

PROVINCIAL EXAMINATION
NOVEMBER 2021
GRADE 10
MARKING GUIDELINES

PHYSICAL SCIENCES (CHEMISTRY) (PAPER 2)

6 pages

SECTION A:

QUESTION 1

1.1	B ✓✓	(2)
1.2	D ✓✓	(2)
1.3	C ✓✓	(2)
1.4	D ✓✓	(2)
1.5	A ✓✓	(2)
1.6	D ✓✓	(2)
1.7	B ✓✓	(2)
1.8	D ✓✓	(2)
1.9	B ✓✓	(2)
1.10	D ✓✓	(2)
		[20]

TOTAL SECTION A: 20

SECTION B

QUESTION 2

2.1 $2\text{KClO}_3(\text{s}) \rightarrow 2\text{KCl}(\text{s}) + 3\text{O}_2(\text{g})$ ✓ (1)

2.2 1:1:3 ✓ (1)

2.3 potassium chloride ✓ (1)

2.4 pure ✓ substance because it is a compound ✓ (2)

2.5 $^{16}_8\text{O}$ $\checkmark 1s^2$
 $\checkmark 2s^2$
 $\checkmark 2p^4$ 1 paired and 2 unpaired (3)

2.6 \checkmark 6 valency electrons for each oxygen
 \checkmark double bond (2)

2.7 test tube ✓ (1)
[11]

QUESTION 3

3.1 H_2O (1)

3.2 solid (1)

3.3 Melting is a physical process that results in the phase transition of a substance from a solid to a liquid. (not melting point) (2)

3.4 The kinetic energy of the particles increases ✓ because in a phase the particles move faster.

The potential energy of the particles stays constant ✓ because in a phase the position of the particles does not change. ✓ (2)

3.5 Boiling point (of water) ✓ (1)

3.6 The water will evaporate (form steam) ✓ and the temperature will increase. ✓ (2)

[9]

QUESTION 4

- 4.1 Isotopes are two or more types of atoms that have the same atomic number and position in the periodic table and that differ in nucleon numbers due to different numbers of neutrons. ✓✓ (2)
- 4.2 protons ✓✓ (1)
- 4.3 $A_r(N) = \frac{(99,6 \times 14) + (0,4 \times 15)}{100} = 14,004$ ✓ (3)
- 4.4 $\% N = \frac{3A_r(N)}{M_r(NH_4)_3PO_4} \times 100 = \frac{3(14)}{149} \times 100 = 28,19 \% N$ ✓ (3)
- 4.5 $n = \frac{m}{M} = \frac{82,24}{14} = 5,874 \text{ mol N}$ $n = \frac{m}{M} = \frac{17,76}{1} = 17,76 \text{ mol H}$ ✓ (3)
- $\frac{5,874}{5,874} : \frac{17,76}{5,874}$ ✓
- 1:3 ✓ (NH₃)
- Ammonia ✓ (not ammonium) (6)
- [15]

QUESTION 5

- 5.1 To flavour food ✓ (any logical answer) (1)
- 5.2 A lighted ✓ splint will pop ✓ (2)
- 5.3 Hydrogen is flammable ✓/hydrochloric acid is corrosive/sodium reacts highly with water. (1)
- 5.4 $2Na + 2HCl \rightarrow 2NaCl + H_2$ (1)
- 5.5 5.5.1 B ✓ (1)
- 5.5.2 A ✓ (1)
- 5.6 $c = \frac{m}{MV} = \frac{25}{(58,5)(0,25)} = 1,71 \text{ mol} \cdot \text{dm}^{-3}$ ✓ NaCl (4)
- [11]

QUESTION 6

6.1 6.1.1 metallic ✓ (1)

6.1.2 covalent ✓ (1)

6.1.3 covalent ✓ (1)

6.1.4 ionic ✓ (1)

6.2 One mole is the amount of substance having the same number of particles as there are atoms in 12 g carbon-12. ✓✓ (2)

6.3 6.3.1 $n = \frac{m}{M} \checkmark = \frac{317,5}{127 \checkmark} = 2,5 \text{ mol I}_2$ (3)

6.3.2 $n(\text{I}_2) : n(\text{Al})$

3:2

2,5 : 1,67 mol Al

$$n = \frac{N}{N_A}$$

$$1,67 \checkmark = \frac{N}{6,02 \times 10^{23} \checkmark}$$

$N = 1,003 \times 10^{24} \checkmark$ atoms Al (3)

6.4 $n = \frac{m}{M} \checkmark = \frac{20,4}{408 \checkmark} = 0,05 \text{ mol AlI}_3 \checkmark$

$n(\text{AlI}_3) : n(\text{Al})$

2 : 2

0,05:0,05 mol Al

$$n = \frac{N}{N_A}$$

$$0,05 \checkmark = \frac{m}{27 \checkmark}$$

$m = 1,35 \text{ g Al} \checkmark$

(6)
[18]

QUESTION 7

- 7.1 The number of protons in the nucleus of an atom. ✓✓ (2)
- 7.2 Top ✓, right ✓ (2)
- 7.3 ion ✓ (1)
- 7.4 earth-alkaline metals ✓ (1)
- 7.5 two/2 ✓ (1)
- 7.6 magnesium ✓ (not Mg) (1)
- 7.7 7.7.1 Energy needed per mole to remove an electron from an atom in the gaseous phase ✓✓ (2)
- 7.7.2 From the top to the bottom in a group ✓ the ionization energy decreases. (2)
- 7.7.3 Phosphorous will have 3 unpaired electrons in the p-orbitals and ✓ sulfur will have a pair of electrons in the p-orbitals. ✓
Less energy is needed to remove the last electron from sulfur ✓
because the electrons in the orbital will repel one another. ✓ (4)

[16]

TOTAL SECTION B: 80

TOTAL MARKS: 100