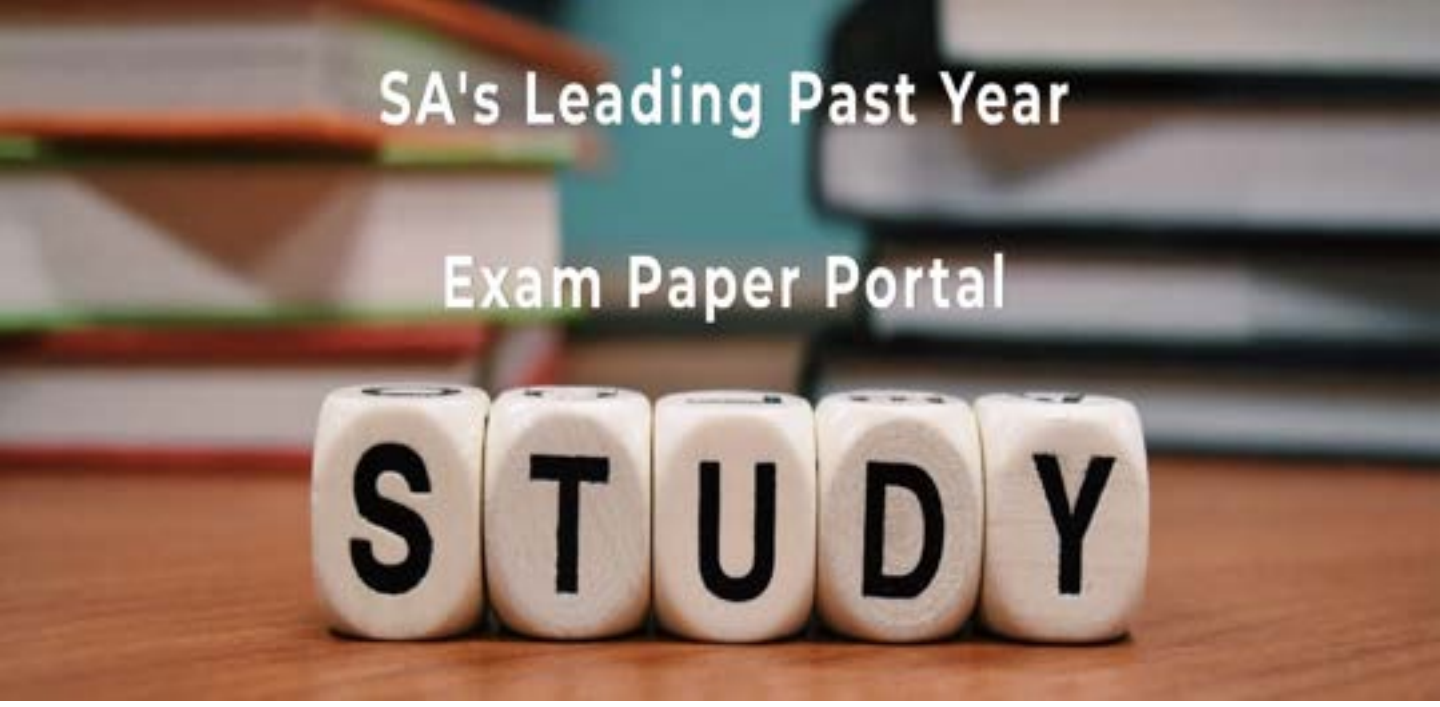

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NATIONAL SENIOR CERTIFICATE

GRADE 12

PHYSICAL SCIENCES

COMMON TEST

MARCH 2022

This marking guideline consists of 7 pages.

MARKS : 100

QUESTION 1

1.1 **B**

1.2 **B**

1.3 **A**

1.4 C ✓✓

1.5 B ✓✓

1.6 D ✓✓

(6 x 2) = 12

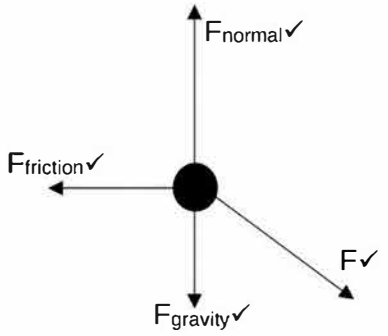
QUESTION 2

2.1.1 When a resultant/net force acts on an object, the object will accelerate in the direction of the force at an acceleration directly proportional to the force✓ and inversely proportional to the mass of the object. ✓

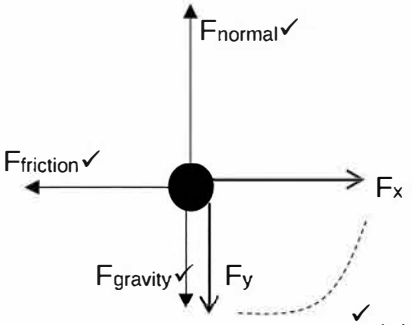
OR

The resultant/net force acting on an object is equal to the rate of change of momentum of the object in the direction of the net force. ✓✓ (2 or 0) (2)

2.1.2



OR



✓ (4)

2.1.3 $F_{net} = ma$

$N = Fg + F_v$ ✓

$N = ((4x9,8) + 10Sin30^o)$✓

$N = 44,20$ N ✓ (3)

2.1.4 $F_{net} = ma$

$F_h - F_f = ma$ ✓

$10Cos30^o$ ✓$– 2 = 4a$✓

$a = 1,67\ m{\cdot}s^{-2}$✓ (4)

2.1.5 DECREASES✓ (1)

2.1.6 INCREASES✓

The horizontal component of the applied force increases✓ and the frictional force decreases. ✓ (2)

2.2.1 State Newton's Law of Universal Gravitation: Each body in the universe attracts every other body with a force that is directly proportional to the product of their masses✓ and inversely proportional to the square of the distance between their centres. ✓ (2)

Note: Underlined phrases must be in context of the law

2.2.2 $g = G\frac{M}{r^2}$ ✓

$= \frac{6{,}67 \times 10^{-11} \cdot 5{,}98 \times 10^{24}}{(6{,}38 \times 10^{6})^2}$ ✓ ✓

$= 9{,}799\ N.kg^{-1}\ (m{\cdot}s^{-2})$ ✓ $(9{,}8\ m{\cdot}s^{-2})$

Note: if only $9{,}8\ m{\cdot}s^{-2}$ written then 1/4 marks (4)

[22]

QUESTION 3

3.1 In an isolated system, ✓ the total linear momentum remains constant (is conserved). ✓ (2)
[first mark awarded only if it is in context of momentumconservation]

3.2 $\Sigma p_i = \Sigma p_f$

$m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$ ✓

$(1500)(0) + (2000)(20)$ ✓$= (1500)(12) + (2000)v_{f2}$ ✓

$v_{f2} = 11\ m{\cdot}s^{-1}$ ✓ (4)

OR $(1500)(0) + (2000)(-20)$ ✓$= (1500)(-12) + (2000)v_{f2}$ ✓

$v_{f2} = -11\ m{\cdot}s^{-1}$ Hence speed $= 11\ m{\cdot}s^{-1}$ ✓

3.3 The driver moves (momentarily) forward. ✓ (1)

3.4 Newton's first Law ✓ OR Inertia (1)

[8]

QUESTION 4

4.1 Motion during which the only force acting on an object is the gravitational force. ✓✓ (2)

4.2 The object is projected upwards from above the ground ✓ / the top of a building. It then moved downwards✓ below the starting position / top of the building. ✓ (3)

4.3

OPTION 1	OPTION 2	OPTION 3
$v_f = v_i + a\Delta t$✓	$v_f = v_i + a\Delta t$✓	Grad = 9,8 ✓$= \frac{0 - v_i}{0,25 - 0}$ ✓
$0 = v_i + (9,8)(0,25)$ ✓	$0 = v_i + (-9,8)(0,25)$ ✓	$v_i = -2,45\ m\cdot s^{-1}$
$v_i =$ 2,45 m·s^{-1} upwards✓	$v_i = -2,45\ m\cdot s^{-1}$	$v_i =$ 2,45 m·s^{-1} upwards✓
	$v_i =$ 2,45 m·s^{-1} upwards✓	

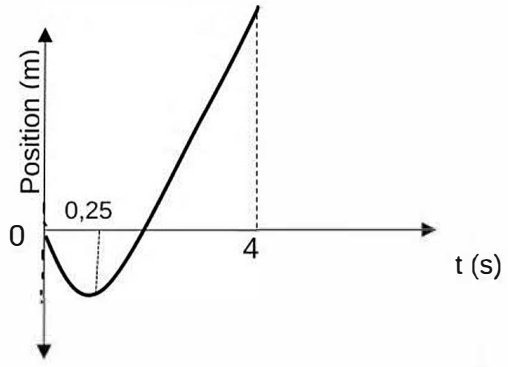
(3)

4.4 **POSITIVE MARKING FROM Q 4.3**

OPTION 1	OPTION 2	OPTION 3
$v_f = v_i + a\Delta t$✓	$v_f = v_i + a\Delta t$✓	Grad = 9,8 ✓$= \frac{v_f - 0}{4 - 0,25}$ ✓
$v_f = 0 + (9,8)(4 - 0,25)$ ✓	$v_f = -2,45 + (9,8)(4\ )$ ✓	$v_i =$ 36,75 m·s^{-1} downward✓
$v_i =$ 36,75 m·s^{-1} downward✓	$v_i =$ 36,75 m·s^{-1} downward✓	

(3)

4.5



CRITERIA	MARK
Correct shape	✓
Indications of the times	✓
Graph starts from origin	✓

(3)

[14]

QUESTION 5

5.1.1. ester✓; accept alkyl alkanoate (1)

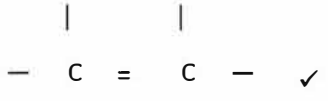
5.1.2 Propyl✓ butanoate✓ (2)

5.1.3 Carboxylic acid✓; accept alkanoic acid (1)

5.2 A bond or an atom or a group of atoms✓ that determine(s) the physical and chemical properties of a group of organic compounds. ✓ (2)

5.3 Carboxyl (group) ✓ (1)

5.4



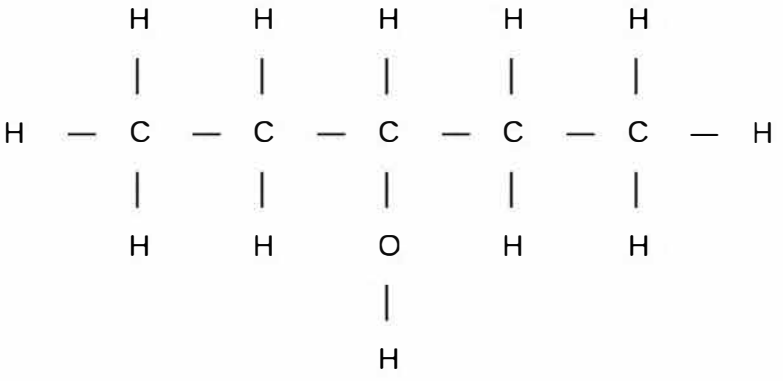
(1)

5.5 Organic molecules with the same molecular✓ formula but different structural formula. ✓ (2)

5.6.1 Secondary ✓

The carbon to which the hydroxyl group is bonded, is bonded to TWO other carbons✓ (2)

5.6.2

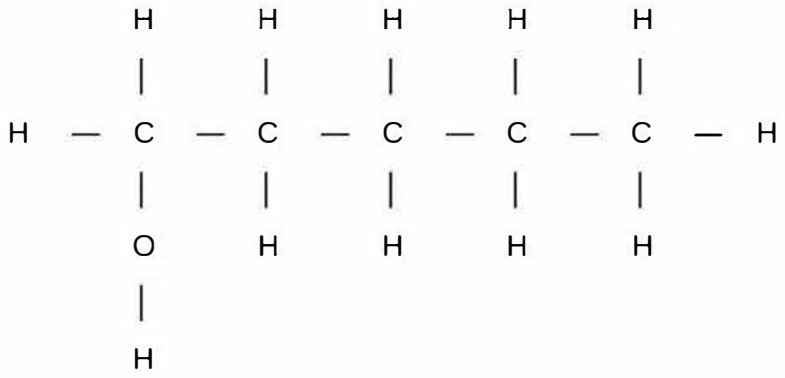


Functional group on correct carbon✓

Whole structure correct✓

NSC

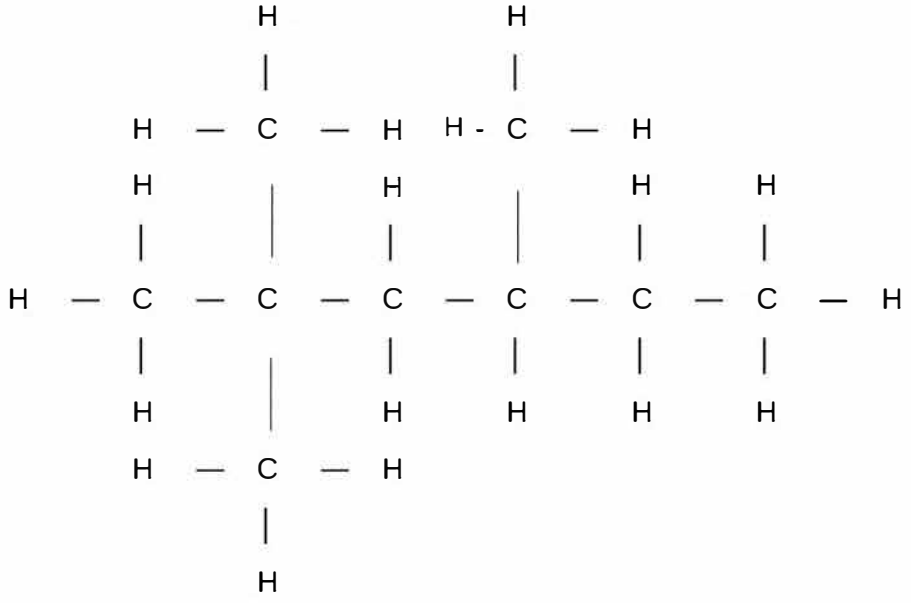
OR



(2)

5.7.1 Organic compounds that consist of carbon and hydrogen✓ ONLY✓ (2)

5.7.2



MARKING CRITERIA	
• 6 Carbon parent chain	✓
• 3 methyl groups on parent chain	✓
• Whole structure correct	✓

(3)

[19]

QUESTION 6

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

6.2 Z ✓

Z has the highest boiling point. ✓ (2)

6.3 X ✓ (1)

6.4 What is the relationship between boiling point and type of functional group/ homologous series?
Identify dependent variable ✓

Identify independent variable ✓ (If answer not stated as question -1 mark) (2)

6.5 To ensure a fair test. / to control the variable (1)

/ to ensure there is only one independent variable ✓

6.6.1 (DO NOT MARK)

6.6.2 (DO NOT MARK)

UPSCALE MARKS TO BE OUT OF 13 USING TABLE:

Mark out of 8	Conversion out of 13
1	2
2	3
3	5
4	7
5	8
6	10
7	11
8	13

[13]

QUESTION 7

7.1.1 Addition/hydrogenation ✓ (1)

7.1.2 Elimination/dehydrohalogenation ✓ (1)

7.2.1 Dehydration ✓ (1)

7.2.2 Hydrohalogenation ✓ (1)

7.3.1 Hydrolysis ✓ (1)

7.3.2 (Mild) heat ✓

Dilute strong base/NaOH/KOH ✓ (2)

7.4 Concentrated strong base/NaOH/KOH✓ (1)

7.5 $CH_3CHCHCH_3$ ✓ + H_2O ✓ ⟶ $CH_3CHOHCH_2CH_3$ ✓ BAL ✓

OR

$CH_2CHCH_2CH_3$ ✓ + H_2O ✓ ⟶ $CH_3CHOHCH_2CH_3$ ✓ BAL ✓ (4)

[12]