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PHYSICS TEST - CHAPTER 5: WORK & ENERGY

Name:		Roll No.		Section:

Total Time: 2:30 Hour
Time Allowed: 150 Minutes

Total Marks: 150

PAPER OBJECTIVE
SECTION-A (MARKS 150)

NOTE: Section-A is compulsory. All parts of this section are to be answered on these pages and handed over to the center superintendent. Deleting / overwriting is not allowed. Do not use lead pencil.

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

Questions	A	B	C	D	A B C D
1. The work done on an object is the ___ product of force and displacement.	scalar (dot)	sum	vector (cross)	ratio	● ○ ○ ○
2. Work is a:	tensor quantity	scalar quantity	dimensionless quantity	vector quantity	○ ● ○ ○
3. In W = Fd cosθ, the angle θ is the angle between:	mass and displacement	force and displacement	displacement and time	force and time	○ ● ○ ○
4. The component of force that does work on an object is:	F / cosθ	F tanθ	F cosθ	F sinθ	○ ○ ● ○
5. The component F sinθ, perpendicular to the displacement, does ___ work.	no	maximum	positive	negative	● ○ ○ ○
6. The SI unit of work is the:	joule	newton	pascal	watt	● ○ ○ ○
7. One joule is equal to:	1 N s	1 N m	1 N / m	1 kg m/s	○ ● ○ ○
8. The SI unit of work, the joule, is named in honour of:	James Watt	Isaac Newton	James Prescott Joule	Galileo Galilei	○ ○ ● ○
9. Work done by a force is positive when the force has a component:	in no direction	perpendicular to the displacement	opposite to the displacement	in the direction of the displacement	○ ○ ○ ●
10. Work done by a force is negative when the force has a component:	opposite to the displacement	in all directions	perpendicular to the displacement	along the displacement	● ○ ○ ○
11. The work done by a force perpendicular to the displacement (θ = 90°) is:	equal to Fd	maximum	negative	zero	○ ○ ○ ●
12. The work done by a force acting along the displacement (θ = 0°) is:	zero	Fd / 2	Fd	−Fd	○ ○ ● ○
13. The work done by a force acting opposite to the displacement (θ = 180°) is:	2Fd	zero	−Fd	Fd	○ ○ ● ○
14. A force of 10 N moves an object 5 m along its own direction. The work done is:	0.5 J	2 J	15 J	50 J	○ ○ ○ ●

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Questions	A	B	C	D	A B C D
15. A porter holds a suitcase and walks horizontally. The work done by his upward supporting force on the suitcase is:	negative	zero	positive	maximum	○●○○
16. A girl pulls a sled with a 20 N force at 60° above the horizontal through 10 m. The work done by her is:	173 J	20 J	200 J	100 J	○○○●
17. A boy pushes a box 4 m along the floor with a horizontal force of 15 N. If friction of 5 N acts, the work done by friction is:	−20 J	−60 J	+60 J	+20 J	●○○○
18. A boy pushes a box 4 m with a horizontal force of 15 N against friction of 5 N. The net work done on the box is:	20 J	60 J	80 J	40 J	○○○●
19. Mehwish pulls a suitcase with a force of 16.8 N at 30° above the horizontal through 4.90 m. The work done by her is about:	142.6 J	82.3 J	71.3 J	41.2 J	○○●○
20. Friction of 0.170 N acts on the suitcase over a displacement of 4.90 m. The work done by friction is:	−0.833 J	−71.3 J	0.170 J	+0.833 J	●○○○
21. Mehwish does 71.3 J of work on a suitcase while friction does −0.833 J. The net work done on the suitcase is about:	70.5 J	72.1 J	0.833 J	71.3 J	●○○○
22. A weightlifter holds a heavy mass stationary overhead for a few seconds. In physics, the work done on the mass during this time is:	negative	very large	positive	zero	○○○●
23. When a weightlifter lowers a mass, the work done by gravity on the mass is:	negative	infinite	zero	positive	○○○●
24. When a weightlifter lifts a mass upward, the work done by gravity on the mass is:	equal to the lifting force	positive	zero	negative	○○○●
25. If both the force and the displacement are increased five times, the work done increases by:	5 times	25 times	0 times	10 times	○●○○
26. A force acts on a body but does no work when the force is:	very large	opposite to the displacement	along the displacement	perpendicular to the displacement	○○○●
27. The Moon revolves in a circular orbit around the Earth. The work done by the Earth's gravity on the Moon during one orbit is:	zero	positive	negative	infinite	●○○○
28. The work done against gravity in lifting a 2 kg book through 1.5 m at constant speed (g = 9.8 m/s²) is:	14.7 J	3 J	29.4 J	19.6 J	○○●○
29. The work done by gravity on a 5 kg mass lowered through 2 m (g = 9.8 m/s²) is:	98 J	10 J	49 J	196 J	●○○○
30. An object of weight 50 N is lifted through a vertical height of 10 m. The work done against gravity is:	500 J	5 J	50 J	60 J	●○○○
31. The area under a force-displacement graph gives the:	work done	momentum	power	impulse	●○○○

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Questions	A	B	C	D	A B C D
32. For a constant force, the force-displacement graph is a:	circle	horizontal straight line	parabola	inclined straight line	○●○○
33. For a constant force, the area under the force-displacement graph is a:	trapezium	triangle	rectangle	circle	○○●○
34. For a force increasing uniformly from zero (like stretching a spring), the area under the force-displacement graph is a:	triangle	rectangle	square	circle	●○○○
35. A constant force of 6 N acts through a displacement of 4 m. The area under its F-d graph (work done) is:	1.5 J	12 J	24 J	10 J	○○●○
36. A force increases uniformly from 0 to 10 N over a displacement of 4 m. The work done is:	40 J	2.5 J	10 J	20 J	○○○●
37. A spring is stretched through 0.5 m by a force rising uniformly from 0 to 20 N. The work done is:	10 J	20 J	40 J	5 J	○○○●
38. To find the work done by a variable force, the total displacement is divided into:	a number of small displacements	equal times	equal forces	equal masses	●○○○
39. In the variable-force method, the total work is the sum of terms of the form:	Fi Δti	mi Δdi	Fi cosθi Δdi	Fi / Δdi	○○●○
40. The work done by a variable force equals the area under the:	a versus t graph	F cosθ versus d graph	F versus t graph	v versus t graph	○●○○
41. Stretching a spring becomes harder the more it is stretched. The force needed is therefore:	variable (increasing)	zero	constant	decreasing	●○○○
42. A force rises uniformly from 2 N to 6 N over a displacement of 5 m. The work done (area of trapezium) is:	30 J	20 J	40 J	10 J	○●○○
43. A force-displacement graph is a rectangle of height 8 N and base 2.5 m. The work done is:	3.2 J	20 J	10 J	16 J	○●○○
44. A force-displacement graph that is a straight line parallel to the displacement axis shows that the force is:	decreasing	oscillating	increasing	constant	○○○●
45. In the graph of a variable force, a thin strip of height F cosθ and width Δd represents:	the total work	the work done in that small displacement	the power	the force	○●○○
46. If the force doubles over the same displacement, the area under the F-d graph becomes:	four times	half	double	unchanged	○○●○
47. A constant force of 3 N moves an object from d = 2 m to d = 7 m. The work done is:	21 J	15 J	9 J	6 J	○●○○
48. A force increases uniformly from 0 to 12 N over a displacement of 3 m. The work done is:	18 J	36 J	9 J	4 J	●○○○

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Questions	A	B	C	D	A B C D
49. A force-displacement graph has a rectangular part of area 10 J and a triangular part of area 15 J. The total work done is:	5 J	150 J	12.5 J	25 J	○○○●
50. Which graph correctly gives the work done by a force?	Area under the velocity-time graph	Slope of the velocity-time graph	Area under the force-displacement graph	Slope of the force-displacement graph	○○●○
51. A field of force is a region around a body where it can:	stop all motion	cool other bodies	exert a force on other bodies	change mass	○○●○
52. Two examples of force fields are:	work and power	speed and time	mass and energy	gravitational and electric fields	○○○●
53. A field is conservative if the work done in moving a particle between two points is:	dependent on the path taken	independent of the path taken	always zero	always negative	○●○○
54. In a conservative field, the work done around a closed path is:	negative	positive	zero	maximum	○○●○
55. Which of the following is a conservative force?	Gravitational force	Frictional force	Viscous drag	Air resistance	●○○○
56. Which of the following is a non-conservative force?	Electrostatic force	None of these	Friction	Gravitational force	○○●○
57. In a non-conservative field, the work done along a closed path is:	always one joule	zero	independent of friction	not zero	○○○●
58. In a non-conservative field, the work done depends on the:	end points only	path followed	mass of the Earth	value of g	○●○○
59. Frictional force, viscous drag and air resistance are all examples of:	non-conservative forces	conservative forces	fundamental forces	nuclear forces	●○○○
60. A box is dragged on a rough floor from A to B along a straight path and then, in another trial, along a longer curved path. The work done against friction is:	greater along the longer path	zero for both paths	the same for both paths	negative for both paths	●○○○
61. A ball is lifted from the ground to a 2 m high shelf by two different paths. The work done against gravity along each path is:	zero	the same	greater along the shorter path	greater along the longer path	○●○○
62. A ball is thrown up and returns to the same point. The net work done by gravity during the round trip is:	zero	positive	mgh	negative	●○○○
63. A girl walks round a rough circular track and returns to the starting point. The work done by friction is:	not zero (it is negative)	equal to mgh	positive	zero	●○○○
64. A conservative field has ___ important properties.	one	four	two	three	○○●○
65. An object moves from A to B along path 1 and along path 2 in a field. If the work done is the same for both paths, the field is:	viscous	conservative	non-conservative	frictional	○●○○

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Questions	A	B	C	D	A B C D
66. Potential energy can be defined only for:	frictional forces	conservative forces	any force	non-conservative forces	○●○○
67. Where potential energy can be defined, the change in potential energy is exactly the ___ of the change in kinetic energy.	same	negative	double	half	○●○○
68. The work done against a frictional force depends upon the:	value of g	path followed	displacement only	mass of the Earth	○●○○
69. Which force is the odd one out among the following?	Frictional force	Gravitational force	Electrostatic force	Spring (elastic) force	●○○○
70. A skydiver falls through the air. The air resistance on him is a ___ force.	nuclear	conservative	electric	non-conservative	○○○●
71. Because the gravitational field is conservative, the work done in lifting a mass m through height h along any path is:	mh / g	mgh	zero	mg / h	○●○○
72. Non-conservative forces acting on a body can change its:	mass	volume only	mechanical energy	charge	○○●○
73. Which statement is true for a conservative force?	It always converts energy into heat	It does zero work over a closed path	It always opposes the motion	Its work depends on the path	○●○○
74. The gravitational field is called a conservative field because the work done by gravity is:	dependent on the path followed	always negative	always positive	independent of the path followed	○○○●
75. The energy possessed by a body due to its motion is called:	potential energy	thermal energy	kinetic energy	chemical energy	○○●○
76. Kinetic energy is a:	scalar quantity	unitless quantity	vector quantity	tensor quantity	●○○○
77. The kinetic energy of a body of mass m moving with velocity v is:	$\frac{1}{2}mv^2$	$\frac{1}{2}mv$	mv^2	mv	●○○○
78. The kinetic energy of a body depends on its:	mass only	speed only	mass and speed	height	○○●○
79. The SI unit of kinetic energy is the:	watt	newton	joule	pascal	○○●○
80. In deriving the kinetic energy formula, a force F acts on a ball at rest through a displacement S. The work done appears as the ball's:	potential energy	momentum	kinetic energy	heat	○○●○
81. In deriving KE = $\frac{1}{2}mv^2$, the distance S is expressed using the:	third equation of motion	first equation of motion	law of reflection	second equation of motion	●○○○
82. In the derivation of kinetic energy, Newton's second law is used to write the force as:	F = ma	F = mv	F = mg	F = m / a	●○○○

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Questions	A	B	C	D	A B C D
83. The work done on an object initially at rest is equal to its:	kinetic energy	momentum	potential energy	weight	●○○○
84. The kinetic energy of a 1 kg object moving at 2 m/s is:	4 J	0.5 J	1 J	2 J	○○○●
85. A 2 kg ball moves at 3 m/s. Its kinetic energy is:	4.5 J	18 J	6 J	9 J	○○○●
86. A 1500 kg car moves at 20 m/s. Its kinetic energy is:	150 kJ	30 kJ	300 kJ	600 kJ	○○●○
87. If the speed of a body is doubled, its kinetic energy becomes:	unchanged	two times	half	four times	○○○●
88. If the mass of a moving body is doubled at the same speed, its kinetic energy becomes:	four times	unchanged	two times	half	○○●○
89. If the speed of a body is tripled, its kinetic energy becomes:	3 times	9 times	1/9 times	6 times	○●○○
90. Two footballs of equal mass move at speeds v and 2v. The ratio of their kinetic energies (slow : fast) is:	1 : 4	1 : 2	2 : 1	4 : 1	●○○○
91. A cricket ball of mass 0.16 kg moves at 25 m/s. Its kinetic energy is:	4 J	50 J	100 J	25 J	○●○○
92. A 60 kg sprinter runs at 10 m/s. His kinetic energy is:	300 J	6000 J	3000 J	600 J	○○●○
93. A 3 kg object has a kinetic energy of 150 J. Its speed is:	100 m/s	10 m/s	5 m/s	50 m/s	○●○○
94. A body of mass 4 kg has a kinetic energy of 32 J. Its speed is:	4 m/s	16 m/s	8 m/s	2 m/s	●○○○
95. A 3.00 kg rocket is launched with an initial kinetic energy equal to its total energy of 2352 J. Its initial speed is about:	19.8 m/s	39.6 m/s	784 m/s	28 m/s	○●○○
96. The 3.00 kg rocket is moving at 15.1 m/s after 2.5 s. Its kinetic energy then is about:	684 J	2352 J	45.3 J	342 J	○○○●
97. The rocket (total energy 2352 J) has a kinetic energy of 342 J after 2.5 s. Its potential energy at that time is about:	342 J	2352 J	2694 J	2010 J	○○○●
98. At its maximum height, the 3.00 kg rocket's total energy of 2352 J is entirely potential. The height is (g = 9.8 m/s²):	40 m	160 m	8 m	80 m	○○○●
99. The total energy (KE + PE) of the rocket stays constant during its flight. This illustrates the law of:	Ohm's law	conservation of momentum	Newton's third law	conservation of energy	○○○●

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Questions	A	B	C	D	A B C D
100. In the derivation of kinetic energy, W = ½m(vf² − vi²). For an object starting from rest, W equals:	½mvi²	zero	½mvf²	mvf²	○○●○
101. Work and kinetic energy are both measured in:	newtons	watts	joules	pascals	○○●○
102. A 1000 kg car moving at 10 m/s has a kinetic energy of:	100 kJ	50 kJ	5 kJ	10 kJ	○●○○
103. Can the kinetic energy of a body ever be negative?	Yes, when moving backward	Yes, when the velocity is negative	No, because v² is always positive	Yes, in a resistive medium	○○●○
104. The speed of a 2 kg object changes from 2 m/s to 4 m/s. The change in its kinetic energy is:	8 J	12 J	16 J	4 J	○●○○
105. The work-energy principle states that the net work done on an object equals the change in its:	momentum	mass	kinetic energy	potential energy	○○●○
106. Mathematically, the work-energy theorem is written as:	Wnet = KEi / KEf	Wnet = KEf + KEi	Wnet = KEf × KEi	Wnet = KEf − KEi	○○○●
107. A net force does 100 J of work on a 2 kg object initially at rest. Its kinetic energy becomes:	50 J	200 J	100 J	zero	○○●○
108. A net work of 50 J is done on a body whose kinetic energy is 30 J. Its final kinetic energy is:	80 J	30 J	50 J	20 J	●○○○
109. The kinetic energy of a moving body decreases from 80 J to 30 J. The net work done on it is:	−110 J	+110 J	+50 J	−50 J	○○○●
110. A 1500 kg car moving at 40 km/h (11.1 m/s) loses its brakes and engine power and must be stopped. The work required is about:	185 kJ	92.6 kJ	16.7 kJ	46.3 kJ	○●○○
111. A 5 kg object at rest is acted on by a net force until its speed becomes 10 m/s. The work done is:	25 J	250 J	500 J	50 J	○●○○
112. The work needed to increase the speed of a 2 kg object from rest to 6 m/s is:	72 J	36 J	18 J	12 J	○●○○
113. The work required to stop a 1000 kg car moving at 20 m/s is:	400 kJ	200 kJ	100 kJ	20 kJ	○●○○
114. A 100 g ball is released from a height of 30 m and the air exerts a constant drag of 0.4 N. Its kinetic energy just before it strikes the ground is about:	17.4 J	12.0 J	29.4 J	41.4 J	●○○○
115. A resistive force on a moving object:	is always zero	helps the motion	opposes the motion of the object	acts perpendicular to the motion	○○●○
116. Two examples of resistive forces are:	gravity and tension	normal force and tension	friction and viscous force	thrust and weight	○○●○

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Questions	A	B	C	D	A B C D
117. In a resistive medium, the work W done by an applied force equals:	ΔKE + Wr	Wr only	ΔKE − Wr	ΔKE × Wr	●○○○
118. In a resistive medium, the work done against the resistive force is given by:	Wr = ΔKE − W	Wr = W + ΔKE	Wr = W − ΔKE	Wr = W × ΔKE	○○●○
119. The work done by an object against a resistive force takes energy away from the object, thereby ____ its kinetic energy.	doubling	not affecting	increasing	decreasing	○○○●
120. A skydiver trusts a parachute because the resistive force of the air:	increases her weight	accelerates the fall	creates gravity	opposes and slows the fall	○○○●
121. A force does 500 J of work on a sledge, while the sledge gains 400 J of kinetic energy. The work done against friction is:	900 J	100 J	400 J	200 J	○●○○
122. A worker does 120 J of work on a trolley, and the trolley gains 90 J of kinetic energy. The work done against resistive forces is:	30 J	120 J	90 J	210 J	●○○○
123. A 10 N force pushes a trolley through 5 m, and 20 J of the work is lost against friction. The gain in kinetic energy is:	20 J	30 J	50 J	70 J	○●○○
124. A 20 N force moves a box 3 m along a rough floor, and the box gains 45 J of kinetic energy. The work done against friction is:	105 J	45 J	15 J	60 J	○○●○
125. A box at rest is pushed with a 30 N force for 4 m against a constant friction of 10 N. Its kinetic energy after 4 m is:	120 J	160 J	40 J	80 J	○○○●
126. A car with 400 kJ of kinetic energy is stopped by a constant braking force of 8000 N. The stopping distance is:	25 m	50 m	3.2 m	100 m	○●○○
127. A 0.02 kg bullet moving at 100 m/s stops after penetrating 0.1 m into a wooden block. The average resistive force is:	10 N	10 000 N	100 N	1000 N	○○○●
128. A 2 kg block sliding at 6 m/s on a rough floor stops after 9 m. The friction force acting on it is:	8 N	36 N	4 N	2 N	○○●○
129. When the force varies and Newton's laws are difficult to apply, the work-energy theorem is:	easier to use	invalid	impossible to use	the same as Newton's third law	●○○○
130. The work-energy theorem is also valid for potential energy when the force is:	resistive	frictional	conservative	non-conservative	○○●○
131. A 2 kg block slides from rest down a frictionless slope of height 5 m (g = 9.8 m/s²). Its kinetic energy at the bottom is:	196 J	10 J	49 J	98 J	○○○●
132. A brake pad does 60 J of negative work on a moving wheel. The kinetic energy of the wheel:	does not change	decreases by 60 J	doubles	increases by 60 J	○●○○
133. Efficiency is the ratio of:	force to distance	load to effort	work input to work output	work (energy) output to work (energy) input	○○○●

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Questions	A	B	C	D	A B C D
134. The efficiency of a machine, in percent, is given by:	(input / output) × 100	output − input	output × input	(output / input) × 100	○○○●
135. Efficiency has:	no unit	the unit joule	the unit watt	the unit newton	●○○○
136. The efficiency of a real machine is always:	more than 150%	less than 100%	greater than 100%	equal to 100%	○●○○
137. The efficiency of an ideal machine is:	200%	100%	50%	0%	○●○○
138. In an ideal machine, the input energy is ____ the output energy.	half of	greater than	less than	equal to	○○○●
139. The input of a mechanical machine is the product of:	the effort and the distance through which the effort acts	mass and speed	force and time	the load and the distance moved by the load	●○○○
140. The output of a mechanical machine is the product of:	force and time	mass and speed	the effort and the distance moved by effort	the load and the distance through which it is lifted	○○○●
141. A machine takes in 500 J of energy and gives out 400 J of useful work. Its efficiency is:	125%	80%	20%	90%	○●○○
142. An automobile engine uses 1000 J of chemical energy and does 100 J of useful work. Its efficiency is:	100%	1%	10%	90%	○○●○
143. A pulley system has an efficiency of 40%. The percentage of the input energy converted to unwanted forms is:	60%	zero	40%	100%	●○○○
144. In an automobile, only about 10% of the fuel energy does useful work. Most of the rest is wasted as:	gravitational potential energy	extra momentum	magnetic energy	thermal energy	○○○●
145. A machine gives 60 J of output and has an efficiency of 30%. Its input energy is:	200 J	18 J	90 J	180 J	●○○○
146. A pulley system of 40% efficiency is given 500 J of input energy. The useful work obtained is:	40 J	300 J	200 J	20 J	○○●○
147. A load of 200 N is lifted through 3 m by an effort of 100 N moving through 8 m. The efficiency of the machine is:	25%	133%	67%	75%	○○○●
148. Which of the following claims is impossible?	A machine with 110% efficiency	A car engine with 10% efficiency	An ideal machine with 100% efficiency	A machine with 40% efficiency	●○○○
149. Almost all energy-transformation technologies work at less than 100% efficiency because the wasted energy mostly becomes:	kinetic energy	thermal energy	light energy only	nuclear energy	○●○○
150. An effort of 50 N moving through 4 m lifts a load of 100 N through 1.5 m. The efficiency of the machine is:	50%	30%	75%	133%	○○●○

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