Multiple Choice

MU	Key Idea	Item #	Dif	R1	R2	R3	R4	NR
4.1-Trans. of Energy	4.1a All energy transfers are governed by the law of conservation of energy.	14	0.70	46	31	2394	**5877**	5
4.1-Trans. of Energy	4.1a All energy transfers are governed by the law of conservation of energy.	50	0.80	758	757	**6665**	160	13
4.1-Trans. of Energy	4.1g When work is done on or by a system, there is a change in the total energy of the system.	17	0.75	1780	163	**6283**	123	4
4.1-Trans. of Energy	4.1i Power is the time-rate at which work is done or energy is expended.	22	0.61	2326	**5122**	498	398	9
4.1-Trans. of Energy	4.1i Power is the time-rate at which work is done or energy is expended.	39	0.60	1312	1893	154	**4985**	9
4.1-Trans. of Energy	4.1i Power is the time-rate at which work is done or energy is expended.	40	0.74	205	589	**6205**	1337	17
4.1-Trans. of Energy	4.1k Moving electric charges produce magnetic fields. The relative motion between. . .	19	0.55	213	449	3061	**4611**	19
4.1-Trans. of Energy	4.1k Moving electric charges produce magnetic fields. The relative motion between. . .	30	0.61	2513	**5087**	584	161	8
4.1-Trans. of Energy	4.1l All materials display a range of conductivity. At constant temperature. . .	20	0.67	821	988	914	**5625**	5
4.1-Trans. of Energy	4.1l All materials display a range of conductivity. At constant temperature. . .	41	0.65	1349	1148	**5393**	426	37
4.1-Trans. of Energy	4.1m The factors affecting resistance in a conductor are length, cross-sectional area, . . .	15	0.63	1031	505	**5231**	1580	6
4.1-Trans. of Energy	4.1o Circuit components may be connected in series or in parallel. . .	25	0.71	**5948**	1396	927	76	6
4.1-Trans. of Energy	4.1p Electrical power and energy can be determined for electric circuits. . .	26	0.84	**7001**	585	353	393	21
4.1-Trans. of Energy	4.1p Electrical power and energy can be determined for electric circuits. . .	43	0.58	**4823**	164	2917	442	7
4.3-Wavelength and Freq.	4.3b Waves carry energy and information without transferring mass. . .	29	0.59	1520	**4966**	664	1195	8
4.3-Wavelength and Freq.	4.3c The model of a wave incorporates the characteristics of amplitude, wavelength. . .	21	0.52	1104	**4335**	2138	765	11
4.3-Wavelength and Freq.	4.3c The model of a wave incorporates the characteristics of amplitude, wavelength. . .	31	0.68	**5696**	461	327	1855	14
4.3-Wavelength and Freq.	4.3c The model of a wave incorporates the characteristics of amplitude, wavelength. . .	34	0.69	2099	**5757**	117	372	8
4.3-Wavelength and Freq.	4.3e Waves are categorized by the direction in which particles in a medium vibrate. . .	24	0.51	**4285**	1008	1479	1570	11
4.3-Wavelength and Freq.	4.3f Resonance occurs when energy is transferred to a system at its natural frequency.	32	0.84	573	73	657	**7044**	6
4.3-Wavelength and Freq.	4.3j The absolute index of refraction is inversely proportional to the speed of a wave.	49	0.64	600	1428	972	**5345**	8
4.3-Wavelength and Freq.	4.3l Diffraction occurs when waves pass by obstacles or through openings. . .	35	0.50	2433	**4177**	1485	254	4
4.3-Wavelength and Freq.	4.3m When waves of a similar nature meet, the resulting interference may be explained. . .	46	0.69	92	**5735**	2402	120	4
4.3-Wavelength and Freq.	4.3n When a wave source and an observer are in relative motion, the observed frequency. . .	33	0.83	659	210	575	**6902**	7
5.1-Patterns of Motion	5.1a Measured quantities can be classified as either vector or scalar.	01	0.67	**5583**	967	125	1676	2
5.1-Patterns of Motion	5.1a Measured quantities can be classified as either vector or scalar.	23	0.57	664	**4726**	648	2298	17
5.1-Patterns of Motion	5.1c The resultant of two or more vectors, acting at any angle, is determined by vector addition.	12	0.73	6058	**286**	1537	463	9
5.1-Patterns of Motion	5.1d An object in linear motion may travel with a constant velocity or with acceleration.	02	0.80	84	1460	6708	97	4
5.1-Patterns of Motion	5.1d An object in linear motion may travel with a constant velocity or with acceleration.	06	0.86	370	322	480	7172	9
5.1-Patterns of Motion	5.1d An object in linear motion may travel with a constant velocity or with acceleration.	08	0.85	306	871	7083	90	3
5.1-Patterns of Motion	5.1f The path of a projectile is the result of the simultaneous effect of the horizontal and . . .	03	0.53	1095	2311	4405	502	40
5.1-Patterns of Motion	5.1g A projectile's time of flight is dependent upon the vertical component of its motion.	45	0.85	186	7097	883	183	4
5.1-Patterns of Motion	5.1i According to Newton's First Law, the inertia of an object is directly proportional. . .	05	0.82	6825	1111	68	345	4
5.1-Patterns of Motion	5.1i According to Newton's First Law, the inertia of an object is directly proportional. . .	07	0.59	1095	1514	4898	831	15
5.1-Patterns of Motion	5.1n Centripetal force is the net force which produces centripetal acceleration. . .	09	0.76	1050	361	566	6355	21
5.1-Patterns of Motion	5.1n Centripetal force is the net force which produces centripetal acceleration. . .	16	0.78	419	747	647	6538	2
5.1-Patterns of Motion	5.1n Centripetal force is the net force which produces centripetal acceleration. . .	37	0.50	3340	354	4195	448	16
5.1-Patterns of Motion	5.1o Kinetic friction is a force that opposes motion.	11	0.81	6796	611	745	174	27

5.1-Patterns of Motion	5.1q According to Newton's Third Law, forces occur in action/reaction pairs. . .	47	0.52	4371	857	3034	84	7
5.1-Patterns of Motion	5.1r Momentum is conserved in a closed system.	10	0.89	202	7475	118	556	2
5.1-Patterns of Motion	5.1r Momentum is conserved in a closed system.	38	0.72	283	1812	6006	242	10
5.1-Patterns of Motion	5.1s Field strength and direction are determined using a suitable test particle. . .	13	0.88	227	7344	451	292	39
5.1-Patterns of Motion	5.1s Field strength and direction are determined using a suitable test particle. . .	28	0.60	2404	5043	547	345	14
5.1-Patterns of Motion	5.1t Gravitational forces are only attractive, whereas electrical and magnetic forces can. . .	48	0.35	2942	175	4219	1014	3
5.1-Patterns of Motion	5.1u The inverse square law applies to electrical and gravitational fields. . .	18	0.68	5658	712	1754	216	13
5.1-Patterns of Motion	5.1u The inverse square law applies to electrical and gravitational fields. . .	42	0.71	484	692	1208	5962	7
5.3-Energy Relationships	5.3b Charge is quantized on two levels. On the atomic level. . .	04	0.80	458	1036	6657	182	20
5.3-Energy Relationships	5.3c On the atomic level, energy is emitted or absorbed in discrete packets called photons.	44	0.41	765	3911	3440	231	6
5.3-Energy Relationships	5.3d The energy of a photon is proportional to its frequency.	27	0.91	211	153	7566	420	3
Standard 6	I3.2 Extend their use of powers of ten notation to understanding the exponential. . .	36	0.69	660	5804	1741	142	6

Constructed Response

MU	Key Idea	Item #	Dif	0	1	NR
4.1-Trans. of Energy	4.1c Potential energy is the energy an object possesses by virtue of its position or condition. . .	52	0.82	1521	6830	2
4.1-Trans. of Energy	4.1c Potential energy is the energy an object possesses by virtue of its position or condition. . .	53	0.75	2098	6253	2
4.1-Trans. of Energy	4.1d Kinetic energy is the energy an object possesses by virtue of its motion.	68	0.87	1100	7251	2
4.1-Trans. of Energy	4.1d Kinetic energy is the energy an object possesses by virtue of its motion.	69	0.87	1092	7260	1
4.1-Trans. of Energy	4.1d Kinetic energy is the energy an object possesses by virtue of its motion.	70	0.92	635	7717	1
4.1-Trans. of Energy	4.1o Circuit components may be connected in series or in parallel. . .	60	0.91	735	7615	3
4.1-Trans. of Energy	4.1o Circuit components may be connected in series or in parallel. . .	61	0.79	1753	6596	4
4.1-Trans. of Energy	4.1o Circuit components may be connected in series or in parallel. . .	62	0.85	1257	7093	3
4.1-Trans. of Energy	4.1o Circuit components may be connected in series or in parallel. . .	63	0.78	1812	6538	3
4.3-Wavelength and Freq.	4.3c The model of a wave incorporates the characteristics of amplitude, wavelength. . .	64	0.73	2275	6076	2
4.3-Wavelength and Freq.	4.3c The model of a wave incorporates the characteristics of amplitude, wavelength. . .	65	0.86	1165	7185	3
4.3-Wavelength and Freq.	4.3h When a wave strikes a boundary between two media, reflection, transmission. . .	80	0.80	1663	6690	0
4.3-Wavelength and Freq.	4.3i When a wave moves from one medium into another, the wave may refract due. . .	77	0.77	1937	6415	1
4.3-Wavelength and Freq.	4.3i When a wave moves from one medium into another, the wave may refract due. . .	78	0.80	1673	6680	0
5.1-Patterns of Motion	5.1d An object in linear motion may travel with a constant velocity or with acceleration.	71	0.76	2013	6339	1
5.1-Patterns of Motion	5.1d An object in linear motion may travel with a constant velocity or with acceleration.	72	0.85	1265	7087	1
5.1-Patterns of Motion	5.1g A projectile's time of flight is dependent upon the vertical component of its motion.	57	0.62	3195	5156	2
5.1-Patterns of Motion	5.1h The horizontal displacement of a projectile is dependent upon. . .	56	0.85	1250	7102	1
5.1-Patterns of Motion	5.1k According to Newton's Second Law, an unbalanced force causes a mass to accelerate.	54	0.79	1747	6603	3
5.1-Patterns of Motion	5.1k According to Newton's Second Law, an unbalanced force causes a mass to accelerate.	55	0.82	1489	6862	2
5.1-Patterns of Motion	5.1u The inverse square law applies to electrical and gravitational fields. . .	58	0.81	1611	6740	2
5.1-Patterns of Motion	5.1u The inverse square law applies to electrical and gravitational fields. . .	59	0.71	2404	5947	2
5.3-Energy Relationships	5.3b Charge is quantized on two levels. On the atomic level. . .	83	0.59	3430	4921	2
5.3-Energy Relationships	5.3g The Standard Model of Particle Physics has evolved. . .	81	0.63	3121	5232	0
5.3-Energy Relationships	5.3g The Standard Model of Particle Physics has evolved. . .	82	0.67	2791	5562	0
5.3-Energy Relationships	5.3j The fundamental source of all energy in the universe is the conversion of mass into energy.	84	0.37	5220	3132	1

5.3-Energy Relationships	5.3j The fundamental source of all energy in the universe is the conversion of mass into energy.	85	0.49	4297	4053	3
Standard 1	M1.1 Use algebraic and geometric representations to describe and compare data.	66	0.96	301	8047	5
Standard 2	M1.1 Use algebraic and geometric representations to describe and compare data.	67	0.90	836	7513	4
Standard 3	M1.1 Use algebraic and geometric representations to describe and compare data.	73	0.79	1766	6585	2
Standard 4	M1.1 Use algebraic and geometric representations to describe and compare data.	74	0.67	2726	5626	1
Standard 5	M1.1 Use algebraic and geometric representations to describe and compare data.	75	0.74	2143	6209	1
Standard 6	M1.1 Use algebraic and geometric representations to describe and compare data.	76	0.77	1885	6468	0
Standard 7	M1.1 Use algebraic and geometric representations to describe and compare data.	79	0.72	2353	5999	1
Standard 8	M2.1 Use of deductive reasoning to construct and evaluate conjectures and arguments. . .	51	0.92	657	7694	2