



**Assertion**  
Retardation is directed opposite to the velocity.

**Reason**

10. Retardation is equal to the time rate of decrease of velocity.

[4 Marks]

- A) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
- B) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion
- C) Assertion is correct but Reason is incorrect
- D) Both Assertion and Reason are incorrect

11. Aman is walking on the road with a speed 3 m/s. Rain is falling vertically at speed 3 m/s. At what angle from the vertical, man has to hold his umbrella to avoid the rain drops? [4 Marks]

- A)  $30^\circ$
- B)  $45^\circ$
- C)  $60^\circ$
- D)  $90^\circ$

12. The speed of a swimmer is  $4\text{ km h}^{-1}$  in still water. If the swimmer makes his strokes normal to the flow of river of width 1km, he reaches a point 750m down the stream on the opposite bank. The speed of the river water is..... $\text{km h}^{-1}$  [4 Marks]

- A) 1
- B) 2
- C) 3
- D) 4

13. At the top of the trajectory of a projectile, the directions of its velocity and acceleration are: [4 Marks]

- A) perpendicular to each other
- B) parallel to each other
- C) inclined to each other at an angle of  $45^\circ$
- D) antiparallel to each other

14. Two projectiles are thrown with same initial velocity at angle  $30^\circ$  &  $45^\circ$  with horizontal. Find ratio of their ranges. [4 Marks]

- A)  $\sqrt{5}/2$
- B)  $\sqrt{7}/2$
- C)  $\sqrt{3}/2$
- D)  $\sqrt{6}/2$

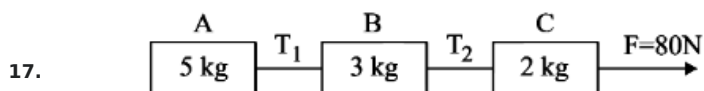
15. The equation of a projectile is  $y = ax - bx^2$ . Its horizontal range is [4 Marks]

- A)  $a/b$
- B)  $b/a$
- C)  $a + b$
- D)  $b - a$

16. A particle moves in two dimensions such that its displacement in the x-direction and y-direction at time  $t$  is given by the equations:  $x=3t^2+2t$  and  $y=4t^3-5t$ . Calculate the velocities in the x-direction and y-direction at time  $t=2$  seconds. [4 Marks]

- A)  $V_x = 12\text{ m/s}$ ,  $V_y = 14\text{ m/s}$
- B)  $V_x = 16\text{ m/s}$ ,  $V_y = 48\text{ m/s}$
- C)  $V_x = 14\text{ m/s}$ ,  $V_y = 43\text{ m/s}$
- D)  $V_x = 14\text{ m/s}$ ,  $V_y = 48\text{ m/s}$

Three blocks A, B and C are pulled on a horizontal smooth surface by a force of 80 N as shown in figure



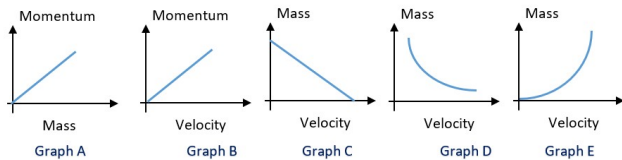
[4 Marks]

The tensions  $T_1$  and  $T_2$  and in the string are respectively:

- A) 40 N, 64 N
- B) 60 N, 80 N
- C) 88 N, 96 N
- D) 80 N, 100 N

Which of the following Graph(s) is/are correct for momentum of a particle?

18.



[4 Marks]

- A) Graph A, B and E only  
 B) Graph B, C and E only  
 C) Graph A, B, and D only  
 D) Graph C and D only

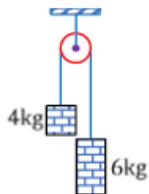
19. Based on Galileo's inclined plane experiment, what happens to the ball after it leaves the inclined plane and moves on the horizontal surface

[4 Marks]

- A) The ball will come to a stop immediately.  
 B) The ball will continue to move with constant speed indefinitely, assuming no friction.  
 C) The ball will accelerate on the horizontal surface.  
 D) The ball will reverse direction and roll back up the inclined plane

Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :

20.

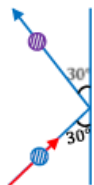


[4 Marks]

- A)  $g/10$   
 B)  $g$   
 C)  $g/2$   
 D)  $g/5$

A 0.5 kg ball moving with a speed of 12 m/s strikes a hard wall at an angle of  $30^\circ$  with the wall. It is reflected with the same speed and at the same angle. If the ball is in contact with the wall for 0.25 seconds, the average force acting on the wall is :-

21.



[4 Marks]

- A) 48 N  
 B) 24 N  
 C) 12 N  
 D) 96 N

22. A horizontal force F acts on the block of mass m and the block remains stationary, the value of friction force on the block is :-

[4 Marks]

- A)  $\mu mg$   
 B)  $\mu mg - F$   
 C) F  
 D) zero

23. Statement 1: The angle of repose is the steepest angle at which a pile of material can stay without sliding down.

[4 Marks]

Statement 2: The angle of repose depends only on the surface area of the material, not its properties.

- A) Statement 1 is true, and Statement 2 is false.  
 B) Statement 1 is false, and Statement 2 is true.  
 C) Both Statement 1 and Statement 2 are true.  
 D) Both Statement 1 and Statement 2 are false.

24. A 0.5 kg block moving at a speed of 12 ms<sup>-1</sup> compresses a spring through a distance 30 cm when its speed is halved. The spring constant of the spring will be Nm<sup>-1</sup>.

[4 Marks]



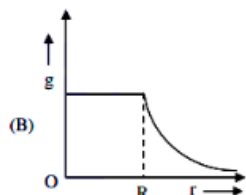
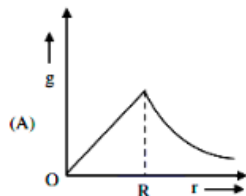
A) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion

B) Both Assertion and Reason are correct but Reason is not the correct explanation for Assertion

C) Assertion is correct but Reason is incorrect

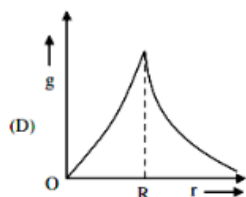
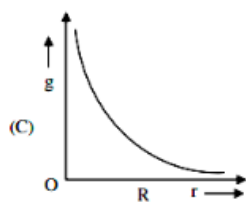
D) Both Assertion and Reason are incorrect

The variation of acceleration due to gravity ( $g$ ) with distance ( $r$ ) from the center of the earth is correctly represented by: (Given  $R$  = radius of earth)



33.

[4 Marks]



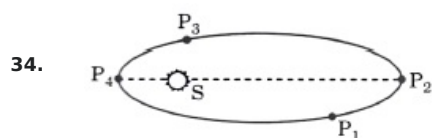
A) A

B) B

C) C

D) D

Figure shows a planet in an elliptical orbit around the sun S. Where is the kinetic energy of the planet maximum?



[4 Marks]

A) P4

B) P3

C) P2

D) P1

35. If  $v_e$  is escape velocity and  $v_0$  is orbital velocity of a satellite for orbit close to the earth's surface, then these are related by:

[4 Marks]

A)  $4v_e = 4v_0$

B)  $v_e = 2v_0$

C)  $v_0 = 2v_e$

D)  $v_0 = v_e$

36. Two particles of mass 1 kg and 0.5 kg are moving in the same direction with speed of 2m/s and 6m/s respectively on a smooth horizontal surface. The speed of centre of mass of the system is :

[4 Marks]

A) 103 m/s

B) 107 m/s

- C) 112 m/s D) 123 m/s

37. Two bodies of mass 1 kg and 3 kg have position vectors  $i\hat{+}2j\hat{+}k\hat{}$  and  $-3i\hat{-}2j\hat{+}k\hat{}$ , respectively. The centre of mass of this system has a position vector [4 Marks]

- A)  $-2i\hat{+}2k\hat{}$  B)  $-i\hat{+}j\hat{+}k\hat{}$   
 C)  $2i\hat{-}j\hat{-}2k\hat{}$  D)  $-2i\hat{-}j\hat{+}k\hat{}$

38. In an inelastic collision- [4 Marks]

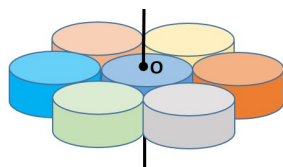
- A) momentum is conserved but kinetic energy is not B) momentum is not conserved but kinetic energy is conserved  
 C) neither momentum nor kinetic energy is conserved D) both the momentum and kinetic energy are conserved

39. A body moves with constant velocity  $v$  in a straight line parallel to  $x$ -axis. The angular momentum with respect to origin is: [4 Marks]

- A) zero B) constant  
 C) continuously increases D) continuously decreases

Seven identical circular planar disks, each of mass  $M$  and radius  $R$  are welded symmetrically as shown. The moment of inertia of the arrangement about the axis normal to the plane and passing through the point  $O$  is  $X4mR^2$ . The value of  $X$  is

40. [4 Marks]



- A) 45 B) 110  
 C) 55 D) 90

41. Let  $F\rightarrow$  be the force acting on a particle having position vector  $r\rightarrow$ , and  $T\rightarrow$  be the torque of this force about the origin. Then [2003] [4 Marks]

- A)  $r\rightarrow\cdot T\rightarrow=0$  and  $F\rightarrow\cdot T\rightarrow\neq 0$  B)  $r\rightarrow\cdot T\rightarrow\neq 0$  and  $F\rightarrow\cdot T\rightarrow=0$   
 C)  $r\rightarrow\cdot T\rightarrow\neq 0$  and  $F\rightarrow\cdot T\rightarrow\neq 0$  D)  $r\rightarrow\cdot T\rightarrow=0$  and  $F\rightarrow\cdot T\rightarrow=0$

42. A tap can be operated easily using two fingers because: [4 Marks]

- A) The force available for the operation will be more B) This helps application of angular forces  
 C) The rotational effect is caused by the couple formed D) The force by one finger overcomes friction and other finger provides the force for the operation

43. The speed of a uniform spherical shell after rolling down an inclined plane of vertical height  $h$  from rest is: [4 Marks]

- A)  $10gh^7$  B)  $6gh^5$   
 C)  $4gh^5$  D)  $2gh$

44. The Dimension formula of Stress and Strain respectively are [4 Marks]

- A)  $M^1L^1T^{-1}$ , No Dimension B)  $M^1L^{-1}T^{-2}$ ,  $M^0L^1T^0$   
 C)  $M^1L^{-1}T^{-2}$ , No Dimension D)  $M^{-1}L^{-1}T^{-2}$ ,  $M^0L^1T^{-1}$

45. A wire is stretched to double of its length. The strain is [4 Marks]

- A) 0.5 B) 0.1  
 C) 1 D) 2

46. **Assertion (A):** Elastic materials regain their original shape and size after the removal of the deforming force. **Reason (R):** Elastic materials have a high modulus of elasticity. [4 Marks]

- |    |                                                                                                         |    |                                                                                                             |
|----|---------------------------------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------|
| A) | Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A). | B) | Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). |
| C) | Assertion (A) is true, but Reason (R) is false.                                                         | D) | Assertion (A) is false, but Reason (R) is true.                                                             |

The stress versus strain graphs for wires of two materials A and B as shown in the figure. If  $Y_A$  and  $Y_B$  are the young's modulus of the materials, then-

47. [4 Marks]



- |    |              |    |              |
|----|--------------|----|--------------|
| A) | $Y_B = 2Y_A$ | B) | $Y_A = Y_B$  |
| C) | $Y_B = 3Y_A$ | D) | $Y_A = 3Y_B$ |

Two rods A and B of different materials are welded together as shown in figure. Their thermal conductivities are  $K_1$  and  $K_2$ . The thermal conductivity of the composite rod will be: -

48. [4 Marks]



- |    |              |    |             |
|----|--------------|----|-------------|
| A) | $3K_1 + K_2$ | B) | $K_1 + K_2$ |
| C) | $2K_1 + K_2$ | D) | $K_1 + K_2$ |