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education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

FURTHER EDUCATION AND TRAINING

GRADE 11

PHYSICAL SCIENCES P1

NOVEMBER 2025

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MARKS: 150

TIME: 3 HOURS

This question paper consists of 18 pages and 2 data sheets

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INSTRUCTIONS AND INFORMATION

1. Write your NAME and GRADE on your answer book
2. 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. You may use a non-programmable calculator.
6. Show ALL formulae and substitutions in ALL calculations
7. Round off your FINAL numerical answers to a minimum of TWO decimal places.
8. Give brief motivations, discussions, etc. where required
9. You are advised to use the attached DATA SHEETS.
10. Write neatly and legibly.



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QUESTION 1

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A–D) next to the question numbers (1.1 to 1.10) in the ANSWER BOOK, e.g. 1.11 E.

1.1 Which of the following pairs can be classified as scalar quantities?

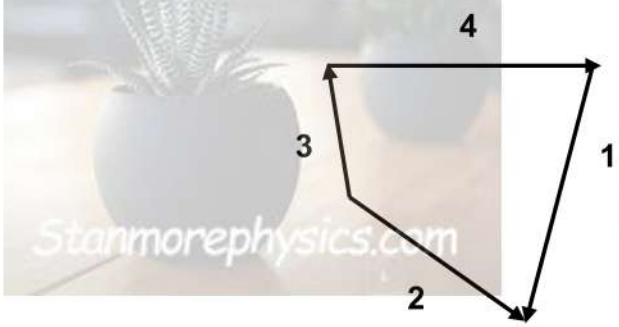
A Weight and frictional force

B Mass and frictional force

C Mass and speed

D Speed and weight (2)

1.2 The diagram below represents four vectors 1, 2, 3 and 4.



Which ONE of the vectors is the resultant of the other three vectors?

A 1

B 2

C 3

D 4 (2)

1.3 Which ONE of the following statements regarding the frictional force acting on? an object is CORRECT?

A Dependent on the velocity of the motion.

B Independent of the type of surface.

C Equal to the weight of the object.

D Directly proportional to Normal force (2)

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1.4 The units for force can be represented as:

A $.kg.m.s^{-1}$

B $.Kg.m^{-1}s^{-1}$

C $.Kg.m.s^{-2}$

D $.Kg.m^{-2}s^{-2}$ (2)

1.5 The gravitational force experienced by an object on the surface of a planet of radius r is F. which of the following combination of changes on the height above the surface and the mass M of the object will result on the gravitational force to be $\frac{1}{2}F$

	Distance (in terms of r) from the SURFACE of the planet	**Mass of the object**
A	$\frac{1}{2}r$	M
B	$2r$	M
C	r	2M
D	$2r$	2M

(2)

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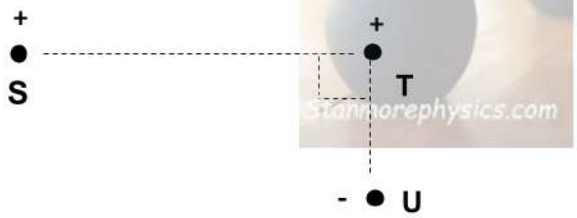
1.6 Two charges of + Q and –Q with the same magnitude are placed along a straight line. A and B are two points that lie within the same straight line as indicated below. Which of the following combinations is correct on the direction of the net electric field at A and B respectively?



	DIRECTION OF NET ELECTRIC FIELD AT A	DIRECTION OF NET ELECTRIC FIELD AT B
A	Right	Right
B	Left	Left
C	Right	Left
D	Left	Right

(2)

1.7 Three charges S, T and U are arranged perpendicular to each other as indicated in the diagram below.



Which of the following vector diagrams shows the CORRECT net electrostatic force experienced by sphere charge **T** ?

A 

B 

C 

D 

(2)

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1.8 The direction of a magnetic field around a current-carrying conductor is:

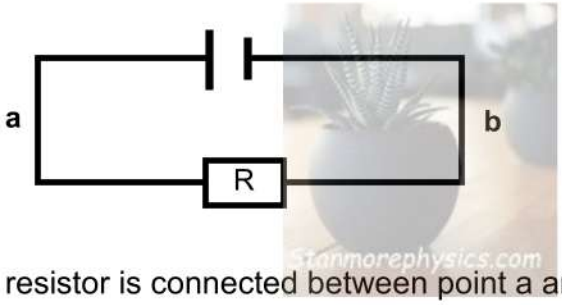
A Clockwise around the conductor with current of electrons into the page

B Clockwise around the conductor with conventional current into the page

C Anti-clockwise to the conductor in the same direction as convectional current

D Clockwise around the conductor with conventional current out of the page (2)

1.9 A resistor is connected in series to a battery with an emf of 9 v and negligible internal resistance as indicated below.



If another identical resistor is connected between point a and b. then the emf of the battery will ….

A Remains the same

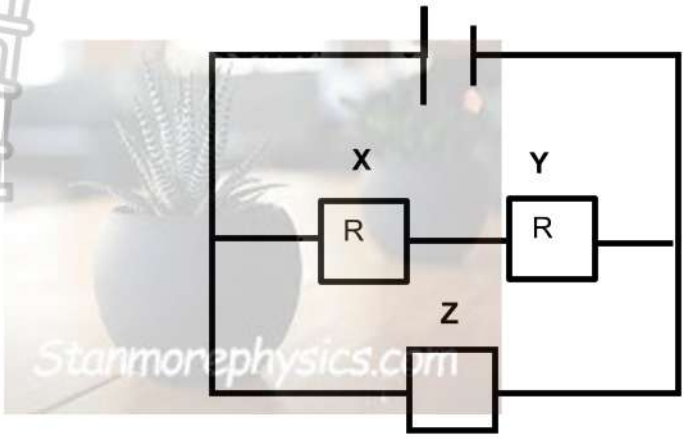
B Increase

C Decrease

D Be zero (2)

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1.10 Three light bulbs X, Y with equal resistance and Z with unknown resistance are connected to a battery with negligible internal resistance.



If the power on resistor Y is expressed as P, and the power on resistor Z is expressed as 4P , then the resistance of resistor Z in terms of R is…

A $4R$

B $2R$

C $\frac{1}{4}R$

D R

(2)

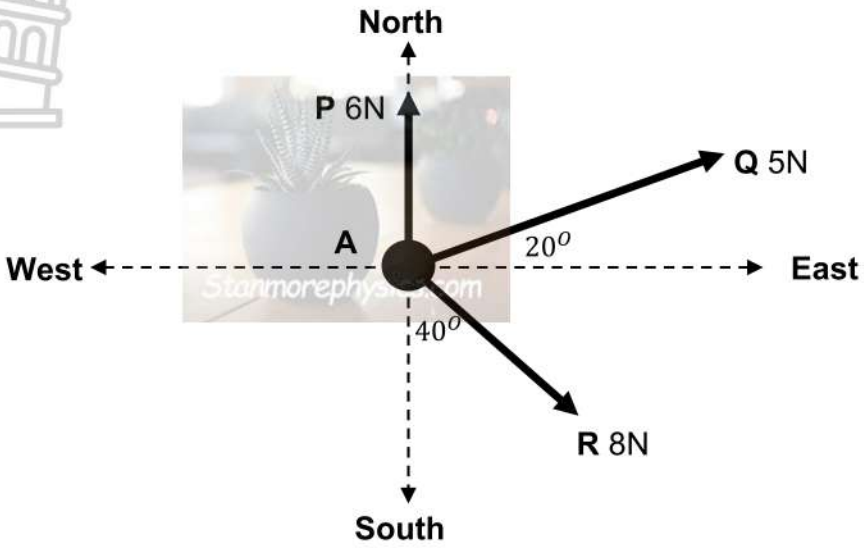
[20]

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QUESTION 2

Three forces P, Q and R acts on a point A as indicated by the directions in the diagram below.



The diagram is not drawn to scale.

2.1 What physical quantity is represented by the length of a vector? (1)

2.2 Determine the horizontal component of P (1)

2.3 Calculate the Magnitude of the :

2.3.1 Horizontal component of Q (2)

2.3.2 Vertical component of R (2)

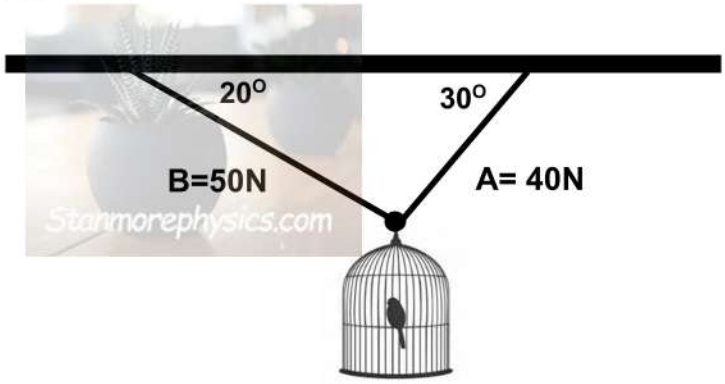
2.3.3 Resultant vector and direction acting on the point A (6)

[12]

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QUESTION 3

Two ropes A and B acts on a 2.5 Kg cage with an **X** Kg bird trapped inside as indicated below, the Magnitude of force on rope A is 40N and force of rope B is 50N as the cage is attached to the roof.



The ropes A and B makes an angle of 30^o and 20^o respectively with the roof of the building causing the cage-bird combination to be at rest.

3.1 Define resultant vector (2)

3.2 Write down the magnitude of the net force acting on the cage-bird combination (1)

3.3 Draw a closed vector diagram for the cage-bird combination, indicate at least one of the two angles above (4)

3.4 Calculate the Magnitude of the:

3.4.2 Weight of the cage-bird combination (3)

3.4.3 Mass **X** of the bird (4)

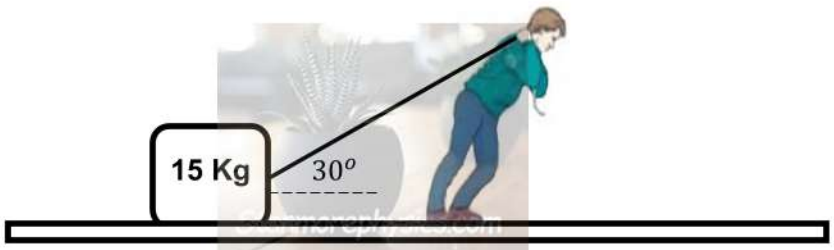
3.5 Can the sum of the vertical component of A and B be regarded as action-reaction pairs according to Newton's third law with the weight of the cage-bird combination? Write only Yes or No. Explain the answer. (3)

[17]

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QUESTION 4

A man attempts to pull a 15 Kg box on a rough horizontal plane as indicated below with an unknown force F at an angle of 30^0 to the plane. A static frictional force of 26.4 N is between the surface and the block to keep it at REST.



4.1 Define Normal force (2)

4.2 Draw a labelled free body diagram indicating ALL the forces acting on the 15 Kg block (4)

4.3 Calculate the Magnitude of the :

4.3.1 Force F ,applied on the block by the man (3)

4.3.2 Normal force between the block and the surface (3)

4.3.3 Co-efficient of the static friction on the surface (2)

[14]

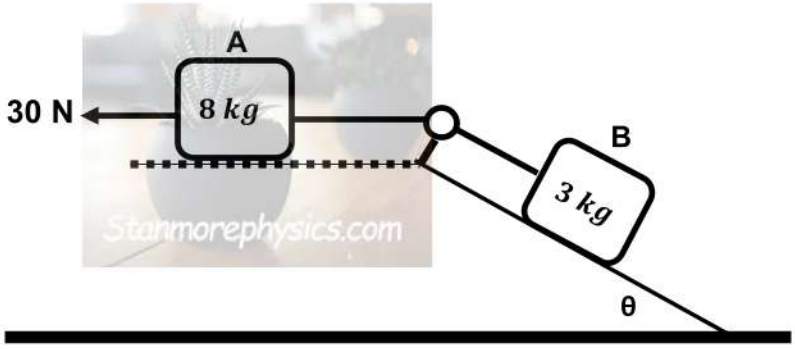
QUESTION 6

Two charged spheres P and Q with magnitudes of +8 μC and -4 μC respectively are separated a distance of 75 cm as indicated below.

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QUESTION 5

Two blocks A and B with masses of 8 Kg and 3 Kg respectively are connected by an inextensible string passing over a frictionless pulley as indicated below. A 30 N force is applied on block A causing the block to accelerate to the left on the rough horizontal surface with an acceleration of $0.15m.s^{-2}$ while block B accelerates up a smooth inclined plane with an unknown angle θ to the horizontal.



The co-efficient of kinetic friction between the 8 kg block and the flat surface is 0.12

5.1 State *Newton's second law* of motion in words (2)

5.2 Draw a labelled free body diagram showing ALL forces acting on the 3 Kg block. (3)

5.3 Calculate the magnitude of the :

5.3.1 Tension in the string (5)

5.3.2 Angle θ of the inclined plane. (4)

5.4 A 500 000 kg rocket called falcon-9 is launched by a space station into low earth orbit which is 160 km above the SURFACE of the earth.

5.4.1 State Newton's law of Universal Gravitation in words (2)

5.4.2 Calculate the difference in the weight of falcon-9 while on earth surface and when on the low earth orbit (5)

[23]



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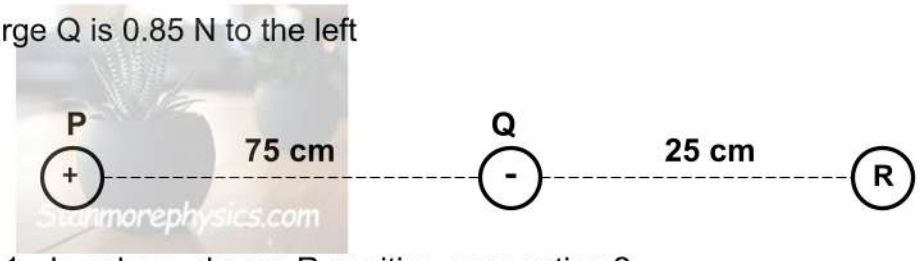
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6.1 State Coulomb's law in words (2)

6.2 Draw the electric field pattern around the two spheres (3)

6.3 Calculate the magnitude of the electrostatic force between the two spheres (3)

6.4 A third charge R with unknown magnitude is now placed 25 cm to the right of sphere Q as indicated below. The net electrostatic force experienced by sphere charge Q is 0.85 N to the left



6.4.1 Is sphere charge R positive or negative ? (1)

6.4.2 Calculate the magnitude of the charge on R (5)

[14]

QUESTION 7

P is a point located 80 mm to the left of sphere charge **x** with a magnitude of -$3X10^{-9}C$ as illustrated below.

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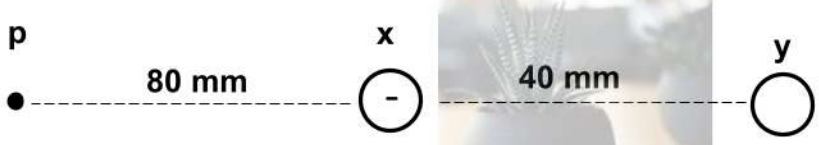
7.1 Define electric field at a point (2)

7.2 Were electrons ADDED TO or REMOVED FROM the sphere to obtain its charge? Assume the sphere was initially neutral. (1)

7.3 Calculate the number of electrons added or removed from the sphere (3)

7.3 Calculate the Electric field at point **p** (4)

7.4 Another sphere charge **y** having a shortage of $3X10^{10}$ electrons is placed a distance of 40 mm to the right of **x** as indicated in the diagram below .



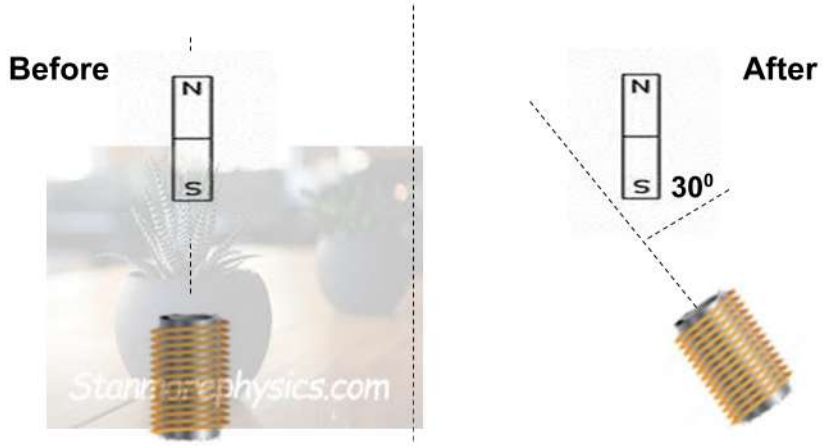
Calculate the magnitude of the net electric field at point **p** (6)

[14]

QUESTION 8

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A bar magnet with a magnetic field of 3,2T is held stationary while a solenoid with 100 loops and a radius of 15 cm is placed vertically below the bar magnet. The solenoid is then rotated an angle of 30^0 in 0.5 seconds as indicated below causing an emf to be induced.



8.1 State Faraday's law in words (2)

8.2 Calculate the :

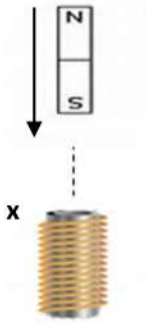
8.2.1 Change in the magnetic flux linkage (3)

8.2.2 Magnitude of the current on the solenoid if the total resistance of the wires is 8 Ω (4)

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8.3 The magnet is now moved inside the stationary solenoid as indicated below to induce an emf with point x being the side on top of the solenoid.



Write down the polarity of point **x** as the magnet is moved inside the solenoid.
Write down only SOUTH POLE or NORTH POLE (1)

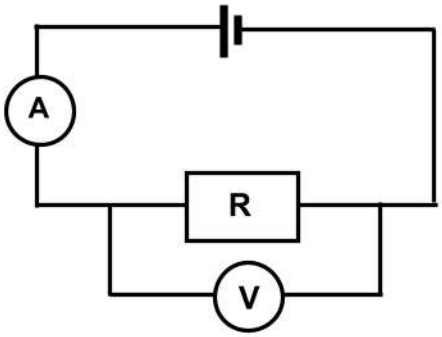
[10]



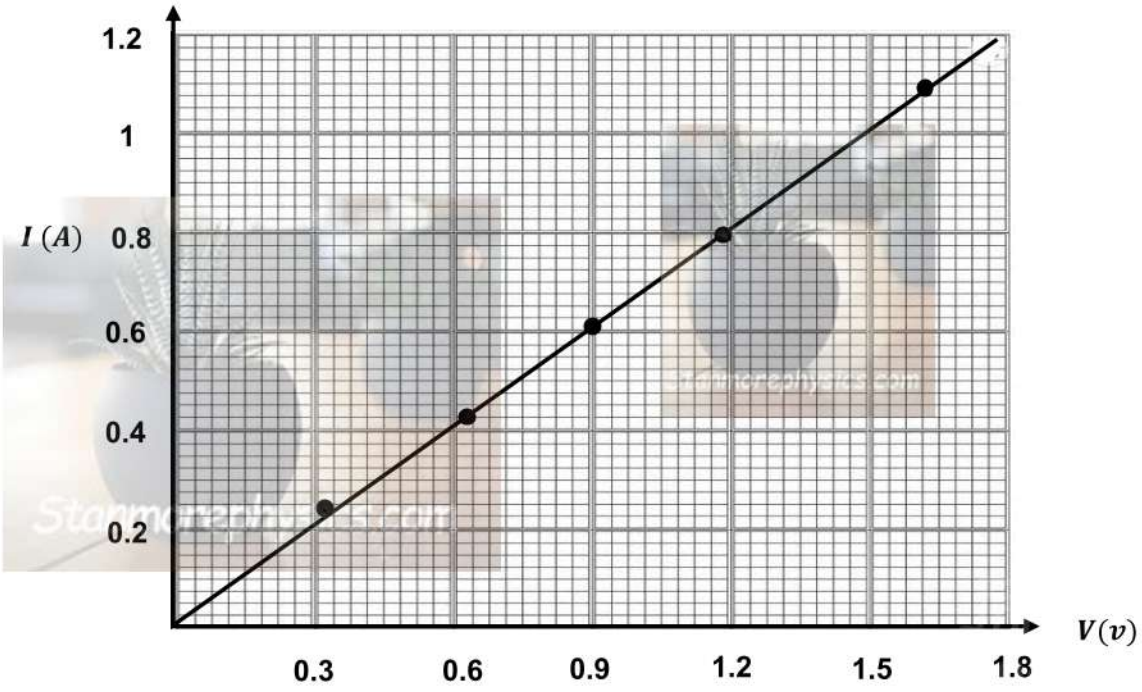
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QUESTION 9

A group of learners wanted to investigate the relationship between current and potential difference by increasing the number of cells on a circuit without changing the resistance of the resistor with unknown resistance.



The graph below indicates the results obtained from the investigation



9.1 State Ohm's law in words (2)

9.2 Write down the :

9.2.1 Independent variable (1)

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9.2.2 Investigative question for this experiment (2)

9.3 Calculate gradient of the graph (3)

9.4 Determine the resistance of the resistor R used by the learners (2)

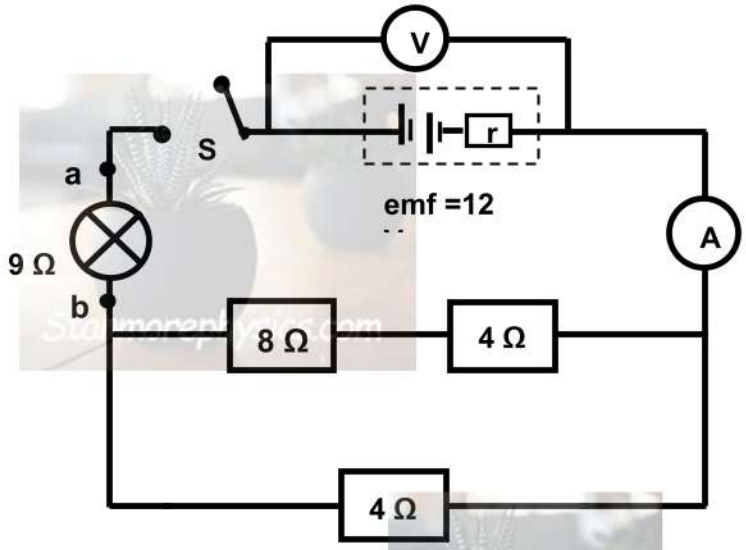
[10]



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QUESTION 10

A battery with an emf of 12 V and an unknown internal resistance is connected to three resistors and a 9 Ω light bulb with two points **a** and **b**, a high resistance voltmeter, an ammeter with negligible resistance and switch **S** initially opened as shown below.



Switch S is now closed and the reading on the voltmeter reads 11.52 V

10.1 Calculate the :

10.1.1 Effective resistance of the parallel combination (3)

10.1.2 Internal resistance of the battery (5)

10.1.3 Amount of heat released by the bulb if it operates for 4 minutes (4)

10.2 A device is now connected across the terminals of the bulb **a** and **b** and the bulb stops glowing. What is the device connected? Choose between **Voltmeter** and **Ammeter**. Explain the answer (2)

10.3 An electrical appliance with an unknown rating is allowed to operate for 24 hours and the tariff for a kilowatt hour (kwh) is R2.60. It was found that the cost of operating the appliance is R155.52. Calculate the power rating of the electrical appliance. (3)

[17]

GRAND TOTAL 150

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DATA FOR PHYSICAL SCIENCES GRADE 11
PAPER 1 (PHYSICS)

GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 11
VRAESTEL 1 (FISIKA)

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

NAME/*NAAM*	SYMBOL/*SIMBOOL*	VALUE/*WAARDE*
Acceleration due to gravity *Swaartekragversnelling*	g	9,8 $m \cdot s^{-2}$
Gravitational constant *Swaartekragkonstante*	G	6,67 x 10^{-11} $N \cdot m^2 \cdot kg^{-2}$
Radius of Earth *Straal van Aarde*	R_E	6,38 x 10^6 m
Coulomb's constant *Coulomb se konstante*	k	9,0 x 10^9 $N \cdot m^2 \cdot C^{-2}$
Speed of light in a vacuum *Spoed van lig in 'n vakuum*	c	3,0 x 10^8 $m \cdot s^{-1}$
Charge on electron *Lading op elektron*	e	-1,6 x 10^{-19} C
Electron mass *Elektronmassa*	m_e	9,11 x 10^{-31} kg
Mass of the earth *Massa van die Aarde*	M	5,98 x 10^{24} kg

TABLE 2: FORMULAE/*TABEL 2: FORMULES*

MOTION/*BEWEGING*

$v_f = v_i + a\Delta t$	$\Delta x = v_i\Delta t + \frac{1}{2}a\Delta t^2$
$v_f^2 = v_i^2 + 2a\Delta x$	$\Delta x = \left(\frac{v_f + v_i}{2}\right)\Delta t$

FORCE/*KRAG*

$F_{net} = ma$	$w = mg$
$F = \frac{Gm_1m_2}{r^2}$	$\mu_s = \frac{f_{s(max)}}{N}$
$\mu_k = \frac{f_k}{N}$	

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WAVES, SOUND AND LIGHT/*GOLWE, KLANK EN LIG*

$v = f\lambda$	$T = \frac{1}{f}$
$n_i \sin\theta_i = n_r \sin\theta_r$	$n = \frac{c}{v}$

ELECTROSTATICS/*ELEKTROSTATIKA*

$F = \frac{kQ_1Q_2}{r^2}$ $(k = 9{,}0 \times 10^9\ N{\cdot}m^2{\cdot}C^{-2})$	$E = \frac{F}{q}$
$E = \frac{kQ}{r^2}$ $(k = 9{,}0 \times 10^9\ N{\cdot}m^2{\cdot}C^{-2})$	$n = \frac{Q}{e}$

ELECTROMAGNETISM/*ELEKTROMAGNETISME*

$\varepsilon = -N\frac{\Delta\Phi}{\Delta t}$	$\Phi = BA\cos\theta$

ELECTRIC CIRCUITS/*ELEKTRIESE STROOMBANE*

$I = \frac{Q}{\Delta t}$	$R = \frac{V}{I}$
$\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3} + \ldots$	$R = r_1 + r_2 + r_3 + \ldots$
$W = Vq$ $W = VI\Delta t$ $W = I^2R\Delta t$ $W = \frac{V^2\Delta t}{R}$	$P = \frac{W}{\Delta t}$ $P = VI$ $P = I^2R$ $P = \frac{V^2}{R}$

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FURTHER EDUCATION AND TRAINING/
VERDERE ONDERWYS EN OPLEIDING

GRADE/ GRAAD 11

PHYSICAL SCIENCES/ FISIESE WETENSKAPPE
NOVEMBER 2025
MARKING GUIDELINE/ NASIENRIGLYNE

Stanmorephysics.com

MARKS/ PUNTE: 150

TIME/ TYD: 3 HOURS/ URE

These marking guidelines consists of 13 pages.

Hierdie nasienriglyne bestaan uit 13 bladsye.

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QUESTION / VRAAG 1

1.1 C✓✓

1.2 B✓✓

1.3 D✓✓

1.4 C✓✓

1.5 C✓✓

1.6 C✓✓

1.7 C✓✓

1.8 B✓✓

1.9 A✓✓

1.10 D✓✓

[20]



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QUESTION / VRAAG

2.1 Magnitude / Grootte ✓ (1)

2.2 0 N ✓ (1)

2.3.1 $Q_x = Q\cos\theta$
$Q_x = 5\cos 20^o$ ✓
$Q_x = 4,70N$ ✓ (2)

2.3.2 $R_y = R\cos\theta$
$R_y = 8\cos 40°$ ✓
$R_y = 6,13N$ ✓ (2)

2.3.3 **POSITIVE MARKING FROM 2.3.1 & 2.3.2**
POSITIEWE MERK VANAF 2.3.1 & 2.3.2

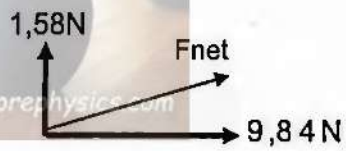
$Q_y = 5\sin 20^o$ $R_x = 8\sin 40^o$
$Q_y = 1,71N$ $R_x = 5,14N$

Both / Beide

Vertical vectors
Vertikale vektore
$y = Q_y + P - R_y$ ✓
$y = 1,71 + 6 - 6,13$ ✓
$y = 1,58N$

Horizontal vectors
Horisontale vektore
$x = Q_x + R_x$ → $8\sin 40^o$
$x = 4,70 + 5,14$ ✓
$x = 9,84N$ (6)

$fnet^2 = fx^2 + fy^2$
$fnet^2 = 9,84^2 + 1,58^2$ ✓
$fnet = 9,97\ N$ ✓



DIRECTION / RIGTING: ✓
9,12° north of east/ above the positive x-axis.
9,15° Noord van oos / bokant die positiewe x-as.

OR/OF:
80,88° east of north/ to the right of the positive y-axis.
80,88° oos van Noord / regs van die positiewe y-as.

[12]

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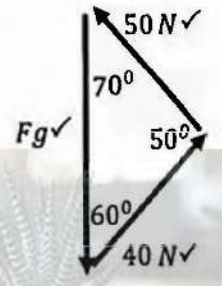
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QUESTION / VRAAG 3

3.1 Single vector having the same effect than two or more vectors together. ✓✓
Enkele vector wat dieselfde effek het as twee of meer vektore tesame. (2)

3.2 0 N ✓ (1)

3.3



✓ angle / hoek (4)

3.4 3.4.1 $A_Y = A\sin\theta$
$A_Y = 40\sin 30°$✓
$A_Y = 20N$

$B_Y = B \sin\theta$
$B_Y = 50\sin 20°$✓
$B_Y = 17{,}10N$

$Fg = 17{,}10 + 20$
$F_g = 37{,}10\,N$✓ (3)

3.4.2 **POSITIVE MARKING FROM 3.4.1**
POSITIEWE MERK VAN 3.4.1
$Fg = mg$ ✓
$37.10 = (m + 2.5$✓$)9.8$✓
$m = 1.29kg$✓

(4)

3.5 NO/NEE ✓

Newton's third law only applies when two objects exert the same magnitude of a force on each other in opposite directions. ✓✓

Newton se derde wet is slegs van toepassing as twee voorwerpe dieselfde grootte krag op mekaar uitoefen, in teenoorgestelde rigtings. (3)
[17]

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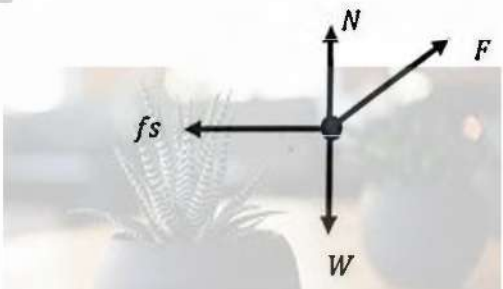
QUESTION / VRAAG 4

4.1 the force or the component of a force which a surface exerts on an object with which it is in contact, and which is perpendicular to the surface. ✓✓
die krag of komponent van 'n krag wat die oppervlak op 'n voorwerp uitoefen wat daarmee in kontak is, en wat loodreg op die oppervlak is.

(2)

If any of the underlined words are omitted in the correct context, deduct one mark/ Indien enige van die onderstreepte woorde in die korrekte konteks uitgelaat is, trek een punt af.

4.2



(4)

Symbol / Simbool	Accepted symbols / Aanvaarbare simbole
N	F_N/ Normal / F_{normal}
fs	f / static friction / statiese wrywing / Ff / 26,4 N
F	F_A / applied force / toegepaste krag
W	Weight / force of gravity / gravitasiekrag / F_g / mg

Notes / Notas:

- Mark is awarded for both label and arrow.
  Punt word toegeken vir beide die byskrif en die pylpunt.
- Do not penalise for the length of the arrow.
  Moenie leerder vir die lengte van die pyl penaliseer nie.
- If arrows don't touch the object / arrow, max: ¾
  Indien pyle nie die voorwerp / pylpunt raak nie, maks: ¾
- Any other additional forces, max: ¾
  Enige ander addisionele kragte: ¾
- If everything is correct but there are no arrows. max: ¾
  Indien alles korrek is, maar geen pylpunte, maks: ¾

4.3.1 $Fnet = 0$ ✓
$F\cos\theta - fs = 0$
$F\cos 30° - 26{,}4 = 0$ ✓
$F = 30{,}48N$ ✓

(3)

4.3.2 **POSITIVE MARKING FROM 4.3.1**
POSITIEWE MERK VANAF 4.3.1
$N = w - Fy$ ✓
$N = (15x9{,}8) - (30{,}48sin30°)$ ✓
$N = 131{,}76N$ ✓

(3)

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4.3.3 **POSITIVE MARKING FROM 4.3.2**
POSITIEWE MERK VANAF 4.3.2

$fs = \mu sN$
$26,4 = \mu s\ 131,76$ ✓
$fs = 0,2$ ✓ (2)

[14]

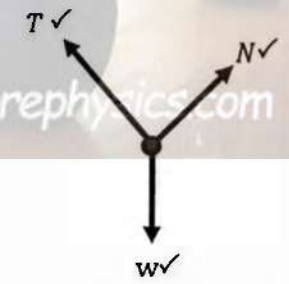
QUESTION / VRAAG 5

5.1 When a net / resultant force acts on an object, the object will accelerate in the direction of the force and the acceleration is directly proportional to the force and inversely proportional to the mass of the object✓✓ (2)

As 'n netto / resultante krag op 'n voorwerp inwerk, sal die voorwerp in die rigting van die krag versnel. Die versnelling is direk eweredig aan die krag en omgekeerd eweredig aan die massa van die voorwerp.

If any of the underlined words are omitted in the correct context, deduct one mark/ Indien enige van die onderstreepte woorde in die korrekte konteks uitgelaat is, trek een punt af.

5.2



(3)

Symbol / Simbool	Accepted symbols / Aanvaarbare simbole
N	F_N/ Normal / F_{normal}
W	Weight / force of gravity / Gravitasiekrag /F_g/ mg
T	F_T/ Tension force / Spankrag

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5.3.1

$$fnet = ma \checkmark$$
$$F - f - T = ma$$
$$30-(0.12)(8x9.8)\checkmark - T\checkmark = 8x0.15\checkmark$$
$$T = 19,39\ N \checkmark$$

(5)

Marking criteria / Nasienriglyne
• Formula / expression ✓ Formule / uitdrukking • Multiplying the 8 kg mass with the acceleration of 0,15 ✓ Vermenigvuldig die 8 kg massa met die versnelling van 0,15 • Whole substitution of F, T and f ✓ Substitusie van F, T en f • Substitution of Kinetic friction or 9,41 N ✓ Substitusie van kinetiese wrywing of 9,41 N • Final answer with correct units ✓ Finale antwoord met korrekte eenheid.

5.3.2 **POSITIVE MARKING FROM 5.3.1**
POSITIEWE MERK VAN 5.3.1

$$Fnet = ma \checkmark$$
$$T-(mg\sin\theta)= ma$$
$$19,39-(3x9,8\sin\theta)\checkmark = 3\,x\,0,15\ \checkmark$$
$$\theta = 40,11^0\ \checkmark$$

(4)

5.4.1 Each body 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✓✓
Enige liggaam in die heelal trek enige ander liggaam aan met 'n krag wat direk eweredig is aan die produk van hul massas en omgekeerd eweredig aan die kwadraat van die afstand tussen hul middelpunte. (2)

5.4.2

$$Fg = \frac{Gm1m2}{d^2}\checkmark$$
$$Fg = \frac{(6,67x10^{-11})(500000)(5,98x10^{24})}{(6,38x10^6)^2}\checkmark$$
$$= 4899544,03\ N$$

OR $F_g = mg$
$= (500000)(9.8)\ \checkmark$
$= 4\ 900\ 000\ N$

$$Fg = \frac{Gm1m2}{d^2}$$
$$Fg = \frac{(6.67x10^{-11})(500000)(5.98x10^{24})}{(6.38x10^6+160\ 000)^2}\checkmark$$
$$= 4662743,50\ N$$

$$\Delta Fg = 4899544,03 - 4662743,50$$
$$= 236\ 800,53\ N\checkmark$$

OR $= 4900000-4662743,50$
$= 237256,5\ N\checkmark$

(5)

21 [23]

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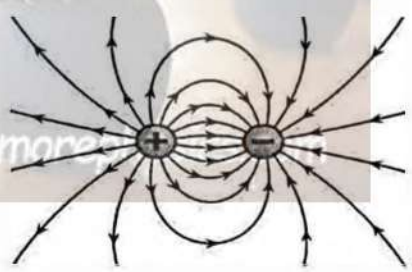
QUESTION / VRAAG 6

6.1 The magnitude of the electrostatic force exerted by one-point charge on another is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance between them ✓✓
Die grootte van die elektrostatiese krag wat een puntlading op 'n ander uitoefen is direk eweredig aan die produk van die ladings en omgekeerd eweredig aan die kwadraat van die afstand tussen die ladings. (2)

If any of the underlined words are omitted in the correct context, deduct one mark/ Indien enige van die onderstreepte woorde in die korrekte konteks uitgelaat is, trek een punt af.

If masses is used instead of charges $^0/_2$
Indien massa gebruik word, ipv ladings $^0/_2$

6.2



Criteria / Kriteria :	
Correct direction of field lines. Korrekte rigting van veldlyne.	✓
Shape of the electric field. Vorm van die elektriese veld.	✓
No field lines crossing each other and no field lines inside the spheres. Veldlyne kruis nie en geen veldlyne binne-in die sfeer.	✓

(3)

6.3 $F = K\frac{Q_1 Q_2}{r^2}$ ✓

$F = \frac{(9x10^9)(8x10^{-6})(4x10^{-6})}{(0,75)^2}$ ✓ (3)

$F = 0,51\ N$ ✓

6.4.1 Negative / Negatief ✓ (1)

6.4.2 **POSITIVE MARKING FROM 6.3**
POSITIEWE MERK VANAF 6.3

$Fnet = F_{PQ} + F_{QR}$ ✓

$0,85 = 0,51 + \frac{9x10^9(4x10^{-6})Q_R}{0,25^2}$ ✓ ✓

$Q_R = 5,89x10^{-7}C$ ✓ (5)

[14]

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QUESTION / VRAAG 7

7.1 the electrostatic force experienced per unit positive charge placed at that point. ✓✓
die elektrostatiese krag ondervind per eenhelds positiewe lading geplaas by daardie punt. (2)

If any of the underlined words are omitted in the correct context, deduct one mark/ Indien enige van die onderstreepte woorde in die korrekte konteks uitgelaat is, trek een punt af.

If electric field is defined $^0/_2$
As elektriese veld gedefinieer word $^0/_2$

7.2 ADDED/ BYGEVOEG ✓ (1)

7.3 $n = \frac{Q}{e}$ ✓
$n = \frac{3x10^{-9}}{1.6x10^{-19}}$ ✓
$n = 1.875x10^{10}$ ✓ (electrons / elektrone) (3)

7.4

$n = \frac{Q}{e}$
$3x10^{10} = \frac{Q}{1.6x10^{-19}}$ ✓
$Q = 4,8x10^{-9}C$

7.4 $E = \frac{KQ}{r^2}$ ✓
$= \frac{(9x10^9)(3x10^{-9})}{(0.08)^2}$ ✓
$= 4218.75 N.C^{-1}$ ✓

7.5 **POSITIVE MARKING FROM 7.3**
POSITIEWE MERK VANAF 7.3

Option / Opsie 1
$Enet = Ex - Ey$ ✓
$Enet = E = \frac{KQx}{r^2}$ ✓ - $E = \frac{KQy}{r^2}$
$Enet = 4218,75 - \frac{(9x10^9)(4,8x10^{-9})}{0,12^2}$ ✓
$Enet = 1218,75\ N.C^{-1}$ ✓

Option / Opsie 2
$Fnet = Fpx - Fpy$
$Fnet = K\frac{Qx\,Qp}{r^2} - K\frac{Qy\,Qp}{r^2}$
$Fnet = \frac{(9x10^9)(3x10^{-9})(1)}{(0,08)^2} - \frac{(9x10^9)(4,8x10^{-9})(1)}{(0,12)^2}$ ✓
$Fnet = 1218,75\ N$
$E = \frac{F}{q}$ ✓
$E = \frac{1218,75}{1}$
$E = 1218,75 N.C^{-1}$ ✓ (6)

4218.75 − 3000

Any SIMILAR value for test charge at P.Enige SOORTGELYKE waarde

15

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QUESTION / VRAAG 8

8.1 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)
Die grootte van die geïnduseerdeemk oor die ente van 'n geleier is direk eweredig aan die tempo van die verandering in die magnetiese vloedkoppeling met die geleier.

If any of the underlined words are omitted in the correct context, deduct one mark/ Indien enige van die onderstreepte woorde in die korrekte konteks uitgelaat is, trek een punt af.

8.2.1
$\Delta\Phi = AB(\cos\theta_f - \cos\theta_i)$
$\Delta\emptyset = (3,2)(0,071)(\cos 60°\checkmark - cos0°\checkmark)$ (3)
$\Delta\emptyset = -0,1136\ Wb\ \checkmark$

8.2.2 **POSITIVE MARKING FROM 8.2.1**
POSITEWE MERK VANAF 8.2.1

$emf = -\frac{N\Delta\emptyset}{\Delta t}$
$emf = -\frac{100(0,1136)\checkmark}{0,5}$ (4)
$= 22,72\ V$
$R = \frac{V}{I}\checkmark$
$8 = \frac{22,72}{I}\checkmark$
$I = 2,84A\ \checkmark$

8.3 SOUTH POLE / SUIDPOOL ✓ (1)
[10]

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QUESTION / VRAAG 9

9.1 The potential difference across a conductor is directly proportional to the current in the conductor at constanttemperature✓✓ (2)
Die potensiaalverskil oor 'n geleier is direk eweredig aan die stroom indien die temperatuur konstant bly.

If any of the underlined words are omitted in the correct context, deduct one mark/ Indien enige van die onderstreepte woorde in die korrekte konteks uitgelaat is, trek een punt af.

9.2.1 Potential difference/Potensiaalverskil ✓ (1)

9.2.2 What is the relationship between potential difference and current? ✓✓ (2)
Wat is die verband tussen potensiaalverskil en die stroom?

9.3 *(Any two points/Enige twee koordinate))*

$$gradient = \frac{\Delta y}{\Delta x}$$
$$gradient = \frac{0,6-0}{0,9-0}\checkmark$$
$$gradient = 0,667\checkmark$$ (3)

9.4 **POSITIVE MARKING FROM 9.3**
POSITIEWE MERK VANAF 9.3

$R = 0,667^{-1}\checkmark$
$R = 1,5\Omega\checkmark$

Option / Opsie 2
(any point / enige punt)

$$R = \frac{V}{I}$$
$$R = \frac{0,9}{0,6}\checkmark$$
$$R = 1,5\Omega\checkmark$$ (2)

[10]

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QUESTION / VRAAG 10

10.1.1 $\frac{1}{Rp} = \frac{1}{R1} + \frac{1}{R2}$ ✓ or $R = \frac{R1 \times R2}{R1 + R2}$

$\frac{1}{Rp} = \frac{1}{(\frac{1}{2})} + \frac{1}{4}$ ✓

$Rp = 3\Omega$ ✓

Marking criteria /Nasienkriteria:

- Formula for parallel combination
  Formule vir parallele kombinasie
- Substitution on parallel formula /Substitusie
- Answer with correct units /Antwoord + eenheid

(3)

10.1.2 **POSITIVE MARKING FROM 10.1.1**
POSITIEWE MERK VANAF 10.1.1

$R = \frac{V}{I}$

$12 = \frac{11,52}{I}$ ✓

$I = 0,96\ A$

$emf = I(R + r)$ ✓

$12 = 0,96(12 ✓ + r)$ ✓

$r = 0,5\Omega$ ✓

$Rt = \frac{Vt}{It}$

$(3 + 9 + r)\frac{12}{0,96}$

(5)

Marking criteria / Nasienkriteria:

- Emf or ohms law formula
  Emk of Ohm se formule
- Calculation of external total current (substitution)
  Bereken stroom (substitusie)
- Addition of 9Ω for total external resistance
  Tel 9 Ω by totale eksterne weerstand
- Substitution / Substitusie
- Answer with correct units / Antwoord met korrekte eenheid

10.1.3 **POSITIVE MARKING FROM 10.1.1**
POSITIEWE MERK VAN 10.1.1

Option / Opsie 1

$W = I^2R\Delta t$ ✓

$W = 0,96^2(9) ✓ (4)(60)$ ✓

$= 1990,66\ J$ ✓

Option / Opsie 2

$W = \frac{V^2}{R}\Delta t$

$W = \frac{8,64^2}{9}(4)(60)$

$= 1990,66\ J$

Option / Opsie 3

$W = VI\Delta t$ ✓

$W = (8,64)(0,96) ✓ (4)(60)$ ✓

$= 1990,66\ J$ ✓

Markingcriteria/Nasienkriteria:

- Formula for work / Formule vir werk
- Substitution for work / Substitusie vir werk
- Substitution for time / substitusie vir tyd
- Answer with correct units / Antwoord met korrekte eenheid

(4)

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10.2 Ammeter ✓

It has no / negligible resistance / current will pass through the ammeter/ it will create a short circuit on the bulb ✓
Dit het geen / weglaatbare weerstand. Stroom sal deur die ammeter beweeg / Dit sal 'n kortsluiting veroorsaak. (2)

10.3 Cost = tariff x power(kWh) / Koste = tarief x drywing in kWh
155,52✓ =power (2,60)(24) ✓
=2,49 kW (2492,31 W) ✓ (3)
[17]

GRAND TOTAL/ GROOTTOTAAL 150

