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VCE Chemistry ½
AOS 1 Revision I [0.11]
Workshop

Error Logbook:

New Ideas/Concepts	Didn't Read Question
Pg / Q #: _____ Notes:	Pg / Q #: _____ Notes:
Algebraic/Arithmetic/ Calculator Input Mistake	**Working Out Not Detailed Enough**
Pg / Q #: _____ Notes:	Pg / Q #: _____ Notes:

Section A: Warm Up (15 Marks)

INSTRUCTION: 15 Marks. 10 Minutes Writing.

Question 1 (4 marks)

For the following atoms, write Schrodinger's electron configuration.

a. Al^{3+}. (1 mark)

_____

b. Cr. (1 mark)

_____

c. Ag. (1 mark)

_____

d. F^{-}. (1 mark)

_____

Space for Personal Notes

Question 2 (7 marks)

Sia is investigating the atomic structure of fluorine, her favourite element after finding out it is present in most modern toothpastes. To do this, she conducts research on an online platform, however, discovers she has forgotten most of the terms used.

a. Explain to Sia what is meant by a subatomic particle. (1 mark)

_____

_____

b. State the number of protons that a fluorine atom has. (1 mark)

_____

c. Is the fluorine ion present in toothpaste a cation or an anion? What is the difference between these two? (2 marks)

_____

_____

d. Explain what mass number is, with reference to what contributes to it. (1 mark)

_____

_____

e. According to the Bohr model, explain the structure of fluorine. (2 marks)

_____

_____

_____

Space for Personal Notes

Question 3 (4 marks)

The octet rule is a fundamental chemistry principle that sets up the basis for atomic reactivity and stability alongside other properties.

a. What is the octet rule? (1 mark)

_____

_____

b. Explain whether helium is stable or not, as compared to hydrogen. (2 marks)

_____

_____

_____

c. Harry remembers learning that noble gases are used in lights where oxygen cannot be present, as they do not react. Explain why this is the case. (1 mark)

_____

_____

Space for Personal Notes

Section B: Ramping Up (15 Marks)

INSTRUCTION: 15 Marks. 11 Minutes Writing.

Question 4 (1 mark)

Which of the following statements about Schrödinger's model of the atom is true?

A. Electrons exist within a region of space called an orbital.

B. The highest electron energy levels are at the innermost shell.

C. Electrons are resistant to the attractive force of the nucleus due to its opposing charge.

D. Electrons can exist anywhere surrounding the nucleus, as long as it follows a fixed radius orbit.

Question 5 (1 mark)

Which list of elements is correctly ordered from lowest first ionisation energy to highest?

A. Na, K, Cl, F

B. F, Cl, Be, Mg

C. F, Cl, Mg, Na

D. Na, Mg, Cl, F

Question 6 (5 marks)

Sasen organises the elements in the period table by exploring the trends which they have, as Dmitri Mendeleev once did in making the first periodic table.

a. What is electronegativity? (1 mark)

_____

_____

b. Explain what happens to atomic radius as the period progresses from left to right. (2 marks)

_____

_____

_____

c. Explain what happens to the first ionisation energy as the group progresses from top to bottom. (2 marks)

_____

_____

_____

Question 7 (4 marks)

Consider Rutherford's famous gold foil experiment.

a. What was the main finding of Rutherford's gold foil experiment? (2 marks)

_____

_____

_____

b. Alannah says that the gold foil experiment was fundamental in explaining that the nucleus of an atom is quite large. Do you agree? Justify your answer. (2 marks)

_____

_____

_____

Space for Personal Notes

Question 8 (4 marks)

For the following pairs of metals, state which is more reactive and briefly explain why.

a. Sr and Ba. (2 marks)

_____

_____

_____

b. Al and Mg. (2 marks)

_____

_____

_____

Space for Personal Notes

Section C: Getting Trickier I (11 Marks)

INSTRUCTION: 11 Marks. 9 Minutes Writing.

Question 9 (1 mark)

What is the most accurate explanation of a molecule having zero non-bonding electron groups?

A. The parent geometry of the molecule is the same as the molecular geometry of the molecule.

B. The central atom's electron groups are all participating in the covalent bonding.

C. The molecule's electron groups are all participating in the covalent bond.

D. The lone pairs of electrons play no part in the 3D structure of the molecule.

Question 10 (10 marks)

Adam comes to class one day adorned with silver jewellery, which captures the attention of his fellow classmates and initiates a conversation regarding metallic bonding and properties.

a. Draw a metallic lattice of silver, including at least four atoms of silver. Ensure to label the type of bonding present, and the charge of relevant particles in the lattice. (3 marks)

b. Adam has a copper ring alongside one of his silver rings. Despite having them both for the same amount of time he notices that the copper ring has oxidised faster. Explain why this is the case with reference to metal reactivity. (2 marks)

_____

_____

_____

c. Would silver or iron be expected to have a higher melting point, and why? (2 marks)

_____

_____

_____

d. Write the full balanced chemical equation for the reaction between iron and oxygen. (1 mark)

_____

e. With reference to the diagram drawn in **part a.**, define and explain what "lustre" is. (2 marks)

_____

_____

Space for Personal Notes

Section D: Getting Trickier II (13 Marks)

INSTRUCTION: 13 Marks. 12 Minutes Writing.

Question 11 (7 marks)

On his trip to the stationary store, Arjun comes across a section of graphite pencils. Seeing these pencils, he is immediately reminded of the revision he did in class.

a. Explain the structure of graphite with reference to the following points: (3 marks)

- Number of covalent bonds formed.
- Lattice structure.
- Electron distribution.

_____

_____

_____

_____

b. Why is graphite able to conduct electricity, whereas diamond is not? (1 mark)

_____

_____

c. What is the key difference between the structure of diamond and graphite? (1 mark)

_____

_____

d. With reference to diamond's structure, explain why it is a good conductor of heat. (2 marks)

_____

_____

_____

Question 12 (6 marks)

Consider the element of iron.

a. Write the Schrödinger electronic configuration for iron. (1 mark)

_____

b. What type of element is iron? (1 mark)

_____

c. Explain whether iron would rather gain or lose electrons, and write the charge that it would most likely be in if it were to ionise. (2 marks)

_____

_____

_____

d. Compare the first ionisation energy between iron and ruthenium. (2 marks)

_____

_____

_____

Let's take a BREAK!

Section E: VCAA-Level Questions I (11 Marks)

INSTRUCTION: 11 Marks. 30 Seconds Reading. 10 Minutes Writing.

Question 13 (4 marks)

With recent rises in plastic waste, environmental pollution and climate change, world leaders from around the world have been in discussion with environmental scientists in order to discuss changes that can be made to decrease the amount of waste and environmental impact.

a. The US is one of the countries which is described as having a majority linear economy. Explain what this means. (2 marks)

_____

_____

_____

b. Due to the malleability and ductility of metals, they are easily recyclable and thus can contribute to developing a circular economy. With reference to what a circular economy is, is it possible to have a 100% circular economy? (2 marks)

_____

_____

_____

Space for Personal Notes

Question 14 (7 marks)

Sodium nitrate is a white crystalline chemical often used to make explosives for military or land clearing purposes.

a. Write the formula of sodium nitrate. (1 mark)

_____

b. Would sodium nitrate be soluble in water? Explain with reference to ion-dipole forces and ionic bonds. (3 marks)

_____

_____

_____

_____

c. In the lab, Khang pinches a piece of sodium nitrate just to see it crumble in his fingers with ease. Explain what this property is called, explaining why it is seen with reference to the ionic bonding model. (3 marks)

_____

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Section F: Multiple Choice Questions (7 Marks)

INSTRUCTION: 7 Marks. 7 Minutes Writing.

Question 15 (1 mark)

Which one of the following statements is true about Bohr's model?

A. Bohr's model does not explain why electrons can occupy specific energy levels.

B. Bohr's model does not explain why electron shells can only hold $2n^2$ electrons.

C. Bohr's model does not explain why the inter-most electrons have the highest energy.

D. Bohr's model does not explain why electron shells can only hold n^2 electrons.

Question 16 (1 mark)

What element does this electron configuration belong to?

$$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$$

A. Zinc

B. Gallium

C. Nickel

D. Copper

Space for Personal Notes

Question 17 (1 mark)

Which one of the following comparisons between bromine and chlorine is correct?

A. Bromine has a larger atomic radius, but chlorine has a lower electronegativity.

B. Bromine has a larger atomic radius, but chlorine has a higher electronegativity.

C. Chlorine has a larger atomic radius, but bromine is less electronegative.

D. Chlorine has a smaller atomic radius, but bromine has a higher electronegativity.

E. The lone pairs of electrons play no part in the 3D structure of the molecule.

Question 18 (1 mark)

What is the main difference between the structures of the covalent lattice found in diamonds and a metal lattice of copper?

A. The copper lattice can conduct electricity, whereas diamond cannot.

B. The copper lattice has a higher boiling point than that of diamond, as diamonds are comprised of just carbon.

C. The diamond lattice comprises covalent bonds between carbon formed by ejecting 1 electron each, whereas the copper lattice comprises copper cations attracted to delocalised electrons.

D. The copper lattice is held together by the electrostatic attraction between the copper cations and the delocalised sea of electrons, whereas the diamond is held together by covalent bonds between carbon.

Question 19 (1 mark)

Select the correct statement that best explains why lithium is never found with itself, but gold is often found as a pure metal.

A. Gold is too reactive and will appear in its true form.

B. Gold is too reactive with O_2 and H_2O, whereas Li reacts with neither.

C. Lithium is too reactive with O_2 and H_2O, whereas Au reacts with neither.

D. Li is too unreactive and will not appear in its true form.

Question 20 (1 mark)

Which one of the following reactions correctly describes when zinc reacts with water?

A. $Zn(s) + H_2O(l) \rightarrow ZnH_2O(l)$

B. $Zn(s) + H_2O(l) \rightarrow ZnO(s) + H_2(g)$

C. $Zn(s) + 2H_2O(l) \rightarrow ZnO_2(s) + 2H_2(g)$

D. $2Zn(s) + H_2O(l) \rightarrow Zn_2O(s) + H_2(g)$

Question 21 (1 mark)

What is the charge of the metal ion in the ionic compound $[Ag(NH_3)_2]OH$?

A. $+1$

B. $+2$

C. -1

D. -2

Space for Personal Notes

Section G: VCAA-Level Questions II (10 Marks)

INSTRUCTION: 10 Marks. 30 Seconds Reading. 9 Minutes Writing.

Question 22 (10 marks)

Muhammad is very interested in cooking, and he wants to use the best tools available to improve his skills.

a. He finds that his old iron pan has a layer of rust, or iron oxide, forming over it because it was passed down in his family. Write the reaction that occurred to produce the rust if the iron used has a valency of +3. (2 marks)

_____

_____

b. Muhammad would like to purchase a new pan because of this, however, it is difficult to choose. He has a choice between a ceramic pan, an iron pan, and an iron pan with a ceramic handle. Muhammad understands that ceramic comprises multiple ionic compounds.

i. He wants to be able to stir fry, which involves very high temperatures. Which option would be the least optimal for that purpose? Justify your answer. (3 marks)

_____

_____

_____

_____

ii. Make a final recommendation for Muhammad, stating the benefits and downsides of the recommended pan with reference to their properties. (3 marks)

_____

_____

_____

_____

c. Is there any suggestion that would help mitigate the downsides identified in **part b.ii.**? Explain. (2 marks)

_____

_____

_____

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Section H: Extension Questions (7 Marks)

Question 23 (7 marks)

Lithium is an important metal as it is required in the production of most modern electronic devices.

a. Lithium is typically mined as lithium oxide. Write the reaction between lithium and oxygen. (1 mark)

_____

b. Lithium is known to be highly reactive.

i. Explain why this is the case. (2 marks)

_____

_____

_____

ii. If we obtain lithium oxide, but cut it in half, state and explain any observations that can be made. (2 marks)

_____

_____

_____

c. Mining lithium is important, but there are considerations that we also need to be aware of. State an environmental disadvantage associated with mining lithium and how it affects the environment. (2 marks)

_____

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