (two-dimensional) Collision Accessory	ME-6802	1
5	Ramrod	ME-6802	1
6	Safety Glasses (2 pair	699-066	1
7	C-Clamp, Large	SE-7285	1
8	Launcher Spares Kit	ME-6802	2
9	Photogate Digital		1

ME-6802 Launcher Spares Kit



Experiment Topics:

1. Projectile Motion
2. Projectile Motion Using Photogates
3. Projectile Range versus Angle
4. Projectile Path
5. Conservation of Energy
6. Conservation of Momentum
7. Vary Angle to Maximize Height

Demonstrations Topics:

1. Do 30° and 60° Launch Angles give the Same Range?
2. Simultaneously Fire Two Balls Horizontally at Different Speeds
3. Shoot through Hoops

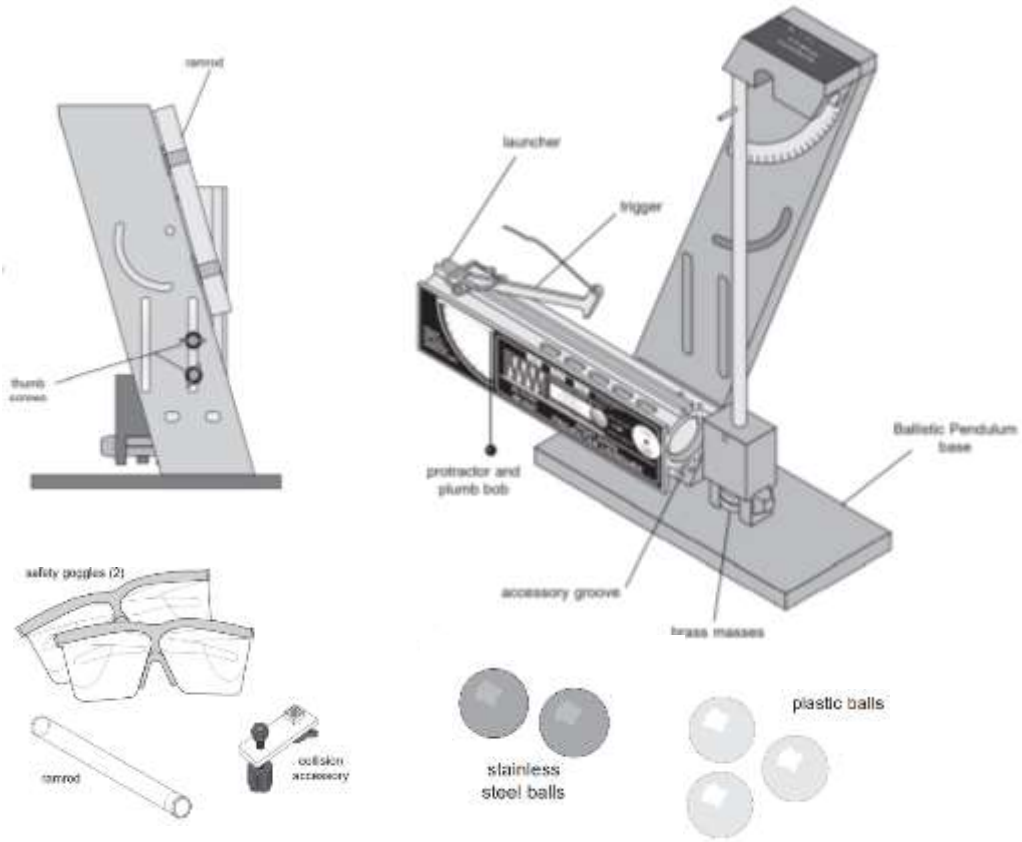
PROJECTILE LAUNCHER…

Equipment Setting:

7. BALLISTIC PENDULUM/PROJECTILE LAUNCHER

Equipment:
The PASCO ME-6830/ME-6831 Ballistic Pendulum/ Projectile Launcher (BPPL)

No	Component	Qny
	ME-6831 Ballistic Pendulum	1
1	Ballistic Pendulum base (assembled)	1
2	steel balls	2
	ME-6830 Ballistic Pendulum/Projectile Launcher	1
3	Short Range Launcher	1
4	Ramrod (Attached with Velcro® To Stand)	1
5	Collision Attachment	1
6	Plastic Balls	3
7	Pendulum Brass Masses	2
8	Safety Goggles	2



BALLISTIC PENDULUM/PROJECTILE LAUNCHER…

Experiment Topics:

1. Projectile Motion
2. Projectile Motion Using Photogates
3. Projectile Range versus Angle
4. Projectile Path
5. Conservation of Energy
6. Conservation of Momentum in Two Dimensions
7. Varying Angle to Maximize Height on a Wall
8. Ballistic Pendulum approximate method
9. Ballistic Pendulum exact method
10. Demo: Do 30° and 60° Give Same Range?
11. Demo: Simultaneously Shoot Two Balls Horizontally at Different Speeds
12. Demo: Shoot through Hoops
13. Demo: Elastic / Inelastic Collisions

Equipment Setting:

8. PHYSICAL PENDULUM

Equipment:

a. Pendulum Rod
b. Protractor
c. Peg to the pendulum shaf

Experiment Topics:

1. Pendulum period
2. Gravity accelerate

Equipment Setting:

9. STRESS/STRAIN APPARATUS

Equipment:

No	Component	Code	Qny
1	Stress/Strain Unit	AP-8214A	1
2	Metal Test Coupons	AP-8223	1
3	Rotary Motion Sensor	CI-6538	1
4	Force Sensor	CI-6746	1

Experiment Topics:

1. Plot Stress vs. Strains in Real Time
2. Determine Young's Modulus
3. Determine the Breaking Point of Various Materials

STRESS/STRAIN APPARATUS…

Equipment Setting:

10. MECHANICS KIT

Equipment: Mechanics Kit (PMS 500)

No	Component Kit	Code	Qnt
	Top Side		
1	Scissor	GLA 011	1
2	Universal Boss head bolts	PWV 160 03	4
3	Helical springs, 25N / m	FME 51.27/40	1
4	Helical springs, 10N / m	FME 51.26/39	1
5	Helical springs, 4.5N / m	PME 100	1
6	Ruler, 50cm	KMS 15/105	1
7	Statif rod, 500mm	KST 30/500	1
8	Statif rod, 250mm	KST 30/250	2
9	Statif rod, 100mm	KST 30/010	1
10	Nylon rope	FME 51.08/09	1
11	Table Clamps	GSN 185	1
12	Table Clamp Pulley	GSN 186	1
13	Boss head, Round	GSN 161	1
14	Statif Foot	FME 51.02/02	2
15	Pencil Holder	PWV 160 02	1
16	Basic Statif	GSN 180	1
17	Dynamics Train	PMK 229	2
18	Motorized Dynamics Train	PMK 226	1
19	Multilevel Beam	FME 51.37/72	1

No	Component Kit	Code	Qnt
	Bottom Side		
1	Flat Spring with Clamps	PWV 160	1
2	Precision Rail	FPT 16.02/66	2
3	Boss head Universal	GSN 162	2
4	Pendulum Ball, 35 g	PMG 160 01	1
	Pendulum Ball, 70 g	PMG 160 02	1
5	Cut Load and Hangers 250g	FME 27.01	1
6	Rubber Rope, 3m	PME 010	1
7	Vibration generator	FAL 29	1
8	Ribbon Typing	FME 69	1
9	Pounder Spring	PMK 200	2
10	Threaded Rod with Butterfly Nut	PWV 160 03	1
11	Pedestal Pegs	PMK 201	2
12	Type Timer	FME 51.40	1
13	Rail Connector	FPT 16.03/67	1
14	Clamped Layers	FPT 16.17/87	2
15	Foot Rail	FPT 16.04/68	2
16	Roller Meter	GMM 221	1
17	Circular Spring	PMK 202	1

MECHANICS KIT…

Experiment Topics:

a. Kinematics and Dynamics Sheet

1. MU 01 Typing timer
2. MU 02 Train Motion Dynamics on Flat Plane
3. MU 03 Regular Straight Motion
4. MU 04 Average Speed and Instantaneous Velocity
5. MU 05 Train Motion Dynamics on Inclined Plane
6. MU 06 Free Fall Movement
7. MU 07 Newton's Second Law of Motion
8. MU 08 Linear Momentum Collision
9. MU 09 Law of Conservation of Momentum on Explosions
10. MU 10 Law of the Conservation of Mechanical Energy

b. Vibration

1. MU 11 Simple Pendulum
2. MU 12 Oscillating Spring-Hanging Load
3. MU 13 Oscillation on a Flat Spring
4. MU 14 Oscillation Curve
5. MU 15 Gravitational Acceleration
6. MU 16 Simple Pendulum Resonance
7. MU 17 Helical Spring Resonance
8. MU 18 Hook's Law

c. Mechanical Waves

1. MU 19 Transmission and Reflection of Transverse Waves
2. MU 20 Standing Wave on the Rope (Thread)
3. MU 21 Standing Wave on a Helical Spring

11. MECHANICS SYSTEM PANEL TYPE KIT

Equipment: Mechanic System Panel Type PMK 360

No	Component	Spesification	Qnt
1	Experiment Board	600 x 600 x 2 mm	1
2	Dynamometer (or spring balance)	0 – 5 Nx0.1N 0 – 500 gram	1
3	Slotted masses and hanger	8 x 50 g, 4 x 20 g, 2 x 10 g, 3 x 50 g	1 set
4	Lever beam	Aluminum tube 600 mm x Ø8 mm	1
5	Pivot mount	-	1
6	Object ring	-	3
7	Degree scale	Magnetic back	1
8	Pulley	Magnetic back, 1 large, 2 small	1 set
9	Pulley block	Two in line	1
10	Incline plane	Angle aluminum plate, double magnetic back	1
11	Friction block	4 difference face: rubber, wood, plastic, and glass	1
12	Torque wheel	-	1
13	Rolling mass	-	1
14	Ruler	-	1
15	Helical spring	-	1
16	Nylon string	-	1

Experiment Topics:

1. Experiment 01: Hooke's Law and the Measurement of Forces
2. Experiment 02: Equilibrant and Resultant of Forces
3. Experiment 03: Resolving a Force
4. Experiment 04: Torques for Parallel Forces
5. Experiment 05: Torques for Non-Parallel Forces (Part 1)
6. Experiment 06: Torques for Non-Parallel Forces (Part 2)
7. Experiment 07: Center of Gravity and Center of Mass
8. Experiment 08: Equilibrium of Extended Body
9. Experiment 09: Simple Machines: The Inclined Plane
10. Experiment 10: Simple Machines: The Lever
11. Experiment 11: Simple Machines: The Pulley

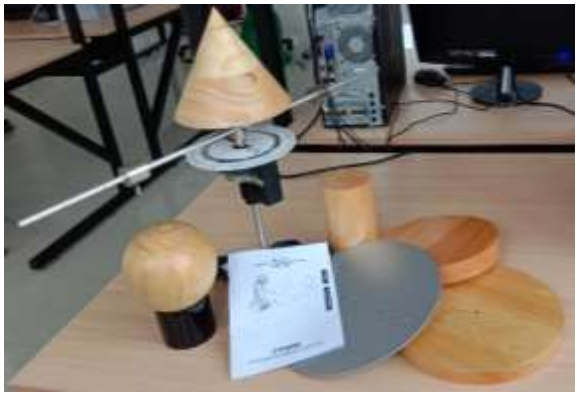
MECHANICS SYSTEM PANEL TYPE KIT…

1. Experiment 12: Sliding Friction
2. EXperiment 13: Simple Harmonic Motion 1: Oscillation of mass hanging on a spring
3. Experiment 14: Simple Harmonic Motion 2: The Simple Pendulum

12. MOMENT OF INERTIA APPARATUS

Equipment:

No	Component	Code	Qny
1	Wooden Cylinder		1
2	Wooden Ball		1
3	Wooden Cone		1
4	Wooden Wheels		1
5	Circular Arc		1
6	Balance Arm		1
7	Statif and Clamps		1



Experiment Topics: **Moment of Inertia**

13. ADVANCED STRUCTURES SET

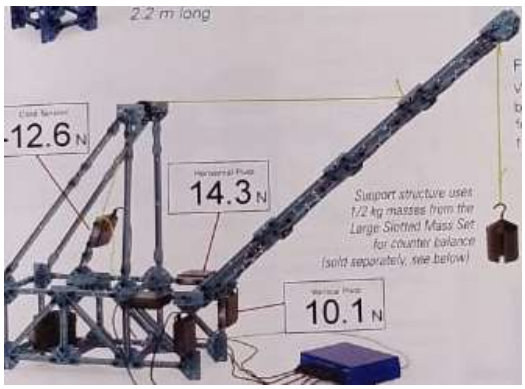
Equipment: Advanced Structured Set ME-6992B

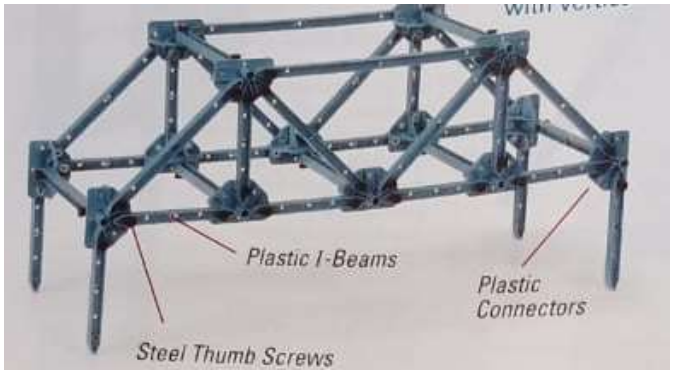
No	Component	Qty
1	#5 Beam (24 cm tong)	24
2	#4 Beam (17 cm long)	54
3	#3 Beam (11.5 cm long)	54
4	#2 Beam (8 cm long)	24
5	#1 Beam (5.5 cm long)	24
6	#3 Flexible Beam (11.5 cm)	16
7	#4 Flexible Beam (17 cm)	16
8	#5 Flexible Beam (24 cm)	16
9	Flat 3 X 4 Beam (19 cm)	16
10	Flat #4 Beam (17 cm) |.	16
11	Flat 2 X 3 Beam (12.5 cm)	16
12	Flat Connector	6
13	Full Round Connector	6
14	Half Round Connector	42
15	Axle (2 each of 3 lengths)	6

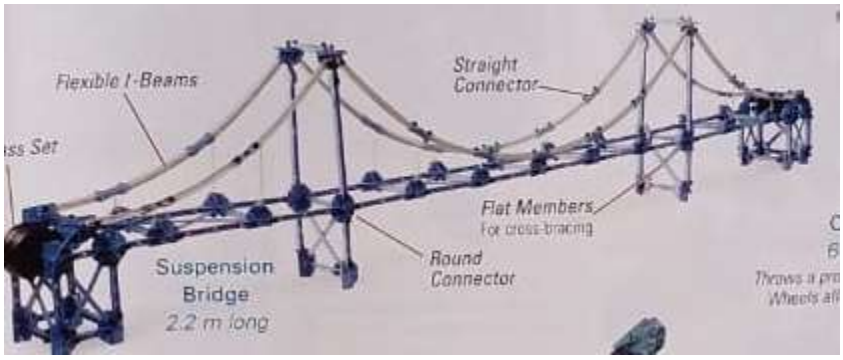
No	Component	Qty
16	Drive Wheel and Tire	4
17	Straight Connector	24
18	Structures Rod Clamp	2
19	Nut and Bolt for PAStrack	6
20	Screw (6-32)	300
21	"O" Ring	12
22	Pulley	12
23	Collet	24
24	Spacer	12
25	Sliding Connector	12
26	Angle Connector	24
27	Cord Tensioning Clip	32
28	Yellow Cord	1 roll
29	Force Structures Bracket	2
30	Storage Box	1

Component Equipment	
ME-6985 Flexible |-Beam Set	ME-6996 Cord Lock Spares
ME-6986 Structures Rod Clamp (2)	ME-6997 Full Round Connectors
ME-6987 Flat Structures Members	ME-6998A Axle Spares
ME-6993 Truss Set Members	ME-6999A Angle Connectors
ME-6994 Truss Set Screws	740-162 Storage Box (12 quart)
Related Equipment	
PS-2198 Load Cell Amplifier	ME-6989 Physics Structures Set
PS-2199 Load Cell and Amplifier Set	ME-6990 Truss Set
PS-2200 100-N Load Cell	ME-6991 Bridge Set
PS-2201 5-N Load Cell	ME-6995 Road Bed Spares
PS-2205 Displacement Sensor	PASPORT Interfaces*
PS-2206 Dual Load Cell Amplifier	Data Acquisition Software*

ADVANCED STRUCTURES SET…







Experiment Topics:

1. Simple Triangles
2. Trusses
3. Common Truss Bridges
4. Different Scales
5. Measuring Bridge Deflection Under Load
6. Bridge Challenges for Students
7. Measuring Static and Dynamic Loading
8. Forces on a Boom
9. Human Leg Model
10. Teeter Totter
11. Human Arm Model
12. Angle Crane
13. Catapult
14. Camelback Truss Bridge and Multi Length Combinations
15. Truss Bridge with Cross Bracing and Trestle with Cross Bracing
16. PAStrack Trestle with Cross Bracing
17. Tower with Cross Bracing
18. Tower with Cross Bracing

ADVANCED STRUCTURES SET···

19. Rubber Band Powered "Car"
20. Spares Part Numbers and Summary of Extra
21. Bridges That Require an Advanced Set and a Bridge Set
22. I-Beam Suspension Bridge Details
23. I-Beam Suspension Bridge End Assembly
24. I-Beam Suspension Bridge Tower
25. I-Beam Suspension Bridge Road Bed Assembly
26. Flexible |-Beam Suspension Bridge
27. Flat Beam Suspension Bridge
28. Cable Stayed Bridge
29. Cable Stayed Bridge Details
30. Baltimore Bridge and Arched Causeway Bridge Details 1
31. Arch Truss Bridge
32. Cantilevered Truss Bridge
33. Tied Arch Bridge with Cross Bracing
34. Double Tied Arch Bridge with Flexible |-Beams
35. PAStrack Cable Stayed Bridge
36. Cable Stayed Bridge Construction Suggestions
37. Resonance Structures: Beam and Tower
38. Force Platform Structures Bracket

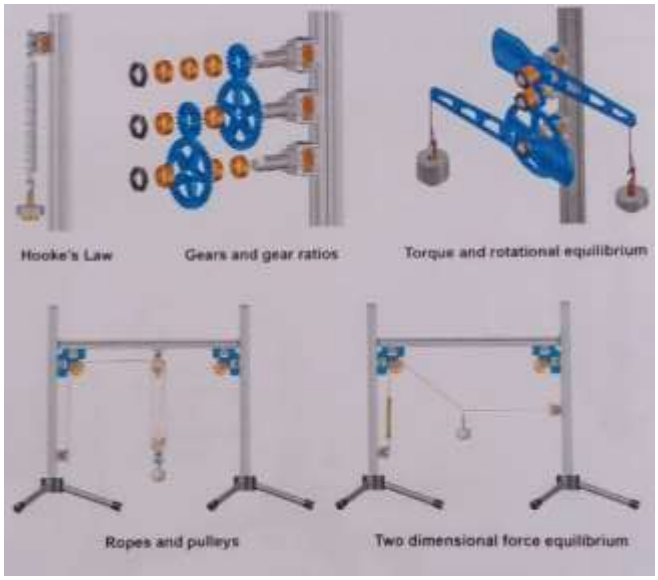
Equipment Setting:

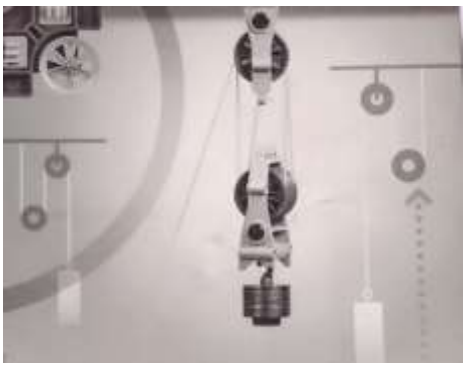
14. FORCES & MACHINE

Equipment:
Essential Physics – Forces + Machines – A STEM Learning Solution
(http://essensial-stem.com)

Component	Qny
Triple-Pulley Blocks Allowing Up to A 6:1 Advantage	2
Friction Block	1
Small Gears (20-Tooth)	3
Medium Gears (40-Tooth)	2
Large Gears (60-Tooth)	2
Balanced Levers (20 Cm Length)	2
Large Pulleys (10 Cm Diameter)	2
Right Angle Connectors with Low-Friction Pulleys	2
Universal Hubs for Attaching Gears and Pulleys	4
Gear and Pulley Spacers	12
Universal Hooks for Connecting Scales, Masses, or Strings	1
Extruded Aluminum Rails (27") Each With Five "No-Lose" Easy-Attach Nuts	2
Tripod Base	1
Extension Springs (25 Cm)	1
High-Quality Metal Spring Scales (10 N)	2
Additional Tripod Stand	1
Weights Sets	1

FORCES & MACHINE…





Experiment Topics:

A. How to set up different experiments

1. Hooke's Law and the Simple Pendulum
2. Measuring Static Friction
3. Building a First Class Lever
4. Different Structure Options
5. Building the Block and Tackle
6. Two-Gear Machines
7. Compound Gear Machines
8. Torsion Balance with Gears
9. Pulley and Gear Machines

B. Electronic resources

1. Weight Calculator
2. Work Calculator
3. Mechanical Advantage Calculator
4. Mechanical Advantage of A Lever
5. Mechanical Advantage of Two Gears
6. Efficiency and Work Calculator
7. Hooke's Law Calculator
8. Static Equilibrium for a Lever
9. Static Equilibrium for a Simply Supported Beam

FORCES & MACHINE…

10. Torque Calculator
11. Rotational Equilibrium for a See-Saw
12. Vector Components

C. Lessons

1. Force and Weight
2. Hooke's Law and the Force From
3. Friction
4. Force Equilibrium in Two Dimensions
5. Mechanical Advantage and the Lever
6. Torque
7. Ropes and Pulleys
8. Work
9. Gears and Ratios
10. The Mechanical Advantage of Gears
11. Designing Gear Machines

Equipment Setting:

FORCES & MACHINE…