GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

NOVEMBER 2021

GRADE 11

MARKING GUIDELINES

PHYSICAL SCIENCES (CHEMISTRY) (PAPER 2)

6 pages

QUESTION 1

1.1 B ✓✓ (2)

1.2 D ✓✓ (2)

1.3 C ✓✓ (2)

1.4 B ✓✓ (2)

1.5 D ✓✓ (2)

1.6 A ✓✓ (2)

1.7 C ✓✓ (2)

1.8 A ✓✓ (2)

1.9 B ✓✓ (2)

1.10 C ✓✓ (2)
[20]

QUESTION 2

2.1 The temperature at which the vapour pressure of a substance equals atmospheric pressure. ✓✓ (2)

2.2 2.2.1 As the molecular mass increases, the boiling point increases. ✓✓ (cannot be DIRECTLY PROPORTIONAL, not shown by graph) (2)

2.2.2 As the molecular mass increases, ✓ the strength of the intermolecular forces increases. ✓ Therefore more energy is needed to overcome/ weaken the intermolecular forces. ✓(No mark if BROKEN is used instead of overcome or weaken.) Thus the boiling point increases. (3)

2.3 2.3.1 H_2O/water ✓ (1)

2.3.2 Hydrogen bonds ✓✓ (2)

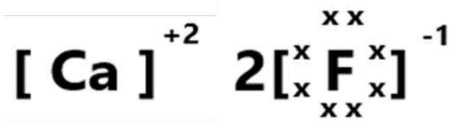
2.3.3 Hydrogen bonds are stronger than dipole-dipole forces ✓ therefore more energy is needed to overcome/weaken the forces. ✓ Thus the boiling point is higher than expected. (2)
[12]

QUESTION 3

3.1 3.1.1

✓✓ (2)

3.1.2



✓✓ (2)

3.2 A polar covalent bond is a bond in which the electron density is shared unequally between the two atoms. ✓✓

OR

A bond between two non-metals where the difference in electronegativity is more than 1. ✓✓ (2)

3.3 3.3.1 HF/Hydrogen fluoride ✓ (1)

3.3.2 $CaSO_4$/Calcium sulphate ✓ (1)

3.4 Electronegativity is a measure of the tendency of an atom in a molecule to attract bonding electrons. ✓✓ (2)

3.5 ΔEN = 4 – 1 = 3 ✓
∴ Ionic bond ✓ (2)

3.6 Polar molecule ✓ (1)

3.7 Δen = 4 – 2,1 = 1,9 ✓
∴ polar bond ✓
Thus, the molecule is polar. (2)
[15]

QUESTION 4

4.1 What is the relationship between the pressure and volume of a gas, when temperature is kept constant? ✓✓ (2)

4.2 4.2.1 Volume ✓ (1)

4.2.2 Temperature/Mass of gas ✓ (1)

4.3 The pressure of an enclosed gas is inversely proportional to the volume it occupies at constant temperature. ✓✓ (2)

4.4 **OPTION 1**

p1V1 = p2V2 ✓

(150)(350) = (400)X✓

X = 131,25 cm^3 ✓

OPTION 2

p1V1 = p2V2 ✓

(150)(0,35) = (0,400)X✓

X = 131,25 cm^3 ✓

Note:
✓ Equation
✓ Substitution
✓ Answer with correct units

(3)

4.5 At high pressure, a real gas's particles will occupy space and have a volume. ✓
The attraction and repulsive forces between the particles become significant. ✓
Thus a real gas will liquefy at high pressures. (2)

[11]

QUESTION 5

5.1 The flask is open.✓
The SO_2 gas is able to escape. ✓
Thus the mass will decrease. (2)

5.2 Accept between 6,4 s and 6,6 s ✓✓ (2)

5.3 **OPTION 1**

Δm = mf – mi ✓
= 116 – 160 ✓
= -44 g
∴ mass decreases by 44 g ✓

OPTION 2

Δm = mi – mf✓
= 160 – 116 ✓
= 44 g ✓

Note:
✓ Equation
✓ Substitution
✓ Positive final answer

(3)

5.4 **Positive marking from 5.3**

OPTION 1

$$\%\ yield = \frac{\Delta m\ (impure)}{\Delta m\ (pure)} \times 100 ✓$$
$$= \frac{135 - 160 ✓}{-44\ ✓}$$
$$= 56{,}82\ \% ✓$$

OPTION 2

$$\%\ yield = \frac{\Delta m\ (impure)}{\Delta m\ (pure)} \times 100 ✓$$
$$= \frac{160 - 135 ✓}{44\ ✓}$$
$$= 56{,}82\ \% ✓$$

Note:
✓ Equation
✓ Substitution (numerator)
✓ Substitution (denominator)
✓ Final answer

(4)

5.5

$$n(O_2) = \frac{m}{M}$$
$$= \frac{50}{32} ✓$$
$$= 1{,}56\ mol$$

$$n(SO_2) = \frac{m}{M}$$
$$= \frac{100}{64} ✓$$
$$= 1{,}56\ mol ✓$$

Note:
✓ Substitution (SO_2)
✓ Substitution (O_2)
✓ Both answers

(3)

5.6 **OPTION 1**

SO_2 : O_2
2 : 1 ✓ (using ratio)
1,56 : 0,78
∴ SO_2 limiting reactant ✓

OPTION 2

SO_2 : O_2
2 : 1 ✓ (using ratio)
3,12 : 1,56
∴ SO_2 limiting reactant ✓

(2)

5.7 $n(SO_3) = 1{,}56 \times \frac{2}{2}$ ✓

$= 1{,}56\ mol$

$m = nM$

$= (1{,}56)(32 + 3(16))$ ✓

$= 124{,}8\ g.mol^{-1}$ ✓

Note:
✓ Using mole ratio
✓ Substitution
✓ Answer

(3)
[19]

QUESTION 6

6.1 Endothermic ✓ (1)

6.2 Products have more energy than the reactants. ✓

OR

More energy is absorbed than released. ✓ (1)

6.3 C ✓ (1)

6.4 Decreases the activation energy, ✓ by providing an alternative pathway for the reaction. ✓ (2)

6.5 The cold decreases the kinetic energy of the particles, slowing them down,✓ thus reducing the volume they will take up (reducing swelling). ✓ (2)
[7]

QUESTION 7

7.1 A loss of electrons ✓✓ (2)

7.2 $N_2 + 6e^- \rightarrow 2N^{3-}$ ✓✓ (2)

7.3 N_2/Nitrogen ✓✓ (2)

7.4 HNO_3 : (+1) + (N) + (-6) = 0
N: +5 ✓✓

Note:
Mark for answer only

(2)
[8]

QUESTION 8

8.1 An acid is a proton (H+ ion) donor. ✓✓ (2)

8.2 $H_2SO_4 + MgCO_3 \rightarrow MgSO4$ ✓+ [H2O + CO2] ✓ (2)

8.3
- Bronsted-Lowry acid: HBr, ✓ Conjugate base is Br^-/NaBr✓
- Bronsted-Lowry base: CN^- (NaCN), ✓ Conjugate base is HCN✓

(4)
[8]

TOTAL: 100