KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

PHYSICAL SCIENCES

COMMON TEST

MARKING GUIDELINE

MARCH 2024

MARKS : 100

This marking guidelines consists of 9 pages.

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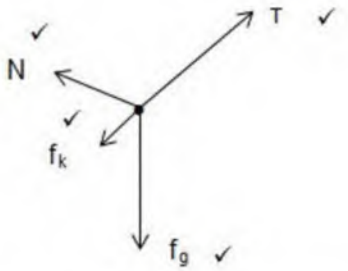
QUESTION 1

1.1 D✓✓ (2)
1.2 D✓✓ (2)
1.3 D✓✓ (Accept C) (2)
1.4 B✓✓ (2)
1.5 A✓✓ (2)
1.6 D ✓✓ (2)

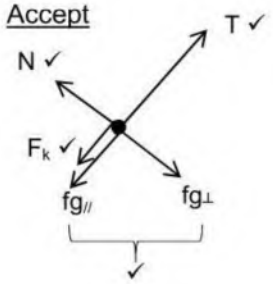
QUESTION 2

2.1 When a net 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)

2.2



Accept



Accepted labels	
W	F_g/F_w/Wight/Gravitational force
f_k	f/friction/Kinetic friction
N	F_N/Normal force
T	Tension/F_T/T

(4)

2.3.1 $N = F_{g_\perp}$

$N = mg\cos\theta$

$N = (3)(9,8)\cos 30^0$ ✓

$N = 25,46N$ ✓ (2)

2.3.2 $f_k = \mu_k N$ ✓

$f_k = (0,15)[(5)(9,8) + (60)\sin 20^0]$ ✓

$f_k = 10,43N$ ✓ (3)

2.3.3 **POSITIVE MARKING FROM 2.3.1 AND 2.3.2**

3kg:

$F_{net} = ma$
$T + (-f_k) + (-f_{g_{//}}) = ma$ ✓

$T - (0,15)(25,46) - (3)(9,8)\sin 30^0 = (3)a$ ✓

$T = 3a + 18,52$ eq.1

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5kg:

$F_{net} = ma$
$f_x + (-f_k) + (-T) = ma$
$(60)\cos 20^0 - 10,43 - T = (5)a$ ✓
$T = 45,95 - 5a$ eq.2

$\therefore 3a + 18,52 = 45,95 - 5a$
$a = 3,43 m.s^{-2}$

$\therefore T = 3(3,43) + 18,52$ ✓
$T = 28,81N$ ✓

OR

$T = 45,95 - 5(3,43)$ ✓
$T = 28,80N$ ✓

(5)

[16]

QUESTION 3

3.1 Inertia.✓ (1)

3.2

3.2.1 0 / zero / 9,8m.s^{-2} downwards ✓ (1)

3.2.2 9,8m.s^{-2} downwards✓ (1)

3.3	
Upwards Positive	**Upwards Negative**
$v_f = v_i + a\Delta t$ ✓ $0 = 20 + (-9,8)\Delta t$ ✓ $\Delta t = 2,04s$ ✓	$v_f = v_i + a\Delta t$ ✓ $0 = -20 + (9,8)\Delta t$ ✓ $\Delta t = 2,04s$ ✓

(3)

3.4 POSITIVE MARKING FROM 3.3

Upwards Positive

$\Delta y = v_i \Delta t$ ✓

$\Delta y = (20)(2,04)$ ✓

$\Delta y = 40,80m$

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

$\Delta y = (20)(2,04) + (0,5)(-9,8)(2,04)^2$ ✓

$\Delta y = 20,41m$

OR

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$(0)^2 = (20)^2 + 2(-9,8)\Delta y$ ✓

$\Delta y = 20,41m$

Distance = 40,80 – 20,41 ✓

= 20,39 m✓

Upwards Negative

$\Delta y = v_i \Delta t$ ✓

$\Delta y = (-20)(2,04)$ ✓

$\Delta y = -40,80m$

$\Delta y = 40,80m$

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

$\Delta y = (-20)(2,04) + (0,5)(9,8)(2,04)^2$ ✓

$\Delta y = -20,41m$

$\Delta y = 20,41m$

OR

$v_f^2 = v_i^2 + 2a\Delta y$ ✓

$(0)^2 = (-20)^2 + 2(9,8)\Delta y$ ✓

$\Delta y = 20,41m$

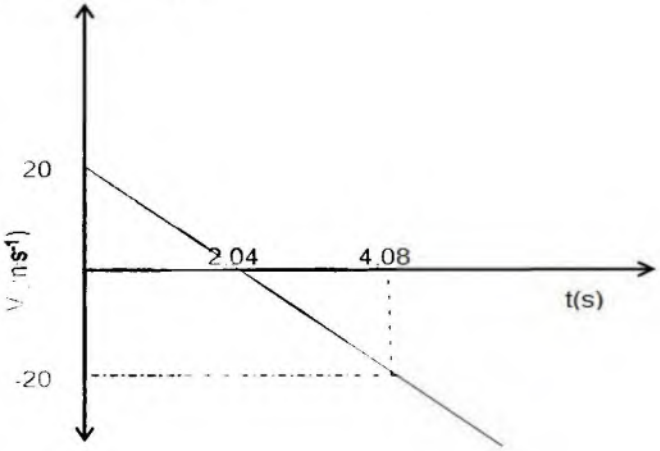
Distance = 40,80 – 20,41 ✓

= 20,39 m✓

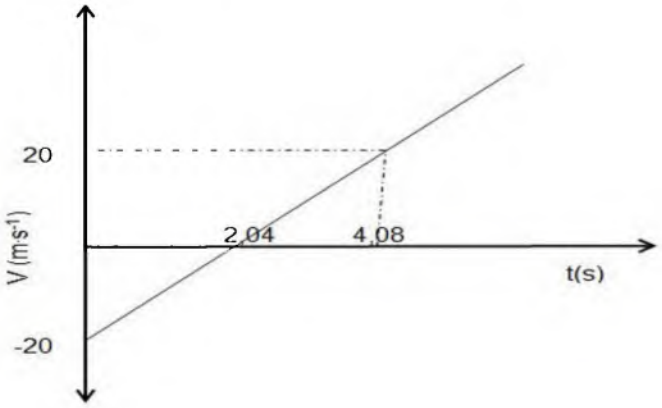
(6)

3.5 POSITIVE MARKING FROM 3.3 AND 3.4

Upwards Positive



Upwards Negative



Marking criteria	
Initial velocity 20 m.s^{-1}/72 km/h	✓
Time for the ball at maximum height, 2,04s	✓
Time for the ball passing point Y, 4,08s	✓
Straight line graph extending beyond point Y.	✓

(4)

[16]

QUESTION 4

4.1 A system on which the net external force is zero.✓✓ (2 or 0) (2)

4.2

$$\sum p_{before} = \sum p_{after}$$
$$m_1 v_{i_1} + m_2 v_{i_2} = (m_1 + m_2) v_f \quad \checkmark$$
$$m_1(30) + (1100)(-20) \checkmark = (m_1 + 1100)(10) \checkmark$$
m_1 = 1650 kg
The total mass is less than the allowed mass✓.
∴ No.✓ (5)

4.3 POSITIVE MARKING FROM 4.2
OPTION 1

$v_f^2 = v_i^2 + 2a\Delta x$✓
$\underline{(0)^2 = (10)^2 + 2(-0,91)\Delta x}$✓
Δx = 54,95m ✓

$F_{net} = ma$ ✓
-2500 = 2750a✓
a = -0,91 m.s^{-2}

(5)

OPTION 2

$F_{net} = \frac{\Delta p}{\Delta t}$

$F_{net} = \frac{m(v_f - v_i)}{\Delta t}$ ✓

$-2500 = \frac{2750(0 - 10)}{\Delta t}$ ✓

$\Delta t = 11$ s

$\Delta x = \frac{v_i + v_f}{2} \times \Delta t$ ✓

$= \frac{10 + 0}{2} \times 11$ ✓

$= 55$ m ✓

[12]

QUESTION 5

5.1.1 1-chloro-2,3-dimethylpentane

Marking criteria:
• correct stem✓
• correct substituents: chloro and dimethyl✓
• IUPAC name completely correct including numbering, sequence and hyphen ✓

(3)

5.1.2 B and E ✓

Have the same molecular formula but different functional groups✓✓

OR

Have the same molecular formula but B is a ketone whereas E is an aldehyde✓✓

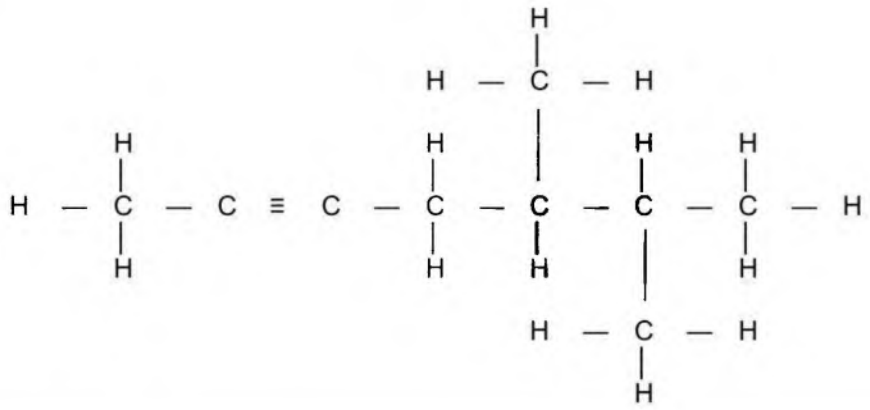
Marking criteria:
If any one of the underlined key phrases in the correct context is omitted , deduct 1 mark.
The underlined phrases must be in the correct context.

(3)

5.1.3 F ✓

The C atom bonded to the functional group/hydroxyl (group)/-OH is bonded to three other C atoms. ✓✓ (3)

5.1.4



Marking criteria:
- Correct functional group✓
- correct stem and substituents: heptyne, dimethyl✓
- Whole structure correct ✓

(3)

5.2.1

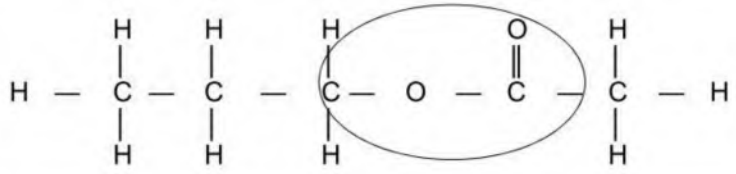
	H	O	C
%	9,80	31,38	58,82
m	9,80	31,38	58,82
$n = \frac{m}{M}$	$\frac{9,80}{1}$ ✓	$\frac{31,38}{16}$ ✓	$\frac{58,82}{12}$ ✓
	= 9,80	= 1,96	= 4,902
Ratio	5	1	2,5 ✓

$C_5H_{10}O_2$✓✓

Marking criteria:
- Correctly calculating number of mols of H✓, C✓ and O✓
- Correct ratio✓
- Correct empirical formula ✓✓

(6)

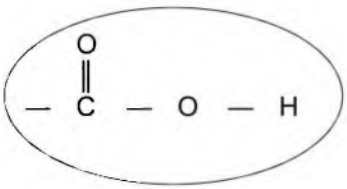
5.2.2



Marking criteria:
- Functional group correct✓
- Whole structure correct ✓✓

(3)

5.2.3



✓

(1)
[22]

QUESTION 6

6.1.

Marking criteria:
If any one of the underlined key phrases in the correct context is omitted, deduct 1 mark.
The underlined phrases must be in the correct context.

The temperature at which the vapour pressure of a substance equals atmospheric pressure. ✓✓

(2)

6.2.1 Boiling point. ✓ (1)

6.2.2 Molecular mass. ✓ (1)

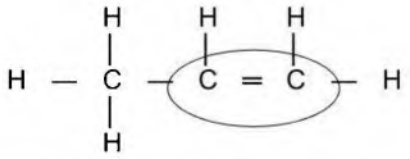
6.3 Carboxyllic acid✓
Ester ✓ (2)

6.4 Alcohol✓ (1)

6.5 The intermolecular forces between molecules of M are dipole-dipole forces✓ while between molecules of P there are hydrogen bonds. ✓
The intermolecular forces between molecules of P are stronger✓ and require more energy to overcome. ✓ (4)
[11]

QUESTION 7

7.1.1



Marking criteria:
• Functional group correct✓
• Whole structure correct ✓

(2)

7.1.2 NaBr✓ (1)

7.2.1 Concentrated strong base/NaOH✓(in ethanol)
Heat ✓ (2)

7.2.2 Elimination✓
dehydrohalogenation✓ (2)

7.3.1 Propan-2-ol✓ (1)

7.3.2 substitution✓ (1)

7.4 Concentrated NaOH in (I) ✓
Dilute NaOH in (II) ✓ (2)
[11]

TOTAL: 100