LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF EDUCATION

GRADE 11

PHYSICAL SCIENCES PAPER 1
JUNE 2016
MEMORANDUM

MARKS : 150

Note: Check the marking guidelines given in the examination guidelines (pages 33-34) before marking the scripts

QUESTION 1: MULTIPLE CHOICE QUESTIONS

1.1	D ✓✓	(2)
1.2	C ✓✓	(2)
1.3	B ✓✓	(2)
1.4	B ✓✓	(2)
1.5	A ✓✓	(2)
1.6	C ✓✓	(2)
1.7	C ✓✓	(2)
1.8	A ✓✓	(2)
1.9	B ✓✓	(2)
1.10	D ✓✓	(2)

[20]

QUESTION 2

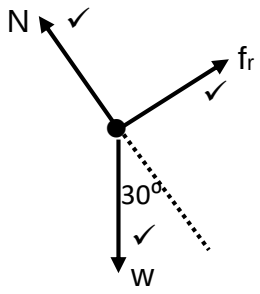
2.1 $T_{1y} = 120 \times \sin 35^0$ ✓ (7)
$= 68,8$ N ✓
$T_{2y} = 100 \times \sin 45^0$ ✓
$= 70,7$ N ✓
$T_{1y} + T_{2y} = 68,8 + 70,7$
$= 139,5$ N ✓
Since the forces are in equilibrium, ✓ $T_3 = 139,5$ N. ✓

2.2 $T_{2y} = T_2 \times \sin 45^0 + 68,8$ ✓ (4)
$= 150$ N ✓
$T_2 = (150-68,8)/\sin 45^0$ ✓
$= 114,9$ N ✓

[11]

QUESTION 3

3.1 (3)



3.2 $N = mg\cos 30^0$ ✓ (4)
$= 8 \times 9,8$✓ $\times \cos 30^o$ ✓
$= 67,90$ N ✓

3.3 $f_r = mg\sin 30^o$ ✓ (4)
$= 8 \times 9.8 \times \sin 30^0$ ✓
$= 39,2$ N ✓up the slope. ✓

[11]

QUESTION 4

4.1 Inertia ✓ (1)

4.2 Newton's first law. ✓ (3)
An object will continue in its state of rest or uniform motion in a straight line unless it is acted upon by an unbalanced force. ✓✓

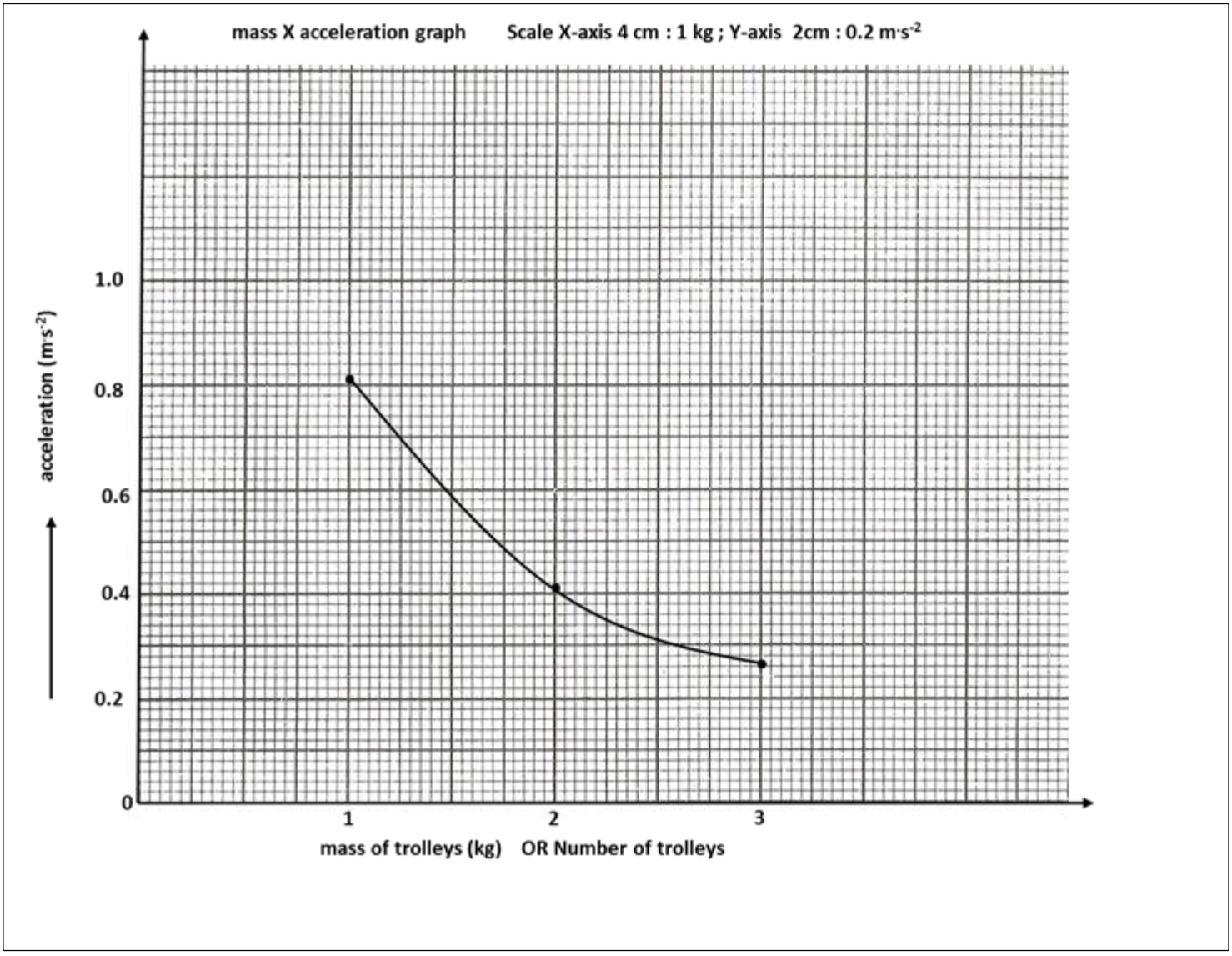
4.3 According to Newton's first law,✓when a car crashes and stops suddenly its occupants will continue to move with the speed of the car✓ and crashes through the windscreen. Safety belts exert a backward force on the occupants ✓ prevent them from crashing through the windscreen and sustain an injury. ✓ (4)

[8]

QUESTION 5

5.1 To compensate for friction. ✓✓ (2)

5.2



5.2 (6)

Criteria to Marking the Graph

Both axes labelled with correct units ✓ (1 mark)
All three points plotted correctly ✓✓✓ (3 marks - 1 mark per point)
Drawing of graph (best fit curve) ✓✓ (2 marks)
Note:Sketch graph given no mark

5.3 Acceleration is inversely proportional to mass,(i.e. a α 1/m.) ✓✓ (2)

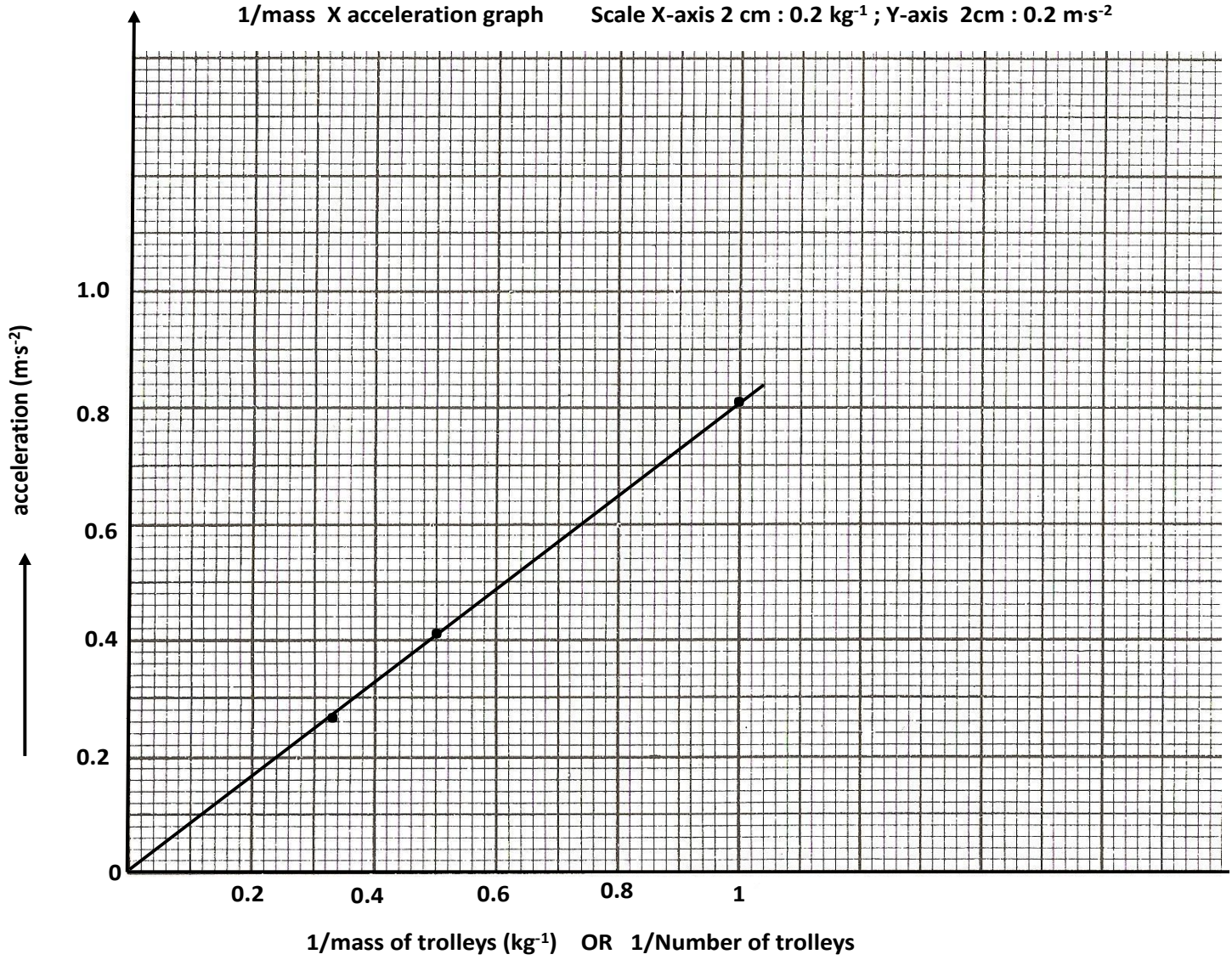
5.4

Mass (kg)/ (Number of Trolleys)	1/mass Kg^{-1}	Acceleration ($m.s^{-2}$)
1	1 ✓	0.81
2	0,5 ✓	0,41
3	0,33 ✓	0,27

(3)

5.5 **Criteria to Marking the Graph (graph follows)**

All three points plotted correctly ✓✓✓ (3 marks – 1 mark per point)
Drawing of graph (best fit) ✓✓ (2 marks) **(5.)**
Note: Sketch graph given No mark



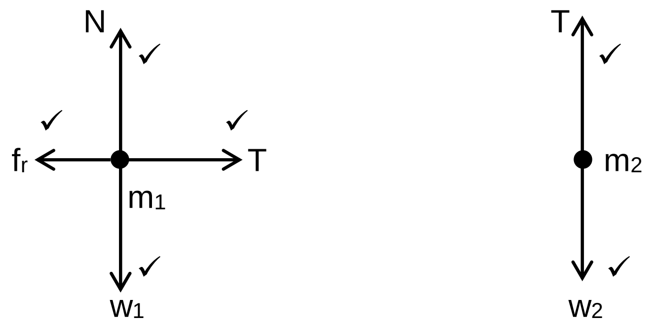
5.7 Force accelerating the trolleys/weight of hanging mass . ✓ (1)

[21]

QUESTION 6

6.1 When a net force acts on an object, the object accelerates in the direction of the net force. The acceleration is directly proportional to the net force and inversely proportional to the mass of the object. ✓✓ (2)

6.2 (6)



6.3 For mass m_1: (6)

$F_{net} = T - f_r = m_1 a$ ✓

$T - 1{,}5 = 5a$ ✓ ………………………….. 1

For mass m_2:

$F_{net} = m_2 g - T = m_2 a$ ✓

$2 \times 9{,}8$ ✓ $- T = 2a$ ✓ ………………………… 2

Add equations 1 and 2:

$2 \times 9{,}8 - 1{,}5 = 7a$

$a = 2{,}59 \text{ m.s}^{-2}$ ✓

6.4 From equation 1: (2)

$T - 1{,}5 = 5 \times 2{,}59$ ✓

$= 12{,}95 \text{ N}$ ✓

[16]

QUESTION 7

7.1 Every particle in the universe attracts every other particle with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them. ✓✓ (2)

7.2 (6)

$F = Gm_1m_2/r^2$ ✓

$2{,}1 \times 10^3$ ✓ $= 6{,}7 \times 10^{-11} \times 220 \times 6 \times 10^{24}/r^2$ ✓

$r = 6{,}49 \times 10^6 \text{ m}$ ✓

Distance above earth's surface $= 6{,}49 \times 10^6 - 6{,}4 \times 10^6$ ✓

$= 9{,}0 \times 10^4 \text{ m}$ ✓

7.3 (5)

$F_1 = ma$ ✓

$= 220 \times 0{,}8$ ✓

$= 176 \text{ N}$

$F_{net} = 176 + 2{,}1 \times 10^3$ ✓

$= 2276 \text{ N}$ ✓ away from the earth ✓

[13]

QUESTION 8

8.1 When an object A exerts a force on another object B, object B simultaneously exerts an equal and opposite force on object A. ✓✓ (2)

8.2 280 N. ✓ (1)

8.3 On the man. ✓ (1)

8.4 To the left. ✓ (1)

8.5 **Static friction** is the opposing **force** that arises when a net force acts on a stationary object to cause the object to slide over the surface on which it is resting. ✓✓ (2)

8.6 $f_s^{max} = \mu_s N$ ✓ $= \mu_s mg$ ✓
$= 0,6 \times 50 \times 9,8$ ✓
$= 294$ N ✓ (4)

8.7 REMAIN STATIONARY. ✓ (1)

8.8 The applied force on the box is less than the maximum static friction of the box. ✓✓ (2)

8.9 Friction force ✓ between the ground and the soles of his shoes. ✓ (2)

8.10

8.10.1 $N = mg - F_y$
$= mg - F\sin\theta$ ✓ $= (5 \times 9,8) - (45 \times \sin 40^0) = 20.075$ N ✓ (2)

8.10.2 $f_k = \mu_k N$ ✓ $= (0.48)(20.075)$ ✓ $= 9.64$ N ✓ to left (3)

[21]

QUESTION 9

9.1 Index of refraction of medium is the ratio of the speed of light in vacuum to the speed of light in the medium. ✓✓ (2)

9.2 $n_g = c/v_g$ ✓
$= (3,0 \times 10^8 / 2,0 \times 10^8)$ ✓
$= 1,5$. ✓ (3)

9.3 Snell's law states that the ratio of the sine of the angle of incidence to the sine of the angle of refraction ✓ is constant when a light ray passes from one medium to the another. ✓ (2)

9.4 $n_g \sin\Theta_c = n_w \sin\Theta_w$ ✓
$\sin\Theta_c = 1,3/1,5$ ✓ $\sin 90^o$ ✓
$= 0.866$
$\Theta_c = 60^0$ ✓ (4)

9.5 Light passes into the water ✓ because the incident angle is less than the critical angle. ✓✓ (3)

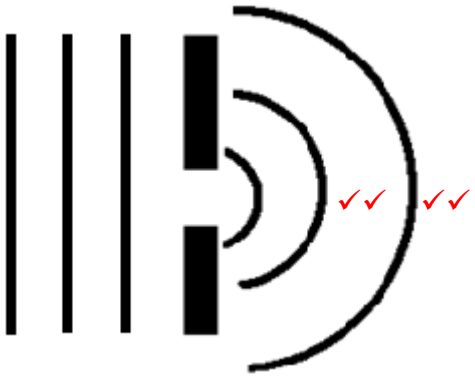
9.6 1. Telecommunications: Optical fibres are used to transmit information from one point to the other. ✓✓ (4)
2. Medicine: Endoscopes are used to look inside a patient's body without performing surgery. ✓✓

[18]

QUESTION 10

10.1 Every point on a wavefront acts as the source of secondary wavelets that spread out in the forward direction with the same speed as the wave. ✓ (2)
The new wavefront is founded by constructing the surface tangent to the secondary wavelets. ✓

10.2 (4)



10.3 There will be less diffraction ✓ since degree of diffraction α 1/width ✓✓ (3)

10.4 The wavelength of light much smaller than most gaps. ✓✓ (2)

[11]

TOTAL 150