



# Basic Education

KwaZulu-Natal Department of Basic Education  
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES P1

**MEMORANDUM**

COMMON TEST

JUNE 2014

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

N.B. This memorandum consists of 6 pages including this page.

## SECTION A

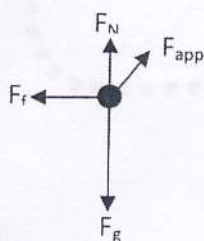
## QUESTION 1

- 1.1 C✓✓  
 1.2 D✓✓  
 1.3 C✓✓  
 1.4 A✓✓  
 1.5 A✓✓  
 1.6 B✓✓  
 1.7 A✓✓

7 x 2 = [10]

## QUESTION 2

2.1



- $F_N$  – normal force✓  
 $F_g$  – weight✓  
 $F_f$  – friction✓  
 $F_{app}$  – applied force✓

 $(F_N \text{ must be less than } F_g)$ 

(4)

2.2  $F_{net} = ma$ ✓

$$29 \cos 36^\circ + (-F_f) = 20 \times 0 \quad \checkmark$$

$$F_f = 23,46 \text{ N} \quad \checkmark$$

(3)

2.3 Increase✓

(1)

- 2.4  $F_N$  increases✓  
 Co-efficient of kinetic friction remains constant✓  
 From the equation  $f_k = \mu_k N$   
 Friction directly proportional to normal force✓

(3)  
[11]

QUESTION 3

3.1 
$$\Delta t = \frac{2,9 - 1,76}{2} \checkmark$$
  

$$= 0,57 \text{ s} \checkmark$$

(2)

3.2 
$$v_f = v_i + a\Delta t \checkmark$$
  

$$0 = v_i + (-9,8)(0,57) \checkmark$$
  

$$= 5,586 \text{ m}\cdot\text{s}^{-1} \checkmark$$

$$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2 \checkmark$$
  

$$= (5,586)(0,57) \checkmark + \frac{1}{2}(-9,8)(0,57)^2 \checkmark$$
  

$$= 1,59201 \text{ m} \checkmark$$

$$y = 4 \times y_1 = 4 \times 1,59201 = 6,37 \text{ m} \checkmark$$

(8)

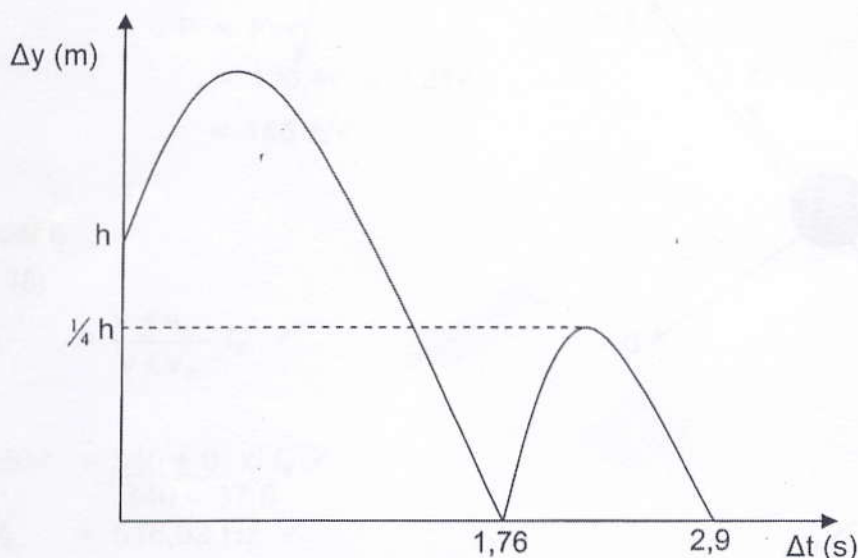
3.3 Inelastic  $\checkmark$



The ball does not bounce to the original height.  $\checkmark$

(2)

3.4



Checklist	Marks
Criteria for graph	
y and y <sub>1</sub> correctly shown	$\checkmark$
1,76 and 2,9 correctly shown	$\checkmark$
Correct shape from 0 to 1,76 s	$\checkmark$
Correct shape from 1,76 to 2,9 s	$\checkmark$
Axes correctly labelled	$\checkmark$

(5)

[17]



## QUESTION 4

4.1 The total linear momentum of an isolated system remains constant in magnitude and direction. ✓✓ (2)

4.2 Total p before = Total p after  
 $mv_i + mv_i = mv_f + mv_f$   
 $(75 \times 3) + (2 \times -5) = (77) v_f$   
 $v_f = 2,79 \text{ m.s}^{-1} \text{ to the right}$  ✓✓ (4)  
 [6]

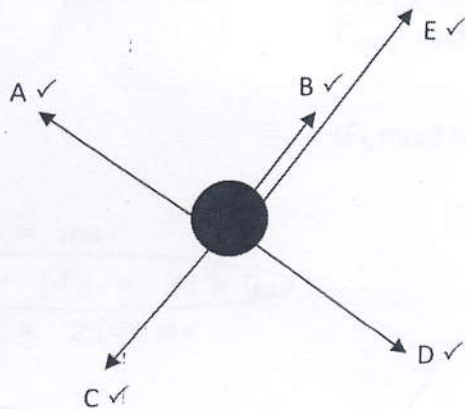
## QUESTION 5

5.1 No. ✓

The crate experiences a frictional force/non-conservative force. ✓  
 The work done by the frictional force/non-conservative force changes the mechanical energy of the crate. ✓ (3)

5.2 A force for which the work done in moving an object between two points is independent of the path taken. (2)

5.3



(5)

5.4  $F_{g//} = mg \sin \theta$  ✓  
 $= 120 \times 9,8 \times \frac{1,5}{10}$  ✓  
 $= 176,4 \text{ N}$  ✓ (3)

5.5 0 J ✓ force acts at right angles to the direction of motion. ✓ ( $\cos 90^\circ = 0$ ) (2)

5.6 The net/total work done on an object is equal to the object's change in kinetic energy. ✓✓ (2)

5.7.1  $W_{Ff} = F_f \Delta x \cos \theta$  ✓  
 $= 50 \times 10 \times \cos 180^\circ$  ✓  
 $= -500 \text{ J}$  ✓ (3)

5.7.2  $W_{Fg//} = F_{g//} \Delta x \cos \theta$   
 $= 176,4 \times 10 \times \cos 0^\circ$  ✓  
 $= 1764 \text{ J}$  ✓ (2)

$$W_{\text{net}} = \Delta K \checkmark$$

$$W_A + W_B + W_C + W_D + W_E = \Delta K$$

$$(0) + (-500) + 1764 + 0 + W_E \checkmark = 0 \checkmark$$

$$W_E = -1264 \text{ J} \checkmark$$

(4)

OR

$$W_{\text{nc}} = \Delta K + \Delta U \checkmark$$

$$W_B + W_E = 0 + mgh_f - mgh_i$$

$$-500 + W_E \checkmark = 0 - (120)(9,8)(1,5) \checkmark$$

$$W_E = -1264 \text{ J} \checkmark$$

5.9

$$W_E = F\Delta x \cos\theta$$

$$-1264 \checkmark = F\Delta x \cos 180^\circ \checkmark$$

$$F = 126,4 \text{ N}$$

$$P = Fv \checkmark$$

$$= 126,4 \checkmark \times 1,25 \checkmark$$

$$= 158 \text{ W} \checkmark$$

(6)

[32]

## QUESTION 6

$$6.1 \quad f_L = \frac{v \pm v_L}{v \pm v_S} f_s \checkmark$$

$$580 \checkmark = \frac{340 + 0}{340 - 37,5} \times f_s \checkmark$$

$$f_s = 516,03 \text{ Hz} \checkmark$$

(4)

6.2 The apparent change in the frequency of a wave when there is relative motion between the source of the wave and an observer.  $\checkmark \checkmark$

(2)

6.3 No  $\checkmark$ 

An increase in the speed of the source producing the sound waves results in a greater number of complete waves reaching the listener per second.  $\checkmark$

The apparent frequency increases and becomes greater than 580 Hz, the detector cannot detect frequencies greater than 580 Hz.  $\checkmark$

(3)

6.4 Equal to.  $\checkmark$ 

There is no relative motion between the source and the listener.  $\checkmark$

(2)

6.5 6.5.1 change in pitch  $\checkmark$ 

(1)

6.5.2 change in colour  $\checkmark$ 

(1)

- 6.6 The Doppler flow meter ✓ uses the Doppler effect to measure the speed of blood flowing through a person's blood vessels. ✓  
Abnormal blood speeds could be an indicator of a health risk. ✓ (3)  
[16]

**QUESTION 7**

- 7.1 The badge is referring to a blue shift caused by the Doppler Effect. ✓  
For the badge to appear blue the car must be travelling at an extremely high speed. ✓ (2)
- 7.2 The claim made by the badge is not possible. ✓  
The car will have to travel at a speed comparable to the speed of light. } ✓  
This is too large for the car. } (2)  
[4]

**TOTAL SECTION B: [86]****TOTAL PART 1: [100]**