higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

PHYSICAL SCIENCE
(Second Paper)
NQF LEVEL 2

16 March 2020

This marking guideline consists of 6 pages.

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SECTION A

QUESTION 1

1.1 Orbitals
1.2 Halogens
1.3 Water cycle
1.4 Homogeneous mixture
1.5 Temperature

(5 × 1) **[5]**

QUESTION 2

2.1 C
2.2 H
2.3 E
2.4 A
2.5 B

(5 × 2) **[10]**

QUESTION 3

3.1 True
3.2 False
3.3 True
3.4 True
3.5 False

(5 × 1) **[5]**

QUESTION 4

4.1 A
4.2 D
4.3 A
4.4 D
4.5 C

(5 × 3) **[15]**

TOTAL SECTION A: 35

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SECTION B

QUESTION 5

5.1
A Sublimation - energy is absorbed
B Deposition - energy is given off
C Condensation - energy is given off
D Evaporation - energy is absorbed
E Freezing - energy is given off
F Melting - energy is absorbed

(6 × 2) (12)

5.2 5.2.1 There is no change in mass during a physical change.

5.2.2 The molecules do not change during a physical change, but their arrangement does.

(2 × 1) (2)

5.3 Evaporation (1)

5.4 Relative density refers to the density of a substance compared to the density of water and it has no unit. (2)

5.5 D = mass ÷ volume
= 4 200 ÷ 5,2 m^3✓
= 807,69 kg/m^3✓
Relative density = density of substance ÷ density of water
= 807,69 ÷ 1 000✓
= 0,808✓ (4)

[21]

QUESTION 6

6.1 6.1.1 A : Nitrogen
B: Lithium (2)

6.1.2 C (1)

6.1.3 20 (1)

6.1.4 6 (1)

6.1.5 E.✓ The energy level of noble gases is filled with electrons having no valence✓ and therefore they are chemically inactive or inert✓ (3)

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6.2 6.2.1 $^{35}_{17}Cl$ (1)

6.2.2 It has the same element✓ and the same number of protons✓ but a different number of neutrons.✓ (3)

6.3 A metallic bond is the electrostatic attractive forces✓ between the delocalised valence electrons and the cations✓ of a single type of metal.✓ (3)

6.4 6.4.1 Covalent
6.4.2 Ionic
6.4.3 Metallic
6.4.4 Covalent
(4 × 1) (4)

6.5 6.5.1 ZnO
6.5.2 KCl
6.5.3 H_2O
6.5.4 H_2O_2
(4 × 1) (4)
[23]

QUESTION 7

7.1
- Energy cannot be created or destroyed. It can be transferred from one form to another.
- When energy moves from one substance to another, the amount of internal energy lost by one substance or substances
- is the same as the amount of internal energy gained by the other substance or substances. (3)

7.2 7.2.1 Transfer of energy through a material by direct contact and it results in physical change

7.2.2 Transfer of heat through electromagnetic waves, e.g. a microwave oven uses electromagnetic waves to cook food

7.2.3 Heat moves by actual motion of matter, for example when water is heated on a stove
(3 × 2) (6)

7.3 7.3.1 Thermometer (1)

7.3.2
- Bimetal thermometer
- Thermocouple thermometer
- Mercury in glass thermometer (3)

7.4 $Q = mc\Delta t$
$c = 1\ 800 \div (3 \times 60)$✓✓
$= 100$ J/kg °C✓✓ (4)

7.5 7.5.1
- Energy is transferred from a hot flame to the molecules of the candle.
- The molecules start to vibrate more vigorously
- so that the force of attraction between them is overcome and the particles move further apart.
- They also move about more randomly and the candle wax has now changed from the solid phase to the liquid phase. (4)

7.5.2
- The average kinetic energy of the molecules increased the temperature.
- During the change phase, the kinetic energy of the molecules remained constant
- and the potential energy increased. (3)

[24]

QUESTION 8

8.1 It is the amount of pure substance containing the same number of chemical units as there are atoms of 12 g of carbon -12, which is $6,02 \times 10^{23}$ atoms. (4)

8.2 8.2.1 Mr Na_2SO_4 $= (2 \times 23)$✓ $+ 32 + (4 \times 16)$✓
$= 142$ g/mol✓

8.2.2 Mr KCl $= 39$✓$+ 35,5$✓
$= 74,5$ g/mol✓

(2 × 3) (6)

8.3 Mr $CaSO_4 = 40 + 32 + (4 \times 16)$
$= 136$ g/mol✓
$m = n \times Mr$
$= 0,5 \times 136$
$= 68$ g✓✓ (3)

8.4 8.4.1 Mr *Mg C* I_2 *= 24 + (2 × 35,5)*
= 95 g/mol ✓
$n = m \div Mr$
$= 30 \div 95$
$= 0,32$ mol ✓
$C = n \div V$✓
$= 0,32 \div 0,1$ dm^3
$= 3,16$ mol/dm^3 ✓

8.4.2 Mr (CH_3COOH) = (2 × 12) + (4 × 1) + (2 × 16)
= 60 g/mol ✓
n = m ÷ Mr
= 25 ÷ 60
= 0,4 mol ✓
C = n ÷ V✓
= 0,4 ÷ 25 dm^3
= 0,02 mol/dm^3 ✓

(2 × 4) (8)

8.5 8.5.1 $H_2SO_4 + 2H_2O \longrightarrow 2H_3O + SO_4^{2-}$

8.5.2 $HNO_3 + H_2O \longrightarrow H_3O^+ + NO_3^-$

8.5.3 $HCl + H_2O \longrightarrow H_3O^+ + Cl^-$

(3 × 2) (6)
[27]

QUESTION 9

9.1
A Transpiration
B Condensation
C Sublimation
D Evaporation
E Precipitation
F Surface runoff
G Infiltration
H Accumulation

(8 × 1) (8)

9.2
- Heat
- Wind

(2)

9.3
- Water is a good solvent.
- It controls the temperature of the earth.
- It has a unique surface tension.
- It has a high density.

(4)

9.4 9.4.1
- Oil spillage
- Dumping of waste and litter
- Sewage and wastewater
- Industrial waste
- Agricultural waste
- Acid rain
- Eutrophication
- Global warming

(Any 4 × 1) (4)

9.4.2
- Chlorination
- Flocculation

(2)
[20]

TOTAL SECTION B: 115
GRAND TOTAL: 150

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