education

Department:
Education
PROVINCE OF KWAZULU-NATAL

NATIONAL
SENIOR CERTIFICATE

GRADE 12

PHYSICAL SCIENCES

COMMON TEST

MARCH 2023

MARKING GUIDELINE

MARKS : 100

Stanmorephysics

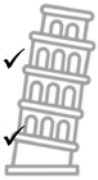
This Marking Guideline consists of 10 pages.

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QUESTION 1: MULTIPLE-CHOICE QUESTIONS

1.1 D✓✓

1.2 C✓✓



1.3 C✓✓

1.4 B✓✓

1.5 A✓✓

1.6 B✓✓

1.7 C✓✓

1.8 A✓✓

1.9 B✓✓

1.10 A✓✓

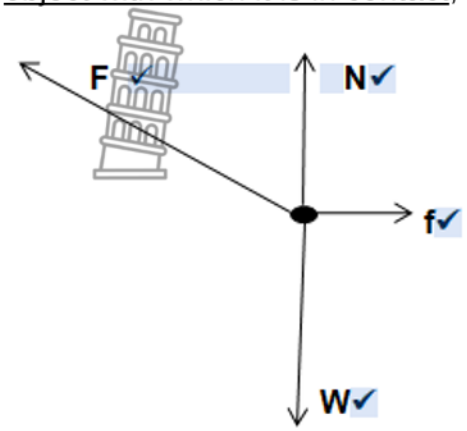
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QUESTION 2 (Start on a new page.)

2.1 **Normal force** is the force or component of a force which a surface exerts on an object with which it is in contact, and which is perpendicular to the surface.✓✓ (2)

2.2



	Accept the following symbols
N	Normal Force/Normal/F_N
f	Static friction/ f_s
W	Weight/F_W /Gravitational force/f_g
F	Force applied/F_A

Notes
- Mark is awarded for label and arrow.
- Do not penalize for length of the arrows.
- Deduct 1 mark or any additional force.
- If force(s) do not make contact with body/dot:*Max:3/4*
- If arrows missing but labels are there: *Max: 3/4*

(4)

2.3
$$f_s^{\max} = \mu_s N \checkmark$$
$$140 = 0,3N \checkmark$$
$$N = 466,67N \checkmark$$

(3)

2.4 **POSITIVE MARKING FROM 2.3**

$$F_x = f_s^{\max} = 140N \checkmark$$
$$N = F_g - F_y$$
$$466,67 = (60)(9,8) - F_y \checkmark$$
$$F_y = 121,33N$$
$$\tan\theta = \frac{F_y}{F_x}$$
$$\tan\theta = \frac{121,33}{140} \checkmark$$
$$\theta = 40.91^0 \checkmark$$

(4)
[13]

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QUESTION 3 (Start on a new page.)

3.1 0,5 m✓ (1)

3.2.1 **OPTION 1/*OPSIE 1***



Upwards positive

$v_f = v_i + a\Delta t$✓

-6,27✓ $= -2 + (-9,8)\Delta t$ ✓

$\Delta t = 0,44$ s ✓

Downwards positive

$v_f = v_i + a\Delta t$✓

6,27✓ $= 2 + (9,8)\Delta t$ ✓

$\Delta t = 0,44$ s ✓

OPTION 2/*OPSIE 2*

Upwards positive

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

-1,8 ✓$= (-2)\Delta t + \frac{1}{2}(-9,8)\Delta t^2$ ✓

$$\Delta t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\Delta t = \frac{-2 \pm \sqrt{(2)^2 - 4(4.9)(-1.8)}}{2(4.9)}$$

= 0,44 s ✓

Downwards positive

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

1,8 ✓$= (2)\Delta t + \frac{1}{2}(9,8)\Delta t^2$ ✓

$$\Delta t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\Delta t = \frac{-2 \pm \sqrt{(-2)^2 - 4(4.9)(-1.8)}}{2(4.9)}$$

= 0,44 s ✓

(4)

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OPTION 3

$\Delta y = \frac{(vi + vf))}{2} \Delta t$ ✓

$1,8 ✓ = \frac{(2 + 6,27))}{2} \Delta t$ ✓

$\Delta t = 0,44$ s✓

(4)

3.2.2 **Upwards positive:**

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$0^2 = v_i^2 + 2(-9,8)(0,9)$ ✓

$v_i = 4,2 \text{ m·s}^{-1}$ ✓upwards ✓

Downwards positive:

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$0^2 = v_i^2 + 2(9,8)(0,9)$ ✓

$v_i = 4,2 \text{ m·s}^{-1}$ ✓ upwards✓

(4)

3.2.3 **Upwards positive:**

$F_{net}\Delta t = m\Delta v$

$F_{net}(0,2) = (0,5)[(4,2 – (-6,27)]$ ✓

$F_{net} = 26,175$ N

$F_{net} = F - Fg$

$26,1755 = F - (0,5)(9,8)$ ✓

$F = 31,075$ N✓

✓ for either equation

Downwards positive:

$F_{net}\Delta t = m\Delta v$ ✓

$F_{net}(0,2) = (0,5)[(-4,2 – (6,27)]$ ✓

$F_{net} = -26,175$ N

$F_{net} = 26,175$ N

$F_{net} = Fg - F$

$-26,1755 = (0,5)(9,8) - F$ ✓

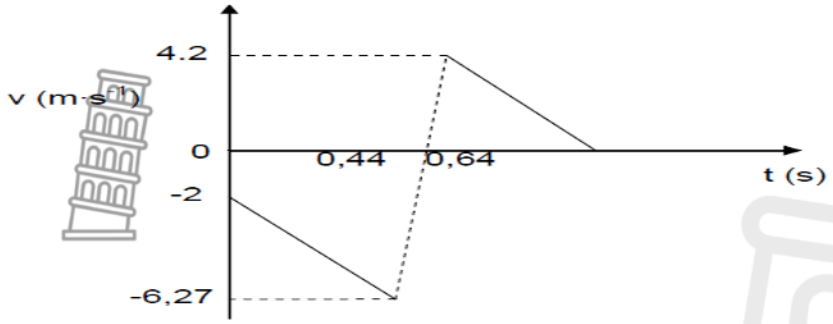
$F = 31,075$ N✓

✓ for either equation

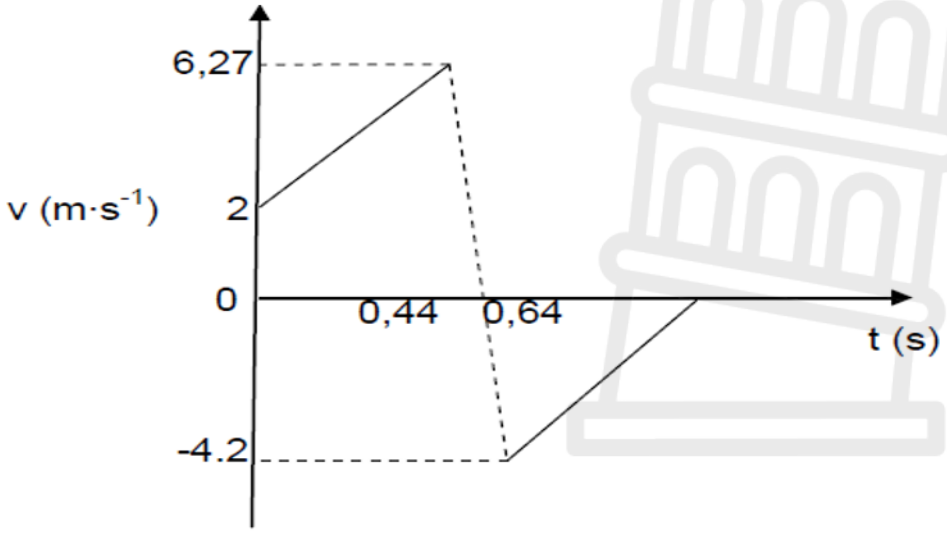
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3.5 **Upwards positive:**



Downwards positive:



Criteria for graph	Marks
2 straight discontinuous parallel lines, one above and one below the time axis	✓
First part of the graph starts at v = 2 m·s^{-1} at t = 0 s and extends until v = 6,27 m·s^{-1} at t = 0,44 s.	✓
Second part of graph starts at v = 4,2 m·s^{-1} at t = 0,64 s until v = 0 m·s^{-1}.	✓

(3)
[16]

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QUESTION 4 (Start on a new page.)

4.1 A system on which the net external force is zero.✓✓ (2)

4.2 **Right as Positive:**

$\Sigma p_i = \Sigma p_f$
$\Delta pA = -\Delta pB$ } Any one✓

$m_A v_{i_A} + m_B v_{i_B} = m_A v_{f_A} + m_B v_{f_B}$
$(0,25)(4) + (0,3)(-6) = (0,25)(-2) + (0,3)(v_{f_2})$ ✓✓
$v_{f_2} = -1\,\text{m.s}^{-1}$
$v_{f_2} = 1\,\text{m.s}^{-1}$ to the left✓

Left as Positive:

$\Sigma p_i = \Sigma p_f$
$\Delta pA = -\Delta pB$ } Any one✓

$m_A v_{i_A} + m_B v_{i_B} = m_A v_{f_A} + m_B v_{f_B}$

$(0,25)(-4) + (0,3)(6) = (0,25)(2) + (0,3)(v_{f_2})$ ✓✓
$v_{f_2} = 1\,\text{m.s}^{-1}$
$v_{f_2} = 1\,\text{m.s}^{-1}$ to the left✓

(4)

4.3 $\Sigma E_{k\,(\text{before})} = \frac{1}{2} m_A v_{i_A}^{\,2} + \frac{1}{2} m_B v_{i_B}^{\,2}$ ✓

$= \frac{1}{2}(0,25)(4)^2 + \frac{1}{2}(0,3)(-6)^2$ ✓

= 7,4 J

$\Sigma E_{k(\text{after})} = \frac{1}{2} m_A v_{f_A}^{\,2} + \frac{1}{2} m_B v_{f_B}^{\,2}$

$= \frac{1}{2}(0,25)(-2)^2 + \frac{1}{2}(0,3)(-1)^2$ ✓

= 0,65 J

$\Sigma E_{k\,(\text{before})} \neq \Sigma E_{k(\text{after})}$ ✓

∴ INELASTIC✓

NOTE: If starts with $\Sigma E_{k\,(\text{before})} = \Sigma E_{k\,(\text{after})}$ maximum 2/5

(5)
[11]

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QUESTION 5

5.1.1 4,5 – dimethyl✓ hex – 2 – ✓ene✓

Marking criteria:
- Identify as alkene:✓
- Hex – 2 -: ✓
- All the substituents correct and correctly numbered: ✓

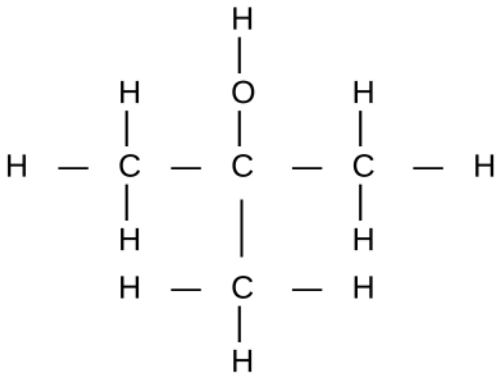
(3)

5.1.2 C ✓ (1)

5.1.3 carboxyl ✓ (1)

5.1.4 C_nH_{2n} ✓ (1)

5.2



Marking criteria:
- Correct functional group: $\frac{1}{2}$
- Whole structure correct: $\frac{2}{2}$

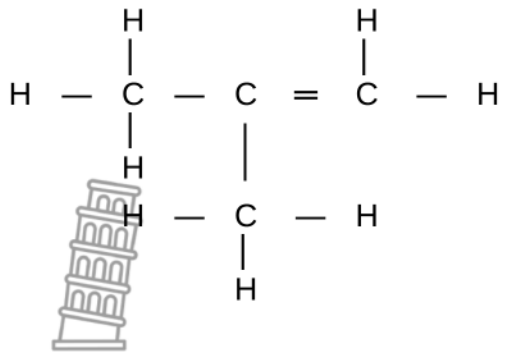
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5.3.1 Organic molecules with the same molecular formula but different positions of the side chains/substituents/functional groups on the parent chain ✓✓ (2)

5.3.2 but – 1 – ene ✓ (1)

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5.3.3



Marking criteria:

- 3 carbons in parent chain with the double bond✓
- Methyl group as a substituent ✓

(2)

5.4 Unsaturated✓
There multiple bonds between C atoms in the hydrocarbon chain/triple bond between C atoms in the hydrocarbon chain. ✓ (2)

5.5 $2\ C_6H_{14} + 19\ O_2 \rightarrow 12\ CO_2 + 14\ H_2O$
Reactants ✓ Products ✓ Balancing ✓ (3)
[18]

QUESTION 6

6.1 The temperature at which the vapour pressure equals atmospheric (external) pressure. ✓✓ (2 or 0) (2)

6.2 Compounds have the same functional group/belong to the same homologous series✓ (1)

6.3 As the length of the carbon chain/molecular mass increases the boiling point increases for the same functional group/homologous series✓✓ (2)

6.4 A✓ (1)

6.5.1 Type of functional group/organic compound/homologous series. ✓ (1)

6.5.2
- B has 2 sites for hydrogen bonding✓ and
- therefore has stronger intermolecular forces✓
- That require more energy to overcome. ✓

OR

- D has only 1 site for hydrogen bonding✓ and
- therefore has weaker intermolecular forces✓
- That require less energy to overcome. ✓

(3)
[10]

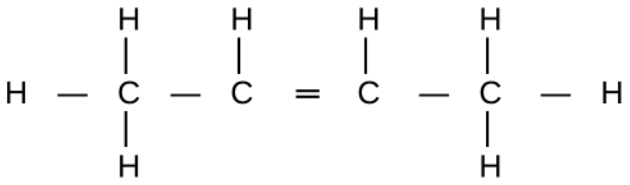
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QUESTION 7

7.1 hydrolysis✓ (1)

7.2.





Double bond between the second and third carbon atoms✓
Whole structure correct✓

(2)

7.3 Water(H_2O)/sulphuric acidH_2SO_4/phosphoric acidH_3PO_4/ hydrogen chloride(HCl) ✓ (1)

7.4 Addition/hydration ✓ (1)

7.5.1 Potassium hydroxide/KOH ✓ (1)

7.5.2 KOH in reaction **I** is dilute. ✓
KOH in reaction **II** is concentrated. ✓ (2)

7.6.1 2 - bromo✓butane✓ (2)

7.6.2 Butan✓ – 2 – ol ✓ (2)

[12]

TOTAL MARKS: 100

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