niversity of Jeddah
iculty of Science
nysics Dept.
nysics 110

جامعة جدة
University of Jeddah

D

Final | 26/4/1438 H | **Time:** 120 mi

Student Name: | Student no.: | Section:

Q.1 Meter is the unit of
(A) Time (B) Weight (C) Length (D) Mass

Q.2 A car is traveling at 25 m/s. The speed of this car is equivalent to:
(A) 56 km/h (B) 90 km/h (C) 97 km/h (D) 23 km/h

Q.3 A cube of edge 25 mm, its volume is:
(A) 0.473 m^3 (B) 47.3 m^3 (C) 1.6×10^{-5} m^3 (D) 43 m^3

Q.4 A train moves with a speed of 50 mile per hour. The speed in SI units is: (Hint: 1 mile = 1610 m)
(A) 22.4 m/s (B) 32 m/s (C) 37 m/s (D) 24 m/s

Q.5 A bicycle travels 10 km in 60 min. Its average speed is:
(A) 18 km/h (B) 28 km/h (C) 10 km/h (D)48 km/h

Q.6 The position of a particle moving on an x axis is given by $x = t^2 - 6t + 5$, with x in (m) and t in (s). The velocity at 4 s is:
(A) 5 m/s (B) 2 m/s (C) 0.4 m/s (D) 4 m/s

Q.7 Which unit of these is used to measure the velocity?
(A) m/s (B) m (C) m/s^2 (D) kg

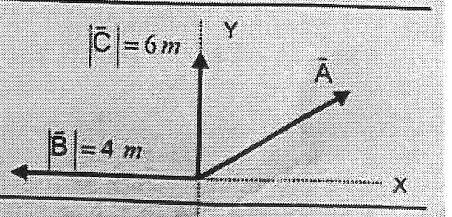
Q.8 A car uniformly changes its speed from 25 m/s to 5 m/s in 4 s. The average acceleration is:
(A) 9 m/s^2 (B) 4 m/s^2 (C) -6 m/s^2 (D) -5 m/s^2

Q.9 The velocity of a train is given by v(t)=95 – 2t, (where t in seconds and v is in m/s), has an acceleration of
(A) -2 m/s^2 (B) 98 m/s^2 (C) 0.3 m/s^2 (D) 2 m/s^2

Q.10 Which of the following quantities is scalar quantity?
(A) Mass (B) Acceleration (C) Force (D) Velocity

Q.11 The component of vector $\bar{A}$ are given as A_x=5 m and A_y = -5 m . The magnitude of vector $\bar{A}$ is:
(A) 6.9 m (B) 7.1 m (C) 8.4 m (D) 6.1 m

Q.12 In figure, if $\bar{A}+\bar{B}-\bar{C}=4\hat{i}$ then the vector $\bar{A}$ in unit vector notation is:
(A) $9\hat{i}+4\hat{j}$ (B) $8\hat{i}+6\hat{j}$ (C) $5\hat{i}+4\hat{j}$ (D) $4\hat{i}+2\hat{j}$



Q.13 The result of $\hat{i}\cdot\hat{k}$ is:
(A) $\hat{i}$ (B) $\hat{k}$ (C) $\hat{j}$ (D) zero

Q.14 A particle moving from $\overrightarrow{r_1} = 12\hat{i} + 5\hat{j} + 8\hat{k}$ to $\overrightarrow{r_2} = 12\hat{i} + 10\hat{j} + 8\hat{k}$, then the displacement is:
(A) $4\hat{i} + 6\hat{j}$ (B) $5\hat{j}$ (C) $10\hat{i} + 5\hat{j}$ (D) $10\hat{i} - 3\hat{j}$

Q.15 A particle moves in xy plane as $x(t) = 2t$ (m) and $y(t) = t^2 - 1$ (m). The velocity of the particle at t=1 s is:
(A) $2\hat{i} + 2\hat{j}$ (m/s) (B) $2\hat{i} + \hat{j}$ (m/s) (C) $2\hat{i} - \hat{j}$ (m/s) (D) $\hat{i} + \hat{j}$ (m/s)

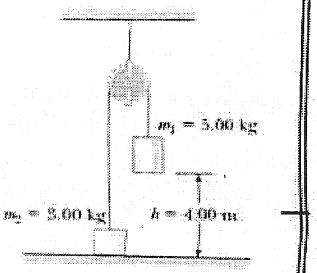
Q.16 A boy can throw a ball a maximum horizontal distance of 40 m on a level field. How far can he throw the same ball vertically upward? Assume that his muscles give the ball the same speed in each case.
(A) 80 m (B) 30 m (C) 20 m (D) 40 m

Q.17 A toy car runs on a horizontal table with 5 m/s. The angle it makes with the horizontal when it leaves the table is:
(A) 45° (B) 60° (C) 90° (D) Zero

Q.18 A car travels toward west constant velocity. The net force on the car is:
(A) zero (B) less than zero (C) 9.8 N (D) greater than zero

Q.19 A 10 kg box is moving with a constant speed. The net force on the box is:
(A) 190.2 N (B) 31.5 N (C) zero (D) 245.1 N

Q.20 Two masses (m_1 = 5kg and m_2 = 3kg) are connected by a light string passing over a light frictionless pulley, as shown in figure. If the mass m1 is released from rest. find the maximum height to which m_2 rises.

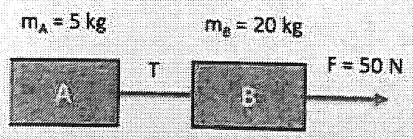


(A) 5 m (B) 6 m (C) 8 m (D) 4 m

Q.21 Refer to question 20, determine the speed of m_2 just as m_1 hits the ground.
(A) 2.21 m/s (B) 4.43 m/s (C) 3.13 m/s (D) 1.1 m/s

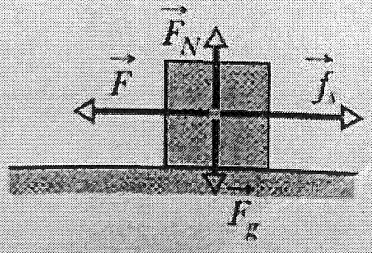
Q.22 A cable hold a ball of weight 200 N in static equilibrium. The tension in the cord is:
(A) 9.8 N (B) 200 N (C) 500 N (D) Zero

Q.23 Two blocks (A and B) are in contact on a horizontal frictionless surface. A 50 N constant force is applied to B as shown, The tension in the cord is:
Solution:



(A) 20 N (B) 10 N (C) 5 N (D) 25 N

Q.24 The fractional force on a moving body is proportional to the:
(A) weight of the body
(B) acceleration of the body
(C) normal force on the body
(D) force casing the motion



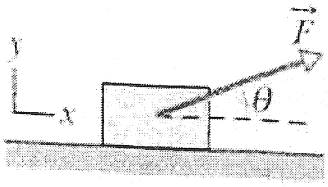
Q.25 A boy pulls a wooden box along a rough horizontal floor at constant speed. Which of the following mu be true?

(A) F = fk and N>W

(B) F>fk and N<W

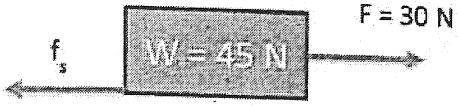
(C) F cosΘ = fk and N=W- F sinΘ

(D) F cosΘ > fk and N=W



Q.26 A block slide on a rough surface (see figure). The block start to slide when a parallel force of 30 N is applied. The coefficient of static friction μ_s is:

(A) 0.33 (B) 0.67 (C) 0.4 (D) 1



Q.27 A moving particle of mass 3 kg, has kinetic energy of 15 J. Its speed is:

(A) 9.8 m/s (B) 10 m/s (C) 3.16 m/s (D) 980 m/

Q.28 A particle moves 5 m in the positive Z direction while being acted upon by a constant force $\vec{F} = (4\hat{i} + 4\hat{k})$N. The work done on the particle by this force is:

(A) 10 J (B) 20 J (C) -20 J (D) 40 J

Q.29 An object that has kinetic energy must be:

(A) Stand (B) at rest (C) at height position (D) Moving

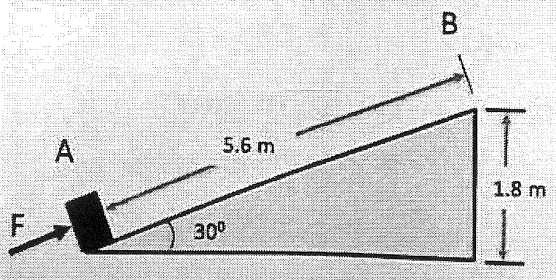
Q.30 A 5 kg cart starts up an incline with a speed of 4 m/s and comes to rest 3 m up the incline. The total w done on the cart is:

(A) -8 J (B) -40 J (C) -18 J (D) -6 J

Q.31 A force F causes the 2 kg box to slide up from point A to point B. The work done by the normal force o the box is:

(A) 110.84 J (B) Zero

(C) 98 J (D) 49 J



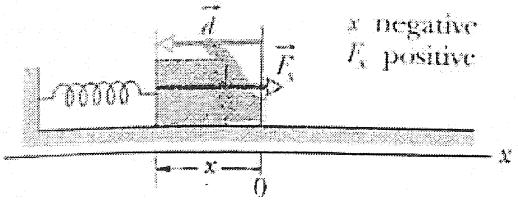
Q.32 Referring to question 31, if F=100 N and the distance between point A to point B is 5.6 m, the work do by the applied force on the box is:

(A) -117.6 J (B) 98 J (C) 980 J (D) 560 J

Q.33 A man of mass 102 kg climbs a stair of 5 m height at constant speed. The work done by the man is:
(A) 510 J (B) 4998 J (C) 2499 J (D) 999.6 J

Q.34 If the restoring force at distance 0.5 m is 15 N, then the work done in stretching a spring a distance of 0.5 m is:
(A) -6 J (B) -9 J (C) -12 J (D) -3.75 J

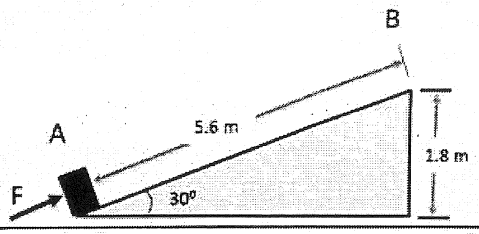
Q.35 A force acts on a spring with length 30 cm. This force compressed it to be 25 cm. If the spring constant is 50 N/m, the work done by the spring is:
(A) -0.0825 J (B) -0.0932 J
(C) -1.236 J (D) -0.0625 J



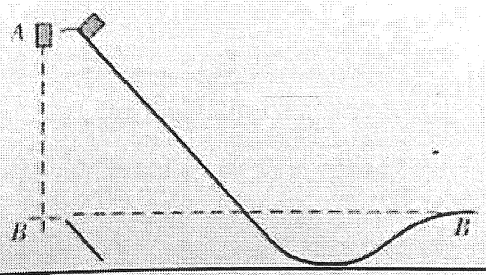
Q.36 If the work done on a particle is 35 J in 5 s. The power is:
(A) 7 W (B) 1 W (C) 6 W (D) 36 W

Q.37 A box was pushed 3 m across the floor in 12 s by a horizontal force of 200 N. The amount of power is:
(A) 100 W (B) 50 W (C) 150 W (D) 25 W

Q.38 *A force F causes the 2 kg box to slide up from point A to point B. The gravitational potential energy gained by the box is:*
(A) 28.40 J (B) 88 J
(C) 270 J (D) 35.28 J



Q.39 In a sliding game at a fun fair, a child train was sliding in different heights. If the train slipped from height A 10 m till height B 7 m. The speed of the train at point B is
(A) 9.87 m/s (B) 7.67 m/s
(C) 6.42 m/s (D) 10.3 m/s



Q.40 A system consists of two particles: particle 1, having the mass m1 = 2.0 kg has the velocity, $v_1 = 2\hat{i} + \hat{j}$ m/s and particle having the mass m2 = 5.0 kg has the velocity, $v_2 = 3\hat{i} - 4\hat{j}$ m/s . The magnitude of the velocity of the center of mass of the system is :
(A) 3.7 m/s (B) 4.9 m/s (C) 2.9 m/s (D) 1.2 m/s

(1)

(1) C

---

(2) $25 \times \frac{3600}{1000} = 90 \text{ km/h}$ (B)

---

(3) $25\text{mm} = \frac{25}{1000} \text{ m} = 0.025\text{m}$

حجم = (طول الضلع)^3

$(0.025)^3 = 1.56 \times 10^{-5} \text{ m}^3$ (C)

---

(4) $1 \text{ mile} = 1610\text{m}$

$50 \text{ mile/h} = 50 \times \frac{1610}{3600}$

$= 22.36 \text{ m/s}$ (A)

---

(5) $\Delta x = 10 \text{ km}$ $\Delta t = 60\text{min} = 1\text{h}$

$v_{avg} = \frac{\Delta x}{\Delta t} = \frac{10}{1} = 10 \text{ km/h}$ (C)

---

(6) $x = t^2 - 6t + 5$

$v = \frac{dx}{dt} = 2t - 6$

$t = 4s \Rightarrow v = 2(4) - 6 = 2\ m/s$ (B)

---

(7) (A)

---

(8) $v_0 = 25\ m/s$ $\quad v = 5\ m/s$

$t = 4s$ $\quad a = ?$

$v = v_0 + at$

$5 = 25 + a(4) \Rightarrow a = -5\ m/s^2$ (D)

---

(9) $v(t) = 95 - 2t$

$a = \frac{dv}{dt} = -2\ m/s^2$ (A)

---

(10) (A)

---

(11) $A_x = 5m$ $\quad A_y = -5m$

$|\vec{A}| = \sqrt{A_x^2 + A_y^2} = \sqrt{(5)^2 + (-5)^2} = 7.07\ m$

(B)

(12) $|\vec{B}| = 4\ m$ $(-x)$

$\vec{B} = -4i$

$|\vec{C}| = 6\ m$ $(+y)$

$\vec{C} = 6j$

$\vec{A} + \vec{B} - \vec{C} = 4i$

$\vec{A} - 4i - 6j = 4i$

$\vec{A} = 4i + 4i + 6j = 8i + 6j$

(B)

---

(13) $i \cdot k = 0$ (D)

---

(14) $\vec{r}_2 = 12i + 10j + 8k$

$\vec{r}_1 = 12i + 5j + 8k$

$\vec{\Delta r} = \vec{r}_2 - \vec{r}_1 = 5j$

(B)

(4)

(15) $x = 2t \qquad y = t^2 - 1$

$\vec{r} = x\hat{i} + y\hat{j} = 2t\hat{i} + (t^2 - 1)\hat{j}$

$\vec{v} = \frac{d\vec{r}}{dt} = 2\hat{i} + 2t\hat{j}$

$t = 1\,s \Rightarrow \vec{v} = 2\hat{i} + 2\hat{j}$ (A)

---

(16) $R_{max} = 40\,m$

$R_{max} = \frac{v_0^2}{g} \Rightarrow 40 = \frac{v_0^2}{9.8}$

$v_0 = 19.8\,m/s$

$v_0 = 19.8\,m/s \qquad a = -9.8\,m$

$v = 0 \qquad y = ?$

$v^2 = v_0^2 + 2ay$

$0 = (19.8)^2 + 2(-9.8)y$

$y = 20\,m$ (C)

17 D

---

18 السرعة ثابتة

net force = $\Sigma F = 0$ A

---

19 C

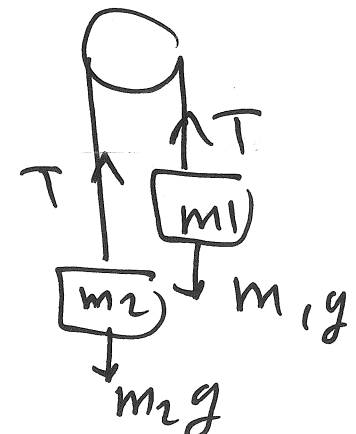
---

20 نفس المسافة التي يقطعها m_1 يقطعها m_2

4m D

---

21 $m_1 = 5kg$ $m_2 = 3kg$



m_1 $m_1 g - T = m_1 a$

$T - m_2 g = m_2 a$

$m_1 g - m_2 g = m_1 a + m_2 a$

$5 \times 9.8 - 3 \times 9.8 = 5a + 3a$

$a = 2.45 m/s^2$

(6)

$v_0 = 0$ $\quad a = 2.45\ m/s^2$

$y = 4m$ $\quad v = ?$

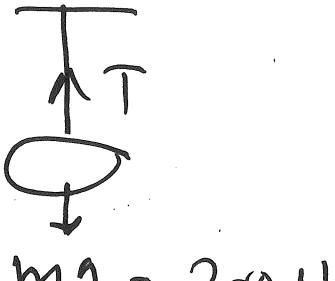
$v^2 = v_0^2 + 2ay$

$v^2 = 0 + 2(2.45)(4)$

$v = 4.43\ m/s$ (B)

---

(22) نحل على

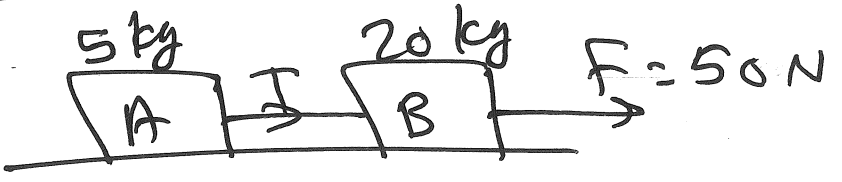


$\Sigma F_y = 0$

$T = mg = 200\ N$ (B)

---

(23)



$\Sigma F = ma \Rightarrow 50 = (5+20)\,a$

$a = 2\ m/s^2$

$T = m_A a = 5(2) = 10\ N$

(B)

(7)

(24)

$$F_k = \mu_k N$$

$F_k \propto N$ (normal force)

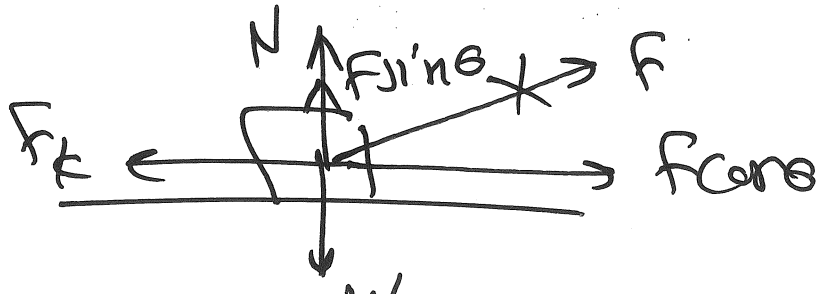
$$F_k = \mu_k (mg)$$

$F_k \propto mg$ (weight)

(A) (C)

---

(25)



$\Sigma F_x = 0 \Rightarrow$ $F_k = F\cos\theta$

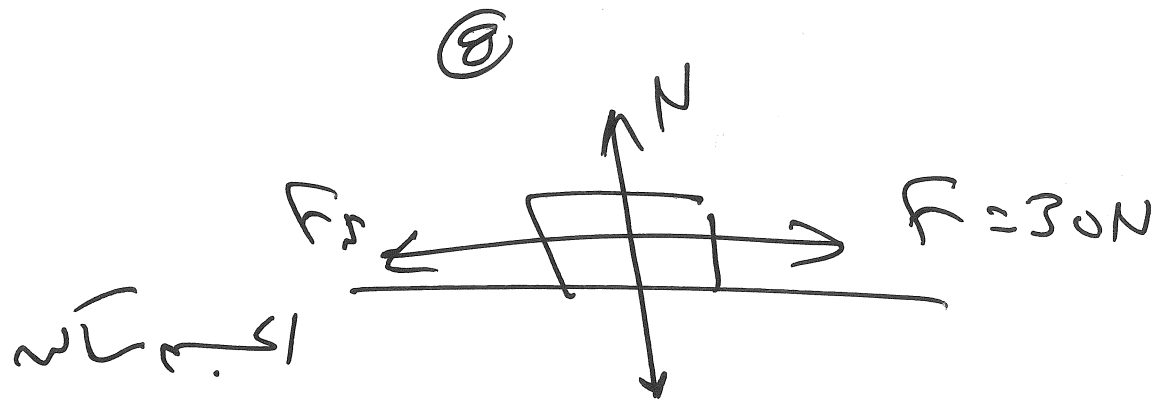
$\Sigma F_y = 0$

$N + F\sin\theta = W$

$N = W - F\sin\theta$

(C)

(26)



$F_s = F = 30N$

$N = mg = 45N$

$\mu_s = \frac{F_s}{N} = \frac{30}{45} = 0.67$ (B)

---

(27) $m = 3kg$ $\quad K = 15J$

$K = \frac{1}{2} m v^2 \Rightarrow 15 = \frac{1}{2}(3) v^2$

$v = 3.16 m/s$ (C)

---

(28) 5m in $+z \Rightarrow \vec{d} = 5k$

$\vec{F} = 4i + 4k$

$\vec{d} = 5k$

$W = \vec{F} \cdot \vec{d} = 0 + 20 = 20J$ (B)

29 D

---

30 $v_i = 4\ m/s \qquad v_f = 0$

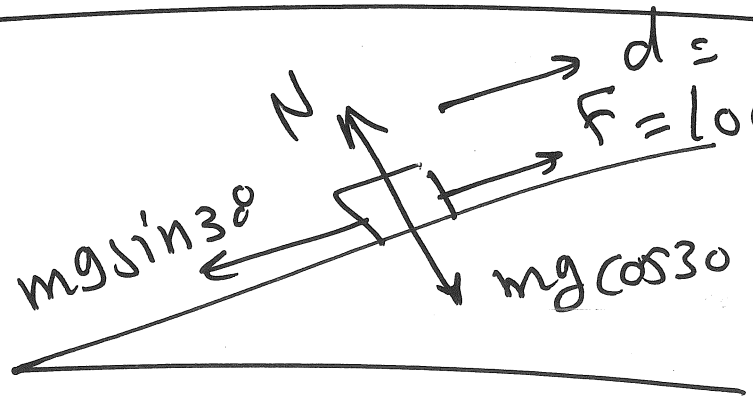
$m = 5\ kg$

$$W_{net} = \Delta K = \frac{1}{2} m (v_f^2 - v_i^2)$$

$$= \frac{1}{2}(5)(0 - (4)^2)$$

$$= -40\ J \qquad (B)$$

31



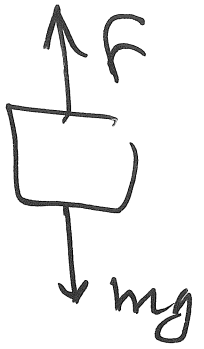
$W_N = 0 \qquad (B)$

---

32 $W_F = Fd = (100)(5.6) = 560\ J$

(D)

(33) $m = 102\ kg$ $d = 5m$



$F = mg = 102 \times 9.8$

$= 999.6\ N$

$W_f = Fd = (999.6)(5) = 4998\ J$ (B)

---

(34) $x_i = 0$ $x_f = 0.5m$ $F = 15N$

$k = \frac{F}{x} = \frac{15}{0.5} = 30\ N/m$

$W_s = -\frac{1}{2} k (x_f^2 - x_i^2)$

$= -\frac{1}{2}(30)((0.5)^2 - 0)$

$= -3.75\ J$ (D)

---

(35) $x_i = 0$ $x_f = 30 - 25 = 5cm$

$k = 50\ N/m$

$W_s = -\frac{1}{2} k (x_f^2 - x_i^2) = -\frac{1}{2}(50)((0.05)^2 - 0)$

$= -0.0625\ J$ (D)

(36) $W = 35\ J$ $\quad t = 5\ s$

$$P = \frac{W}{t} = \frac{35}{5} = 7\ watt$$ (A)

---

(37)

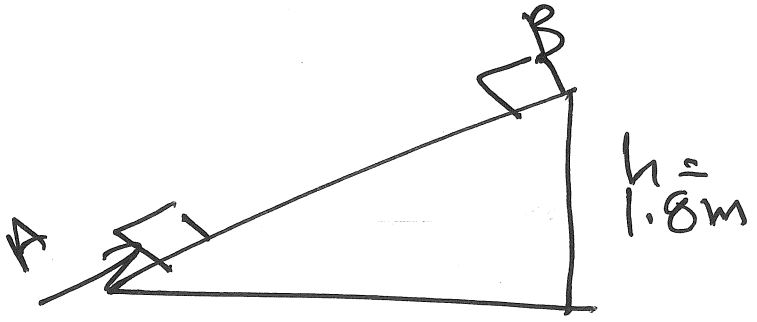
$t = 12\ s$ $\quad d = 3\ m$

$$W_f = Fd = (200)(3) = 600\ J$$

$$P = \frac{W_f}{t} = \frac{600}{12} = 50\ W$$ (B)

---

(38) $m = 2\ kg$

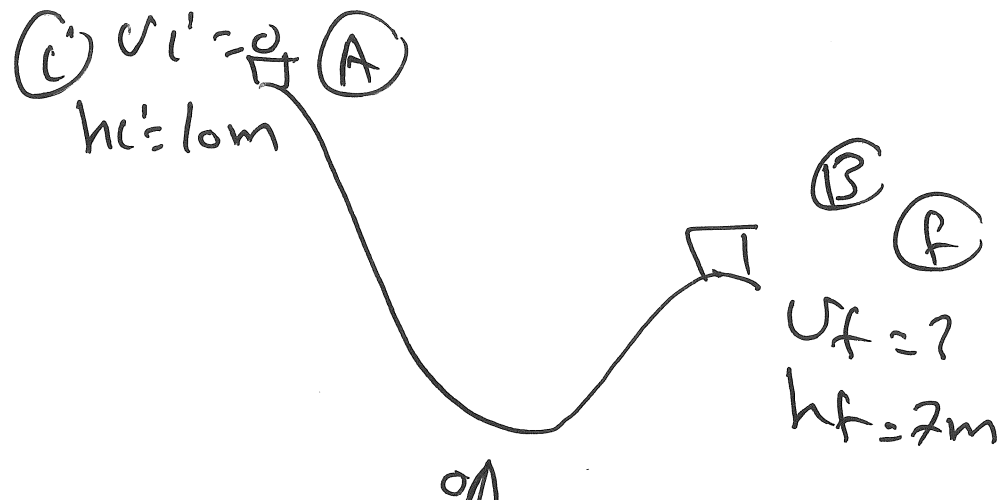


$$U_g = mgh$$

$$= 2 \times 9.8 \times 1.8 = 35.28\ J$$ (D)

(12)

(39)



$$W = \Delta E + \Delta U_g + \Delta U_s$$

$$\frac{1}{2}m(v_f^2 - v_i^2) + mg(h_f - h_i) = 0$$

$(\div m)$

$$\frac{1}{2}(v_f^2 - 0) + 9.8(7 - 10) = 0$$

$$v_f = 7.67 \text{ m/s} \quad \text{(B)}$$

---

(40) $m_1 = 2kg \quad \vec{v}_1 = 2i + j$

$m_2 = 5kg \quad \vec{v}_2 = 3i - 4j$

$$\Sigma P_i = \Sigma P_f \Longrightarrow m_1\vec{v}_1 + m_2\vec{v}_2 = (m_1+m_2)\vec{v}_{com}$$

$$2(2i+j) + 5(3i-4j) = 5\vec{v}_{com}$$

(13)

$4\hat{i} + 2\hat{j} + 15\hat{i} - 20\hat{j} = 5\,v_{com}$

$19\hat{i} - 18\hat{j} = 5\,v_{com}$ $\quad (\div 5)$

$v_{com} = 3.8\hat{i} - 3.6\hat{j}$

$|\vec{v}_{com}| = \sqrt{(3.8)^2 + (3.6)^2}$

$\approx 5.23 \text{ m/s}$