

1. The position of a vehicle of mass 1000 kg moving on a straight track along the x -axis is given by the equation $x(t) = t^3 - t^2 - 6t$, where x is in meters and t is in seconds. What is the instantaneous force acting on the vehicle at $t = 3$ s?

- 1) Zero
- 2) 3000 N
- 3) 6000 N
- 4) 12000 N
- 5) 16000 N

2. A force given by $F(x) = 6x + 3x^2$ acts upon a projectile that starts from rest at the origin. How much work is done on the 5 kg projectile if it travels 5 m?

- 1) 155 J
- 2) 175 J
- 3) 200 J
- 4) 225 J
- 5) 400 J

3. A 50 kg car travels along a straight track along the x -axis according to the equation $x(t) = t^2 + 4t + 5$, where x is in meters and t is in seconds. What is the car's kinetic energy after 1 s?

- 1) 900 J
- 2) 1000 J
- 3) 1500 J
- 4) 2000 J
- 5) 2705 J

4. The potential energy of an object is given by $U(x) = 0.5kx^2 + 3kx$, where U is in joules, x is in meters and k is a constant. What is the force acting on the object when $x = 0$?

- 1) $-3k$
- 2) $-k$
- 3) Zero
- 4) k
- 5) $3k$

5. A force acting on an object given by the function $F(x) = 3x^2 + 4$, where F is in Newtons and x is in meters. What is the change in the object's kinetic energy as it moves from $x = 1$ to $x = 3$ m?

- 1) 26 J
- 2) 27 J
- 3) 31 J
- 4) 34 J
- 5) 36 J

6. A 10 kg particle's acceleration is given by the equation $a(t) = 4t$, where a is in m/s^2 and t is in seconds. The particle is initially at rest at the origin. What is the particle's kinetic energy at $t = 5$ s?

- 1) 2.5 kJ
- 2) 5 kJ
- 3) 12.5 kJ
- 4) 125 kJ
- 5) 250 kJ

7. A force acting on an object of mass 3 kg is given by the equation $F(x) = 6x + 2$, where F is in Newtons and x is in meters. If the object starts at rest, what is the final velocity of the object as it travels from $x = 0$ to $x = 4$ m?

- 1) 2 m/s
- 2) 4 m/s
- 3) 6 m/s
- 4) 8 m/s
- 5) 12 m/s

8. The velocity of an object of mass m is given by the equation $v = 2x + 4$. What is an expression for the kinetic energy of the object?

- 1) $2m$
- 2) $m(2 + x)$
- 3) $m(4x + x^2)$
- 4) $m(2x^2 + 8x + 8)$
- 5) $m(8x^2 + 4x^3 + x^4/2)$

9. An object is pushed by a force given by $F(x) = 6x - 4$. What is the amount of work done to push the object 4 m.

- 1) 16 J
- 2) 20 J
- 3) 32 J
- 4) 44 J
- 5) 80 J

10. An object with an initial potential energy k experiences a conservative force given by $F(x) = x^2 + 2$ over the interval $0 \leq x \leq 2$. What is the equation for the potential energy U of this object?

- 1) $U(x) = x^3/3 + 2x + k$
- 2) $U(x) = -x^3/3 - 2x - k$
- 3) $U(x) = -x^3/3 - 2x + k$
- 4) $U(x) = -x^3/3 - 2x$
- 5) $U(x) = x^3/3 + 2x$

11. What is the expression of the kinetic energy of an object of mass 5 kg whose acceleration is given by $a(t) = 4t - 5$ and that is initially at rest?

- 1) $5(4t - 5)$
- 2) $5(2t^2 - 5t)$
- 3) $5(2t^2 - 5t)^2$
- 4) $2.5(2t^2 - 5t)^2$
- 5) $2.5(4t - 5)^2$

12. If a force moves an object of mass m so that its velocity is given by $v(t) = 4t - 2$, what is the power exerted by that force?

- 1) $0.5m(4t - 2)^2$
- 2) $4m(4t - 2)$
- 3) $4m(2t^2 - 2t)$
- 4) $4m$
- 5) $m(4t - 2)$

13. If the power delivered to an object by a force acting on it is given by $P(t) = t^3 - 2t$ and the velocity of the object is given by $v(t) = 2t$, what is the force acting on the object in terms of t ?

- 1) $F(t) = t^3 - 4t$
- 2) $F(t) = t^3$
- 3) $F(t) = t^2/2 - 1$
- 4) $F(t) = 3t^2 - 2$
- 5) More information is needed to determine the force

14. An object that starts at rest from the origin is pushed by a constant force of 10 N has a position given by $x(t) = 5t^2$. What is the power delivered to the object by the force at time $t = 1$ s?

- 1) 50 J
 - 2) 50 W
 - 3) 100 J
 - 4) 100 W
 - 5) 125 W
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Answer Key
[New Exam]

1. 5

2. 3

3. 1

4. 1

5. 4

6. 3

7. 3

8. 4

9. 3

10. 3

11. 4

12. 2

13. 3

14. 4

Name _____

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