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Homework/Classwork 1

Date: _____

1. Explain term projectile.
2. Define the term free fall.
3. Four possible answers are given for the following questions. Each question has only ONE correct answer. Choose the correct answer.

3.1 A car is moving at a **constant velocity**.

Which ONE of the following statements about the forces acting on the car is CORRECT?

- A The net force acting on the car is zero.
- B There are no forces acting on the car.
- C The weight of the car is equal to the normal force acting on the car.
- D There is a non-zero net force acting on the car.

3.2 A ball is projected vertically upwards. Ignore air resistance.

Which ONE of the following statements about the acceleration of the ball at its maximum height is CORRECT?

The acceleration is equal to ...

- A zero.
- B g and is directed downwards.
- C g and is directed upwards.
- D g and is directed horizontally.

Homework/Classwork 2

Date: _____

1. A student throws a tennis ball vertically upwards into the air. She catches the ball 10 s later at the same height from which she threw it. Which ONE of the following statements is **INCORRECT** with regards to the above situation?
 - A. The velocity of the ball decreases as it moves upwards.
 - B The velocity of the ball is zero when it reaches its maximum height.
 - C The ball returns to the student's hands with the same speed with which she threw the ball upwards.
 - D The acceleration of the ball as it goes upwards is equal to the acceleration of the ball as it falls downwards but in the opposite direction.

2. An object, moving vertically upwards, reaches a maximum height and falls back to the ground. Ignore air resistance. Which **ONE** of the following statements is **TRUE**? The object experiences an acceleration which
- A is always downwards
B is first upwards and then downwards
C is first downwards and then upwards
D decreases first and then increases
3. A hot air balloon rises vertically upwards at a constant velocity of $9,8 \text{ m}\cdot\text{s}^{-1}$ when a man throws out one of the sandbags at a velocity of $9,8 \text{ m}\cdot\text{s}^{-1}$ downwards. What is the initial velocity of the sandbag with regards to Earth?
- A. $0 \text{ m}\cdot\text{s}^{-2}$
B. $9,8 \text{ m}\cdot\text{s}^{-2}$ downwards
C. $0 \text{ m}\cdot\text{s}^{-1}$
D. $9,8 \text{ m}\cdot\text{s}^{-1}$ downwards

Homework/Classwork 3

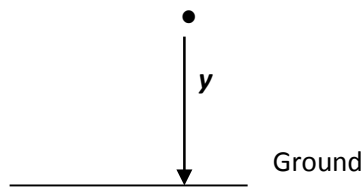
Date: _____

1. The stone is thrown vertically upward and returns to starting position.
- 1.1 Draw displacement time graph.
1.2 Draw velocity time graph
2. The ball is thrown vertically downwards.
- 2.1 Draw position time graph.
2.2 Draw velocity time graph
2.3 Draw acceleration time graph

Homework/Classwork 4

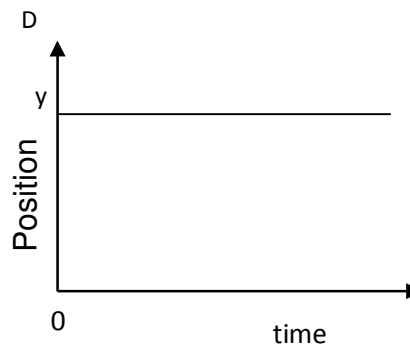
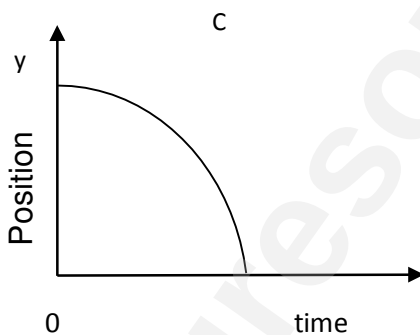
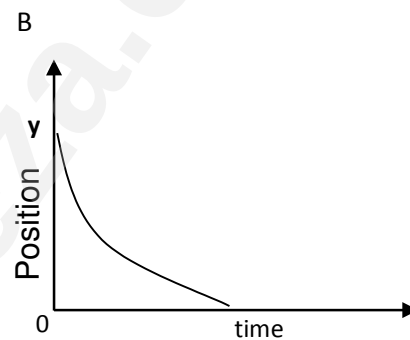
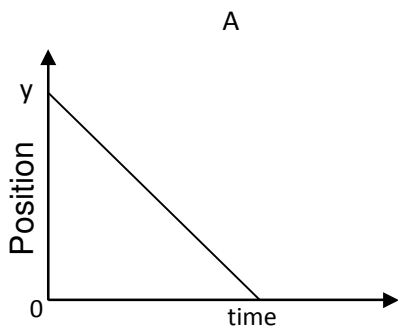
Date: _____

1. A small stone is dropped from a height y above the ground. It strikes the ground after time t , as shown in the diagram below.

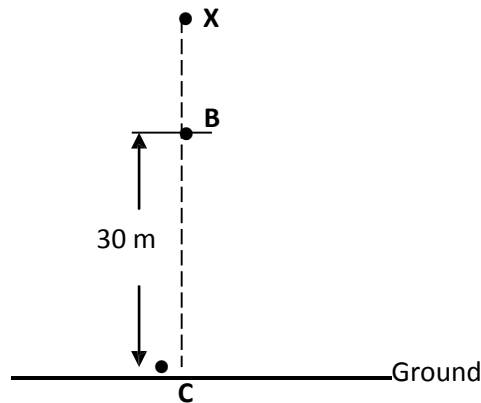


Take upwards as the positive direction and the ground as zero reference. Ignore the effects of air resistance.

Which ONE of the following diagrams shows a correct position-time graph for the motion of the stone?



2, An object is released from rest from a point **X**, above the ground as shown in the diagram below. It travels the last 30 m (**BC**) in 1,5 s before hitting the ground. Ignore the effects of air friction.



2.1 Name the type of motion described above. (1)

2.2 Calculate the:

2.2.1 Magnitude of the velocity of the object at point **B** (4)

2.2.2 Height of point **X** above the ground (5)

After hitting the ground, the object bounces once and then comes to rest on the ground.

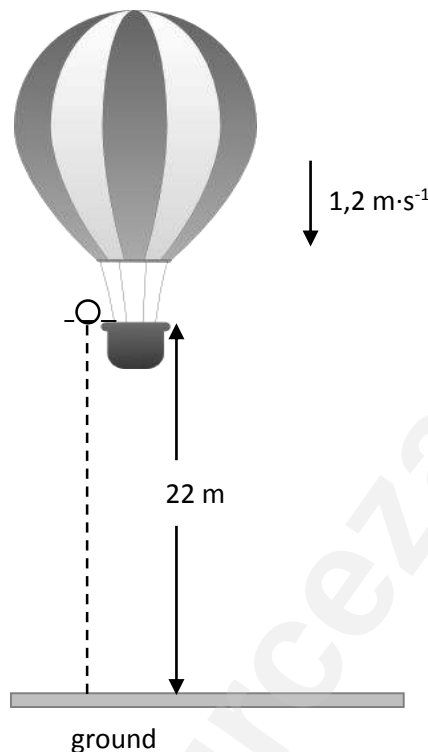
2.3 Sketch an acceleration-time graph for the entire motion of the object. (3)

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Homework/Classwork 5

Date: _____

A hot-air balloon moves vertically downwards at a constant velocity of $1,2 \text{ m}\cdot\text{s}^{-1}$. When it reaches a height of 22 m from the ground, a ball is dropped from the balloon. Refer to the diagram below.



Assume that the dropping of the ball has no effect on the speed of the hot-air balloon. Ignore air friction for the motion of the ball.

1. Is the hot-air balloon in free fall? Give a reason for the answer. (2)
2. Calculate the time it takes for the ball to hit the ground after it is dropped. (4)

When the ball lands on the ground, it is in contact with the ground for 0,3 s and then it bounces vertically upwards with a speed of $15 \text{ m}\cdot\text{s}^{-1}$.

3. Calculate how high the balloon is from the ground when the ball reaches its maximum height after the first bounce. (6)

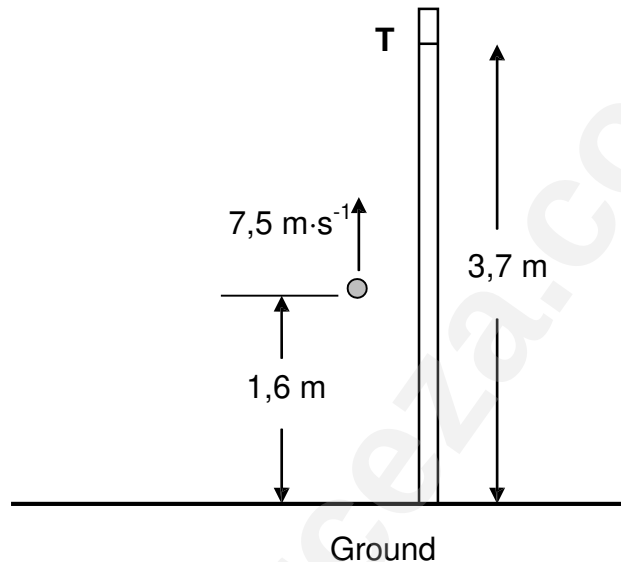
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Homework/Classwork 6

Date: _____

In a competition, participants must attempt to throw a ball vertically upwards past point **T**, marked on a tall vertical pole. Point **T** is 3,7 m above the ground. Point **T** may, or may not, be the highest point during the motion of the ball.

One participant throws the ball vertically upwards at a velocity of $7,5 \text{ m}\cdot\text{s}^{-1}$ from a point that is 1,6 m above the ground, as shown in the diagram below. Ignore the effects of air resistance.



1. In which direction is the net force acting on the ball while it moves towards point **T**?
Choose from: UPWARDS or DOWNWARDS. Give a reason for the answer. (2)
2. Calculate the time taken by the ball to reach its highest point. (3)
3. Determine, by means of a calculation, whether the ball will pass point **T** or not. (6)
4. Draw a velocity-time graph for the motion of the ball from the instant it is thrown upwards until it reaches its highest point.

Indicate the following on the graph:

- The initial velocity and final velocity
- Time taken to reach the highest point

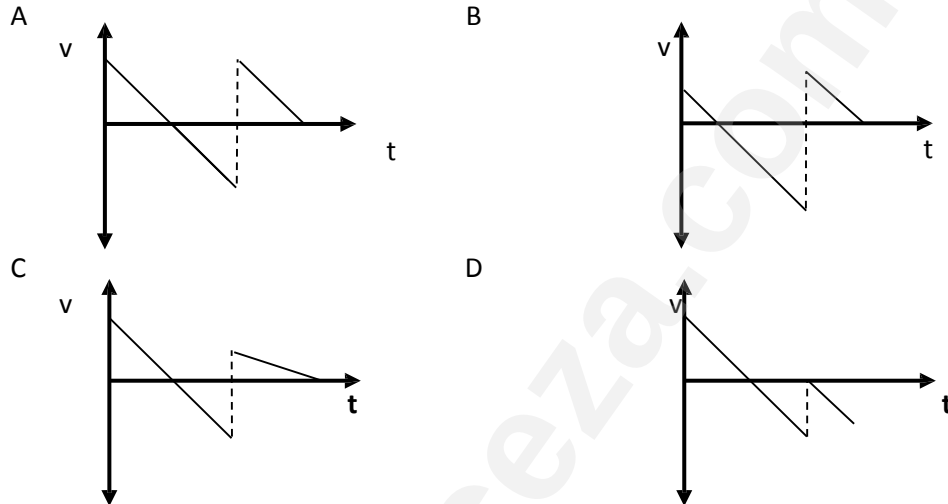
(2)
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Homework/Classwork 7

Date: _____

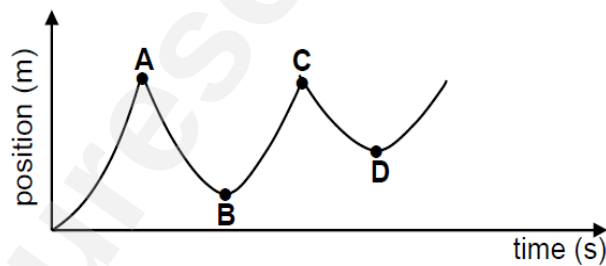
1. A ball is projected vertically upwards from the ground. It returns to the ground, makes an elastic collision with the ground and then bounces to a maximum height. Ignore air resistance.

Which ONE of the following velocity-time graphs CORRECTLY describes the motion of the ball?



- 2.

A ball is released from rest from a certain height above the floor and bounces off the floor a number of times. The position-time graph below represents the motion of the bouncing ball from the instant it is released from rest.



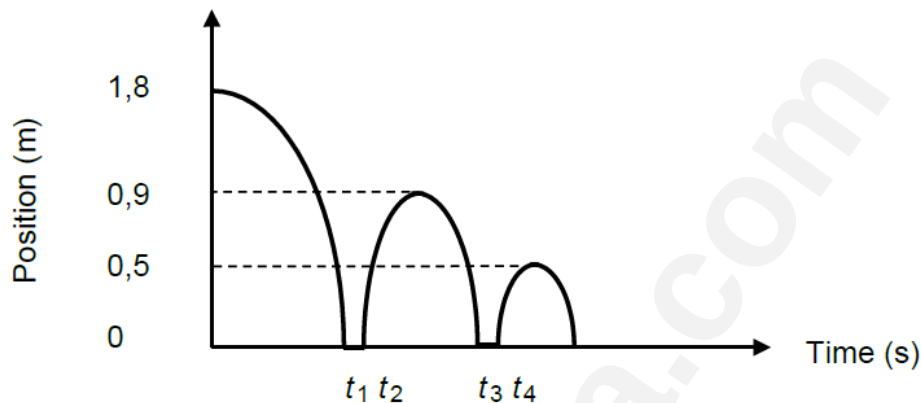
Neglecting air resistance, which point (A, B, C or D) on the graph represents the position-time coordinates of the maximum height reached by the ball after the SECOND bounce?

- A A
- B B
- C C
- D D

Homework/Classwork 8

Date: _____

A ball of mass $0,5 \text{ kg}$ is projected vertically downwards towards the ground from a height of $1,8 \text{ m}$ at a velocity of $2 \text{ m}\cdot\text{s}^{-1}$. The position-time graph for the motion of the ball is shown:



1. What is the maximum vertical height reached by the ball after the second bounce? (1)

Calculate the:

2. Magnitude of the time t_1 indicated on the graph (5)
3. Velocity with which the ball rebounds from the ground during the first bounce
The ball is in contact with the ground for $0,2 \text{ s}$ during the first bounce. (4)
4. Calculate the magnitude of the force exerted by the ground on the ball during the first bounce if the ball strikes the ground at $6,27 \text{ m}\cdot\text{s}^{-1}$. (4)
5. Draw a velocity-time graph for the motion of the ball from the time that it is projected to the time when it rebounds to a height of $0,9 \text{ m}$.

Clearly show the following on your graph:

The time when the ball hits the ground

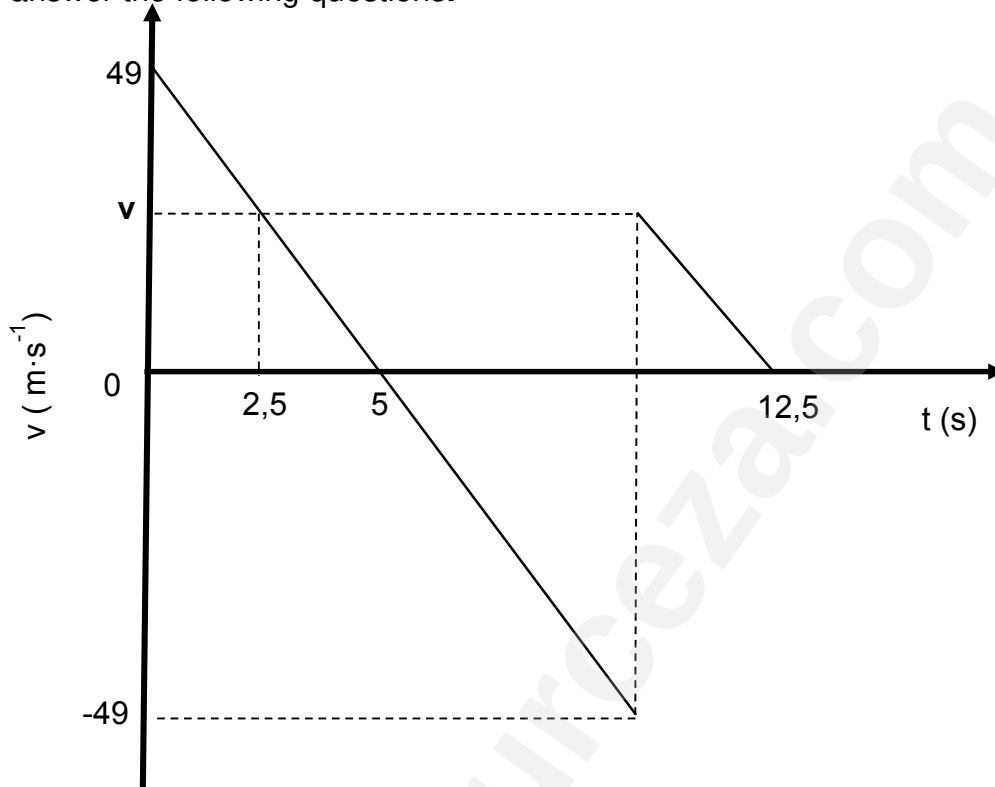
The velocity of the ball when it hits the ground

The velocity of the ball when it rebounds from the ground (3)

Homework/Classwork 9

Date: _____

A velocity-time graph below shows the motion of a projectile. Study the graph and answer the following questions.



- 1 What is the physical quantity represented by the gradient of the graph? (1)
- 2 Calculate the value of v on the graph. (3)
- 3 Use the graph (NOT equations of motion) to calculate the following:
 - 3.1 The magnitude of the maximum displacement of the projectile (2)
 - 3.2 The magnitude of the displacement of the projectile after 12,5 s (2)
- 4 Draw the position time graph for the projectile during 12,5 s. In your graph indicate the following (Use point of projection as zero position):
 - the position of the projectile at 5 s.
 - the time the projectile reaches the projection point.
 - position of the projectile at 12,5 s.

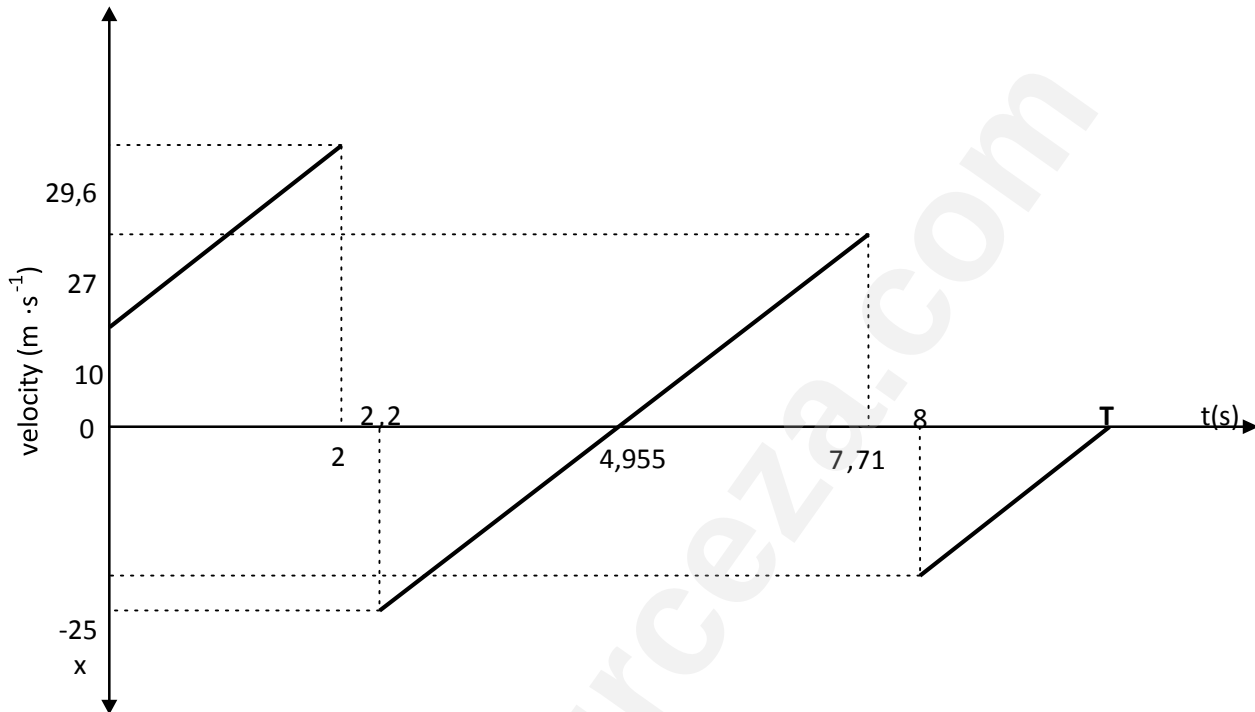
(5)

[13]

Homework/Classwork 10

Date: _____

A ball is thrown **vertically downwards** from the top of a building and bounces a few times as it hits the ground. The velocity-time graph below describes the motion of the ball from the time it is thrown, up to a certain time **T**.



Take downwards as the positive direction and the ground as zero reference. The graph is NOT drawn to scale. The effects of air friction are ignored.

- 1 Write down the speed with which the ball is thrown. (1)
- 2 ALL parts of the graph have the same gradient. Give a reason for this. (2)
- 3 Calculate the:
 - 3.1 Height from which the ball is thrown (3)
 - 3.2 Time (T) shown on the graph (4)
- 4 Write down the:
 - 4.1 Time that the ball is in contact with the ground at the first bounce (1)
 - 4.2 The acceleration of the ball at its maximum height. (2)
 - 4.2 Time at which the ball reaches its maximum height after the first bounce (1)
 - 4.3 Value of **X** (1)
- 5 Is the collision of the ball with the ground *elastic* or *inelastic*? Give a reason for the answer using information in the graph. (2)

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