KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCES

COMMON TEST

SEPTEMBER 2022

MARKING GUIDELINE

MARKS: 100

TIME: 2 hours

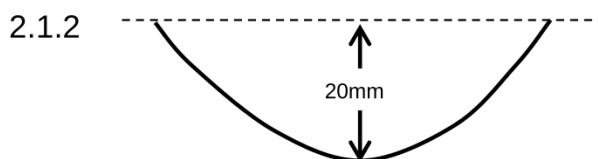**This marking guideline consists of 8 pages.**

QUESTION 1: MULTIPLE- CHOICE

1.1   D ✓✓   (2)

1.2   B ✓✓   (2)

1.3   C ✓✓   (2)

1.4   C ✓✓   (2)

1.5   B ✓✓   (2)

1.6   D ✓✓   (2)

1.7   C ✓✓   (2)

                                                                                              [14]

QUESTION 2

2.1.1   • when two waves occupy the same space at the same time✓
        • the resultant displacement is the algebraic sum of the two waves ✓   (2)

2.1.2

        • ✓✓ for shape (trough)
        • ✓ 20mm correctly indicated

                                                                                              (3)

2.1.3   Destructive✓   (1)

2.1.4   • same displacement from the rest position✓
        • both moving in the same direction at the same time ✓   (2)

2.1.5 $f = \dfrac{1}{T}$ ✓

        $= \dfrac{1}{1,8}$ ✓

        $= 0,56\,Hz$ ✓   (3)

2.1.6   1,75 wavelengths✓ = 280 mm✓
        1 wavelength = 160mm ✓ OR   0,16m   (3)

2.1.7   POSITIVE MARKING FROM 2.1.5 AND 2.1.6
        v = f x λ ✓
            = 0,56 x 0,16✓
            = 0,09 m.s^{-1}✓   (3)

2.2
2.2.1   PARALLEL TO ✓   (1)

2.2.2   To ensure that <u>particles of the medium</u> vibrate <u>along the medium</u> ✓
          OR do not vibrate perpendicular medium of the wave   (1)

2.2.3
$2 waves: 5s$ ✓

$1 wave: x$ ✓

$x = \dfrac{5}{2}$

$= 2,55$ s ✓
                                                                           (3)

2.2.4   MOVES TO THE LEFT ✓   (1)
                                                                           [23]

QUESTION 3

3.1   A sound wave that is reflected off a surface ✓✓   (2)

3.2   **<u>OPTION 1</u>:**
        The distance covered in 3 s = ($2x -$
        300)m

        $v = \dfrac{D}{\Delta t}$ ✓

        $340 = \dfrac{2x - 300}{3}$ ✓ ✓

        $x = 660\, m$

        $dis\tan ce = (660 - 300)$ ✓

        $= 360\, m$

<u>OPTION 2</u>:
Δt for sound to travel from position 1
to position 2:

$v = \dfrac{D}{\Delta t}$ ✓

$340 = \dfrac{300}{\Delta t}$ ✓

$\Delta t = 0,882$ s

Δt for sound to travel from position 2
to obstacle = $\dfrac{3 - 0,882}{2} = 1,059$ s ✓

Distance = $v\Delta t$ = 340 x 1,059 ✓

        = 360 m   (5)

<u>OPTION 3:</u>
Distance covered= 300 + 2d ✓

$v = \dfrac{D}{\Delta t}$ ✓

$340 = \dfrac{(300 + 2d)}{3}$ ✓

$D = 360\ m$ ✓

3.3.1   1 (cm)✓ ✓   (2)

3.3.2   0,8(s) ✓✓   (2)

3.3.3   • pitch is <u>inversely proportional</u> to period ✓
        • therefore when the <u>pitch is halved</u> then the <u>period will double</u> ✓   (2)

3.4   <u>20 000 – 100 000 Hz</u> ✓   (1)
                                                                                    [14]

QUESTION 4

4.1.1   Ag ✓   (1)

4.1.2   Solid ✓   (1)

4.1.3 O_2 ✓   (1)

4.1.4   Water ✓ or dihydrogen oxide   (1)

4.1.5   II ✓   (1)

4.1.6   I ✓   (1)

4.2.1 $3KBr + Fe(OH)_3 \rightarrow 3 KOH + FeBr_3$
        • ✓ for reactants
        • ✓ for products
        • ✓ for Balanced Equation   (3)

4.2.2   148 g✓   (1)

4.2.3   REMAIN THE SAME ✓   (1)

4.2.4   • According to the <u>law of conservation of mass</u> ✓
        • The total mass of the reactants must equal the total
          mass of the products. ✓✓   (3)
                                                                                    [14]

QUESTION 5

5.1. • one mole of any substance ✓
• contains $6{,}02 \times 10^{23}$ particles ✓ (2)

5.2 $\dfrac{m}{n} = \dfrac{N}{N_A}$ ✓

$\dfrac{9{,}8}{98}$ ✓ $= \dfrac{N}{6{,}02 \times 10^{23}}$ ✓

$N = 6{,}02 \times 10^{22} \underline{molecules\, of\, H_2SO_4}$

$= 4 \times 6{,}02 \times 10^{22}$ atoms of oxygen ✓
$= 2{,}41 \times 10^{23}$ atoms ✓

<center>**OR**</center>

$n = \dfrac{m}{M}$

$= \dfrac{9{,}8}{98}$ ✓

✓ for BOTH $n = \dfrac{m}{M}$ and $n = \dfrac{m}{M}$

$= 0{,}1\, mol$

$n = \dfrac{N}{N_A}$ ✓

$0{,}1 = \dfrac{N}{6{,}02 \times 10^{23}}$ ✓ ✓

$N = 6{,}02 \times 10^{22} \underline{molecules\, of\, H_2SO_4}$

$= 4 \times 6{,}02 \times 10^{22}$ atoms of oxygen ✓
$= 2{,}41 \times 10^{23}$ atoms ✓ (5)

5.3.1 REMAINS THE SAME ✓ (1)

5.3.2 The law of constant composition ✓ (1)

5.4.1 • The number of moles of dissolved solute ✓
• Per dm^3 of solution ✓ (2)

5.4.2

$$c = \frac{m}{MV} \checkmark$$
$$\checkmark$$
$$0,22 = \frac{4,4}{40 \times V} \quad \checkmark$$
$$V = 0,5\,dm^3 \quad \checkmark$$

OR

$$n = \frac{n}{M}$$
$$= \frac{4,4}{40} \quad \checkmark$$
$$= 0,11\,mol.$$
$$c = \frac{n}{V}$$
$$0,22 = \frac{0,11}{V} \quad \checkmark$$
$$V = 0,5\,dm^3 \quad \checkmark$$

$\checkmark$ for BOTH $n = \dfrac{m}{M}$ and $c = \dfrac{n}{V}$

(4)
[15]

QUESTION 6

6.1
- The amount of water molecules which is present $\checkmark$
- In one formula unit of salt $\checkmark$

(2)

6.2

$$For\, H_2O : n = \frac{m}{M}$$
$$= \frac{44,72}{18} \quad \checkmark$$
$$= 2,48\,mol \cdot$$
$$for\, AlCl_3 : n = \frac{55,28}{133,50} \quad \checkmark$$
$$= 0,41\,mol$$

$$Ratio\, of\, AlCl_3 : H_2O$$
$$= 0,41 : 2,48 \quad \checkmark$$
$$= \frac{0,41}{0,41} : \frac{2,48}{0,41} \quad \checkmark$$
$$= 1 \quad\quad : 6$$

$$Therefore\, n_{H_2O} = 6 \quad \checkmark$$

(5)

6.3 **POSITIVE MARKING FROM QUESTION 6.2**

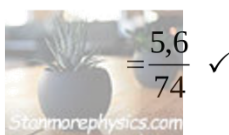$$\%H = \frac{6(1\times 2)}{27+(35,5\times 3)+6(18)}\times 100$$

$$= \frac{12 \checkmark}{241,50 \checkmark}\times 100$$

$$= 4,97\% \checkmark$$

(3)

[10]

QUESTION 7

7.1

$$For\,Ca(OH)_2 : n = \frac{m}{M}$$

$$= \frac{5,6}{74}\;\checkmark$$

$$= 0,08\,mol\;\checkmark$$

$$NH_4Cl : Ca(OH)_2$$

$$= \quad 2:1$$

$$Therefore\,n_{NH_4CL} = 0,16\,mol\;\checkmark$$

(3)

7.2 POSITIVE MARKING FROM 7.1

$$NH_4Cl : NH_3$$
$$= 2:2$$
$$= 1:1$$

$$For\,NH_3 : n\frac{V}{Vm}\;\checkmark$$

$$0,16 = \frac{V}{22,4}\;\checkmark$$

$$V = 3,58\,dm^3\;\checkmark$$

(4)

7.3 **POSITIVE MARKING FROM QUESTION 7.2**

$$\% \, yield = \frac{actual \ yield}{theoritical \ yield} \times 100 \ \checkmark$$

$$= \frac{2{,}90}{3{,}58} \times 100 \ \checkmark$$

$$= 80{,}92\% \ \checkmark$$

(3)
[10]

TOTAL MARKS: 100