

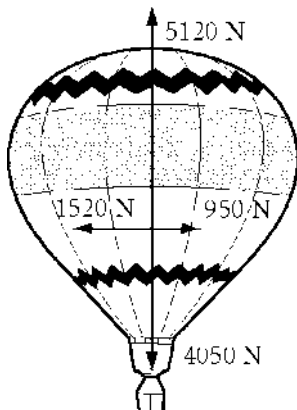
IB PHYSICS SL SEMESTER 1 FINAL REVIEW**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

- _____ 1. A rocket is fired vertically. At its highest point, it explodes. Which **one** of the following describes what happens to its total momentum and total kinetic energy as a result of the explosion?

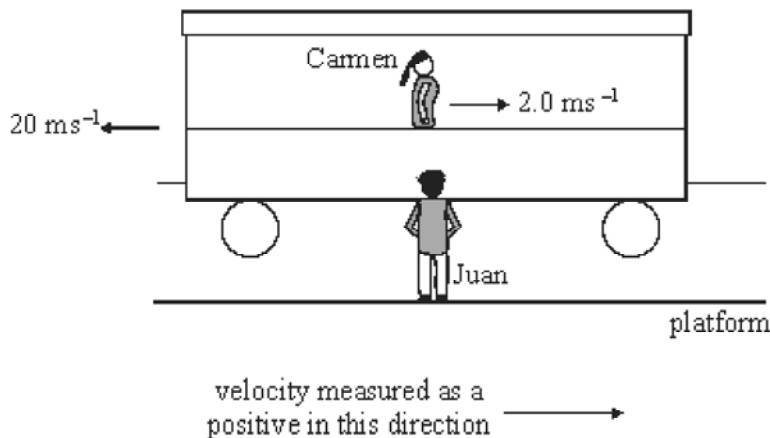
	Total momentum	Total kinetic energy
A.	unchanged	increased
B.	unchanged	unchanged
C.	increased	increased
D.	increased	unchanged

- a. C only
b. All of the above
c. A only
d. None of the above
- _____ 2. A ball, initially at rest, takes time t to fall through a vertical distance h . If air resistance is ignored, the time taken for the ball to fall from rest through a vertical distance $9h$ is
- a. $10t$
b. $3t$
c. $9t$
d. $5t$



- _____ 3. In the free-body diagram shown above, which of the following is the gravitational force acting on the balloon?
- a. 1520 N
b. 5120 N
c. 950 N
d. 4050 N

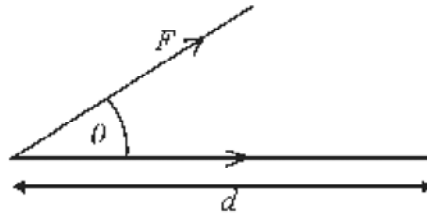
- _____ 4. Juan is standing on the platform at a railway station. A train passes through the station with speed 20 m s^{-1} in the direction shown measured relative to the platform. Carmen is walking along one of the carriages of the train with a speed of 2.0 m s^{-1} measured relative to the carriage in the direction shown. Velocity is measured as positive in the direction shown on the diagram.



The velocity of Carmen relative to Juan is

- a. -18 m s^{-1} .
 b. $+22 \text{ m s}^{-1}$.
 c. -22 m s^{-1} .
 d. $+18 \text{ m s}^{-1}$.
- _____ 5. A hammer drives a nail into a piece of wood. Identify an action-reaction pair in this situation.
- a. The nail exerts a force on the hammer; the hammer exerts a force on the wood.
 b. The hammer exerts a force on the nail; the hammer exerts a force on the wood.
 c. The hammer exerts a force on the nail; the wood exerts a force on the nail.
 d. The hammer exerts a force on the nail; the nail exerts a force on the hammer.
- _____ 6. An object of mass m_1 has a kinetic energy K_1 . Another object of mass m_2 has a kinetic energy K_2 . If the momentum of both objects is the same, the ratio $\frac{K_1}{K_2}$ is equal to
- a. $\frac{m_2}{m_1}$
 b. $\sqrt{\frac{m_2}{m_1}}$
 c. $\sqrt{\frac{m_1}{m_2}}$
 d. $\frac{m_1}{m_2}$

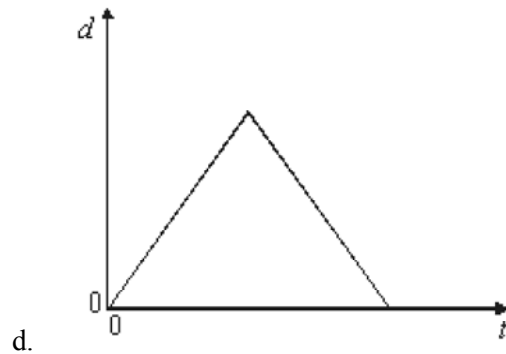
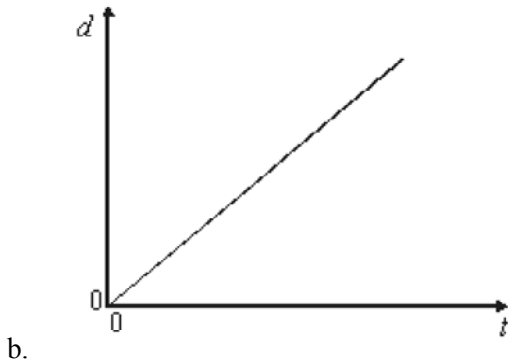
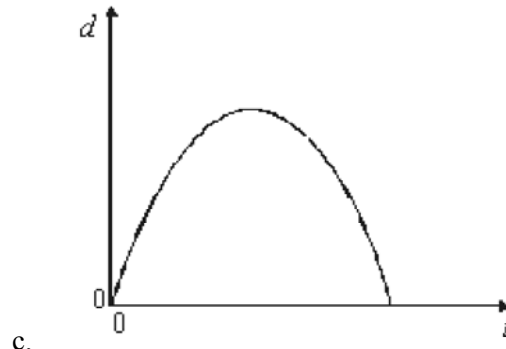
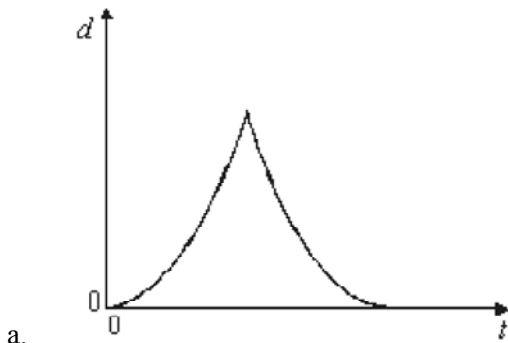
7. The point of action of a constant force F is displaced a distance d . The angle between the force and the direction of the displacement is θ , as shown below.



Which **one** of the following is the correct expression for the work done by the force?

- a. $Fd \sin\theta$
- b. $Fd \tan\theta$
- c. $Fd \cos\theta$
- d. Fd

8. An athlete runs round a circular track at constant speed. Which **one** of the following graphs best represents the variation with time t of the magnitude d of the **displacement** of the athlete from the starting position during one lap of the track?



9. Since 1983 the standard meter has been defined in terms of which of the following?
- a. specific alloy bar housed at Sevres, France
 - b. distance from the Earth's equator to the North Pole
 - c. the distance light travels in a certain fraction of a second
 - d. the radius of the Earth
 - e. wavelength of light emitted by krypton-86

___ 10. The resistive force F acting on a sphere of radius r moving at speed v through a liquid is given by

$$F = cvr$$

where c is a constant. Which of the following is a correct unit for c ?

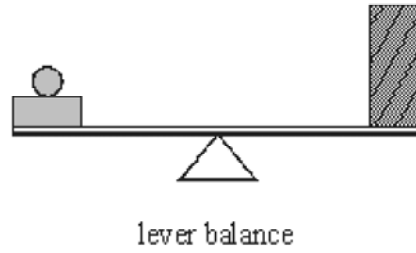
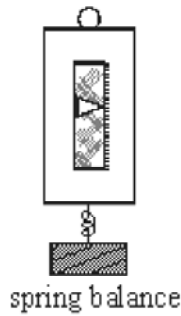
- a. N m s⁻¹
- b. N m⁻² s
- c. N
- d. N s⁻¹

___ 11. Which of the following is the best estimate, to one significant digit, of the quantity shown below?

$$\frac{\pi \times 8.1}{\sqrt{(15.9)}}$$

- a. 5.8
- b. 6.0
- c. 1.5
- d. 2.0

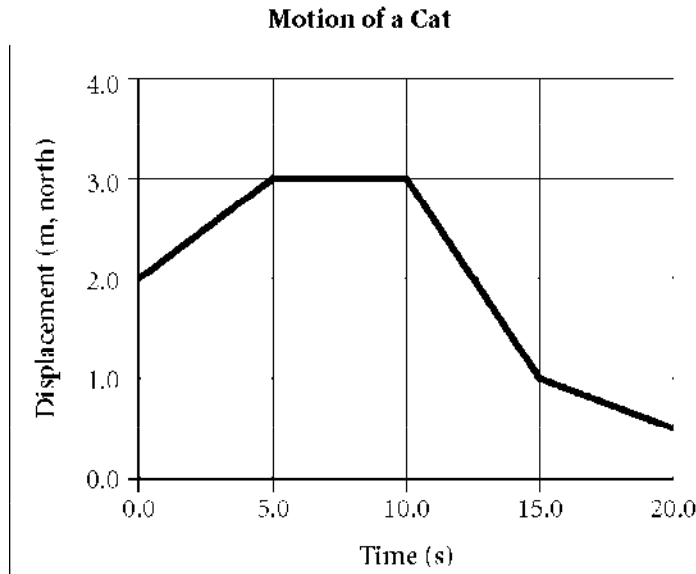
___ 12. The weight of a mass is measured on Earth using a spring balance and a lever balance, as shown below.



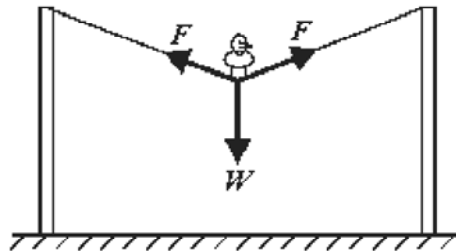
What change, if any, would occur in the measurements if they were repeated on the Moon's surface?

	Spring balance	Lever balance
A.	same	same
B.	same	decrease
C.	decrease	same
D.	decrease	decrease

- a. A only
- b. A and C
- c. B only
- d. C only



- ____ 13. According to the graph above, during which interval is the cat at rest?
- a. 15.0–20.0 s c. 5.0–10.0 s
 b. 10.0–15.0 s d. 0.0–5.0 s
- ____ 14. A bird of weight W lands at the midpoint of a horizontal wire stretched between two poles. The magnitude of the force exerted by each pole on the wire is F .



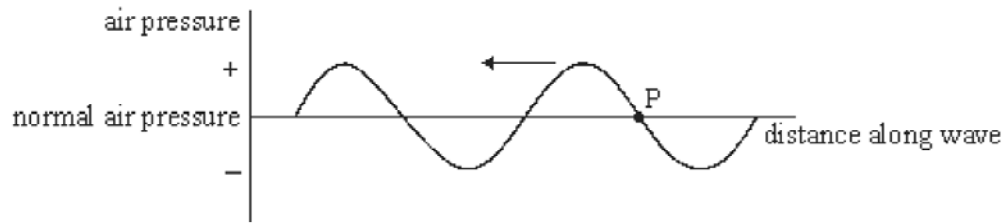
The bird will be in equilibrium if

- A. $2F > W$.
 B. $2F = W$.
 C. $2F < W$.
 D. $F = W$.

- a. $F = W$. c. $2F < W$.
 b. $2F = W$. d. $2F > W$.

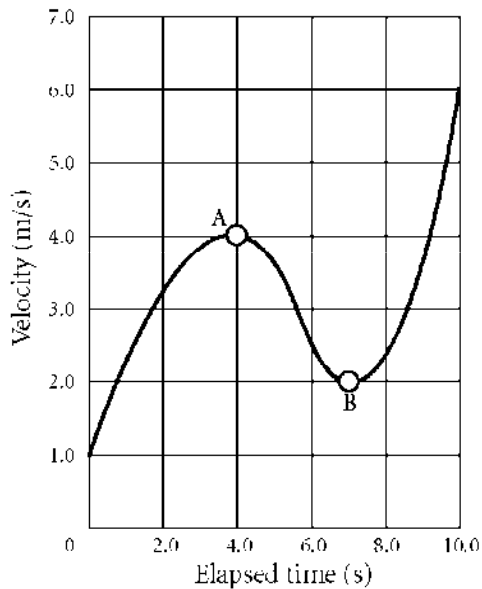
- ____ 15. A raindrop falling through air reaches a terminal velocity before hitting the ground. At terminal velocity, the frictional force on the raindrop is
- a. zero. c. less than the weight of the raindrop.
 b. greater than the weight of the raindrop. d. equal to the weight of the raindrop

16. The graph below shows the variation of air pressure with distance along a wave at one given time. The arrow indicates the direction of travel of the wave.



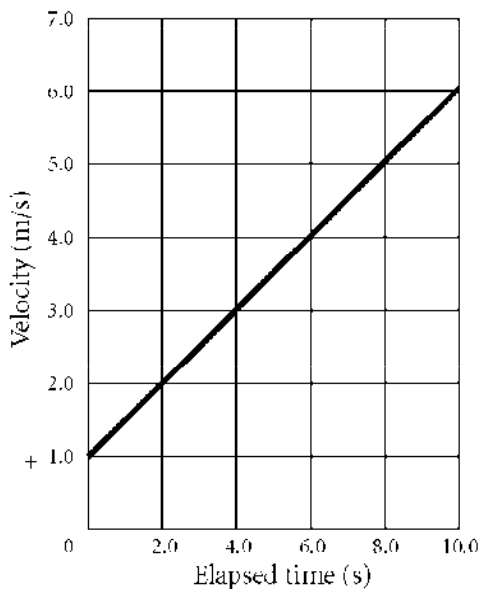
The air pressure at point P is

- a. zero.
 - b. increasing.
 - c. decreasing.
 - d. constant.
17. I drop a 60-g golf ball from 2.0 m high. It rebounds to 1.5 m. How much energy is lost?
- a. 1.0 J
 - b. 1.1 J
 - c. 0.88 J
 - d. 0.29 J
 - e. 0.50 J



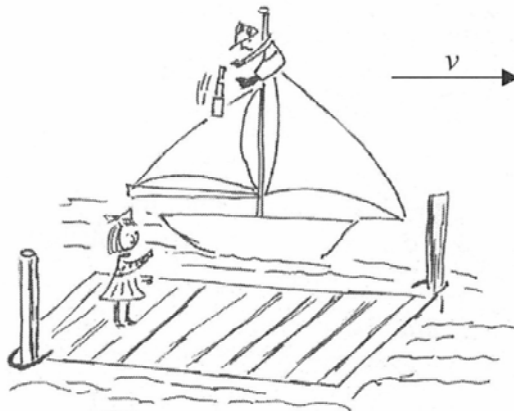
18. In the graph above, how does the acceleration at A compare with the acceleration at B?
- a. The accelerations at A and B are each zero.
 - b. The acceleration at A is positive and less than the acceleration at B.
 - c. The acceleration at B is positive and less than the acceleration at A.
 - d. The accelerations at A and B cannot be determined.

- _____ 19. A truck collides head on with a less massive car moving in the opposite direction to the truck. During the collision, the average force exerted by the truck on the car is F_T and the average force exerted by the car on the truck is F_C . Which **one** of the following statements is correct?
- a. F_T will be greater in magnitude than F_C only when the speed of the car is less than the speed of the truck. c. F_T will always be greater in magnitude than F_C .
- b. F_T will be equal in magnitude to F_C only when the speed of the truck is equal to the speed of the car. d. F_T will always be equal in magnitude to F_C .
- _____ 20. When a body is accelerating, the resultant force acting on it is equal to its
- a. change of momentum. c. rate of change of kinetic energy.
b. acceleration per unit of mass. d. rate of change of momentum.







- _____ 21. The graph above describes the motion of a cyclist. The graph illustrates that the acceleration of the cyclist
- a. decreases. c. is constant.
b. increases. d. is zero.

- ___ 22. A sailing boat is moving with constant velocity v to the right parallel to the dock.

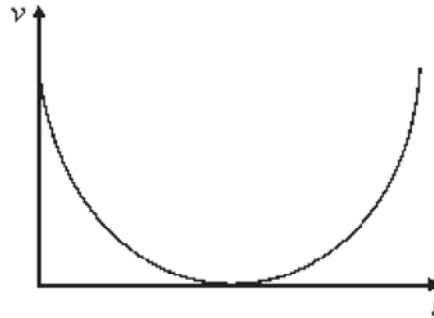


Sailor Hulot, up on the mast, drops his telescope at the moment he is opposite Lucie who is standing on the dock. Which **one** of the following best shows the path of the falling telescope as seen by Lucie?

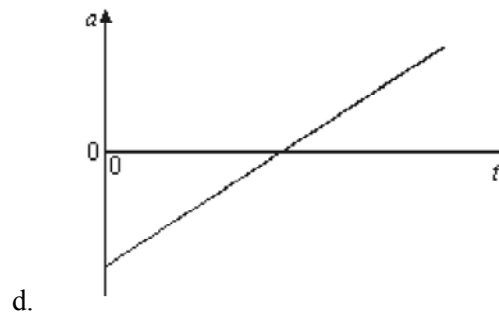
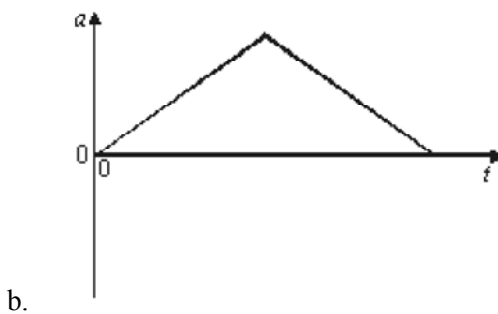
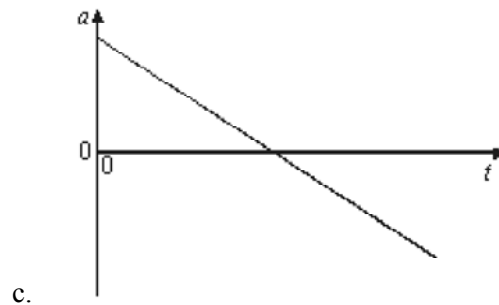
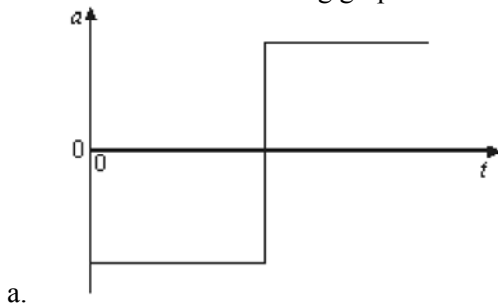
- a. 
- b. 
- c. 
- d. 

- ___ 23. A child with a mass of 23 kg rides a bike with a mass of 5.5 kg at a velocity of 4.5 m/s to the south. Compare the momentum of the child with the momentum of the bike.
- The child has a greater momentum than the bike.
 - The bike has a greater momentum than the child.
 - Both the child and the bike have the same momentum.
 - Neither the child nor the bike has momentum.

24. The graph shows the variation with time t of the velocity v of an object.



Which **one** of the following graphs best represents the variation with time t of the acceleration a of the object?



25. A ball of mass m , travelling in a direction at right angles to a vertical wall, strikes the wall with a speed v_1 . It rebounds at right angles to the wall with a speed v_2 . The ball is in contact with the wall for a time Δt . The magnitude of the force that the ball exerts on the wall is

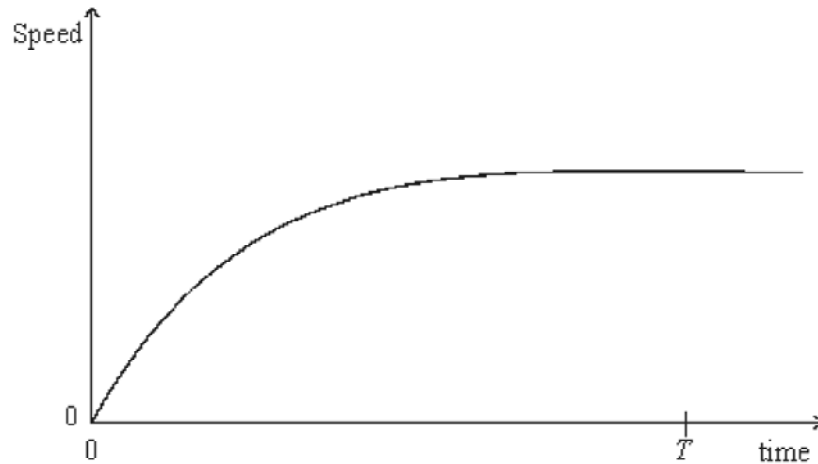
a. $\frac{m(v_1 + v_2)}{\Delta t}$

c. $m(v_1 + v_2)\Delta t$

b. $\frac{m(v_1 - v_2)}{\Delta t}$

d. $m(v_1 - v_2)\Delta t$

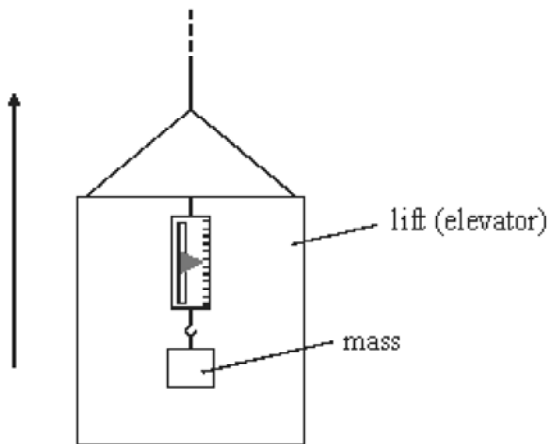
___ 26. The variation with time of the vertical speed of a ball falling in air is shown below.



During the time from 0 to T , the ball gains kinetic energy and loses gravitational potential energy ΔE_p . Which of the following statements is true?

- a. ΔE_p is equal to the gain in kinetic energy. c. ΔE_p is less than the work done against air resistance.
 b. ΔE_p is greater than the gain in kinetic energy. d. ΔE_p is equal to the work done against air resistance.

___ 27. A mass is suspended from the roof of a lift (elevator) by means of a spring balance, as illustrated below.



The lift (elevator) is moving upwards and the readings of the spring balance are noted as follows.

Accelerating: R_a

Constant speed: R_c

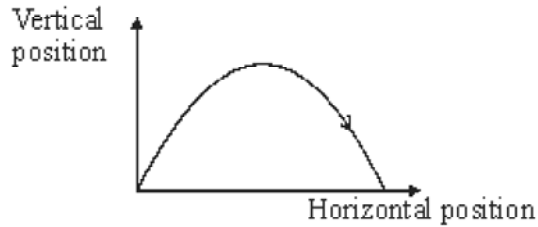
Slowing down: R_s

Which **one** of the following is a correct relationship between the readings?

- a. $R_c = R_s$ c. $R_a = R_s$
 b. $R_c < R_s$ d. $R_a > R_c$

- ___ 28. An object is moving at constant velocity. Which **one** of the following quantities **must** have zero magnitude?
- a. Resultant force on object
 - b. Momentum of object
 - c. Kinetic energy of object
 - d. Weight of object

- ___ 29. The diagram below shows the path of a projectile in the absence of air resistance.

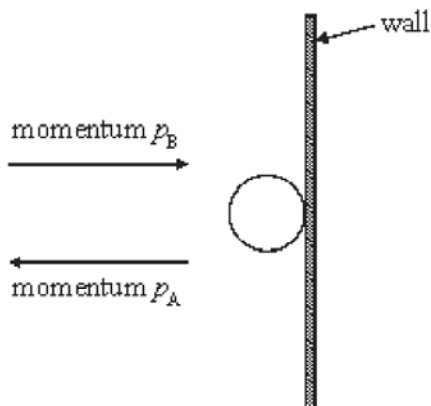


Which **one** of the following diagrams best represents the path of the projectile under the same initial conditions when the air resistance is taken into account? (*The path in absence of air resistance is shown for comparison as a dotted line.*)

- a. c.
- b. d.

- ___ 30. The main difference between kinetic energy and potential energy is that
- a. although both energies involve position, only potential energy involves motion.
 - b. although both energies involve motion, only kinetic energy involves position.
 - c. kinetic energy involves motion, and potential energy involves position.
 - d. kinetic energy involves position, and potential energy involves motion.

- ____ 31. A sphere of mass m strikes a vertical wall and bounces off it, as shown below.



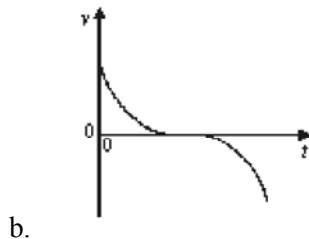
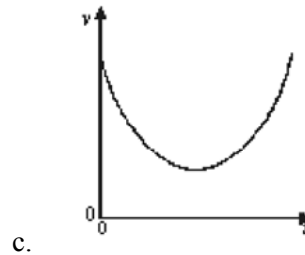
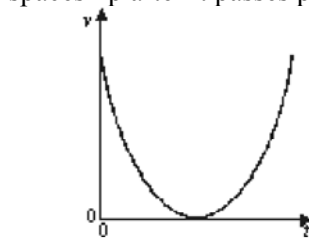
The magnitude of the momentum of the sphere just before impact is p_B and just after impact is p_A . The sphere is in contact with the wall for time t . The magnitude of the average force exerted by the wall on the sphere is

- a. $\frac{(p_B - p_A)}{mt}$ c. $\frac{(p_B + p_A)}{mt}$
 b. $\frac{(p_B + p_A)}{t}$ d. $\frac{(p_B - p_A)}{t}$
- ____ 32. As I slide a box at constant speed up a frictionless slope, pulling parallel to the slope, the tension in the rope will be:
- less than the tension would be if the box were stationary.
 - less than the weight of the box.
 - greater than the tension would be if the box were stationary.
 - equal to the weight of the box.
 - greater than the weight of the box.

- ___ 33. A powered spaceship is moving directly away from a planet as shown below.



At point P the motors of the spaceship are switched off but the spaceship remains under the influence of the planet. Which **one** of the following graphs best represents the variation with time t of the **velocity** v of the spaceship after it passes point P?

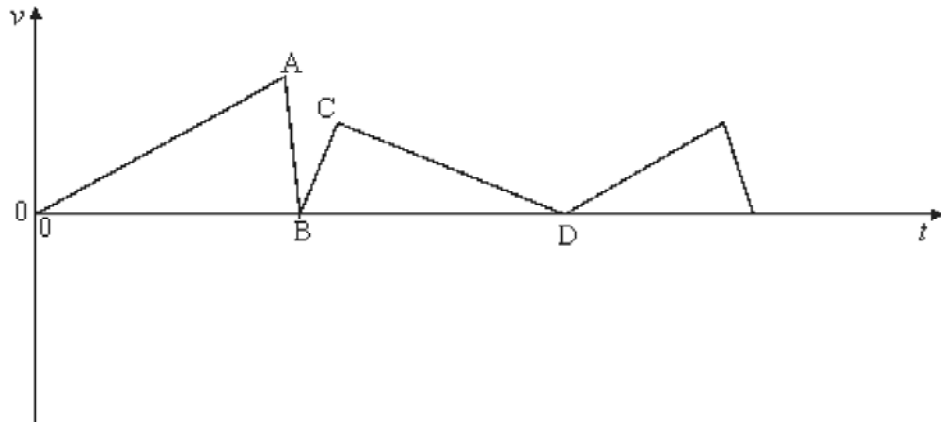


- ___ 34. The diameter of the nucleus of a hydrogen atom is of the order of
- | | |
|-----------------|-----------------|
| a. 10^{-8} m | c. 10^{-23} m |
| b. 10^{-15} m | d. 10^{-30} m |

Name: _____

ID: A

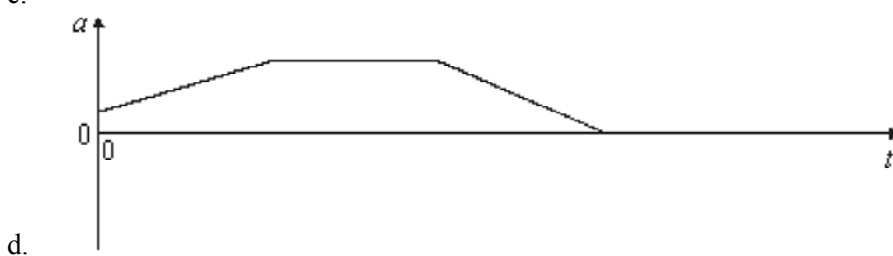
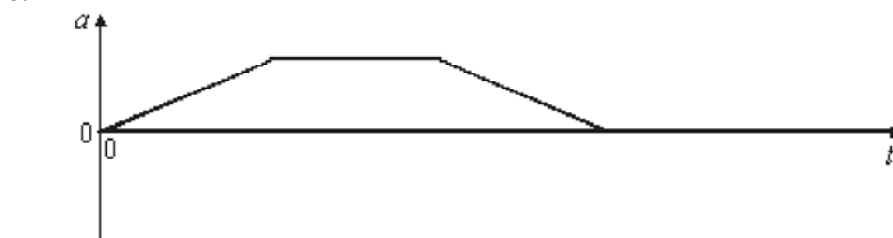
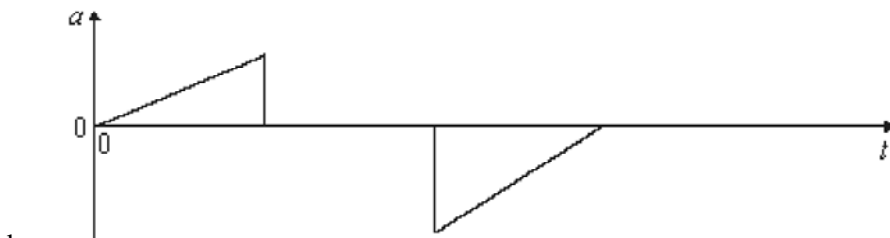
35. A ball is dropped from rest at time $t = 0$ on to a horizontal surface from which it rebounds. The graph shows the variation of time t with **speed** v of the ball.



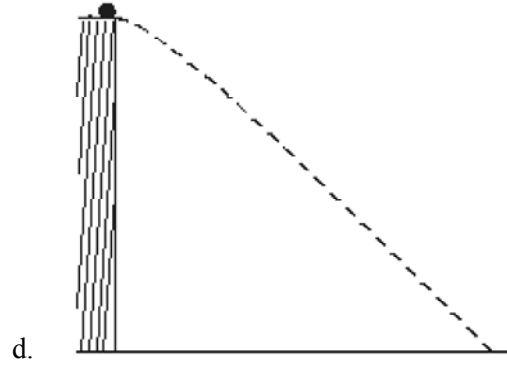
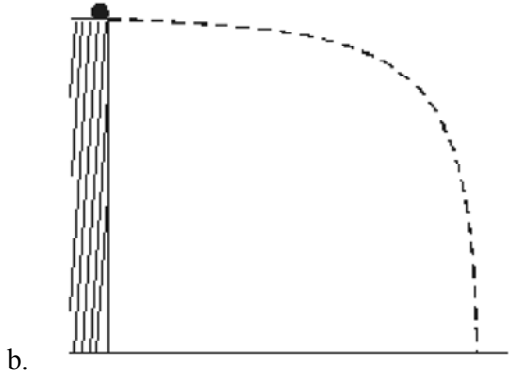
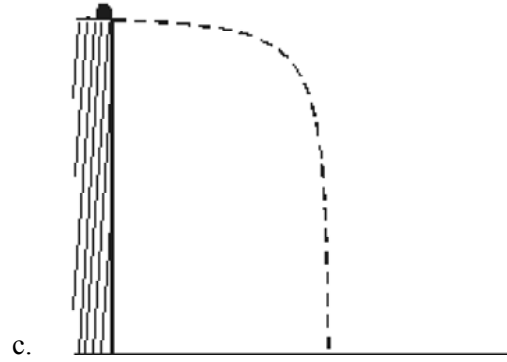
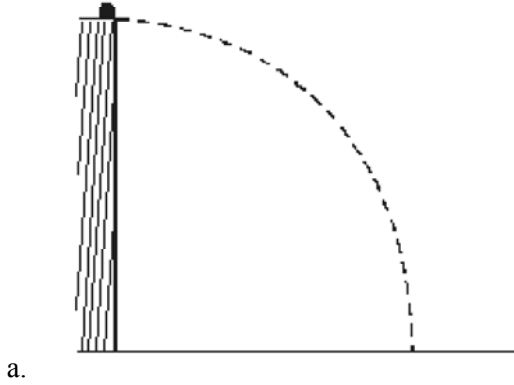
Which **one** of the following best represents the point at which the ball just loses contact with the surface after the first bounce?

- a. C
- b. B
- c. A
- d. D

36. A car accelerates uniformly from rest. It then continues at constant speed before the brakes are applied, bringing the car to rest. Which of the following graphs best shows the variation with time t of the acceleration a of the car?



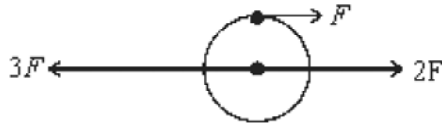
37. A ball is thrown horizontally from the top of a cliff. Air resistance is negligible. Which of the following diagrams best represents the subsequent path of the ball?



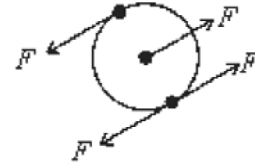
38. A metal disc is acted upon by a number of forces. The forces are all in the plane of the disc and the weight of the disc is negligible.

In which of the following situations is the disc in equilibrium?

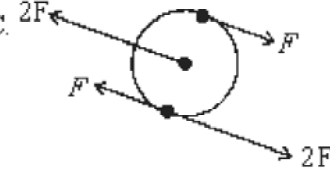
A.



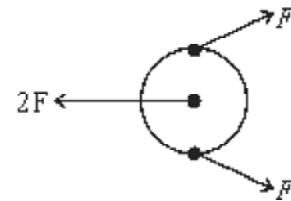
B.



C.

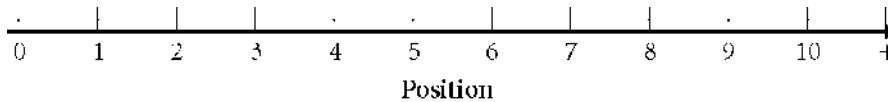


D.



- a. B only
- b. C only

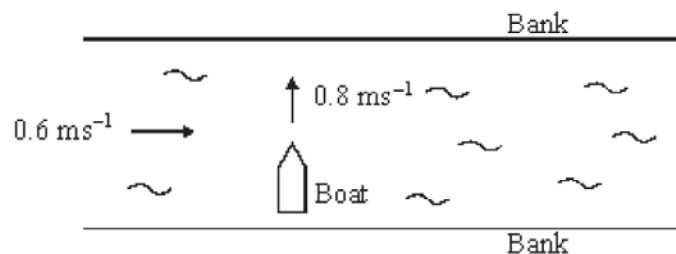
- c. All are in equilibrium
- d. B and C



39. In the graph above, a toy car rolls from +3 m to +5 m. Which of the following statements is true?

- a. $x_f = +3$ m
- b. $x_i = +3$ m
- c. $\Delta x = +3$ m
- d. $v_{avg} = 3$ m/s

40. The diagram below shows a boat that is about to cross a river in a direction perpendicular to the bank at a speed of 0.8 ms^{-1} . The current flows at 0.6 ms^{-1} in the direction shown.

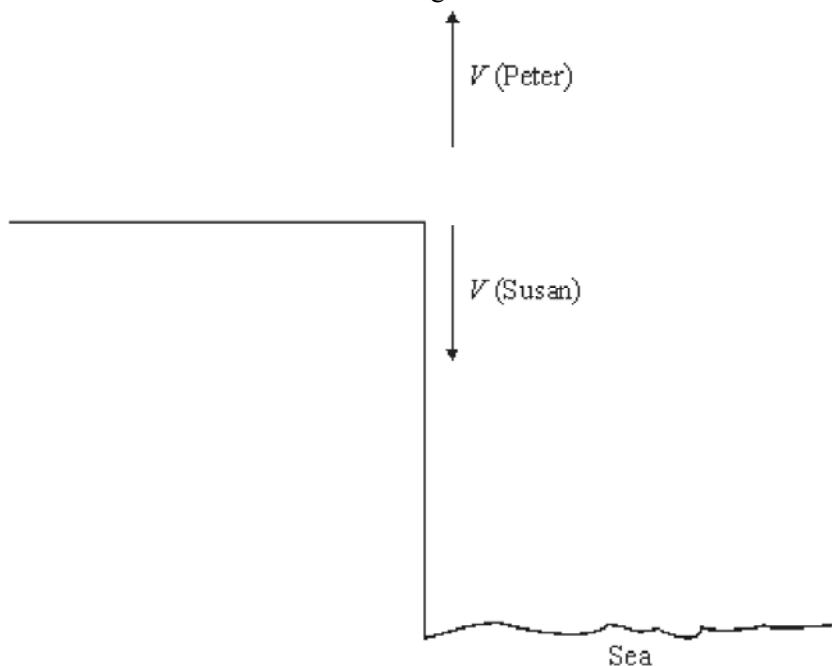


The magnitude of the displacement of the boat 5 seconds after leaving the bank is

- a. 3 m
- b. 5 m
- c. 4 m
- d. 7 m

- _____ 41. A ball is released from rest near the surface of the Moon. Which **one** of the following quantities increases at a constant rate?
- a. Only speed
 - b. Only speed and distance fallen
 - c. Only distance fallen
 - d. Only speed and acceleration
- _____ 42. Two objects of different mass are released simultaneously from the top of a 20-m tower and fall to the ground. If air resistance is negligible, which statement best applies?
- a. The greater mass hits the ground first.
 - b. No conclusion can be made with the information given.
 - c. Both objects hit the ground together.
 - d. The smaller mass hits the ground first.
- _____ 43. A stone is thrown horizontally from the top of a high cliff. Assuming air resistance is negligible, what is the effect of gravitational force on the horizontal and on the vertical components of the velocity of the stone?
- a. decreases to zero; increases to a constant value
 - b. stays constant; increases continuously
 - c. stays constant; increases to a constant value
 - d. decreases to zero; increases continuously
- _____ 44. Ann the Astronaut weighs 60 kg. She is space walking outside the space shuttle and pushes a 350-kg satellite away from the shuttle at 0.90 m/s. What speed does this give Ann as she moves toward the shuttle?
- a. 9.0 m/s
 - b. 4.0 m/s
 - c. 9.7 m/s
 - d. 5.3 m/s
 - e. 8.5 m/s

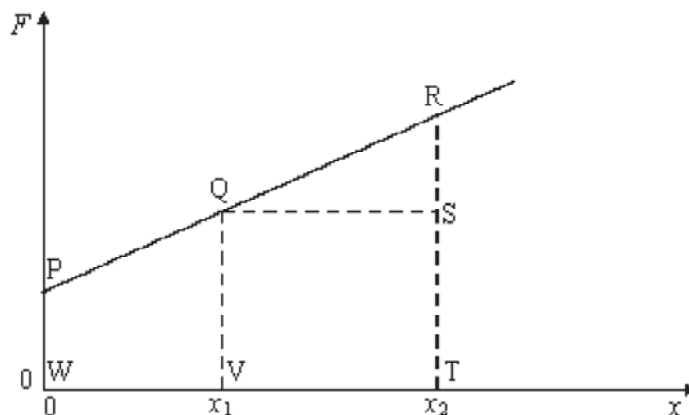
- _____ 45. Peter and Susan both stand on the edge of a vertical cliff.



Susan throws a stone vertically downwards and, at the same time, Peter throws a stone vertically upwards. The speed V with which both stones are thrown is the same. Neglecting air resistance, which **one** of the following statements is true?

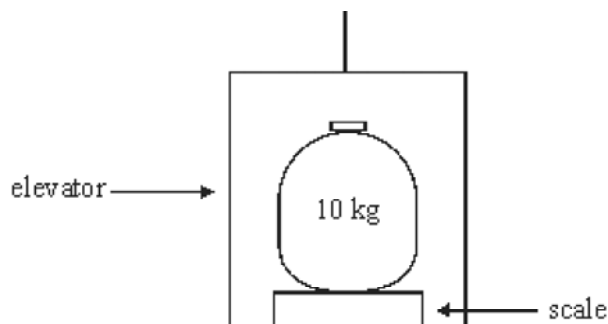
- | | |
|--|--|
| a. In order to determine which stone hits the sea first, the height of the cliff must be known. | c. The stone thrown by Susan will hit the sea with a greater speed than the stone thrown by Peter. |
| b. In order to determine which stone hits the sea first both the height of the cliff and the mass of each stone must be known. | d. Both stones will hit the sea with the same speed no matter what the height of the cliff. |
- _____ 46. An electric train develops a power of 1.0 MW when travelling at a constant speed of 50 ms⁻¹. The net resistive force acting on the train is
- | | |
|------------|-----------|
| a. 20 kN. | c. 50 MN. |
| b. 200 kN. | d. 200 N |
- _____ 47. What is the kinetic energy of a 0.135-kg baseball thrown at 40.0 m/s (90.0 mph)?
- | |
|-----------|
| a. 54.0 J |
| b. 216 J |
| c. 87.0 J |
| d. 256 J |
| e. 108 J |
- _____ 48. Two forces of magnitudes 7 N and 5 N act at a point. Which **one** of the following is **not** a possible value for the magnitude of the resultant force?
- | | |
|--------|--------|
| a. 5 N | c. 7 N |
| b. 3 N | d. 1 N |

49. The diagram below shows the variation with displacement x of the force F acting on an object in the direction of the displacement.



Which area represents the work done by the force when the displacement changes from x_1 to x_2 ?

- a. WPRT
b. WPQV
c. VQRT
d. QRS
50. An elevator (lift) is used to either raise or lower sacks of potatoes. In the diagram, a sack of potatoes of mass 10 kg is resting on a scale that is resting on the floor of an accelerating elevator. The scale reads 12 kg.



The best estimate for the acceleration of the elevator is

- a. 2.0 m s^{-2} upwards.
b. 1.2 m s^{-2} downwards.
c. 1.2 m s^{-2} upwards.
d. 2.0 m s^{-2} downwards.

IB PHYSICS SL SEMESTER 1 FINAL REVIEW

Answer Section

MULTIPLE CHOICE

1. ANS: C PTS: 1
2. ANS: B PTS: 1
3. ANS: D PTS: 1 DIF: II OBJ: 4-1.2
TOP: IB 2.2.2
4. ANS: A PTS: 1
5. ANS: D PTS: 1 DIF: II OBJ: 4-3.3
TOP: 2.2.14
6. ANS: A PTS: 1
7. ANS: C PTS: 1
8. ANS: C PTS: 1
9. ANS: C PTS: 1 DIF: I
TOP: 1.1 Standards of Length | Mass | and Time
10. ANS: B PTS: 1
11. ANS: B PTS: 1
12. ANS: D PTS: 1
13. ANS: C PTS: 1 DIF: II OBJ: 2-1.3
14. ANS: D PTS: 1
15. ANS: D PTS: 1
16. ANS: C PTS: 1
17. ANS: D PTS: 1 DIF: 2
TOP: 5.5 Systems and Energy Conservation
18. ANS: A PTS: 1 DIF: II OBJ: 2-2.2
19. ANS: D PTS: 1
20. ANS: D PTS: 1
21. ANS: C PTS: 1 DIF: I OBJ: 2-2.2
22. ANS: D PTS: 1
23. ANS: A PTS: 1 DIF: II OBJ: 6-1.1
24. ANS: D PTS: 1
25. ANS: A PTS: 1
26. ANS: B PTS: 1
27. ANS: D PTS: 1
28. ANS: A PTS: 1
29. ANS: C PTS: 1
30. ANS: C PTS: 1 DIF: I OBJ: 5-2.4
31. ANS: B PTS: 1
32. ANS: B PTS: 1 DIF: 2 TOP: 4.5 Applications of Newton's Laws
33. ANS: B PTS: 1
34. ANS: B PTS: 1
35. ANS: A PTS: 1
36. ANS: A PTS: 1
37. ANS: A PTS: 1

38. ANS: B PTS: 1
39. ANS: B PTS: 1 DIF: 1 OBJ: 2-1.1
40. ANS: B PTS: 1
41. ANS: A PTS: 1
42. ANS: C PTS: 1 DIF: 2 TOP: 2.6 Freely-Falling Objects
43. ANS: B PTS: 1
44. ANS: D PTS: 1 DIF: 2 TOP: 6.2 Conservation of Momentum
45. ANS: D PTS: 1
46. ANS: A PTS: 1
47. ANS: E PTS: 1 DIF: 1
TOP: 5.2 Kinetic energy and the Work-Energy Theorem
48. ANS: D PTS: 1
49. ANS: C PTS: 1
50. ANS: A PTS: 1