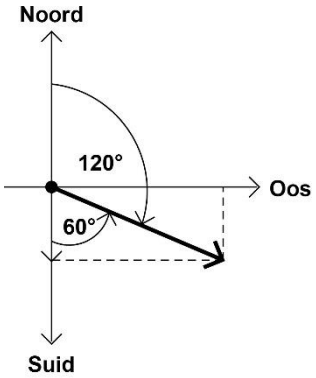
PHYSICAL SCIENCE
GRADE 11
2023 November
PHYSICS PAPER 1
Final Examination
MARKS: 150
MARKING GUIDELINE

QUESTION 1 **REASON:**

1.1 A ✓✓ (2)

1.2 C ✓✓



$$\cos 60° = \frac{south}{1000}$$
$$\therefore south = 1000\cos 60°$$
$$= 500\ N$$

(2)

1.3 C ✓✓

$$f = \mu_K F_N$$
$$\therefore f \alpha F_N$$
$$F_N = m.g$$
$$\therefore F_N \alpha m$$
$$\therefore if\ m \uparrow then\ F_N \uparrow and\ therefore\ f \uparrow$$

(2)

1.4 D ✓✓ (2)

1.5 D ✓✓

$$Q = N.q_e$$
$$= 6\times10^{6}\left(-1,6\times10^{-19}\right)$$
$$= 9,6\times10^{-13}\,C$$

(2)

1.6 D ✓✓ (2)

1.7 B ✓✓ (2)

1.8 A ✓✓ (2)

1.9 D ✓✓

$$W = V.I.t$$
$$= 120(10)(30)$$
$$= 36000\ J$$
$$= 3,6 \times 10^4\ J$$

(2)

1.10 C ✓✓ Current divides in parallel. Twice the current will flow through the 3Ω resistor. The lower the resistance, the more current will pass through that resistor. (2)

[20]

QUESTION 2

2.1 The vector sum of two or more forces. ✓✓
OR
The single force with the same effect as two or more forces together. (2)

2.2.1

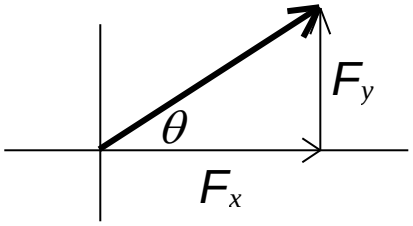
	x-component	*y-component*
F_1	*500cos60° = 250 N*	*500sin60° = 433,01 N*
F_2	*400cos30° = 346,41 N*	*400sin30° = – 200 N*
F_{res}	*596,41 N* ✓	*233,01 N* ✓

$F_{res} = \sqrt{(596{,}41)^2}$✓ $+ (233{,}01)^2$ ✓
= 640,31 N ✓ (5)

2.2.2 $tan\theta = \frac{F_{res}(y)}{F_{res}(x)}$

$\theta = tan^{-1}\left(\frac{233{,}01}{596{,}41}\right)$ ✓

$= 21{,}34°$ ✓$with\ respect\ to\ the\ +x-axis$



(2)

2.3 The rock remains at rest. ✓ (1)

2.4 $f_s = F_{res}$ ✓ (Rock is at rest)
= 596,41 N✓ (2)

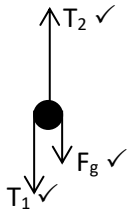
2.5 INCREASES ✓ (1)

[13]

QUESTION 3

3.1 A body will remain in its state of rest or motion at constant velocity unless a non-zero resultant/net force acts on it. ✓✓ (2)

3.2



(3)

3.3 **T_2** ✓ (1)

3.4 ***Consider the 5 kg block***

$F_{net} = ma$ ✓
$T_2 + (-F_g) + (-T_1) = 5a$
$\underline{120 - 5(9,8) - T_1} = 5a$✓
$T_1 = -5a + 71$ ----------[1]

Consider the 3 kg block

$F_{net} = ma$
$T_1 + (-F_g) = ma$
$\underline{T_1 - 3(9,8)}$ ✓$= 3a$
$T_1 = 3a + 29,4$----------[2]

Put [1] = [2] ✓
$-5a + 71 = 3a + 29,4$
$a = 5,2\ m.s^{-2}$

$T_1 = 3(5,2) + 29,4 = 45$ N ✓

The string will not break.✓ (6)

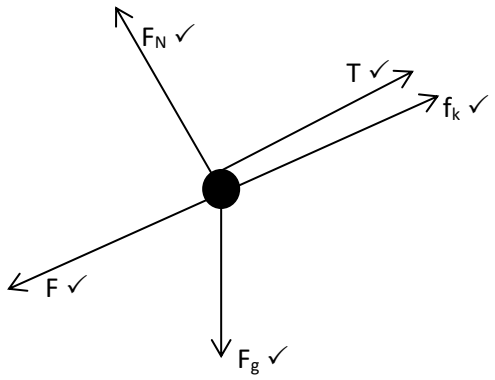
3.5 REMAINS THE SAME ✓ (1)

[13]

QUESTION 4

4.1 When a resultant/net force acts on an object, the object accelerates in the direction of the force. This acceleration directly proportional to the force and inversely proportional to the mass of the object. ✓✓ (2)

4.2



(5)

4.3.1 $F_{netA} = ma$ ✓
$T + (-F_g) = 0$ ✓
$T - (9,8)(4) = 0$
$T = 39.2N$ ✓ (3)

4.3.2 $F_{netB} = ma$ ✓
$F + F_{g||} + f_{kB} + T = 0$
$2,2 + (10)(9,8)\sin\theta$ ✓ $- 26 - 39,2 = 0$ ✓
$\Theta = 40°$ ✓ (4)

4.3.3 $f_k = \mu_k F_N$ ✓
$26 = \mu_k(10)(9,8)\cos 40°$ ✓
$\mu_k = 0,35$ ✓ (0,346) (3)

4.4.1 REMAIN THE SAME ✓ (1)

4.4.2 DECREASES ✓ ; because θ increases , $F_{g(perpendicular)}$ decreases ✓, therefore F_N decreases ✓ ($F_N \alpha f_k$). (3)

[21]

QUESTION 5

5.1 Everybody in the universe attracts every other body with a 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 body A exerts a force on a body B, body B exerts a force of equal magnitude in the opposite direction on body A. ✓✓ (2)

5.4 $F = \frac{Gmm}{r^2}$ ✓

$= \frac{(6{,}67\times10^{-11})(7{,}35\times10^{22})(5{,}98\times10^{24})}{(384400\times10^{3})^2}$ ✓ ✓

$= 1{,}98 \times 10^{20}\ N$ ✓ (4)

5.5 $g_{moon} = (1/6)g_{earth}$
$g_{moon} = 9.8/6 = 1.63 m.s^{-2}$

$m = F/g_{moon}$ ✓
$m = 3000/1.63$ ✓
m= 1 836.74 – 1849.49 kg ✓ (3)

5.6 High and low tides of the ocean/Waves ✓ (1)

[13]

QUESTION 6

6.1 $E_{Q_1} = \frac{kQ}{r^2}$ ✓

$= \frac{(9\times10^9)(3\times10^{-6})}{(0,4)^2}$ ✓

$= 1,69 \times 10^5\ N.C^{-1}$; East (Right)

$E_{Q_2} = \frac{kQ}{r^2}$

$= \frac{(9\times10^9)(5\times10^{-6})}{(0,1)^2}$ ✓

$= 4,5 \times 10^6\ N.C^{-1}$; west (leftwards)

$E_{net} = 4,5 \times 10^6 - 1,69 \times 10^5$✓

$= 4,33 \times 10^6\ N.C^{-1}$✓; west (leftwards) ✓ (6)

6.2 $Q_{new} = \frac{3\times10^{-6}+(-5\times10^{-6})}{2}$ ✓

$= -1 \times 10^{-6}\ C$ or -1uC ✓ (2)

6.3 NEGATIVE ✓ (1)

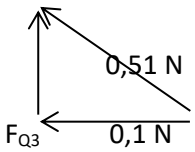
6.4 The electrostatic force that two charges exert on each other is directly proportional to the product of the magnitude of the charges and inversely proportional to the square of the distance between them.✓✓ (2)

6.5

$F_{Q_2} = \frac{kQ_1Q_2}{r^2}$ ✓

$= \frac{(9\times10^9)(1\times10^{-6})(1\times10^{-6})}{(0,3)^2}$ ✓

$= 0,1\ N$



$0,51^2 = 0,1^2 + F_{Q_3}^2$ ✓

$F_{Q_3} = 0,5\ N$

$F_{Q_3} = \frac{kQ_1Q_3}{r^2}$

$0{,}5 = \frac{(9\times10^{9})(1\times10^{-6})Q_3}{(0{,}25)^2}$ ✓ $Q_3 = 3{,}47 \times 10^{-6}\ C$ ✓	

(5)

[16]

QUESTION 7

7.1 A region in which an electric charge experiences a force. ✓✓ (2)

7.2 Electric field ✓ (1)

7.3 The electrostatic force (F) experienced by a charge is directly proportional to the electric field (E) in which the charge is placed. ✓ (1)

7.4 (Electric) charge ✓ (1)

7.5 gradient = $\frac{\Delta F}{\Delta E}$ or $\frac{\Delta y}{\Delta x}$ ✓

$= \frac{(20-5)\times10^{-8}}{(4-1)\times10^{3}}$ ✓

$= 5 \times 10^{-11}$ ✓ (3)

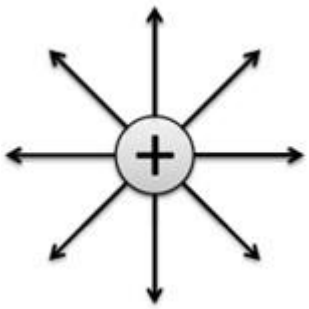
7.6 $q = 5 \times 10^{-11}$ C ✓ (1)

7.7 $n = \frac{Q}{q_e}$ ✓

$= \frac{5\times10^{-11}}{1,6\times10^{-19}}$ ✓

= 312 500000 electrons ✓ ($3,125 \times 10^{8}$) (3)

7.8



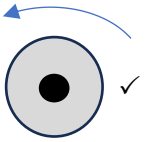
Shape of the field lines	✓
Arrow directions. It must be a positive charge due to the positive gradient of the graph.	✓

(2)

[14]

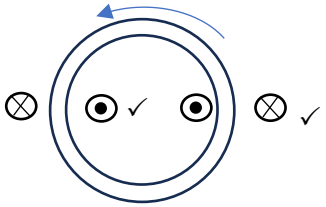
QUESTION 8

8.1.1



ANTICLOCKWISE✓ (2)

8.1.2



(2)

8.1.3 B✓ (1)

8.2.1 The magnitude of the induced emf (in a conductor) is equal to the rate of change of magnetic flux linkage. ✓✓

OR

The emf induced in a conducting loop is equal to the negative of the rate at which the magnetic flux through the loop is changing with time.

OR

The magnitude of the induced emf across the ends of a conductor is directly proportional to the rate of change in the magnetic flux linkage with the conductor. (2)

8.2.2 Move the magnet quickly inside the coil/ increase the number of coils/ increase surface area of the solenoid/ Use a stronger magnet.✓✓

(2)

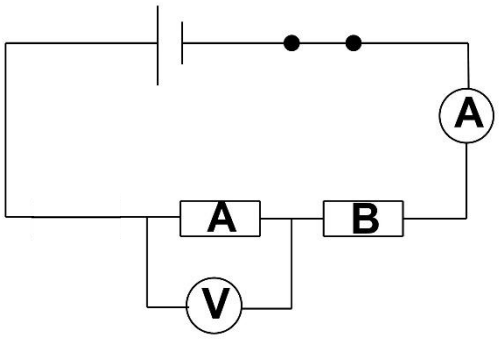
8.2.3 **Y TO X** ✓ (1)

8.2.4 North pole (N-pole) ✓ (1)

[11]

QUESTION 9

9.1



Ammeter & voltmeter correctly placed (over either resistor or battery)	✓✓
Battery/Cell	✓
Resistors	✓
Series arrangemnet	✓

(5)

9.2 B✓; The graph is not a straight line✓ (V is not directly proportional to I) (2)

9.3 Temperature ✓ (1)

9.4 Resistance ✓ (1)

9.5 $R = \frac{\Delta V}{\Delta I}$ ✓

$= \frac{12-0\checkmark}{(80\times10^{-3})\checkmark-0}$

$= 150\ \Omega$ ✓ (4)

[13]

QUESTION 10

10.1 Power is the rate at which work is done or energy is transferred. ✓✓ (2)

10.2.1 $P = I^2R$ ✓
$0,81 = I^2(100)$ ✓
$I = 0,09$ A ✓ (3)

10.2.2

$V_2 = V_P$ ✓		$V_{100} = IR_{100}$✓		$I_{50} = I_t/2$ ✓
$= I_PR_P$✓	or	$V_{100} = 0,09\ (100)$ ✓	or	$I_{50} = 0,045$A✓
$= 0,09\ (25)$ ✓		$V_{100} = 9$V		$V_{50} = I_{50}R_{50}$✓
$= 2,25$ V ✓		$V_{100} = V_p/4$✓ $V_p = 2,25$V✓		$V2 = V_{50} = 2,25$V ✓

(4)

10.2.3 $\frac{1}{R} = \frac{1}{R} + \frac{1}{R}$ ✓

$= \frac{1}{50} + \frac{1}{50}$

$\therefore R_p = 25\ \Omega$ ✓ (2)

10.2.4 $R_T = R_P + R_s$ ✓
$= 25 + 100 + 25$
$= 150\ \Omega$ ✓

$V = IR$ ✓
$= 0,09(150)$
$= 13,5$ V ✓ (4)

10.3 DECREASES ✓ (1)

[16]

TOTAL: 150