KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL STANDARDISED ASSESSMENT

GRADE 12

PHYSICAL SCIENCES P1 (PHYSICS)

PREPARATORY EXAMINATION

MARKING GUIDELINES

SEPTEMBER 2026

Marks: 150

Duration: 3 hours

This marking guidelines consists of 10 pages.

QUESTION 1

1.1	B ✓✓	(2)
1.2	A ✓✓	(2)
1.3	C ✓✓	(2)
1.4	D ✓✓	(2)
1.5	A ✓✓	(2)
1.6	B ✓✓	(2)
1.7	A ✓✓	(2)
1.8	D ✓✓	(2)
1.9	C ✓✓	(2)
1.10	C ✓✓	(2)
		[20]

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QUESTION 2

2.1



(3)

NB: Any force including vertical forces deduct one mark

2.2 $f_k = \mu_k N$ ✓
$f_k = \mu_k(mg - F\sin\theta)$

$= \underline{0,2\ (2x \times 9,8)}$ ✓ $\underline{- 0,2\ (40 \sin 30°)}]$ ✓
$= 3,92x - 4$ N

(3)

2.3 When a net force acts on an object, the object will accelerate in the direction of the net force, and the acceleration is directly proportional to the force ✓ and inversely proportional to the mass ✓ of the object. (2)
NB: If any of the underlined words or phrases are missing deduct 1 mark.

2.4

Block A	**Block B**
$F_{net} = ma$ ✓	$F_{net} = ma$
$T - Fg = ma$	$F\cos\theta - T - f_k = ma$
$T - 9,8x$ ✓ $= 1,5x$	$40\cos 30° - T - (3,92x - 4)$ ✓ $= 3x$

$x = 2,12$ kg
mass of block B = 2,12 x 2 ✓ = 4,24 kg ✓ ✓ (6)

2.5.1 Remains the same. ✓ (1)

2.5.2 Increases. ✓ (1)

[16]

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QUESTION 3

3.1 An object that has been given an initial velocity and then moves under the influence of the gravitational force only. ✓✓

(2 or 0)

3.2

Upward as positive	**Downward as positive**
$v_f = v_i + a\Delta t$ ✓	$v_f = v_i + a\Delta t$ ✓
$0 = vi + (-9,8).\ 1,5$ ✓	$0 = vi + (9,8).\ 1,5$ ✓
$v_i = 14,7\ m.s^{-1}$	$v_i = -14,7\ m.s^{-1}$
Therefore the initial velocity is	Therefore the initial velocity is
14,7 $m.s^{-1}$upwards✓	14,7 $m.s^{-1}$upwards✓

(3)

3.3 **OPTION 1**

Upward as positive	Downward as positive
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$✓	$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$✓
$30 = 25\Delta t + \frac{1}{2}(-9.8)\Delta t^2$ ✓	$-30 = -25\Delta t + \frac{1}{2}(9.8)\Delta t^2$ ✓
$\Delta t = 1,93$ s ✓	$\Delta t = 1,93$ s ✓

OPTION 2

Upward as positive	Downward as positive
$v_f^2 = v_i^2 + 2a\Delta y$	$v_f^2 = v_i^2 + 2a\Delta y$
$v_f^2 = 25^2 + 2(-9,8)(30)$	$v_f^2 = (-25)^2 + 2(9,8)(-30)$
$v_f = 6,08\ m \cdot s^{-1}$	$v_f = 6,08\ m \cdot s^{-1}$
$v_f = v_i + a\Delta t$✓ ✓	$v_f = v_i + a\Delta t$✓ ✓
$6,08 = 25 + (-9,8)\ \Delta t$	$-6,08 = -25 + (9,8)\ \Delta t$
$\Delta t = 1,93$ s✓	$\Delta t = 1,93$ s✓

(3)

3.4 **POSITIVE MARKING FROM 3.2**

Ball M

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

$-(30 - P) = 14,7\ t + \frac{1}{2}(-9.8)t^2$ ✓

Equating equations 1 and 2 ✓

P = 27,86 m ✓

Ball N

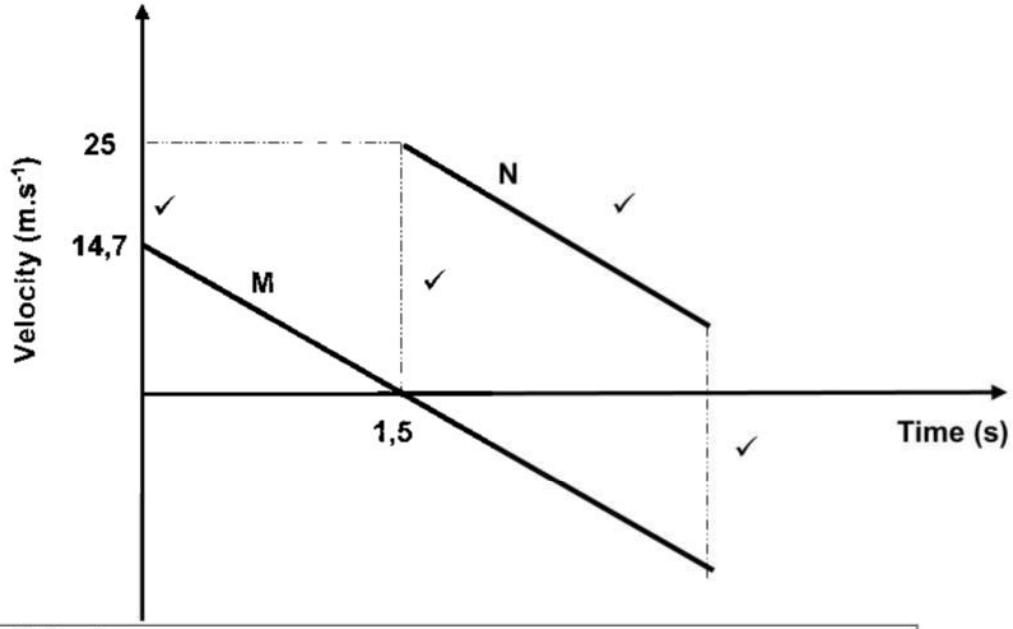
$\Delta y = v_i\Delta t + \frac{1}{2}a\Delta t^2$

$P = 25\ (t - 1,5) + \frac{1}{2}(-9.8)(t - 1,5)^2$ ✓

(5)

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3.5 **POSITIVE MARKING FROM 3.2**



(4)

Criteria	
Both initial velocities of M and N on y-axis.	✓
Graph of N starts at time 1,5 s.	✓
Graphs are parallel to each other.	✓
Both graphs end at same time, with graph of N above the x-axis and M below the x-axis.	✓

[17]

QUESTION 4

4.1 The product of the net force acting on an object and the time the net force acts on the object. ✓✓ (2 or 0)

(2)

4.2 (Combined mass of pistol and two bullets = 0,8 + 2(0,012) = 0,824kg)

Choosing West as Positive

Impulse = m ($v_f - v_i$) ✓

= 0, 824 (4,8 – 0) ✓

= 3,96 N.s ✓

(3)

4.3 $\sum p_{before} = \sum p_{after}$

$v_i(m_p + m_b) = m_p v_{pf} + m_b v_{bf}$ ✓

Bullets velocity v_b.

$\underline{0 = [(0,8 + 0,024) \times (-4,8)] + (0,012.v_b)}$ ✓

$V_b = 329,6\ m.s^{-1}$, East.

Recoil velocity after the last bullet is shot.

$v_i(m_p + m_b) = m_p v_{pf} + m_b v_{bf}$

$0 = \underline{0,8\ v_p}$ ✓ $+ \underline{(0,012 \times 329,6)}$ ✓

$v_p = -4,94\ m.s^{-1}$

Therefore $v_p = \underline{4,94\ m.s^{-1}, West}$ ✓

(5)

[10]

QUESTION 5

5.1 Work done is $W = F\Delta x\cos\theta$, where F is the magnitude of the force, Δx is the magnitude of the displacement, and ~~Θ~~ the angle between the force and the displacement. ✓✓

or

The product of the force and the displacement of the object in the direction of the displacement. ✓✓ (2 or 0)

(2)

5.2 $W_{Fg} = mghcos\theta$ ✓

$= 150 \times 9,8 \times 8 \times \cos 180^o$ ✓

$= -11760\ J$ ✓

(3)

5.3 $\Delta x = v.\Delta t = 1,5 \times 12$ ✓ $= 18m$

$\sin\theta = \frac{8}{18}$ ✓; therefore $\theta = 26,39^o$

$W_{fk} = f_k \Delta x \cos\theta$

$= (\mu mg\cos\theta)\Delta x\cos\theta$ ✓

$= [\underline{0,3\ (150 \times 9,8 \times \cos 26,39^o)}$ ✓ $\times 18 \times \cos 180^o]$ ✓

$W_{fk} = -7110,78\ J.$ ✓

(6)

5.4 The rate at which work is done. ✓✓(2 or 0) (2)

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5.5 $W_{net} = W_T + W_N + W_{Fg} + W_{fk}$

$0 = W_T + 0 + (-11760) + (-7110,78)$ ✓

$W_T = 18870,78$ J

$P = \frac{W}{\Delta t}$ ✓ $= \frac{18870,78}{12}$ ✓ $= 1572,57$W ✓

Therefore, Motor-winch **B.** ✓ (5)

[18]

QUESTION 6

6.1 The change in frequency of the sound detected by a listener, because the sound source and the listener have different velocities relative to the medium of sound propagation. ✓✓
Or
An (apparent) change in observed/detected frequency/pitch as a result of the relative motion between a source and an observer/listener. ✓✓ (2)
NB: If any of the underlined words or phrases are missing deduct 1 mark

6.2 Away. ✓
The detected frequency is lower than the emitted sound frequency. ✓ (2)

6.3 $f_L = \frac{v \pm v_L}{v \pm v_s} f_s$ ✓

719 ✓$= \left(\frac{V}{V + 14,745} \right)$ ✓ 750 ✓

$v = 341,99$ m.s^{-1} ✓ (5)

6.4.1 Decreases. ✓ (1)

6.4.2 Remains the same. ✓ (1)

6.5 Ultrasound scanning✓/ Doppler flowmeter. (any other correct answer) (1)
[12]

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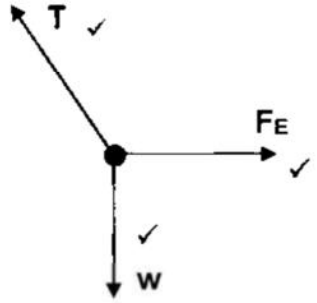
QUESTION 7

7.1.1 The magnitude of the electrostatic force exerted by one point charge on another point charge is directly proportional to the product of the magnitudes of the charges and inversely proportional to the square of the distance between them. ✓✓ (2)

NB:

- If any of the underlined words or phrases are missing deduct 1 mark.
- If they state the Universal Law of gravitation = 0/2

7.1.2



(3)

7.1.3

$$F = \frac{kQ_1Q_2}{r^2} \checkmark$$

$$F = \frac{9\times10^{9} \times 12\times10^{-7} \times 20 \times 10^{-7}}{(0,17)^2} \checkmark$$

$$F = 0,7474 \text{ N}$$

$$\frac{mg}{\sin 70^o} = \frac{0,7474}{\sin 20^o} \checkmark$$

m x 9,8 = 2,053 ✓

m = 0, 21 kg. ✓

$$\tan 70^0 = \frac{mg}{0,7474} \checkmark$$

$0,7474 \tan 70^0$ = m x 9,8✓

m = 0,21 kg✓

(5)

7.2.1 Region in space where an electric charge can experience a force. ✓✓(2 or 0) (2)

NB: If they define **electric field at point** award full marks.

7.2.2 $E = \frac{kQ}{r^2}$ ✓

$$\frac{9\times10^{9}\times20\times10^{-9}}{(d - 0,06)^2} \checkmark = \frac{9\times10^{9}\times5\times10^{-9}}{(0,06)^2} \checkmark$$

= 0,18 m ✓

(4)

[16]

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QUESTION 8

8.1.1 The maximum energy provided by a battery per unit charge passing through it. ✓✓ (2 or 0) (2)

8.1.2 Inverse of emf ✓ (Reciprocal of emf)

Equation in the form y=mx + c

$\frac{1}{V} = \frac{r}{\varepsilon R} + \frac{1}{\varepsilon}$ ✓✓ (3)

8.1.3 y-intercept from the graph = 0,26

$\frac{1}{\varepsilon} r = m$

$0,26 \checkmark r = \frac{0,78 - 0,38 \checkmark}{3,9 - 0,9 \checkmark}$

$r = 0,51\ \Omega$ ✓ (4)

8.2.1 12V ✓ (1)

8.2.2 0 V (Zero) ✓ (1)

8.2.3 $V_{10} = IR = 0,72 \times 10 \checkmark = 7,2V$

$I_{15} = \frac{V}{R} = \frac{7,2}{15} \checkmark = 0,48\ A$

$I_T = I_{10} + I_{15} = 0,72 + 0,48 = 1,2\ A$ ✓

$\varepsilon = I(R + r)$

$\varepsilon = IR + Ir + V_{//}$ ✓

$12 = 1,2R + 1,2x0,2 + 7,2$ ✓

$R = 3,80\ \Omega$ ✓ (6)

8.2.4 No effect. ✓ (1)

8.2.5 Decreases. ✓✓ (2)

[20]

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QUESTION 9

9.1 Mechanical to electrical energy. ✓ (1)

9.2 Anticlockwise. ✓ (1)

9.3 Increase the rotational speed. ✓ (1)

9.4 Increasing the rotational speed increases the rate of change of the magnetic flux. ✓
The induced emf is directly proportional to the rate of change of the magnetic flux. ✓ (or $\mathcal{E} = - N \frac{\Delta\Phi}{\Delta t}$) (2)

9.5.1 Root mean square. ✓ (1)

9.5.2 $V_{rms} = \frac{V_{max}}{\sqrt{2}} = \frac{311,127}{\sqrt{2}}$ ✓ = 220V

$P_{ave} = \frac{V_{rms}^2}{R}$ ✓

$1200 = \frac{220^2}{R}$ ✓

$R = 40,33\ \Omega$ ✓ (4)

9.5.3 Remains the same ✓ (1)

[11]

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QUESTION 10

10.1 Threshold/ Cut-off frequency. ✓ (1)

10.2 Potassium. ✓ (1)

10.3 **Caesium**

$E = W_o + E_{kmax}$ ✓ Any

$hf = hf_o + E_{kmax}$

$6{,}63\times10^{-34}.\ f = 6{,}63\times10^{-34} \times 5{,}07 \times 10^{14} + E_{kmax}$ ✓… eqn 1

Potassium

$hf = hfo + E_{kmax}$

$6{,}63\times10^{-34}.\ f = 6{,}63\times10^{-34} \times 5{,}55 \times 10^{14} + 0{,}83E_{kmax}$ ✓… eqn 2

Equate eqn 1 and 2:

✓

$6{,}63\times10^{-34} \times 5{,}07 \times 10^{14} + E_{kmax} = 6{,}63\times10^{-34} \times 5{,}55 \times 10^{14} + 0{,}83E_{kmax}$

$E_{kmax} = 1{,}872 \times 10^{-19}J$

E_{kmax} value in eqn 1

$6{,}63\times10^{-34}.\ f = 6{,}63\times10^{-34} \times 5{,}07 \times 10^{14} + 1{,}872 \times 10^{-19}$ ✓

$f = 7{,}89 \times 10^{14}$ Hz ✓ (6)

10.4.1 Remains the same. ✓ (1)

10.4.2 Increases. ✓ (1)

[10]

TOTAL: [150]

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