



# Education

KwaZulu-Natal Department of Education  
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES: PHYSICS (P1)

COMMON TEST

MARCH 2017

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

MARKS: 50

TIME : 1 hour

This question paper consists of 7 pages and a data sheet.

**INSTRUCTIONS AND INFORMATION TO CANDIDATES**

1. Write your name on the **ANSWER BOOK**.
2. This question paper consists of **FOUR** questions. Answer **ALL** the questions in the **ANSWER BOOK**.
3. Start **EACH** question on a **NEW** page in the **ANSWER BOOK**.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Leave **ONE** line between two subsections, for example between **QUESTION 2.1** and **QUESTION 2.2**.
6. You may use a non-programmable calculator.
7. You may use appropriate mathematical instruments.
8. You are advised to use the attached **DATA SHEET**.
9. Show **ALL** formulae and substitutions in **ALL** calculations.
10. Round off your final numerical answers to a minimum of **TWO** decimal places.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

**QUESTION 1: MULTIPLE- CHOICE QUESTIONS**

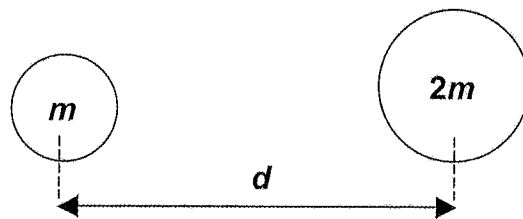
Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write only the letter (A - D) next to the question number (1.1 – 1.4) in the ANSWER BOOK, for example 1.5 D.

1.1 Which **ONE** of the following forces **ALWAYS** acts perpendicular to the surface on which an object is placed.

- A normal force
- B tension force
- C frictional force
- D gravitational force

(2)

1.2 Two objects of masses  $m$  and  $2m$  are arranged as shown in the diagram below:

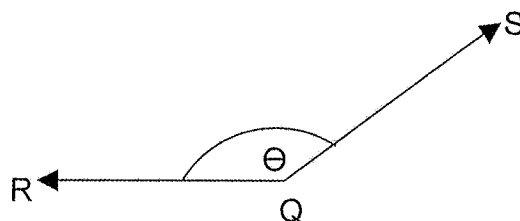


Which ONE of the changes below will produce the GREATEST increase in the gravitational force exerted by the one mass on the other.

- A halve the smaller mass.
- B double the larger mass.
- C halve the distance between the masses.
- D double the distance between the masses.

(2)

1.3 Two forces R and S are applied simultaneously on an object Q as shown in the sketch below:

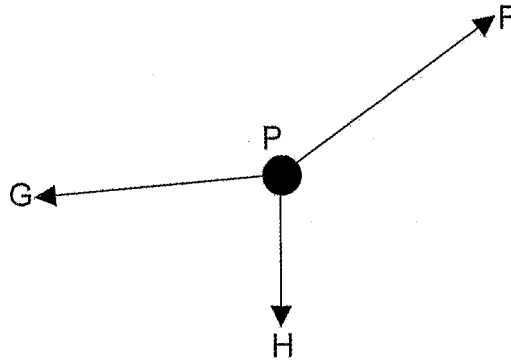


To obtain a maximum resultant force the angle,  $\theta$ , between force R and force S must be .....

- A  $180^\circ$
- B  $120^\circ$
- C  $60^\circ$
- D  $0^\circ$

(2)

1.4 A point P, is kept in equilibrium by three forces, F, G and H, as shown in the diagram below:



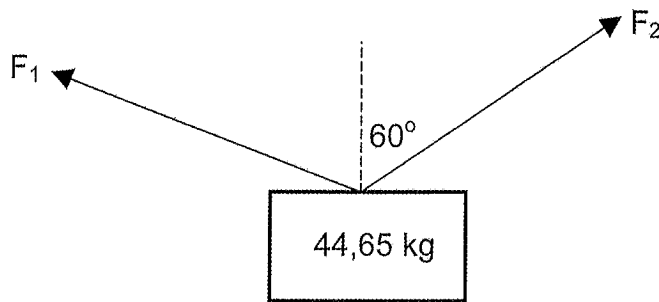
Which ONE of the following statements is NOT TRUE with reference to the three forces?

- A all three forces lie in the same plane.
- B the resultant of the three forces is zero.
- C H is the resultant of F and G acting together.
- D the sum of the components of all three forces in any chosen direction is zero.

(2)  
[8]

**QUESTION 2**

An object of mass 44,65 kg is suspended vertically in the air by TWO forces  $F_1$  and  $F_2$  as shown in the sketch below:



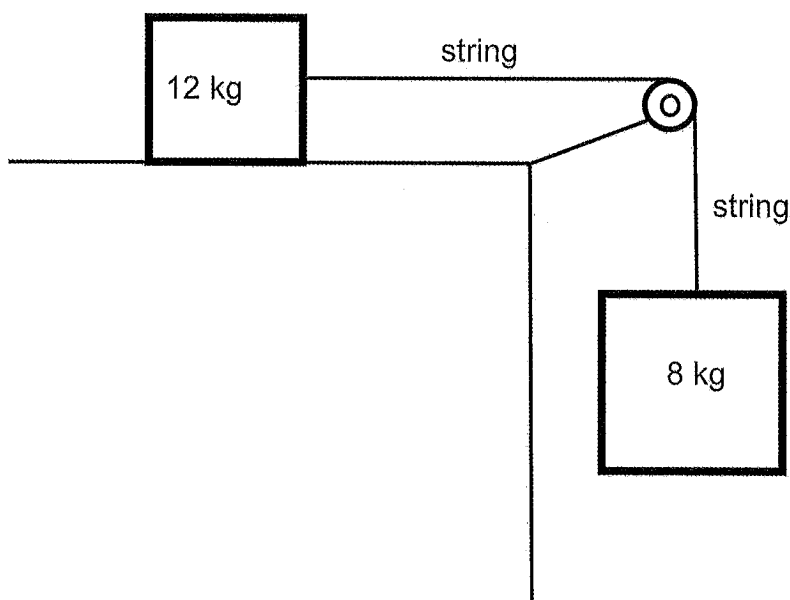
$F_2$  makes an angle of  $60^\circ$  with the vertical as shown.

- 2.1  $F_1$  and  $F_2$  are classified as vectors. Define a vector. (2)
- 2.2 The object can be suspended vertically by a SINGLE FORCE instead of  $F_1$  and  $F_2$ .
- 2.2.1 Provide a suitable name for this single force that can replace  $F_1$  and  $F_2$ . (1)
- 2.2.2 Calculate the magnitude of this single force. (3)
- 2.3 The vertical component of  $F_1$  has a magnitude of 262, 54 N. Calculate the magnitude of  $F_2$ . (5)

**[11]**

**QUESTION 3**

- 3.1 State Newton's Second Law of motion, in words. (2)
- 3.2 The diagram below shows two blocks, each of mass 8 kg and 12 kg respectively, joined by an inelastic string of negligible mass. The string runs over a frictionless pulley. The 12 kg block is on a rough horizontal surface while the 8 kg block is suspended as shown in the diagram below.



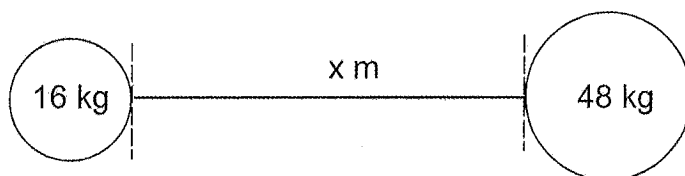
Both the 12 kg and 8 kg blocks move with constant velocity.

- 3.2.1 Draw a labelled free body diagram to show ALL the forces that act on the 8 kg block. (2)
- 3.2.2 By means of a calculation, show that the tension in the string that joins the TWO blocks together is 78,40 N. (2)
- 3.2.3 Draw a labelled free body diagram to show ALL the forces that act on the 12 kg block as it moves with constant velocity. (4)
- 3.2.4 Write down the magnitude of the net force acting on the 12 kg block. (1)
- 3.2.5 Define frictional force. (2)
- 3.2.6 Calculate the co-efficient of kinetic friction between the 12 kg block and the surface. (4)
- 3.2.7 If the 12 kg block had a larger surface area in contact with the surface, how would this affect the co-efficient of kinetic friction calculated in 3.2.6 above. Assume that the rest of the system remains unchanged. Only write down, INCREASES, DECREASES or REMAINS THE SAME. Give a reason for the answer. (2)

**[19]**

**QUESTION 4**

A body of mass 16 kg and radius 0.10 m is placed a distance "x" m, from another body of mass 48 kg and radius 0,15 m as shown in the sketch below:



- 4.1 State Newton's Law of Universal Gravitation, in words. (2)
- 4.2 Give reason why Newton's Law of Universal Gravitation is said to be **UNIVERSAL**. (1)
- 4.3 It is observed that the 16kg body exerts a force of magnitude  $2,30 \times 10^{-8}$  N on the 48kg body when they are placed as shown in the sketch above.
- 4.3.1 Write down the magnitude of the force that the 48 kg body exerts on the 16 kg body. Give a reason for the answer. (3)
- 4.3.2 Calculate the distance, x. (6)

**[12]****TOTAL: 50**

**DATA FOR PHYSICAL SCIENCES GRADE 11  
PAPER 1 (PHYSICS)**

**GEGEWENS VIR FISIESTE WETENSAPPE (FISIKA) GRAAD 11  
VRAESTEL 1 (FISIKA)**

**TABLE 1: PHYSICAL CONSTANTS/TABEL 1: FISIESTE KONSTANTES**

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Acceleration due to gravity <i>Swaartekragversnelling</i>	g	9,8 m·s <sup>-2</sup>
Universal gravitational constant <i>Swaartekragkonstante</i>	G	6,67 x 10 <sup>-11</sup> N·m <sup>2</sup> ·kg <sup>-2</sup>

**TABLE 2: FORMULAE/TABEL 2: FORMULES**

**FORCE/KRAG**

$F_{\text{net}} = ma$	$F_g = mg$
$F = \frac{Gm_1m_2}{r^2}$	
$f_s^{\text{max}} = \mu_s N$	$f_k = \mu_k N$





# Education

KwaZulu-Natal Department of Education  
REPUBLIC OF SOUTH AFRICA

PHYSICAL SCIENCES P1  
MEMORANDUM  
COMMON TEST  
MARCH 2017

NATIONAL  
SENIOR CERTIFICATE

GRADE 11

N.B. This memorandum consists of 4 pages.

4 x 2 = [8]

### QUESTION 1

- 1.1 A✓✓
- 1.2 C✓✓
- 1.3 D✓✓
- 1.4 C✓✓

### QUESTION 2

2.1 A physical quantity that has magnitude and direction. ✓✓ (2)

2.2.1 resultant✓ (1)

$$2.2.2 \begin{aligned} R &= F_g = mg \checkmark \\ &= (44,65)(9,8) \checkmark \\ &= 437,57 \text{ N} \checkmark \end{aligned}$$

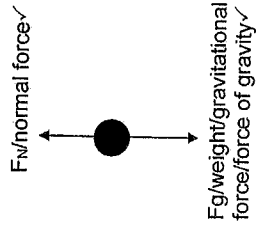
$$2.3 \begin{aligned} F_{1y} &= 437,57 \checkmark \\ 262,54 \checkmark &+ F_{2y} = 437,57 \checkmark \\ &+ F_{2y} = 437,57 \checkmark \\ &F_{2y} = 175,03 \text{ N} \end{aligned}$$

$$\begin{aligned} \cos 60^\circ &= \frac{F_{2y}}{F_2} \checkmark \\ &= \frac{175,03}{F_2} \checkmark \\ F_2 &= 350,06 \text{ N} \checkmark \end{aligned}$$

### QUESTION 3

3.1 When a resultant/net force acts on an object, the object will accelerate in the direction of the force at an acceleration directly proportional to the force ✓ and inversely proportional to the mass of the object. ✓ (2 or 0) (5) [11]

3.2.1



(2)

