Downloaded from Stanmorephysics.com

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES P1

FINAL EXAMINATION

NOVEMBER 2025

Stanmorephysics.com

MARKS: 100

DURATION: 2 hours

This question paper consists of 12 pages and a data sheet.

Downloaded from Stanmorephysics.com

INSTRUCTIONS AND INFORMATION

1. This question paper consists of EIGHT questions. Answer ALL the questions in the ANSWER BOOK.
2. Start EACH question on a NEW page in the ANSWER BOOK.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Leave ONE line between two sub-questions, for example between QUESTION 2.1 and QUESTION 2.2.
5. You may use a non-programmable calculator.
6. You may use appropriate mathematical instruments.
7. You are advised to use the attached DATA SHEET.
8. Show ALL formulae and substitutions in ALL calculations.
9. Round off your final numerical answers to a minimum of TWO decimal places.
10. Give brief motivations, discussions et cetera where required.
11. Write neatly and legibly.

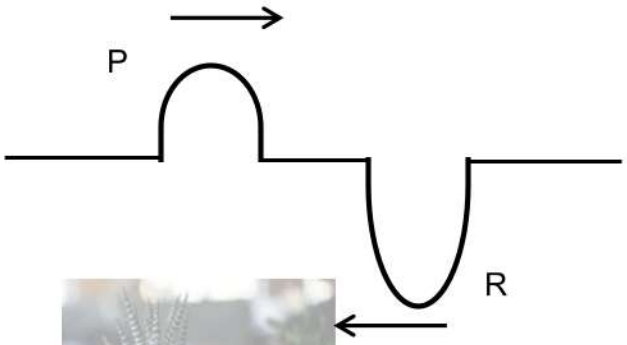
Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four 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 number (1.1–1.5) in the ANSWER BOOK, for example 1.6 E.

1.1 Pulse P, moving to the right, with an amplitude of X metres overlaps with Pulse R, moving to the left, to form a TROUGH with an amplitude of 2,25X metres.



Which of the following combinations will be CORRECT when the pulses meet at the same point in the medium?

	Type of interference	Amplitude of Pulse R
A	Constructive	1,25X
B	Destructive	1,25X
C	Constructive	3,25X
D	Destructive	3,25X

(2)

1.2 Which of the following indicates the region of low pressure in a longitudinal wave?

A Compression

B Crest

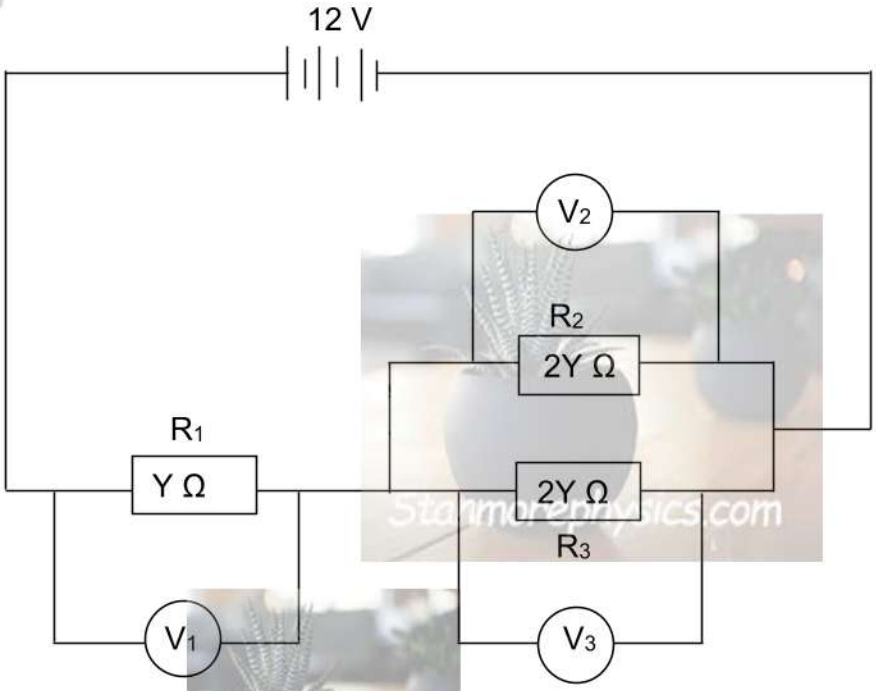
C Rarefaction

D Trough (2)

Copyright reserved

Downloaded from Stanmorephysics.com

1.3 A 12 V battery is connected to 3 resistors as shown in the circuit diagram below.



Which of the following combinations of voltmeter readings will be CORRECT?

	V_1 Reading	**V_2 Reading**	**V_3 Reading**
A	4V	4V	4V
B	6V	6V	6V
C	4V	8V	8V
D	8V	4V	4V

(2)

1.4 Which ONE of the following statements are TRUE?

An object experiences negative acceleration when it is moving in the…

A negative direction at a constant velocity.

B positive direction, experiencing a constant decrease in speed.

C negative direction, experiencing a constant decrease in speed.

D positive direction, experiencing a constant increase in speed. (2)

Copyright reserved

Downloaded from Stanmorephysics.com

1.5 The mechanical energy of an object dropped from the top of a building of height H metres is E.

Which ONE of the following is the mechanical energy of the object when it is ¼H metres above the ground?

A E

B ½E

C ¼E

D ¾E (2)

[2 X 5 = 10]

QUESTION 2 (Start on a new page.)

2.1 During an earthquake, seismic waves travel through the earths crust. In a type of seismic wave, called *p-waves*, the particles in the medium move back and forth in the same direction that the wave travels.

A seismic station located 300 km from the epicentre of an earthquake detects the first wave 45 seconds after the start of the earthquake.
The measured wavelength of the seismic wave is 3600 m.

2.1.1 Are the seismic waves described above, TRANSVERSE or LONGITUDINAL waves? (1)

2.1.2 Calculate the:

a) Speed of the wave (3)

b) Frequency of the wave (3)

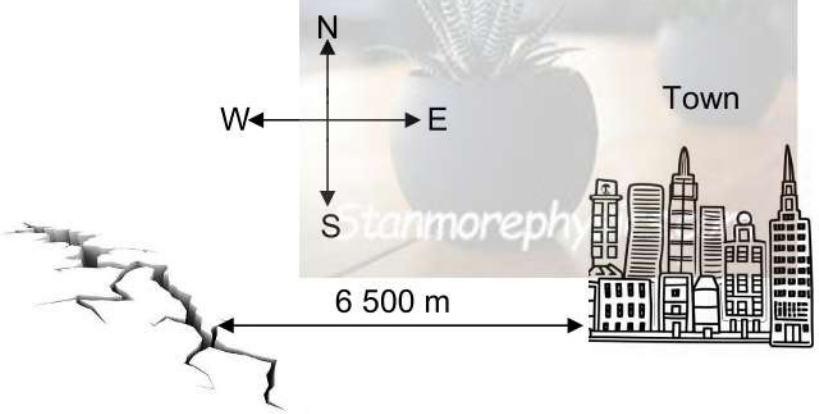
2.1.3 Determine the number of waves that pass the seismic station in the first minute of the earthquake. (4)

Copyright reserved

Downloaded from Stanmorephysics.com

2.2 An earthquake produces a loud sound, of frequency 490 Hz, that travels through the air.

A town lies 6 500 m east of the earthquakes epicentre, and the sound wave from the earthquake reaches the town in 19 seconds.



The speed of sound in air does not change between the epicentre of the earthquake and the town.

2.2.1 Define the term *wavelength* in words. (2)

2.2.2 Determine the wavelength of the sound wave. (5)

[18]

QUESTION 3 (Start on a new page.)

Sunscreens contain ingredients that absorb ultraviolet (UV) radiation before it damages skin cells.

A photon of ultraviolet radiation, UV-B, has a maximum frequency of $1{,}2 \times 10^{15}$ Hz. Photon energies of at least $4{,}5 \times 10^{-19}$ J results in damage to DNA.

3.1 Use suitable calculations to show that UV-B will cause damage to DNA. (4)

3.2 A sunscreen claims to absorb ultraviolet radiation with wavelengths as short as 300 nm. (4)

Determine if this sunscreen will provide protection against UV-B.

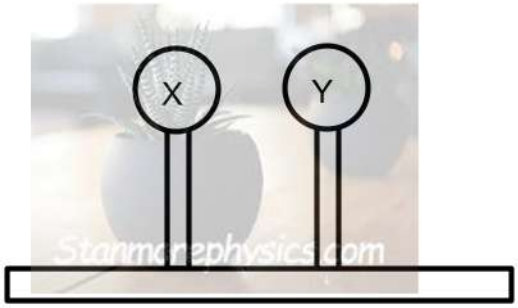
[8]

Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 4 (Start on a new page.)

Two identical conducting spheres X and Y are placed on insulating stands. The charge on both spheres is unknown.



The spheres are allowed to touch, resulting in ELECTRONS MOVING FROM SPHERE X TO Y and are then separated.

After separation:

- Each sphere now carries a charge of 2×10^{-6} C.
- The charge on each sphere changed by 4×10^{-6} C.

4.1 Write down the principle of charge quantization in words. (2)

4.2 Calculate the number of electrons that were transferred in this process. (3)

4.3 Determine the initial charge on:

4.3.1 Sphere Y (2)

4.3.2 Sphere X (3)

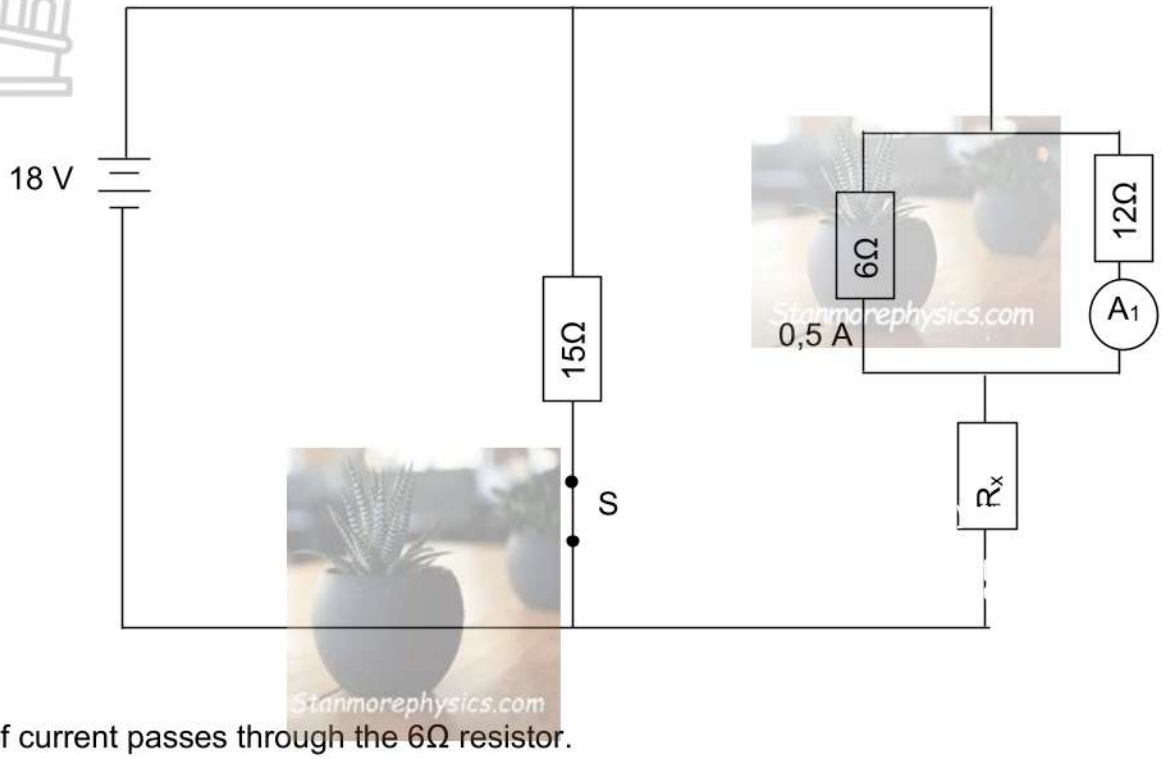
[10]

Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 5 (Start on a new page)

A battery with an EMF of 18 V is connected to four resistors as shown in the circuit diagram below. The connecting wires and the battery have negligible resistance.



0,5 A of current passes through the 6Ω resistor.

5.1 Define the term *resistance* in words. (2)

5.2 Determine the:

5.2.1 Reading on Ammeter A_1 (4)

5.2.2 Resistance of Resistor R_x (4)

5.2.3 Energy transferred in the 6Ω resistor in 3 minutes (5)

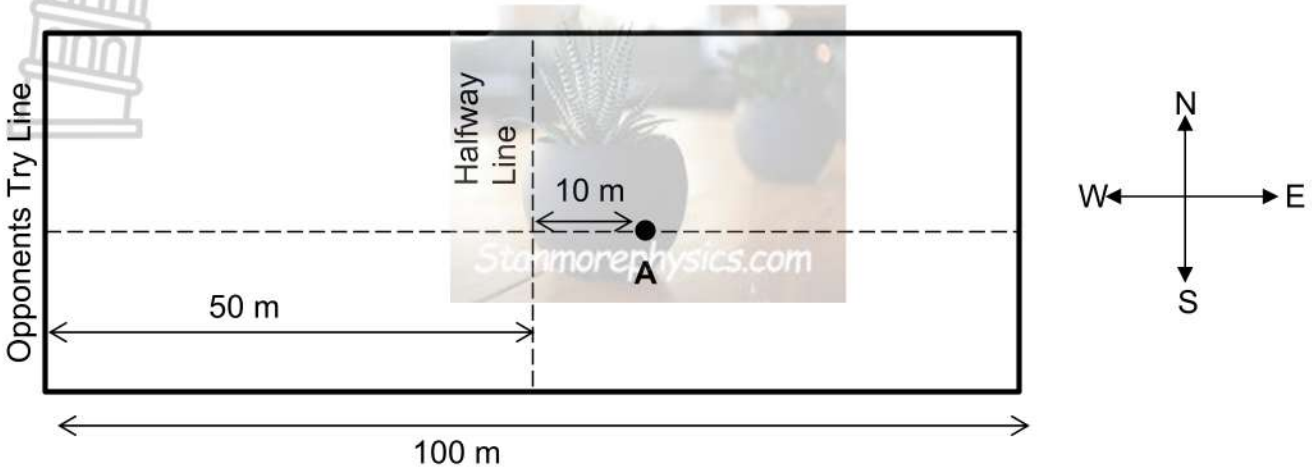
[15]

Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 6 (Start on a new page)

6.1 A rugby player catches the ball, at point A, 10 m east of the halfway line on a standard 100 m pitch. The halfway line is on the 50 m mark.



The player then performs the following sequence of movements along a straight line:

- Run 30 m westwards, towards the opponents try line in 6 seconds.
- Gets tackled and is pushed 15 m eastwards in 3 seconds.
- Recovers and sprints 25 m westward in 5 seconds, before passing the ball.

6.1.1 Define the term *displacement* in words. (2)

6.1.2 Write down the position of the player relative to the halfway line after the first 6 seconds. (1)

6.1.3 Determine the average velocity of the player for the entire motion. (4)

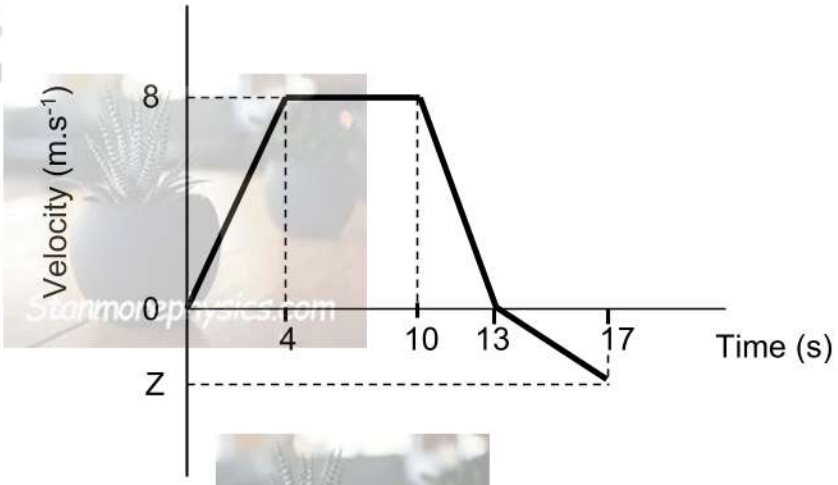
6.1.4 Is the average speed for the entire motion GREATER THAN, LESS THAN or EQUAL TO the average velocity?
Explain the answer. (3)

Copyright reserved

Downloaded from Stanmorephysics.com

6.2 In a different play the rugby player, starting from rest, runs towards the opponents try line due west of his initial position. The player moves along a straight line.

His motion is shown in the velocity-time graph (not drawn to scale) below.



6.2.1 Determine the distance covered by the player for the first 13 seconds. (4)

6.2.2 The player is tackled at 13 seconds and is pushed eastwards at a constant acceleration of – 0,5 m·s^{-2} for 4 seconds. (5)

Using the graph only (no equations of motion), determine the displacement of the player over the entire 17 seconds.

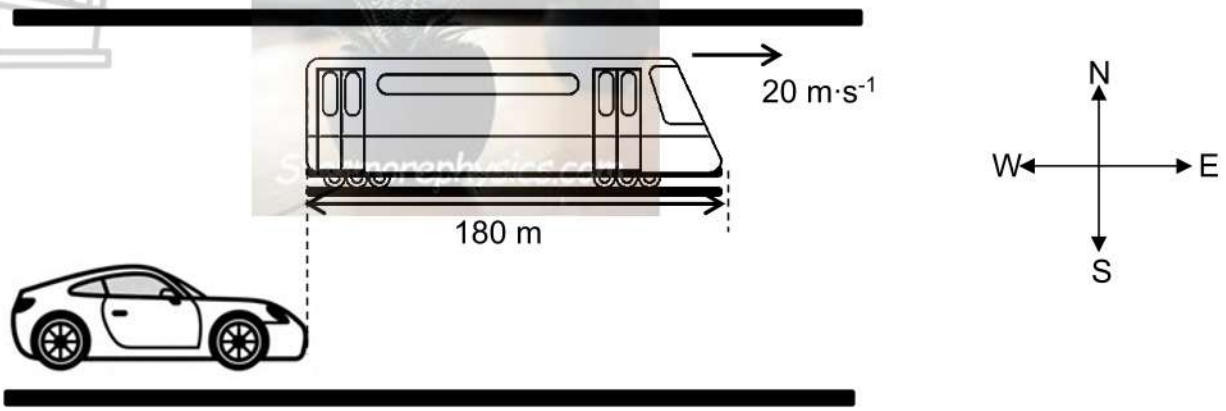
[19]

Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 7 (Start on a new page)

A train of length 180 m is moving at constant velocity of 20 m·s^{-1} east. A car parked alongside the train, takes off from rest when the front of the car is in line with the back of the train.
The car also travels due east and accelerates uniformly at 4m·s^{-2} to reach a maximum speed of 50 m·s^{-1}.



7.1 Define the term *acceleration* in words. (2)

7.2 Calculate the time taken for the car to reach a maximum velocity of 50 m·s^{-1} east. (3)

7.3 Determine the distance between the front of the train and car when the car reaches maximum velocity. (5)

[10]

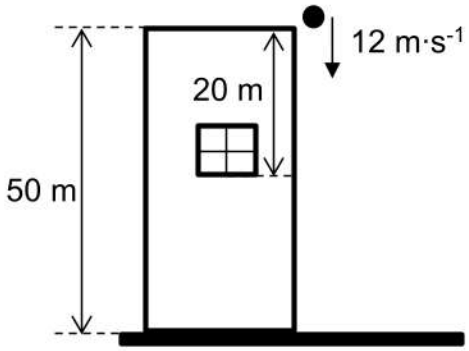
Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 8 (Start on a new page)

A 0,5 kg stone is thrown vertically downward at 12 m·s^{-1} from the top of a 50 m high building. The bottom of a window is located 20 m below the top of the building, as shown in the diagram.

Ignore the effects of air friction.



8.1 Calculate the mechanical energy of the stone. (3)

8.2 Determine the following at the bottom of the window:

8.2.1 Gravitational potential energy of the stone (3)

8.2.2 Speed of the stone (4)

[10]

TOTAL: 100

Copyright reserved

Downloaded from Stanmorephysics.com

DATA FOR PHYSICAL SCIENCES GRADE 10
PAPER 1 (PHYSICS)

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	9,8 $m.s^{-2}$
Speed of light in a vacuum	c	3,0 x 10^{8} $m{\cdot}s^{-1}$
Planck's constant	h	6,63 x 10^{-34} J·s
Charge on electron	q_e	-1,6 x 10^{-19} C
Electron mass	m_e	9,11 x 10^{-31} kg

TABLE 2: FORMULAE

.

WAVES, SOUND AND LIGHT

$v = f\lambda$ or $c = f\lambda$	$T = \frac{1}{f}$
E = hf	$E = \frac{hc}{\lambda}$

ELECTROSTATICS

$Q = n \times q_e$	$Q = \frac{Q1 + Q2}{2}$

ELECTRIC CIRCUITS

$Q = I \times \Delta t$	$\frac{1}{Rp} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots.$
$R_s = R_1 + R_2 + \cdots$	$V = \frac{W}{Q}$
V = IR	

MOTION

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

WORK, ENERGY AND POWER

U = mgh or E_p = mgh	$K = {}^1/_2\, mv^2$ or $E_k = {}^1/_2\, mv^2$

Copyright reserved

Downloaded from Stanmorephysics.com

KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES P1

FINAL EXAMINATION MARKING MEMORANDUM

NOVEMBER 2025

MARKS: 100

DURATION: 2 hours

Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 1:

1.1 D ✓✓ (2)
1.2 C ✓✓ (2)
1.3 B ✓✓ (2)
1.4 B ✓✓ (2)
1.5 A ✓✓ (2)
[10]

QUESTION 2

2.1.1 Longitudinal ✓ (1)

2.1.2a) $\text{speed} = \frac{\text{distance}}{\text{time}}$ ✓

$= \frac{300000}{45}$ ✓

$= 6666{,}67\ m \cdot s^{-1}$ ✓ (3)

2.1.2b) **POSITIVE MARKING FROM 2.1.2a)**

$v = f \times \lambda$ ✓

$6666{,}67 = f \times 3600$ ✓

$f = 1{,}85\ Hz$ ✓ (3)

2.1.3 **POSITIVE MARKING FROM 2.1.2b)**

OPTION 1

$t = 60 - 45$ ✓

$= 15\ s$

$1{,}85$ ✓ $= \frac{\text{number of waves}}{15}$ ✓

$= 27{,}75$ waves ✓

OPTION 2

$t = 60 - 45$ ✓

$= 15\ s$

$T = \frac{1}{f}$

$T = \frac{1}{1{,}85}$

$= 0{,}54\ s$

$\text{number of waves} = \frac{15}{0{,}54}$ ✓✓

$= 27{,}75$ waves ✓ (4)

Copyright reserved

Downloaded from Stanmorephysics.com

2.2.1 The distance between two successive points in phase. ✓✓ (2)

2.2.2
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$
$$= \frac{6500\ ✓}{19\ ✓}$$
$$= 342{,}11\ \text{m·s}^{-1}$$
$v = f \times \lambda$ ✓
$342{,}11 = 490 \times \lambda$ ✓
$\lambda = 0{,}7\ \text{m}$ ✓ (5)

[18]

QUESTION 3

3.1

OPTION 1	**OPTION 2**
$E = h \times f$ ✓	$E = h \times f$ ✓
$= 6{,}63 \times 10^{-34} \times 1{,}2 \times 10^{15}$ ✓	$4{,}5 \times 10^{-19} = 6{,}63 \times 10^{-34} \times f$ ✓
$= 7{,}96 \times 10^{-19}$ J ✓	$f = 6{,}79 \times 10^{14}$ Hz ✓
$E_{(UV-B)} > 4{,}5 \times 10^{-19}$ J ✓	$f_{(UV-B)}$ OR $(1{,}2 \times 10^{15}\ \text{Hz}) > 6{,}79 \times 10^{14}$ Hz ✓

(4)

3.2 $c = f \times \lambda$ ✓
$3 \times 10^{8} = f \times 300 \times 10^{-9}$ ✓
$f = 1 \times 10^{15}$ Hz ✓
It will NOT provide protection against UV-B (since $f < 1{,}2 \times 10^{15}$ Hz) ✓ (4)

[8]

QUESTION 4

4.1 All charges in the universe consists of an integer multiple ✓ of the charge on one electron. ✓ (2)

4.2 $Q = n \times q_e$ ✓
$4 \times 10^{-6} = n \times 1{,}6 \times 10^{-19}$ ✓
$n = 2{,}5 \times 10^{13}$ ✓ (3)

4.3.1 $Q_Y = 2 \times 10^{-6} + 4 \times 10^{-6}$ ✓
$= 6 \times 10^{-6}$ C (2)

4.3.2 **POSITIVE MARKING FROM 4.3.1**
$$Q = \frac{Q1 + Q2}{2} ✓$$
$$2 \times 10^{-6} = \frac{Q_X + 6 \times 10^{-6}}{2} ✓$$
$Q_X = -2 \times 10^{-9}$ C ✓ (3)

[10]

Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 5

5.1 The ratio of the potential difference across a resistor to the current in the resistor. ✓✓ (2)

5.2.1

OPTION 1

$V_{6\Omega} = IR$
$= 0,5 \times 6$ ✓
$= 3$ V
$V_{12\Omega} = IR$✓
$3 = I \times 12$ ✓
$I = 0,25$ A ✓

OPTION 2

$I_{12\Omega} = ½ I_{6\Omega}$ ✓
$= ½ (0,5)$ ✓✓
$= 0,25$ A ✓

(4)

5.2.2 **POSITIVE MARKING FROM QUESTION 5.2.1**

$V_{Rx} = 18 - 3$ ✓
$= 15$ V
$I_{Rx} = 0,5 + 0,25$ ✓
$= 0,75$ A

$R_x = \frac{V}{I}$
$= \frac{15}{0,75}$ ✓
$= 20\ \Omega$ ✓

(4)

5.2.3

OPTION 1

$Q = I\Delta t$
$= 0,5 \times 180$ ✓
$= 90$

$W = VQ$✓
$= 3$✓ $\times 90$ ✓
$= 270$ J✓

OPTION 2

$W = I^2R\Delta t$ ✓
$= 0,5^2$ ✓$\times 6$ ✓$\times 180$ ✓
$= 270$ J ✓

OPTION 3

$W = VI\Delta t$ ✓
$= 3$ ✓$\times 0,5$✓ $\times 180$✓
$= 270$ J ✓

OPTION 4

$W = \frac{V^2}{R}\Delta t$✓
$W = \frac{3^2}{6}$✓$\times 180$✓
$= 270$ J ✓

(5)

[15]

Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 6

6.1.1 The difference in position in space ✓✓ (2)

6.1.2 20 m west ✓ (1)

6.1.3 $\Delta x = 30 - 15 + 25$ ✓
$= 40$ m
$v = \frac{\Delta x}{\Delta t}$ ✓
$= \frac{40}{14}$ ✓
$= 2{,}86$ m·s^{-1} West ✓ (4)

6.1.4 Greater than✓ (3)
Since the player changes direction/pushed east ✓, the distance is greater than displacement. ✓

6.2.1 $\Delta x = \frac{1}{2} \times 4 \times 8$ ✓ $+ 6 \times 8$ ✓ $\times \frac{1}{2} \times 3 \times 8$ ✓
Distance = 76 m✓ (4)

6.2.2 $a = \frac{y_2 - y_1}{x_2 - x_1}$
$-0{,}5$✓ $= \frac{Z - 0}{17 - 13}$ ✓
$Z = -2$ m·s^{-1}
$\Delta x_{13-17\ s} = \frac{1}{2} \times 4 \times (-2)$ ✓
$= -4$ m
$\Delta x = 76 - 4$ ✓
$= 72$ m west ✓ (5)
[19]

Stanmorephysics.com

Copyright reserved

Downloaded from Stanmorephysics.com

QUESTION 7

7.1 Rate of change of velocity ✓✓ (2)

7.2 $v_f = v_i + a\Delta t$ ✓
$50 = 0 + 4\Delta t$ ✓
$\Delta t = 12,5$ s ✓ (3)

7.3 **POSITIVE MARKING FROM QUESTION 7.2**

Car:
$\Delta x = v_i\Delta t + \frac{1}{2} a\Delta t^2$ ✓
$= (0)(12,5) + \frac{1}{2}(4)(12,5^2)$ ✓
$= 312,5$ m

OR $v_f^2 = v_i^2 + 2a\Delta x$ ✓
$(50)^2 = 0^2 + 2(4)\Delta x$ ✓
$\Delta x = 312,5$ m

Train:
$\Delta x = v_i\Delta t + \frac{1}{2} a\Delta t^2$
$= (20)12,5 + \frac{1}{2}(0)(12,5^2)$ ✓
$= 250$ m

OR $\Delta x = v\Delta t$
$= (20)12,5$ ✓
$= 250$ m

Distance = 250 + 180 - 312,5 ✓
= 117,5 m ✓ (5)

[10]

QUESTION 8

8.1 $E_T = mgh + \frac{1}{2}mv^2$ ✓
$= \underline{0,5 \times 9,8 \times 50} + \underline{\frac{1}{2} \times 0,5 \times (12)^2}$ ✓
$= 281$ J ✓ (3)

8.2.1 $E_P = mgh$
$= \underline{0,5 \times 9,8}$ ✓ x $\underline{30}$ ✓
$= 147$ J ✓ (3)

8.2.2 **POSITIVE MARKING FROM 8.1 AND 8.2.1**
$E_k = 281 - 147$ ✓
$= 134$ J
$E_k = \frac{1}{2}mv^2$
134 ✓$= \frac{1}{2} \times 0,5 \times v^2$ ✓
$v = 23,15$ m·s^{-1} ✓ (4)

[10]

TOTAL: 100

Copyright reserved