ALEXANDER ROAD HIGH SCHOOL

November 2021 **PHYSICAL SCIENCES ASSESSMENT PAPER 2** 2 HOURS

JA **GRADE 10 MEMO** TOTAL = 100

1.1 B ✓✓

1.2 A ✓✓

1.3 D ✓✓

1.4 B ✓✓

1.5 D ✓✓

1.6 C ✓✓

1.7 A ✓✓

2.1 The temperature of a liquid at which its vapour pressure equals the external (atmospheric) pressure. ✓✓ (2 or 0)

2.2 120°C ✓ (must include unit)

2.3.1 Solid ✓

2.3.2 Liquid and gas ✓

2.4 Melting / fusion ✓

2.5.1 Substance X is heating up ✓
which means the particles are moving faster / have more kinetic energy. ✓

2.5.2 Substance X is boiling / changing phase (from liquid to gas) ✓
which means the forces between the particles are breaking ✓
allowing the particles to move freely / randomly / with large spaces between them. ✓

[11]

3.1 ✓$1s^2$ level with paired e^- ✓$2s^2$ level with paired e^- ✓$2p^2$ level with unpaired e^-

3.2 $1s^2$ ✓ $2s^2$ $2p^6$ ✓ $3s^2$ $3p^6$ ✓

3.3.1 Atoms having the same number of protons, but different numbers of neutrons.
OR
Atoms of the same element with different numbers of neutrons. ✓✓ (2 or 0)

3.3.2 Silver / Ag ✓

3.3.3 ✓ for any indication the learner understands ${}^{y}_{5}\mathrm{B}$ is 80% of the sample.

$$10{,}8 = \frac{20(10) + 80y \ \checkmark}{100} \ \checkmark$$

$$1080 = 200 + 80y$$

$$80y = 880$$

$$y = 11 \ \checkmark$$

3.4.1 A charged particle made from an atom by the loss or gain of electrons. ✓✓ (2 or 0)

3.4.2 Protons – 29 ✓ Neutrons – 36 ✓ Electrons – 28 ✓

[18]

4.1 Energy needed per mole to remove the first electron from an atom in the gaseous phase. ✓✓ (-1 if "per mole" or "in the gaseous phase" is omitted; otherwise 2 or 0)

4.2 Moving down the group atomic radius increases. ✓
Therefore, the valence electron is further away / not held as tightly from/to the nucleus making it easier to remove. ✓

4.3 GREATER THAN ✓
(First) ionisation energy increases moving left to right in a period. ✓

4.4 The (second) electron is held more tightly ✓ by the positive lithium ion ✓ making it harder to remove.

[8]

5.1 The overlapping of half-filled orbitals which results in the sharing of electrons OR
The sharing of electrons between atoms to form molecules.
✓✓ (-1 if only "sharing of electrons"; otherwise 2 or 0)

5.2 ✓ C at centre surrounded by four Hs ✓ number of electrons

5.3 POLAR ✓
$\Delta \text{E.N.} = 2{,}5 - 2{,}1 = 0{,}4$ ✓

5.4 $\text{O} = \text{C} = \text{O}$ ✓ C at centre surrounded by two Os ✓ double bonds

5.5 $\text{CH}_4 + 2\,\text{O}_2$ ✓ $\rightarrow \text{CO}_2 + 2\,\text{H}_2\text{O}$ ✓

5.6 EXOTHERMIC ✓
It produces heat. ✓

[12]

6.1 CHEMICAL ✓

6.2.1 KI ✓ions ✓ratio

6.2.2 $\text{Pb(NO}_3)_2$ ✓ions ✓ratio

6.3 Ionic ✓

6.4 Lead iodide / PbI_2 ✓✓

[8]

7.1 The amount of substance having the same number of particles as there are atoms in 12 g carbon-12. ✓✓ (2 or 0)

7.2.1 $n = \frac{m}{M}$ ✓formula $= \frac{35}{2(14)}$ ✓substitution $= 1{,}25\ mol$ ✓

7.2.2 $n_{\text{H}_2} = 3.n_{\text{N}_2} = 3(1{,}25) = 3{,}75\ mol$ ✓use of ratio with + marking from 7.2.1
$n = \frac{N}{N_A}$ ✓formula
$3{,}75 = \frac{N}{6{,}02 \times 10^{23}}$ ✓substitution
$\therefore N = 2{,}26 \times 10^{24}$ ✓ H_2 molecules

7.2.3 $n_{NH_3} = 2.n_{N_2} = 2(1,25) = 2,5\ mol$ ✓use of ratio with + marking from 7.2.1

$\therefore m = n.M = (2,5)\left(14 + 3(1)\ \checkmark^{\text{molar mass=17}}\right) \checkmark^{\text{substitution}} = 42,5\ \text{g}\ \checkmark$

7.3.1 $M = 2(14) + 9(1) + 1(31) + 4(16)\ \checkmark\ = 132\ g.mol^{-1}\ \checkmark$

7.3.2 $c = \frac{m}{MV}\ \checkmark^{\text{formula}} = \frac{10}{(132)(0,5)}\ \checkmark\checkmark^{\text{substitution with+marking from 7.3.1}} = 0,15\ mol.dm^{-3}\ \checkmark$

OR

$n = \frac{m}{M} = \frac{10}{132} = 0,0\dot{7}\dot{5}\ mol\ \checkmark^{\text{calculating } n \text{ with+marking from 7.3.1}}$

$\therefore c = \frac{n}{V}\ \checkmark^{\text{formula}} = \frac{0,0\dot{7}\dot{5}}{0,5}\ \checkmark^{\text{substitution}} = 0,15\ mol.dm^{-3}\ \checkmark$

[19]

8.1 Aqueous ✓

8.2 The <u>sea of delocalised valence electrons</u> ✓ is able to <u>freely move</u> ✓ thus producing a current (electricity).

8.3 $c = \frac{n}{V}$

$0,25 = \frac{n}{0,8}\ \checkmark^{\text{calculating } n}$

$\therefore n = 0,2\ mol$

$n_{H_2} = \frac{1}{2}.n_{HC\ell} = \frac{1}{2}(0,2) = 0,1\ mol\ \checkmark^{\text{use of ratio}}$

$n = \frac{V}{V_m}\ \checkmark^{\text{formula}}$

$0,1 = \frac{V}{22,4}\ \checkmark^{\text{substitution}}$

$\therefore V = 2,24\ dm^3\ \checkmark$

8.4.1 INCREASES ✓

8.4.2 At a higher temperature…

- The H_2 particles will move faster and hence spread out more.
- The molar volume (V_m) will increase.

✓ (any one)

[10]

TOTAL SECTION B = [86]