

HILLCREST HIGH SCHOOL



PHYSICAL SCIENCE EXAM MEMO

GRADE 10
TIME: 2 HRS
EXAMINER: MRS SMITH

JUNE 2023
TOTAL : 139
MODERATOR: MS BADENHORST
MRS KNOX-WHITEHEAD

SECTION A : CHEMISTRY 90

QUESTION 1:

(2 x 6 = 12)

- 1.1 C
- 1.2 B
- 1.3 D
- 1.4 A
- 1.5 C
- 1.6 D

QUESTION 2

(6)

2.1 $26 - 12 \checkmark = 14 \checkmark$

(2)

$$2.2 \text{ RAM} = (78.99/100 \times \underline{23,985}) \checkmark + (10,00/100 \times \underline{24,986}) \checkmark + (11,01/100 \times \underline{25,985}) \checkmark$$

$$\text{RAM} = 24,31 \text{ amu} \quad \checkmark \quad (4)$$

QUESTION 3

(9)

3.1.1 54 °C \checkmark (1)

3.1.2 93 °C \checkmark (1)

3.2 No. \checkmark The boiling point isn't 100 °C / melting point isn't 0°C \checkmark (2)

3.3 It is changing phase from a liquid into a gas \checkmark (1)

3.4 solid \checkmark (1)

3.5 It remains constant. \checkmark Energy supplied is used up in changing the phase of matter \checkmark
and for overcoming the attractive forces rather than increasing the Ek. \checkmark (3)

QUESTION 4

(13)

4.1.1 Energy needed per mole to remove an electron from an atom in the gaseous phase . $\checkmark\checkmark$ (2)

4.1.2 the energy released when an electron is attached to an atom or molecule to form a negative ion $\checkmark\checkmark$ (2)

4.2 The graph below show the first ionisation energies of the first 20 elements of the periodic table.

4.2.1 element X . \checkmark It has a low ionisation energy \checkmark (2)

4.2.2 it has a full outer energy level. \checkmark So it is hard to remove electrons from a stable shell \checkmark making the element unreactive \checkmark (3)

4.2.3.1 decreases \checkmark (1)

4.2.3.2 increases \checkmark (1)

- 4.2.4 No 4 / Be has the structure $1s^2 2s^2$ which means it as a full sub-shell ✓ with a strongly attracted pair of electrons
No 5 / B has the structure $1s^2 2s^2 2p^1$ which means it has a half-filled p-orbital ✓
It is easier to remove a single electron than an electron in a pair ✓ so the IE is lower for No 5 / B (3)
-

QUESTION 5

(24)

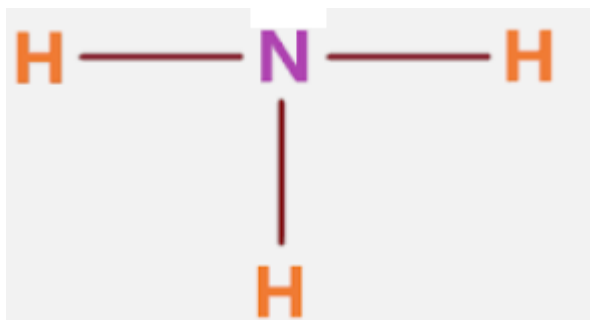
- 5.1.1 K_2SO_3 (2)
- 5.1.2 $Ca(NO_3)_2$ (2)
- 5.1.3 N_2O_4 (2)
- 5.2.1 ammonium carbonate (2)
- 5.2.2 lead (IV) oxide (2)
- 5.2.3 hydrogen nitrate / nitric acid (2)
- 5.2.4 copper (II) chloride (2)
- 5.3.1 $6 CO_2 + 6 H_2O \rightarrow C_6H_{12}O_6 + 6 O_2$ (2)
- 5.3.2 $2 KClO_3 \rightarrow 2 KCl + 3 O_2$ (2)
- 5.4.1 HOMOGENEOUS. All the components are in the same phase/the composition is uniform throughout (2)
- 5.4.2 $4 Fe + 3 O_2 \rightarrow 2 Fe_2O_3$ (4)
-

QUESTION 6

(18)

- 6.1 (polar) covalent (1)

6.2



(2)

6.3 metallic

(1)

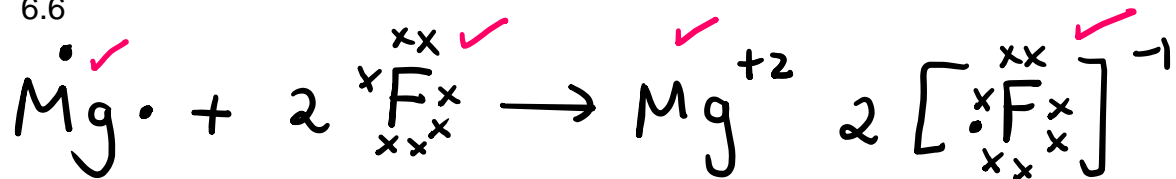
6.4 Hydrogen bonds

(1)

6.5 KCl or MgF₂

(1)

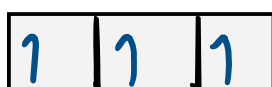
6.6



6.7 O₂

(1)

6.8



(3)

← Ca⁺² ion, not Ca

6.9 1s² 2s² 2p⁶ 3s² 3p⁶

(2)

6.10 Ca₃P₂

(2)

QUESTION 7

(6)

7.1 $\Delta H = H_{\text{products}} - H_{\text{reactants}}$ OR $E_p - E_r$ ✓

$$\Delta H = 300 - 100 \quad \checkmark$$

$$\Delta H = 200 \text{ kJ} \cdot \text{mol}^{-1} \quad \checkmark$$

Forward reaction is endothermic ✓ (4)

7.2 $100 \text{ kJ} \cdot \text{mol}^{-1}$ ✓ (1)

7.3 a catalyst was added ✓ (1)

SUB TOTAL (90)

8.1 $m = n \cdot M$
 $m = 2,5 (28)$
 $= 70 \text{ g}$

← remember N_2 is diatomic

8.2 $n = \frac{m}{M}$ ✓

$$n = \frac{72}{16} \quad \checkmark$$

$$n = 4,5 \text{ mol}$$

$$No = n \times N_A \quad \checkmark$$

$$No = 4,5 \times 6,02 \times 10^{23} \quad \checkmark$$

$$No(\text{molecules}) = 2,709 \times 10^{24} \text{ molecules}$$

$$No(\text{Atoms}) = 2,709 \times 10^{24} \times 5 \quad \checkmark$$

$$= 1,35 \times 10^{25} \text{ atoms} \quad \checkmark$$

← every CH_4 molecule has 5 atoms

(6)

SECTION B : PHYSICS**(50)****QUESTION 9****(4 X 2 = 8)**

9.1 C

9.2 A

9.3 B

9.4 B .

QUESTION 10**(3)**

10.1 0,03 litres

10.2 5,5 m²10.3 27,78 m.s⁻¹

QUESTION 11**(11)**

11.1 3

(1)

10.2 DF

(1)

10.3 5 waves → 3 s ✓

1 wave → 3/5 s → 0,6 s ✓

$$T = \frac{\text{total time}}{\text{total waves}}$$

$$= \frac{3}{5} \text{ ✓}$$

$$= 0,6 \text{ s ✓}$$

(2)

10.4.1 2,5 / 2 = 1,25 m ✓✓

(2)

10.4.2 $f = 1 / T$

$f = 1 / 0,6$ ✓

$f = 1,67 \text{ Hz}$ ✓

(2)

10.4.3 $v = f \times \lambda$ ✓

$v = 1,67 \times 10$ ✓

$v = 16,67 \text{ m} \cdot \text{s}^{-1}$ ✓

OR

$$v = \frac{\Delta x}{\Delta t}$$

$$= 10 / 0,6$$

$$= 16,67 \text{ m} \cdot \text{s}^{-1}$$

(3)

QUESTION 12

(9)

12.1 Waves with a frequency higher than 20 kHz/20 000 Hz

(2)

12.2 $\lambda = v / f$ ✓

$\lambda = 340 / 34\,000$ ✓

$\lambda = 0,01 \text{ m}$ ✓

(3)

12.3 $d = v \times t$

$$\Delta x = v \cdot \Delta t$$

$d = 340 \times (1,5 \times 10^{-3} / 2)$ ✓

OR

$d = 0,26 \text{ m}$

(4)

QUESTION 13

(10)

13.1 accelerating charges

(2)

13.2 $f = c / \lambda$

$f = 3 \times 10^8 / 2,5 \times 10^{-2}$

$f = 1,2 \times 10^{10} \text{ m}$ ✓

(3)

13.3 Ultraviolet, it has a higher frequency ✓

(2)

13.4 $E = hf$ ✓

$$E = 6,63 \times 10^{-34} \times 7 \times 10^{16}$$
 ✓

$$E = 4,64 \times 10^{-17} \text{ J}$$
 ✓

(3)

SUB TOTAL (50)

TOTAL (140)
