PHYSICAL SCIENCE
GRADE 11
2024 11 November 2024
PHYSICS PAPER 1
FINAL EXAMINATION
MARKS: 150
MARKING GUIDELINE

QUESTION 1 **REASON:**

1.1 A ✓✓ (2)

1.2 C ✓✓ (2)

1.3 A ✓✓ (2)

1.4 C ✓✓ $gradient = \frac{\Delta y}{\Delta x} = \frac{F_g}{m} = g$ $\left(F_g = mg \therefore g = \frac{F_g}{m}\right)$ (2)

1.5 B ✓✓ $F \propto \frac{QQ}{r^2} \propto \frac{(2)(2)}{2^2} \propto 1 \propto F$ (2)

1.6 D ✓✓ $F \propto QQ \propto (+)(+) = +$ (repulsive force)
$F \propto QQ \propto (-)(-) = +$ (repulsive force)
$F \propto QQ \propto (-)(+) = -$ (attractive force) (2)

1.7 D ✓✓ $V = IR \therefore V \propto I$ (2)

1.8 B ✓✓ $I = \frac{Q}{\Delta t}$ (2)

1.9 C ✓✓ (2)

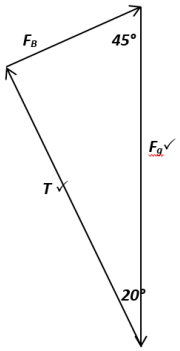
1.10 C ✓✓ (2)

[20]

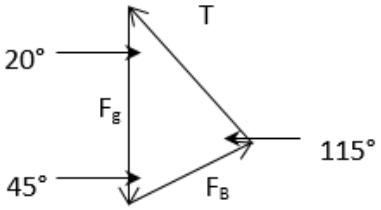
QUESTION 2

2.1 The resultant of the forces is zero.✓✓ / F_{net} = 0 N (2)

2.2



or



(3)

2.3.1 Fg = mg✓
Fg = (50)(9.8) ✓
Fg = 490N✓ (3)

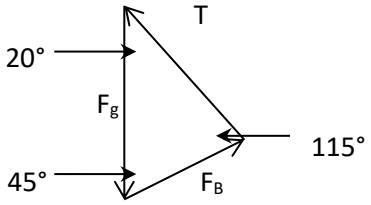
2.3.2

OPTION 1

$\frac{T}{sin45°} = \frac{F_g}{sin115°}$ ✓

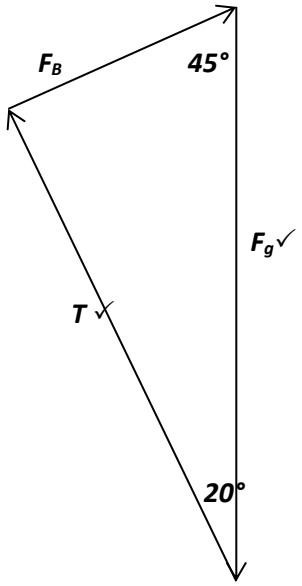
$T = \frac{50(9,8)✓}{sin115°} \times sin45°✓$

$T = 382,30\ N$ ✓



OPTION 2

F_g = mg = (50)(9,8) = 490 N ✓
SCALE 10 mm = 50 N
F_g = 490 N = 98 mm (Accept 97 – 99mm)



T = 76,5 × 5 = 382,5 N ✓ (Accept 76,4 – 76,6 mm)

(4)

2.4 Static frictional force ✓ (1)

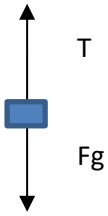
2.5.1 The sensation experienced when all contact forces are removed. ✓✓ (1)

2.5.2 Gravitational force ✓ (1)

[16]

QUESTION 3

3.1.1

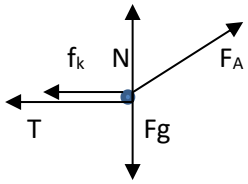


(2)

3.1.2 $Fnet = 0$✓
$T - Fg = 0$✓
$T = (4)(9.8)$✓
$T = 39{,}2N$✓

(4)

3.2



(5)

3.3 $T_2 = T_1 = 39{,}2N$✓ (1)

3.4 $F_{netx} = 0$✓
$F_{Ax} - f_k - T = 0$✓
$f_k = F_A cos\theta - T$
$f_k = 40cos30 - 39{,}2$✓
$f_k = 4{,}1N$ ✓

(4)

3.5 $F_{nety} = 0$✓
$F_{Ay} + N - Fg = 0$✓
$N = Fg - F_{Ay}$
$N = (6)(9{,}8) - 50sin30$
$N = 33{,}8N$
$u_k = \frac{f_k}{N}$✓
$u_k = \frac{4{,}1}{33{,}8}$✓
$u_k = 0{,}12$✓

(5)

3.6 DECREASE✓ Decreases the normal force which will decrease the frictional force✓ (2)

[23]

QUESTION 4

4.1

m (trolley mass) in gram (*g*)	***a*** (m.s^{-2})	***ma*** (N)
200 = 0,2 kg	**X=10**✓	2
400 = 0,4 kg	5	2
600 = 0,6 kg	3,33	**Y=2**✓
Z=800 = 0,8 kg✓	2,5	2
1000 = 1 kg	2	2

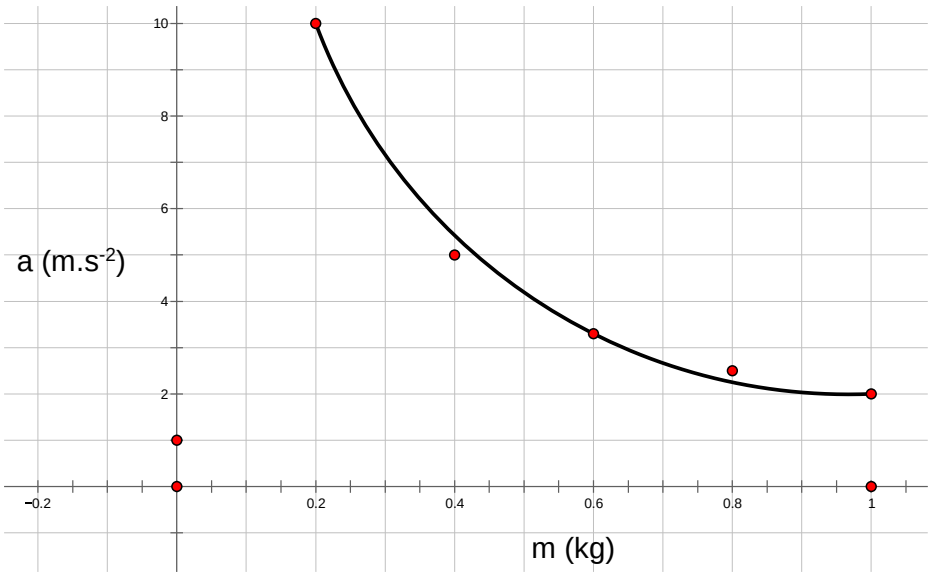
(3)

4.2 To compensate for friction. ✓ (1)

4.3 Net force ✓/ resultant force / Fnet (1)

4.4 One mark for the heading. ✓
One mark for each axis with its correct unit. ✓✓
One mark for the shape of the graph. ✓
One point for the plotted coordinates. ✓

The graph of acceleration versus mass



(5)

4.5 $a = 4.1 - 4.3\ m.s^{-2}$ ✓ (1)

4.6 Acceleration is inversely proportional to Mass. As the mass increases the acceleration decreases. ✓✓ (2)

4.7 Newton's second law of motion. ✓ (1)

[14]

QUESTION 5

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

5.2 EQUAL TO ✓ (1)

5.3 When object A exerts a force on object B, object B SIMULTANEOUSLY exerts an oppositely directed force of equal magnitude on object A. ✓✓ (2)

5.4 $F_g = \frac{Gm_p m_p}{r^2}$✓

$= \frac{6{,}67\times10^{-11}(1{,}67\times10^{-27})(1{,}67\times10^{-27})}{(5{,}29\times10^{-11})^2}$✓✓

$= 6{,}65 \times 10^{-44} N$✓ (4)

5.5 ATTRACTIVE ✓ (1)

[10]

QUESTION 6

6.1 The magnitude of the electrostatic force exerted by two point charges (Q_1 and Q_2) on each other is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance (r) between them. ✓✓ (2)

6.2 The spheres possess equal charges and repel each other with the same magnitude ✓ of electrostatic force. This electrostatic force does not increase or decrease (it remains constant) as the charges remain the same because they are hanging from insulated strings. ✓ (2)

6.3 $N = \frac{Q}{e}$ ✓

$= \frac{-3\times10^{-9}}{-1{,}6\times10^{-19}}$ ✓

$= 1{,}875 \times 10^{10}$ ✓$electrons$ (3)

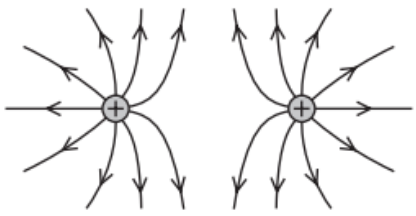
6.4 $Q_{new} = \frac{Q_P + Q_s}{2}$✓

$= \frac{(-3\times10^{-9})+(6\times10^{-9})}{2}$ ✓

$= 1{,}5 \times 10^{-9}\ C$✓ (3)

6.5 LOSE ✓ (1)

6.6



Marking criteria	
Shape	✓
Direction	✓
Do not intersect / touch and start on the sphere	✓

(3)

6.7 $F = \frac{kQQ}{r^2}$✓

$= \frac{9\times10^9(1.5\times10^{-9})(1.5\times10^{-9})}{(0,15)^2}$✓✓

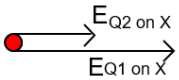
$= 0,9 \times 10^{-6}\ N;\ repulsive$ ✓ (4)

[18]

QUESTION 7

7.1 The electric field strength at a point is the electrostatic force experienced per unit positive charge placed at that point. ✓✓ (2)

7.2



✓✓ (2)

7.3 $E_{net} = E_{Q1\ on\ X} + E_{Q2\ on\ X}$ ✓

$= \frac{kQ_1}{r^2} + \frac{kQ_2}{r^2}$ ✓

$= \frac{9\times10^9(2\times10^{-5})}{(0,25)^2}$ ✓ $+ \frac{9\times10^9(8\times10^{-6})}{(0.15)^2}$ ✓

$= 2.88 \times 10^6 + 3.2 \times 10^6$

$= 6,08 \times 10^6 N.C^{-1}$✓$; to\ the\ right$ ✓

(6)

7.4 $E_{net} = \frac{F_{net}}{Q_3}$✓

$F_{net} = (6,08 \times 10^6)(4 \times 10^{-5})$✓

$F_{net} = 243,2N$✓$;\ to\ the\ left$✓ (4)

7.5 GREATER THAN✓ (1)

[15]

QUESTION 8

8.1.1 Bar magnet/electromagnet✓ (1)

8.1.2 A✓ (1)

8.1.3 B✓ (1)

8.1.4 Right hand Soleniod rule. ✓
Fingers show current direction and Thumb shows magnetic field direction. ✓ (2)

8.2.1 A current is induced in the coil. ✓ (1)

8.2.2 Faradays Law of Induction✓ (1)

8.2.3 B to A✓ (1)

8.2.4 Increase speed of the magnet✓
Use a strong magnetic✓
Increase number of loops in the coil✓
Increase the area of the loop✓ ANY 3 (3)

[11]

QUESTION 9

9.1.1 Power is the rate at which work is done / energy is transferred. ✓✓ (2)

9.1.2 A voltmeter is connected in parallel across components, and therefore must not offer any alternative route for the current to flow. ✓ (1)

9.1.3 $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2}$ ✓
$= \frac{1}{6} + \frac{1}{15}$ ✓
$= 4{,}29\ \Omega$ ✓ (3)

9.1.4 Positive marking from QUESTION 9.1.3.
$P = \frac{V^2}{R}$ ✓
$50 = \frac{V^2}{4{,}29}$ ✓
$V = 14{,}65\ V$ ✓ (3)

9.1.5 Positive marking from QUESTION 9.1.3 and 9.1.4.

OPTION 1	***OPTION 2***
$R = \frac{V}{I}$✓ $4{,}29 = \frac{14{,}65}{I}$✓ $I = 3{,}41\ A$✓	$P = VI$ ✓ $50 = (14{,}65)I$ ✓ $I = 3{,}41\ A$ ✓
OPTION 3	***OPTION 4***
$P = I^2R$✓ $50 = I^2(4{,}29)$✓ $I = 3{,}41\ A$✓	$V = IR$✓ $14{,}65 = I(6)$ $I = 2{,}44\ A$ $V = IR$ $14{,}65 = I(15)$ $I = 0{,}98\ A$ $2{,}44 + 0{,}98$ ✓ $= 3{,}42\ A$✓

(3)

9.1.6 DECREASES ✓ (1)

9.1.7 Total resistance increases. ✓
The current in the circuit decreases. ✓
The resistance of R is constant✓, so the potential difference across resistor R will decrease. (3)

9.2.1 $P = \frac{W}{t}$ ✓

$3500 = \frac{W}{5 \times 60 \times 60}$ ✓

$W = 6{,}3 \times 10^7 J$ ✓ (4)

9.2.2 $Cost = price \times unit\ kWh$✓
$= 99 \times (3{,}5)$✓$(5)(30)$✓
$= 51\,975\ cents$ or
$= R\ 519{,}75$ ✓ (4)

[25]

TOTAL: 150

TAXONOMY LEVELS					
GRADE 11					
PHYSICAL SCIENCES – PHYSICS PAPER 1					
FINAL EXAMINATION - TERM 4 - 2024					
MARKS: 150					
QUESTION	**RECALL**	**COMPREHENSION**	**ANALYSIS APPLICATION**	**EVALUATION SYNTHESIS**	**TOTAAL**
DESIRED %	**15%**	**35%**	**40%**	**10%**	**100%**
1.1	2				2
1.2			2		2
1.3			2		2
1.4			2		2
1.5			2		2
1.6		2			2
1.7		2			2
1.8	2				2
1.9				2	2
1.10	2				2
2.1	2				2
2.2		3			3
2.3.1			4		4
2.3.2			4		4
2.4	1				1
2.5.1	1				1
2.5.2	1				1
3.1	2				2
3.2	3				3
3.3			5		5
3.4.1			4		4
3.4.2			4		4
3.5				1	1
3.6				2	2
4.1			3		2
4.2		1			1
4.3		1			1
4.4		5			3
4.5		2			2
4.6		2			1
4.7	1				1
5.1	2				2

5.2		1			1
5.3			4		4
5.4	2				2
5.5		2			1
6.1	2				2
6.2		2			2
6.3			3		3
6.4			2		2
6.5		2			1
6.6		3			2
6.7			4		4
7.1			4		4
7.2	2				2
7.3		2			2
7.4			6		6
8.1	2				2
8.2			4		4
8.3			4		4
9.1.1	2				2
9.1.2				2	2
9.1.3			3		3
9.1.4			3		3
9.1.5			3		3
9.1.6				1	1
9.1.7				3	3
9.2.1			4		4
9.2.2			4		4
Total	**29**	**30**	**80**	**11**	**150**
Actual %	**19**	**20**	**53**	**7**	**100**
Desired %	**15%**	**35%**	**40%**	**10%**	**100**