basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*
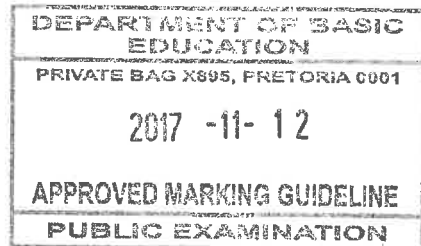
GRADE/*GRAAD* 10

PHYSICAL SCIENCES: PHYSICS (P1)
FISIESE WETENSKAPPE: FISIKA (V1)

NOVEMBER 2017
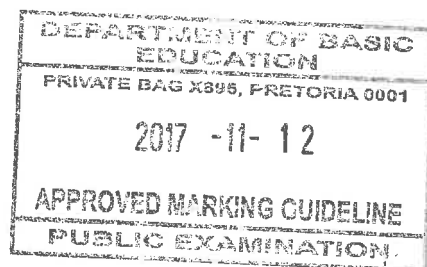
MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 13 pages.
Hierdie nasienriglyne bestaan uit 13 bladsye.

Approved
Dajraugi
Internal Mod-
DBE-
2017: 11: 12

CHIEF EXAMINER
2017 | 11 | 12

QUESTION/*VRAAG 1*

1.1   B✓✓   (2)

1.2   C✓✓   (2)

1.3   A✓✓   (2)

1.4   D✓✓   (2)

1.5   C✓✓   (2)

1.6   C✓✓   (2)

1.7   A✓✓   (2)

1.8   C✓✓   (2)

1.9   D✓✓   (2)

1.10   D✓✓   (2)

                                                            [20]

QUESTION/*VRAAG 2*

2.1   The total distance travelled per total time✓✓
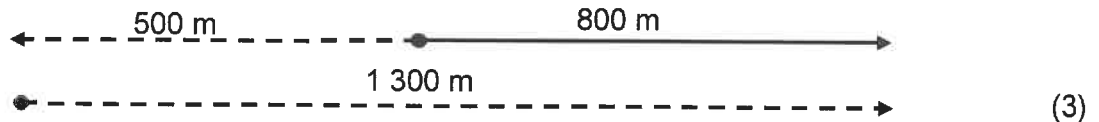*Die totale afstand beweeg per totale tyd.* ✓✓

OR/OF

The distance travelled divided by the total time✓✓
Die afstand beweeg gedeel deur die totale tyd. ✓✓   (2)

2.2
$$\text{Average speed/}Gemiddelde\ spoed = \frac{\text{distance travelled/}afstand}{\text{time taken/}tyd} \checkmark$$

$$= \frac{(500 + 800)\checkmark}{(30 \times 60)\checkmark}$$

$$= 0{,}72 \text{ m·s}^{-1} \checkmark$$ (4)

2.3

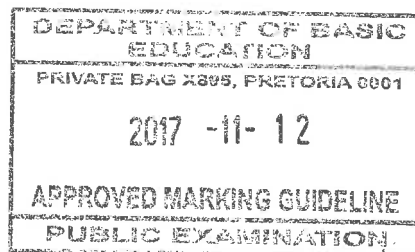| **MARK ALLOCATION:**	*PUNTETOEKENNING:*
✓1 x correct scale length for 800 m	✓*1 x korrekte skaal vir 800 m*
✓1 x arrow and	✓*1 x pylpunt*
✓1 x 800 m (3)	✓*1 x 800 m*

(3)

2.4   **POSITIVE MARKING FROM QUESTION 2.2**
POSITIEWE NASIEN VANAF VRAAG 2.2

$$\text{Average speed/}Gemiddelde\ spoed = \frac{\text{distance travelled/}afstand}{\text{time taken/}tyd} \checkmark$$

$$0{,}72\checkmark = \frac{(500 + 500 + 1\,300)}{\text{time taken/}tyd} \checkmark$$

$$t = 3\,194{,}44 \text{ s} \checkmark$$ (4)
[13]

QUESTION/*VRAAG 3*

3.1   (Average) velocity ✓/(*Gemiddelde*) *snelheid* ✓   (1)
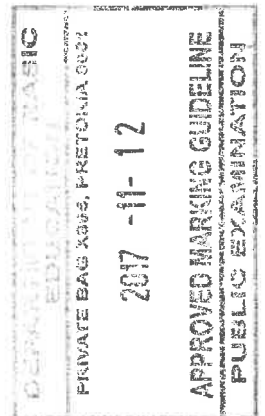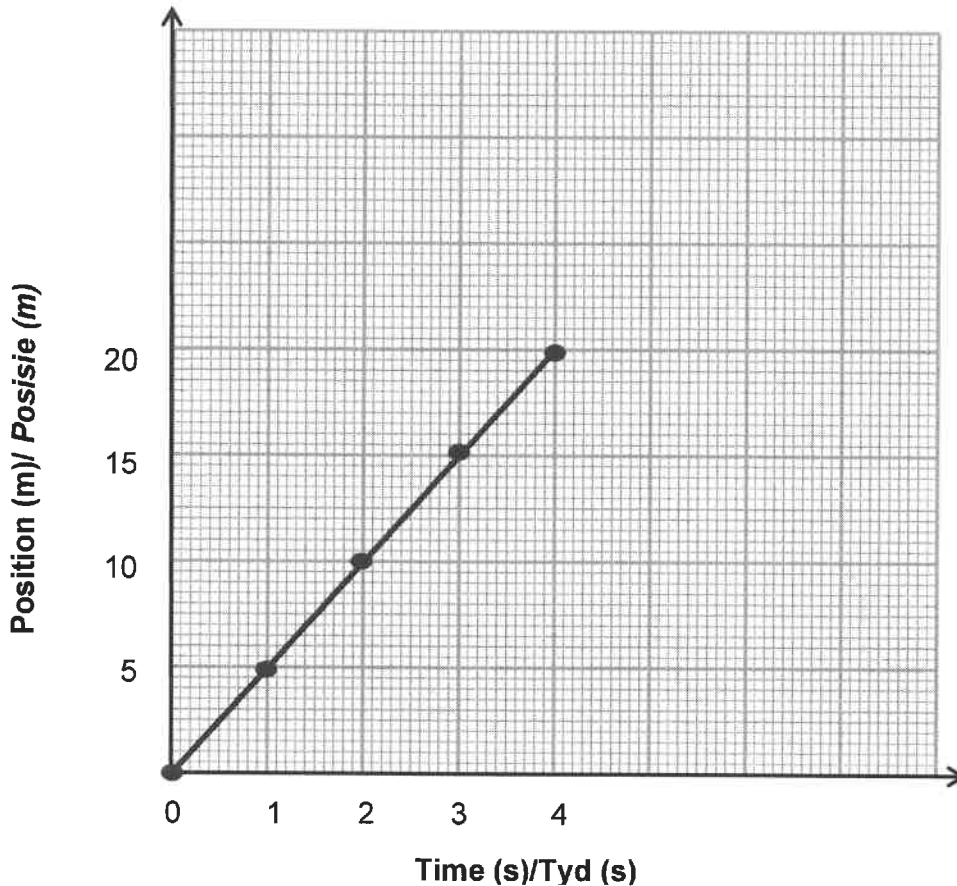
3.2.1   Time ✓/*Tyd* ✓   (1)

3.2.2   Position ✓/*Posisie* ✓   (Accept: Change in position/*Aanvaar verandering in
posisie*))   (1)

3.3

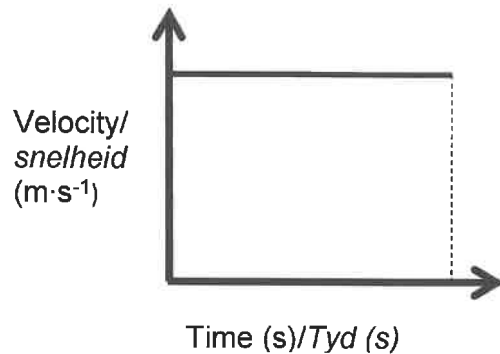| MARK ALLOCATION:	*PUNTETOEKENNING:*
✓ 1 x correct y-axis label and unit	✓ *1 x y-as benoem en eenheid*
✓ 1 x correct x-axis label and unit	✓ *1 x x-as benoem en eenheid*
✓✓ 2 x points plotted and joined	✓✓ *2 x punte geplot en verbind*
✓ 1 x shape of graph	✓ *1 x vorm van grafiek*

(5)

3.4

$$\text{Gradient/}Helling = \frac{\Delta y}{\Delta x} \checkmark$$

$$= \frac{20 - 5 \checkmark}{4 - 1 \checkmark}$$ **Accept**: other sets of values/*Aanvaar*:
enige stel korrekte waardes

$$= 5(\text{ m·s}^{-1}) \checkmark$$ (4)

3.5

✓ Correct shape/*korrekte vorm*

✓ Axes/*Asse*

(2)

3.6   The car has zero (acceleration)/ 0 m·s⁻² ✓✓ as its velocity is constant.
Die motor het geen versnelling /0 m·s⁻² ✓✓ ✓nie as gevolg van 'n konstante snelheid.

(2)

[16]

QUESTION/*VRAAG* 4

4.1   Rate of change of velocity ✓✓/*Tempo van verandering in snelheid* ✓✓   (2)

4.2.1 $\Delta x = v_i \Delta t + \frac{1}{2}a\Delta t^2$ ✓

$\Delta x = 0(2)$ ✓ $+ \frac{1}{2}(15)2^2$ ✓

$\Delta x = 30$ m ✓

(4)

4.2.2   **POSITIVE MARKING FROM QUESTION 4.2.1**
POSITIEWE NASIEN VANAF VRAAG 4.2.1

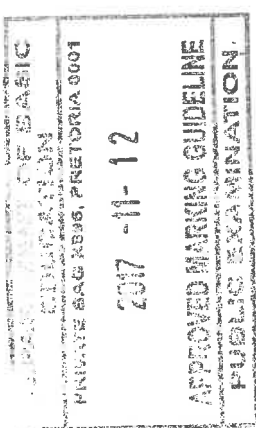| OPTION 1/*OPSIE 1*	OPTION 2/*OPSIE 2*
$v_f^2 = v_i^2 + 2a\Delta x$ ✓ $v_f^2 = 0^2$ ✓ $+ 2(15)(30)$ ✓ $v_f = 30$ m·s⁻¹ to the right ✓/*regs*	$v_f = v_i + a\Delta t$ $= 0$ ✓ $+ 15 \times 2$ ✓ $v_f = 30$ m·s⁻¹ to the right ✓/*regs*
OPTION 3/*OPSIE 3*	
$\Delta x = \left(\dfrac{v_i + v_f}{2}\right)\Delta t$ ✓ $30 = \left(\dfrac{0 ✓ + v_f}{2}\right)2$ ✓ $v_f = 30$ m·s⁻¹ to the right ✓/*regs*	

Accept: To the right/East/In the direction of motion
Aanvaar: *Regs/Oos/In die bewegingsrigting*

(4)

4.3   When following a car, a motorist should keep a safe distance such that it takes more than 2s ✓ to reach the same position ✓ as the car in front.
Motoriste moet 'n veilige afstand tussen ander voertuie handhaaf, sodat dit meer as 2 sekondes ✓ sal neem om dieselfde posisie✓ as die voertuig voor jou te bereik.
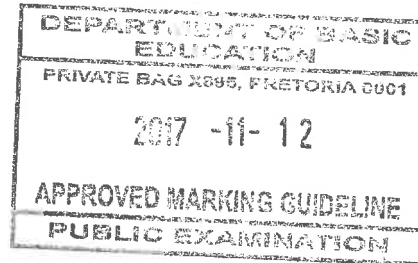
(2)

OR/*OF*

The car will need 2 s to stop in an emergency and not hit the car in front. ✓✓
Die motor het 2 sekondes nodig om in 'n noodsituasie tot stilstand te kom,
sonder om die voertuig voor jou te stamp.✓✓

4.4   Convert 90 km·h⁻¹ into m·s⁻¹/*Skakel 90 km·h⁻¹ om na m·s⁻¹*

$$\frac{90 \text{ km}}{1 \text{ h}} = \frac{90 \times 10^3}{3600} = 25 \text{ m·s}^{-1} ✓✓$$

OPTION 1/*OPSIE 1*:	**OPTION 2/*OPSIE 2*:**
$\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$ ✓	$\Delta x = \left(\frac{v_i + v_f}{2}\right) \Delta t$ ✓
$\Delta x = (25)(2)$ ✓ $+ \frac{1}{2}(0)2^2$ ✓	$\Delta x = \left(\frac{25 + 25}{2}\right)$ ✓ (2) ✓
$\Delta x = 50 \text{ m}$ ✓	$\Delta x = 50 \text{ m}$ ✓

(6)

4.5   **POSITIVE MARKING FROM QUESTION 4.4**
     POSITIEWE NASIEN VANAF VRAAG 4.4

$$\frac{108 \text{ km}}{1 \text{ h}} = \frac{108 \times 10^3}{3600} = 30 \text{ m·s}^{-1} ✓$$

Difference in speed/*Verskil in spoed*: 30 – 25
$$= 5 \text{ m·s}^{-1} ✓$$

Car has to travel 30 m (80 – 50) at 5 m·s⁻¹ to be at a 2 second distance behind
the truck. Therefore: distance = (v) (t) ✓
$$30 ✓ = (5) \text{ (t)}$$
$$t = 6 \text{ s} ✓$$

Motor moet 30 m (80 – 50) teen 5 m·s⁻¹ry om 2 sekonde-afstand agter trok te
wees. Daarom: afstand = (v) (t) ✓
$$30 ✓ = (5) \text{ (t)}$$
$$t = 6 \text{ s} ✓$$

(5)

[21]

QUESTION/*VRAAG* 5

5.1   The energy an object has as a result of its <u>motion</u>. ✓✓
     Die energie wat 'n voorwerp het as gevolg van sy <u>beweging</u>. ✓✓   (2)

5.2 E_p = mgh ✓
     = 72 x 9,8 x 100 ✓
     = 70 560 J ✓   (3)

5.3   The <u>sum of the gravitational potential energy and kinetic energy</u> ✓ in an <u>isolated</u>   (2)
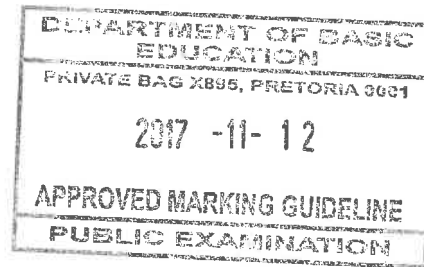
system is constant. ✓

Die <u>som van die gravitasie-potensiële energie en kinetiese energie</u> ✓ in 'n geïsoleerde/geslote stelsel <u>bly behoue/konstant</u>. ✓

OR/*OF*

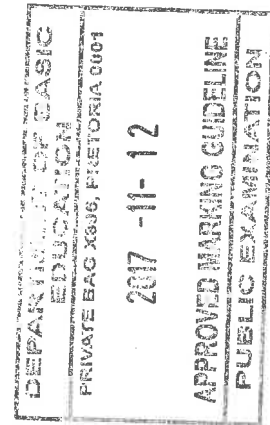The total mechanical energy of an isolated system remains constant. ✓✓

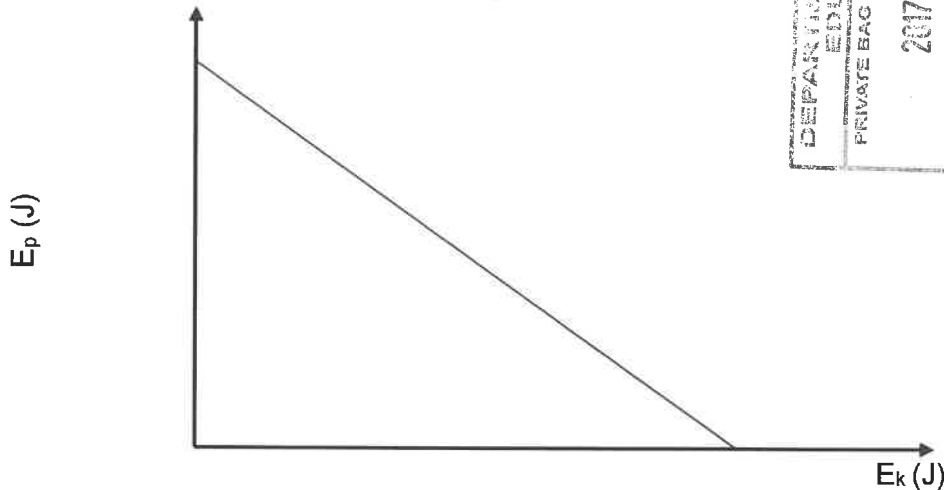*Die totale meganiese energie in 'n geïsoleerde/geslote stelsel bly behoue/konstant. ✓✓*

5.4 **POSITIVE MARKING FROM QUESTION 5.2**
POSITIEWE NASIEN VANAF VRAAG 5.2

$$(E_p + E_k)_{top/bo} = (E_p + E_k)_{bottom/onder}$$
$$mgh + 0 = mgh + \tfrac{1}{2}mv^2 \quad \Big\} \checkmark$$
$$70\ 560 \checkmark = \underline{(72)(9,8)(50)} \checkmark + \tfrac{1}{2} \times 72 \times v^2 \checkmark$$
$$v = 31,3 \text{ m·s}^{-1} \checkmark$$

(5)

5.5

Marking criteria for graph *Nasienkriteria vir grafiek*	
Axes with correct/appropriate labels *Asse met korrekte/toepaslike byskrifte*	✓
Straight line with decreasing slope *Reguitlyn met afnemende helling* Lines not touching (deduct a mark) *Indien lyne nie die asse raak (trek een punt af)*	✓✓

(3)
[15]

QUESTION/*VRAAG 6*

6.1 Superposition of pulses.✓ Algebraic sum of the amplitudes of two pulses that occupy the same space at the same time. ✓✓

Accept: Interference of waves✓ Phenomenon where the crest of one pulse overlaps with the trough of another, resulting in a pulse of reduced amplitude. ✓✓

Superposisie van pulse.✓ *Die algabraïese som van die amplitudes van twee pulse wat in dieselfde ruimte op dieselfde tyd is.* ✓✓
Aanvaar: Interferensie van pulse✓*Die verskynsel waar die kruin van een puls kruis met die trog van 'n ander. Die gevolg is 'n pulse met 'n verminderde amplitude.* ✓✓

(3)

6.2

(Shape/*Vorm*) ✓

(2)

6.3   Destructive (interference)✓/*Destruktiewe (interferensie)* ✓   (1)

6.4   Amplitude = (+4) + (-6)
            = 2 cm✓✓   (Accept/*Aanvaar*. - 2 cm)
        (Marks/*Punte*: 2 or/of 0)   (2)

6.5   REMAINS THE SAME✓/*BLY DIESELFDE* ✓   (1)
                                                        [9]

QUESTION/*VRAAG* 7

7.1   Sound with frequencies that are higher than what is audible to the human
        ear. ✓✓
        Klank met frekwensies wat hoër is as wat vir die menslike oor hoorbaar is. ✓✓   (2)

7.2 $v = f\lambda$ ✓
        1480 ✓ = 130 000 λ ✓
            ∴ λ = 0,011 m✓   (4)

7.3
        Speed/*Spoed* = $\dfrac{\text{distance}/afstand}{\text{time}/tyd}$ ✓

        1 480✓ = $\dfrac{\text{distance}/afstand}{2}$ ✓

        ∴ distance/*afstand* = 2 960 m✓   (4)

7.4 • The speed of sound in air is slower✓, as air is less dense ✓and the particles
     are further apart.
     *Die spoed van klank in lug is stadiger✓ as in water, omdat lug minder dig ✓
     is/deeltjies is verder van mekaar af.*

     OR/ OF

     • The speed of sound in sea water is faster✓, as sea water is denser ✓and the
     particles are closer together.
     *Die spoed van klank in water is vinniger✓ as lug, omdat water meer dig is✓/
     die deeltjies nader aan mekaar is.*   (2)

7.5 • Dolphins send out a sound frequency✓/*Dolfyne stuur klankgolwe uit* ✓
     • The sound reflects off the prey and returns to the dolphin✓
       Die klank weerkaats vanaf die prooi terug na die dolfyn toe.✓
     • The dolphin estimates distance from prey by using time for echo to return✓
       *Die dolfyn skat dan die afstand tussen sy prooi en homself deur die tyd te
       gebruik wat die eggo geneem het om te weerkaats. ✓*   (3)
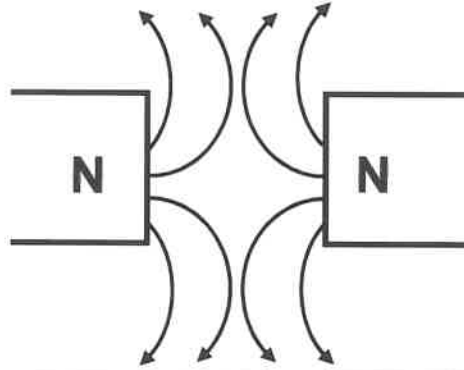
                                                                                [15]

QUESTION/*VRAAG* 8

8.1.1 Infrared waves✓/*Infrarooi golwe* ✓   (1)

8.1.2 Radio waves **OR** microwaves✓/*Radiogolwe OF mikrogolwe* ✓   (1)

8.2.1 Packet of energy found in light✓✓
       Pakkie energie wat in lig aangetref word. ✓✓   (2)

8.2.2

OPTION 1/*OPSIE 1*:	**OPTION 2/*OPSIE 2*:**
$c = f \times \lambda$✓	$E = \dfrac{hc}{\lambda}$✓✓
3×10^8 ✓$= f \times 620 \times 10^{-9}$✓	
$\therefore f = 4{,}84 \times 10^{14}$ Hz	$E = \dfrac{6{,}63 \times 10^{-34}\ ✓\times\ 3 \times 10^8}{620 \times 10^{-9}✓}$✓
$E = hf$✓	
$= 6{,}63 \times 10^{-34}$✓ $\times 4{,}84 \times 10^{14}$	$E = 3{,}21 \times 10^{-19}$ J ✓
$= 3{,}21 \times 10^{-19}$ J✓	

                                                                                (6)

8.2.3 • Laser light has high frequency and can penetrate soft tissues of humans✓
         Laserlig het 'n hoër frekwensie ✓en kan sagte weefsel indring
       • This can lead to damage of eye tissue✓
         Dit kan skade aan oogweefsel veroorsaak✓   (2)

                                                                                [12]

QUESTION/*VRAAG 9*

9.1   Magnetic field: A region in space where another magnet or ferromagnetic substance can experience a magnetic force. ✓✓
        Magneetveld: 'n Gebied in die ruimte waar 'n magneet of ferromagnetiese materiaal 'n magnetise krag sal ondervind.✓✓   (2)

9.2

MARK ALLOCATION:	***PUNTETOEKENNING:***
✓ 1 x lines not touching	✓ *1 x lyne raak nie*
✓ 1 x curved magnetic lines	✓ *1 x vorm van magneetveldlyne*
✓ 1 x field direction away from north	✓ *1 x veldrigting weg van die N-pool*

(3)

9.3.1   Magnetic force is <u>inversely proportional</u> ✓ to the distance (or square of the distance) between two magnets. **OR** If the distance between the magnets increases, the force decreases.
        Magnetiese krag is <u>omgekeerd eweredig</u> ✓ *aan die afstand tussen twee magnete. OF Indien die afstand tussen die magnete toeneem, sal die krag afneem.*   (1)

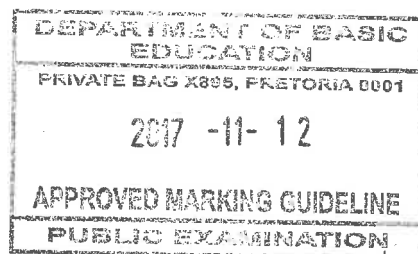9.3.2   0,1 N ✓   (1)

9.3.3   10 cm ✓   (1)
                                                                            [8]

QUESTION/*VRAAG 10*

10.1   Neutral object: Has equal amount of both protons and electrons✓
        Charged object: Has either gained or lost electrons. ✓
        Neutrale voorwerp: Gelyke hoeveelhede protone en elektrone. ✓
        Gelaaide voorwerpe het elektrone gewen of verloor.✓   (2)

10.2   Gain ✓/*Bygevoeg* ✓   (1)

10.3 $n = \dfrac{Q}{e}$ ✓

$n = \dfrac{3,5 \times 10^{-15}}{1,6 \times 10^{-19}}$ ✓

= 21875 ✓ (electrons/*elektrone*)   (3)

10.4.1   When the charged plastic ruler is brought closer to the uncharged pieces of paper, the paper is polarised. ✓ The negative charges on the paper are repelled by the negative charges on the ruler. ✓ This leaves the side of the paper closest to the ruler positive. ✓
Die stukkies papier word gepolariseer ✓ *sodra die gelaaide liniaal nader gebring word. Die negatiewe ladings van die papiertjies word afgestoot* ✓ *deur die negatief gelaaide liniaal. Dit laat die kant van die papier wat na die liniaal toe wys positief* ✓ *en die papier word aangetrek.*   (3)

10.4.2   Photocopier✓/*Fotostaatmasjien* ✓
Finger printing/*Vingerafdrukke*
Spray painting/*Spuitverf*   (Any one/*Enige een*)   (1)
                                                                                [10]

QUESTION/*VRAAG 11*

11.1   Work done per unit charge by the source (battery) ✓✓
Die arbeid verrig per eenheidslading deur die bron (battery) ✓✓   (2)

11.2 $\dfrac{1}{R_p} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$

$= \dfrac{1}{1,5} + \dfrac{1}{1,5}$ ✓

$= \dfrac{2}{3} + \dfrac{2}{3}$

$= \dfrac{4}{3}$
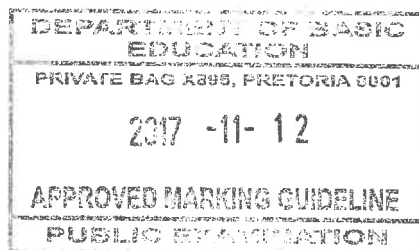
$\therefore R_P = \dfrac{3}{4} = 0,75\ \Omega$ ✓

$R_p = \dfrac{R_1 \times R_2}{R_1 + R_2}$

$= \dfrac{1,5 \times 1,5}{1,5 + 1,5}$ ✓

$\therefore R_P = 0,75\ \Omega$ ✓

                                                                                (2)

11.3.1   1,5 A ✓   (1)

11.3.2

$V_T = V_1 + V_2$

$9 = V_1 + 2V_1$ ✓

$9 = 3V_1$ ✓

$V_1 = 3$ V ✓

Accept:/*Aanvaar*

$V = IR$ ✓

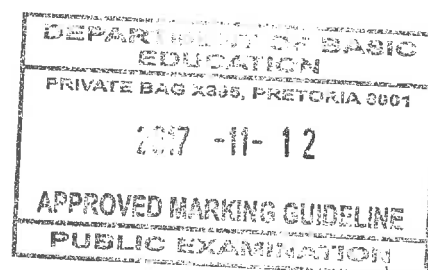$V = 1,5(2)$ ✓

$V = 3V$ ✓ (3)

11.4
- INCREASE ✓ /*TOENEEM* ✓
- If 1,5 Ω resistor is added, the <u>resistance of the whole circuit decreases</u> ✓
  Indien 1,5 Ω resistor bygevoeg word, neem die totale <u>weerstand van die stroombaan af.</u> ✓
- Since $R \propto \dfrac{1}{I}$, if R decreases, ∴ V is constant and <u>I of the circuit</u> <u>increases</u> ✓
  Aangesien $R \propto \dfrac{1}{I}$, indien R afneem en V konstant bly, sal <u>I van die stroombaan toeneem.</u> ✓ (3)

[11]

TOTAL/*TOTAAL*:   150

NOTE: Some provinces felt that 11.4 was an unfair question because it is not within the curriculum of grade 10 physical sciences. Therefore, these provinces can opt to exclude question 11.4 and mark the paper of the total of 147 and scale the total to 150.