

2007

Problem	Topic	Comment		
1	Kinematics	Position-time equation	Kinematics	7
2	Kinematics	Velocity-time graph	Dynamics	6
3	Kinematics	Average velocity	Energy	7
4	Kinematics	Free fall	Collisions	3
5	Dynamics	Force and effects	System of Masses	2
6	Kinematics	Position from velocity-time equation	Rigid Bodies	8
7	Energy	Comparison of amounts	Oscillatory Motion	3
8	Gravity	Gravitational potential energy	Gravity	2
9	System of Masses	Motion of center of mass	Fluids	0
10	Rigid Bodies	Rotational analog of Newton's 2nd Law	Other	0
11	Rigid Bodies	Moments of inertia and energy		38
12	Dynamics	Statics, balance of torques		
13	Collisions	Conservation laws		
14	Dynamics	Direction of forces		
15	System of Masses	Translational and rotational dynamics		
16	Collisions	Conservation laws		
17	Kinematics	Acceleration over time in projectile motion		
18	Energy	Conservation of energy		
19	Energy	Spring and conservation of energy		
20	Collisions	Energy, momentum, and velocity		
21	Rigid Bodies	Value of moments of inertia		
22	Energy	Work, energy, momentum		
23	Gravity	Centripetal force		
24	Kinematics	Projectile motion		
25	Oscillatory Motion	Period in water		
26	Dynamics	Kinematics and coefficient of friction		
27	Rigid Bodies	Conservation laws, centripetal force		
28	Rigid Bodies	Analysis of bicycle, equilibrium		
29	Rigid Bodies	Analysis of bicycle, equilibrium		
30	Rigid Bodies	Analysis of bicycle, equilibrium		
31	Rigid Bodies	Rotational inertia of a rod		
32	Oscillatory Motion	Angular frequency		
33	Oscillatory Motion	Angular frequency		
34	Dynamics	Object winding up around a cylinder		
35	Energy	Kinetic energy of object		
36	Dynamics	Original length of rope		
37	Energy	Ratio of velocities		
38	Energy	Ratio of kinetic energies		

2008

1	Kinematics	Uniform acceleration equations	Kinematics	7
2	Kinematics	Displacement	Dynamics	6
3	Kinematics	Velocity from position-time graph	Energy	1
4	Kinematics	Displacement from velocity-time graph	Collisions	3
5	Kinematics	a-t graph from v-t graph	System of Masses	2
6	Kinematics	Projectile motion and range	Rigid Bodies	1
7	Collisions	Conservation laws	Oscillatory Motion	1
8	Dynamics	Friction and centripetal force	Gravity	3
9	Collisions	Conservation laws	Fluids	0
10	Dynamics	Dynamics	Other	1
11	Dynamics	Dynamics		25
12	Rigid Bodies	Moments of inertia and kinetic energy		
13	Oscillatory Motion	Spring constant and amplitude		
14	System of Masses	Angular momentum and energy		
15	Dynamics	Statics, balance of torques		
16	Dynamics	Spring and acceleration		
17	Dynamics	Spring and acceleration		
18	Gravity	Potential and kinetic energy		
19	Energy	Power and acceleration		
20	Elasticity	Young's modulus, Elimination of answers		
21	System of Masses	Conservation laws		
22	Collisions	Conservation laws and circular motion		
23	Gravity	Relationship between variables		
24	Kinematics	Bouncing ball		
25	Gravity	Velocity and orbit		

2009

1	Collisions	Impulse and pressure	Kinematics	7
2	Collisions	Motion after elastic collision	Dynamics	4
3	Collisions	Motion after inelastic collision	Energy	1
4	Dynamics	Apparent weight	Collisions	5
5	Gravity	Comparison after angular momentum	System of Masses	0
6	Kinematics	Projectile motion, velocity and angle	Rigid Bodies	1
7	Kinematics	Uniform acceleration equations	Oscillatory Motion	3
8	Kinematics	Rotational motion, ω -t graph	Gravity	3
9	Kinematics	Rotational motion, ω -t graph	Fluids	0
10	Kinematics	Projectile motion	Other	1
11	Kinematics	a-t graph, work		25
12	Energy	Work		
13	Dynamics	Statics, torque		
14	Collisions			
15	Dynamics	Determining coefficient of friction		
16	Oscillatory Motion	Angular frequency of oscillation		
17	Experiment	Measure quantities in SI units		
18	Oscillatory Motion	Period of pendulum		
19	Kinematics	Projectile motion, height and range		
20	Collisions	Conservation laws		
21	Gravity	Gravitational potential energy		
22	Gravity	Period of orbit		
23	Oscillatory Motion	Simple harmonic motion, Power		
24	Dynamics	Tipping over of box		
25	Rigid Bodies	Angular velocity, friction		

2010

1	Kinematics	Position-time graph	Kinematics	6
2	Kinematics	Velocity-time graph	Dynamics	6
3	Kinematics	Acceleration-time graph	Energy	4
4	Kinematics	Free fall	Collisions	1
5	Kinematics	Projectile motion	System of Masses	2
6	Kinematics	Projectile motion, height and range	Rigid Bodies	2
7	Dynamics	Centripetal force, angular momentum	Oscillatory Motion	0
8	Dynamics	Friction, acceleration	Gravity	3
9	Dynamics	Acceleration	Fluids	1
10	Dynamics	Acceleration, friction	Other	0
11	Dynamics	Statics		25
12	Energy	Kinetic energy and projectile motion		
13	Rigid Bodies	Energy and moment of inertia		
14	Collisions	Conservation laws, friction		
15	System of Masses	Conservation laws		
16	System of Masses	Conservation laws		
17	Gravity	Potential energy of configuration		
18	Energy	Force and potential energy		
19	Energy	Potential and position-time graph		
20	Energy	Position-time graph, energy		
21	Gravity	Gravitational self potential energy		
22	Dynamics	Centripetal force		
23	Fluids	Cross-sectional area and velocity		
24	Rigid Bodies	Determining moments of inertia		
25	Gravity	Energy and velocity		

2011

1	Kinematics	Average speed and displacement	Kinematics	5
2	Kinematics	Velocity-time graph	Dynamics	3
3	Kinematics	Velocity-time graph	Energy	2
4	Kinematics	Velocity-time graph	Collisions	1
5	Gravity	Centripetal acceleration	System of Masses	0
6	Collisions	Conservation laws	Rigid Bodies	4
7	Rigid Bodies	Angular momentum, energy	Oscillatory Motion	4
8	Fluids	Fraction of block floating	Gravity	3
9	Dynamics	Force on length of spring	Fluids	2
10	Oscillatory Motion	Factors that increase period	Other	1
11	Fluids	Water level - time graph		25
12	Gravity	Compressive force		
13	Rigid Bodies	Statics, balance of torques		
14	Kinematics	Free fall		
15	Oscillatory Motion	Determination of spring constant		
16	Dynamics	Statics, friction		
17	Dynamics	Acceleration		
18	Energy	Friction, conservation laws		
19	Oscillatory Motion	Return to origin		
20	Oscillatory Motion	Amplitude		
21	Dimensional Analysis	Same units		
22	Energy	Torque, rotation frequency, and power		
23	Gravity	Kepler's laws		
24	Rigid Bodies	Rotation, power, friction		
25	Rigid Bodies	Comparison of motion down a plane		

2012

1	Kinematics	Free fall	Kinematics	4
2	Kinematics	Projectile motion, height and range	Dynamics	5
3	Dynamics	Angle for toppling	Energy	3
4	System of Masses	Conservation laws	Collisions	1
5	Collisions	Loss of kinetic energy	System of Masses	1
6	Kinematics	Free fall	Rigid Bodies	2
7	Kinematics	Free fall	Oscillatory Motion	3
8	Energy	Friction, conservation of energy	Gravity	2
9	Gravity	Escape velocity	Fluids	2
10	Rigid Bodies	Comparison of acceleration down a plane	Other	2
11	Dynamics	Change in forces over time		25
12	Dynamics	Change in forces over time		
13	Energy	Work and velocity		
14	Rigid Bodies	Torque, moments of inertia		
15	Energy	Power and velocity		
16	Oscillatory Motion	Vibration frequency of spring		
17	Oscillatory Motion	Period-amplitude graph		
18	Oscillatory Motion	Relationship between variables		
19	Fluids	Energy, power, velocity		
20	Fluids	Buoyancy, apparent weight		
21	Dynamics	Change in height of springs		
22	Dimensional Analysis	Equivalent units		
23	Experiment	Equipments used to determine constants		
24	Dynamics	Determining spring constant		
25	Gravity	Comparison of velocities and orbits		

2013

1	Kinematics	Uniform acceleration equations	Kinematics	3
2	Kinematics	Elastic collision with wall	Dynamics	8
3	Kinematics	Projectile motion	Energy	5
4	Dynamics	Statics, balance of torques	Collisions	1
5	Dynamics	Aparent weight, velocity	System of Masses	2
6	Dynamics	Aparent weight, velocity	Rigid Bodies	2
7	Energy	Comparison of momentum and energy	Oscillatory Motion	1
8	Energy	Conservation laws	Gravity	1
9	Energy	Conservation laws	Fluids	1
10	Rigid Bodies	Difference between solid and hollow spheres	Other	1
11	System of Masses	Normal force of system to table		25
12	Rigid Bodies	Acceleration and moments of inertia		
13	Gravity	Velocity and distance		
14	Collisions	Velocity of center of mass		
15	Fluids	Fraction of rod above water		
16	Dimensional Analysis	Same units		
17	Dynamics	Change in forces over time		
18	System of Masses	Conservation laws		
19	Dynamics	Tension, pendulum		
20	Dynamics	Tension, pendulum		
21	Oscillatory Motion	Determination of period		
22	Dynamics	Statics, balance of torques		
23	Energy	Determination of spring constant		
24	Energy	Extension of cord		
25	Dynamics	Power and velocity		

2014

1	Dynamics	Angular momentum and acceleration vectors	Kinematics	0
2	Rigid Bodies	Direction of force	Dynamics	7
3	Fluids	Floating object	Energy	5
4	System of Masses	Conservation laws	Collisions	2
5	Dynamics	Torques, centripetal force	System of Masses	3
6	Collisions	Coefficient of restitution	Rigid Bodies	2
7	Dynamics	Statics, balance of torques	Oscillatory Motion	1
8	Oscillatory Motion	Determining period	Gravity	2
9	Energy	Impulse, velocity	Fluids	1
10	Dynamics	Tension, centripetal force	Other	2
11	Energy	Energy graphs		25
12	Dimensional Analysis	Same units		
13	Dimensional Analysis	Same units		
14	Rigid Bodies	Translational and rotational kinetic energy		
15	Energy	Power and velocity		
16	Collisions	Speed ratio		
17	Gravity	Determining gravitational acceleration		
18	Dynamics	Tension, pulley system		
19	Dynamics	Air resistance		
20	Energy	Centripetal force		
21	Dynamics	Moments of inertia, pulley system		
22	Gravity	Relationship between variables		
23	System of Masses	Impulse, conservation laws		
24	System of Masses	Velocity turns through an angle		
25	Energy	Friction, conservation laws		

2015

1	Kinematics	Addition of velocities	Kinematics	4
2	Kinematics	Average speed	Dynamics	4
3	Energy	Force and power	Energy	6
4	Dynamics	Graph analysis of motion	Collisions	4
5	Kinematics	Projectile motion	System of Masses	0
6	Collisions	Conservation of momentum	Rigid Bodies	0
7	Collisions	Conservation of momentum	Oscillatory Motion	2
8	Collisions	Conservation of momentum	Gravity	0
9	Collisions	Conservation of momentum	Fluids	2
10	Energy	Analysis of kinetic energies from collisions	Other	3
11	Fluids	Buoyancy		25
12	Dynamics	Acceleration of pendulum		
13	Dynamics	Direction of pendulum acceleration		
14	Dynamics	Forces and circular motion		
15	Energy	Work-energy theorem		
16	Energy	Analysis of potential energy graph		
17	Dimensional Analysis	Dimensional analysis		
18	Graphs	Re-expression of data		
19	Oscillatory Motion	Oscillation of a liquid in a U-tube		
20	Fluids	Balance of forces, equilibrium		
21	Kinematics	Coefficient of restitution, infinite series		
22	Energy	Graph analysis		
23	Energy	Vertical spring, conservation of energy		
24	Waves	Transverse wave, fundamental frequencies		
25	Oscillatory Motion	Coupled oscillators		

2016

1	Kinematics	Angular velocity of car wheels	Kinematics	5
2	Fluids	Adding oil to water	Dynamics	3
3	Energy	Book hitting snow	Energy	4
4	Dynamics	Sliding bead, finding acceleration	Collisions	1
5	Kinematics	Projectile motion, reference frames	System of Masses	2
6	Kinematics	Projectile motion, reference frames	Rigid Bodies	3
7	Oscillatory Motion	Oscillating mass, linear approximations	Oscillatory Motion	3
8	Gravity	Kepler's laws	Gravity	1
9	Energy	Sliding bead	Fluids	2
10	Dynamics	Two hanging blocks	Other	1
11	Energy	Power output and maximum velocity		25
12	Fluids	Acceleration of container		
13	Collisions	Elastic and perfectly inelastic collisions		
14	Oscillatory Motion	Rod oscillation, linear approximations		
15	Oscillatory Motion	Rod oscillation, linear approximations		
16	Kinematics	Reference frame, projectile motion		
17	Rigid Bodies	Rotating sphere under friction		
18	Kinematics	Angular kinematics		
19	Energy	Projectile motion		
20	Rigid Bodies	Critical angle, center of mass		
21	System of Masses	Center of mass		
22	System of Masses	Conservation of energy		
23	Dynamics	Making linear approximations		
24	Rigid Bodies	Calculating moments inertia		
25	Other	Error propagation		

2017

1	Dynamics	Friction, circular motion	Kinematics	3
2	Oscillatory Motion	Coupled oscillators	Dynamics	5
3	System of Masses	Center of mass	Energy	3
4	Kinematics	Constant acceleration motion	Collisions	3
5	Kinematics	Maximizing range	System of Masses	3
6	Dynamics	Balance of torques	Rigid Bodies	3
7	Energy	System with increasing energy	Oscillatory Motion	1
8	Energy	Power, accounting for dissipation	Gravity	1
9	Fluids	Comparing pressures	Fluids	2
10	Fluids	Gauge pressure	Other	1
11	System of Masses	Center of mass, torques		25
12	System of Masses	Center of mass, torques		
13	Dynamics	Atwood machine, limiting case		
14	Rigid Bodies	Rolling down an incline		
15	Rigid Bodies	Comparing moments of inertia		
16	Rigid Bodies	Motion of a rod		
17	Kinematics	Free fall motion		
18	Dynamics	Tracking acceleration vector		
19	Dynamics	Infer coefficient of friction from graph		
20	Collisions	Completely inelastic		
21	Collisions	Elastic, momentum transfer		
22	Collisions	Elastic, energy transfer		
23	Waves	Speed of wave in string		
24	Energy	Collision, potential energy in spring		
25	Gravity	Orbital speeds, conservation of energy		

Percent	Average appearance	TOTAL:	
15.28	3.82	Kinematics	44
20.14	5.03	Dynamics	58
13.89	3.47	Energy	40
10.07	2.52	Collisions	29
6.25	1.56	System of Masses	18
7.64	1.91	Rigid Bodies	22
9.38	2.34	Oscillatory Motion	27
7.64	1.91	Gravity	22
5.21	1.30	Fluids	15
4.51	1.13	Other	13
100.00	25.00		288