

Some of the formatting is
messed up. Apologies.

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Part A - Multiple Choice, (75 MARKS)

1. Your lab partner is adding acid to a series of test tubes when one suddenly erupts in her face.
 - a) first aid kit.
 - b) eyewash station.
 - c) teacher.
 - d) medical room.
2. Five kilometers are equal to how many centimeters?
 - a) 5.0×10^{15} cm.
 - b) 5.0×10^{13} cm
 - c) 5.0×10^9 cm.
 - d) 5.0×10^5 cm.
3. Which one of the following measurements is expressed with three significant figures?
 - a) 7.30×10^{-7} km.
 - b) 0.007 m.
 - c) 0.070 mm.
 - d) 7077 mg.
4. Suppose that the most accurate atomic weights available for silver, boron, and fluorine are:
Ag: 107.868; B: 10.81; F: 18.998403
The number of significant figures that should be reported in the calculated molar mass of AgBF_4 is:
 - a) five b) six c) seven d) - eight
5. The sum of the experimentally measured quantities $15.0 + 0.379 + 5.12$ is best expressed as...
 - a) 20.5
 - b) 20.50
 - c) 21
 - d) 20.499
6. Which of the following statements provides the best evidence for the existence of ions?
 - a) non-metals form covalent bonds.
 - b) metals are good electrical conductors.
 - c) salts are composed of metals and non-metals.
 - d) salt solutions are good electrical conductors.

7. Which one of the following is NOT a physical property of water? a) boiling point is 100 degrees Celcius. b) colourless liquid. c) composed of hydrogen and oxygen. d) sugar dissolves in it.
8. Metallic gold (1) conducts electricity, (2) is yellow, (3) does not corrode, (4) has a density of 19.3 g/cm³, (5) melts at 1063 oC. Which of these are physical properties?
x) 1,2,4,5 b) 1,2,5
C) 3,4,5
d) none of them
9. When substance V is heated a net gain in mass is recorded. This is best described as....
a) a physical change.
b) melting.
c) a chemical change.
d) a decomposition.
10. The correct name for (NH₄)₂CrO₄ is:
A. ammonia dichromate
B. ammonia chromate
C. ammonium dichromate
D. ammonium chromate

Refer to the following information when answering questions 11, 12, 13, 14, and 15.

A scientist had the opportunity to collect samples of matter from two previously unexplored planets. Upon returning to his spacecraft, he recorded the following information in his notebook.

- Sample 1 green powder, uniform appearance; dissolves readily in ethanol.
- Sample 2 purple crystals and orange particles; purple crystals dissolve in water.
- Sample 3 yellow pebbles, uniform appearance; releases a gas upon heating.
- Sample 4 blue liquid which evaporates readily and leaves behind a white residue

11. The data for sample 3 indicates that upon heating the yellow pebbles probably... a) decompose. b) disintegrate. c) melt. d) vaporise.
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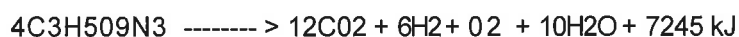
12. If the scientist stated in his report that Sample 1 was most likely an element, he would be making
- an observation.
 - an interpretation.
 - a conclusion.
 - a hypothesis.
13. The purple and orange particles in sample 2 could best be separated by...
- distillation.
 - adding water and then filtering.
 - evaporation and distillation.
 - heating.
14. The sample which is most likely a mixture would be....
- Sample 1
 - Sample 2
 - Sample 3
 - Sample 4
15. Which of the scientist's samples is most likely heterogeneous?
- Sample 1
 - Sample 2
 - Sample 3
 - Sample 4
16. When a substance is heated, the energy that is absorbed results in the particles being...
- arranged more randomly and moving more slowly.
 - arranged less randomly and moving more quickly.
 - arranged more randomly and moving more quickly.
 - arranged less randomly and moving more slowly.
17. A substance which releases H^+ ions when mixed in water is best described as....
- a base.
 - a salt.
 - a hydride.
 - an acid.
18. Which of the following is the most likely formula for the combination of nitrogen and chlorine?
- NC_3
 - NCI
 - N_2Cl_3
 - N_5Cl_3
19. The correct name for $K_2Cr_2O_7$ is most likely...
- Potassium chromium oxide.
 - potassium dichromate.
 - potassium chromoxide.
 - potassium heptaoxide.
-

20. Which one of the following formulas most likely represents a compound formed from strontium and bromine?
- Sr₂Br
 - SrBr
 - SrBr₂
 - Sr₂Br₂
21. Which one of the following is the most likely mass for 11.2 L of chlorine gas at STP?
- 8.9 g
 - 17.8 g
 - 35.5 g
 - 70.0 g
22. Isotopes of an element vary in the number of ...
- protons.
 - electrons.
 - neutrons.
 - nucleons.
23. If the atomic mass of carbon-12 had been assigned exactly 100 amu, instead of 12 amu, the atomic mass of oxygen would have been:
- 16
 - 104
 - 133
 - 128
24. Which one of the following best describes the molar mass of (NH₄)₃P⁰4?
- 113 g/mol
 - 121 g/mol
 - 149 g/mol
 - 239 g/mol
25. Which of the following units is best suited to describing a large number of things?
- a dozen.
 - a mole.
 - a gross.
 - a metric tonne.
26. How many molecules would be inside a balloon containing 0.40 moles of H₂ gas?
- 2.4×10^{23}
 - 4.8
 - 6.02×10^{23}
 - 2.4×10^{24}
27. Which of the following is the most likely mass for 0.850 moles of AuCl₂?
- 228 g
 - 267 g
 - 268 g
 - 314 g

28. "Equal volumes of gases under the same conditions of temperature and pressure contain equal numbers of particles." This statement is best described as... a) Boyle's law.
 b) Guy-Lussac's Gas law.
 c) Molar law.
 d) Avogadro's hypothesis.

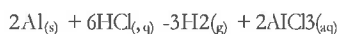
29. In a chemical reaction the mass of the products...
 a) is less than the mass of the reactants.
 b) is greater than the mass of the reactants. c) is equal to the mass of the reactants.
 d) has no relationship to the mass of the reactants.

Use the following equation for the explosion of nitroglycerine to answer questions 30, 31,



30. This reaction is best described as: a) a synthesis reaction. b) a combustion reaction. c) an endothermic reaction. d) an exothermic reaction.
31. if only one mole of nitroglycerine was used, the amount of heat energy released would most likely be...
 a) 906 kJ
 b) 1811 kJ
 c) 3622 kJ
 d) 14,490 kJ

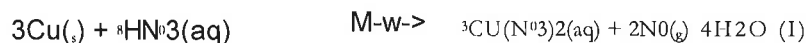
32. When 10.0 g of aluminum react according to the equation



What volume of hydrogen gas at STP is produced?

- A. 5.53L B. 12.4L C. 90.7L D. 336L

Refer to the following equation when answering questions 33, 34, and 35.



33. If you could drop 12 atoms of copper into a beaker containing the nitric acid, how many molecules of NO would be produced?
 a) 2
 b) 8
 c) 12
 d) 18

3 4 . Calculate the moles of water produced when 6.6 moles of $\text{Cu}(\text{NO}_3)_2$ are formed in the reaction.

- a) 4 moles. b) 4.9 moles. c) 6.6 moles. d) 8.8 moles.

3 5 . How many grams of Copper would be needed to react with 4.0 moles of HNO_3 ?

- a) 1.50 grams. b) 63.5 grams, c) 95.3 grams. d) 191 grams.

3 6 . Determine the coefficient X when one mole of $\text{C}_2\text{H}_5\text{OH}$ is used in the following equation.



- a) 2 b) 5 c) 7 d) 3

37. In which of the following reactions do the reactants change partners? a) double displacement. b) synthesis. c) decomposition. d) single displacement.

Refer to the following equation when answering question 38.



38. If 15 L each of H_2 and N_2 is allowed to react, how many liters of NH_3 will be produced?
a) 10 L b) 15L c) 20L d) 30L

Refer to the following equation when answering question 39. Mg



3 9 . If 2.43 g of magnesium is allowed to react with an excess amount of HCl , how many grams of MgCl_2 will be produced?
a) 4.76 g b) 9.53 g c) 9.73 g d) 95.3 g

40. A compound has an empirical formula $C_3H_5O_2$ and a molecular weight of 292.

The molecular formula is...

- a) $C_{15}H_{25}O_{10}$
- b) $C_{13}H_{24}O_7$
- c) $C_{12}H_{20}O_8$
- d) $C_9H_{15}O_6$

Refer to the following equation when answering question 41.

sodium carbonate plus tin II nitrate forms

41. Which one of the following is most likely a product of the above reaction?
- a) tin II nitrate
 - b) sodium carbonate
 - c) sodium carbonate and tin II carbonate
 - d) sodium nitrate



- A) $PbN + 2KI_{103}$
- b) $PbI_2 + 2KNO_3$
- c) $PbK + INO_3$
- d) $PbKI + 2NO_3$

43. In which of the following pairs does each ion have a stable octet configuration?

- a) Br^- , Ge^{3-}
- b) Se^{4+} , O^{2-}
- c) Be^{2+} , As^{3-}
- d) Tl^+ , O^+

44. Element # 112 was recently discovered by some German scientists. What does electron configuration end in?

- a) $5f^{15}$
- b) $5f^{14}$
- c) $7s^2 5d^6$
- a) $7s^2 6d^1$

45. Which one of the following conditions best describes covalent bonding?

- a) shared electrons.
- b) Noble gas configuration.
- c) metal plus non-metal.
- d) electron transfer.

46. In which of the following molecules does the central atom violate the "octet rule"? a) OF₂
 b) SF₄
 c) PF₃
 d) ClF

47. Which one of the following compounds possesses an ionic bond?
 a) Rb₂O
 b) CO
 c) SiCl₄
 d) NH₃

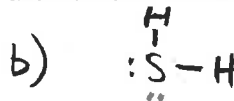
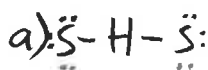
48. Given the following electron configurations, representing neutral atoms, answer the following.
 Which electron configuration above, represents the atom having the lowest second ionization energy?
 a) 1s² 2s² 2p⁶ 3s²
 b) 1s² 2s² 2p⁶ 3s¹
 c) 1s² 2s² 2p⁶
 d) 1s² 2s² 2p⁵
 e) 1s² 2s² 2p³

49. The Bohr model of the atom is characterized by...
 a) electrons and protons mixed equally.
 b) electrons orbiting the nucleus in circular orbits.
 c) electrons occupying set energy levels about the nucleus.
 d) electrons occupying the nucleus along with the protons.

50. The complete electron configuration of Ge is...

- a) 1s²2s²2p⁶3s²3p⁶3d⁴
 b) 1s²2s²2p⁶3s²3p⁶3d¹⁰4s²4p²
 c) 1s²2s²2p⁶3s²3p⁶4s²4p²4d¹⁰
 d) 1s²2s²2p⁶3d¹⁰3s²3p⁶4s²4p²

51. Which of the following represents the Lewis structure for Hydrogen sulphide?



52. Which one of the following best describes the halogens?
 a) all are metals which are good conductors.
 b) have low reactivity and a high melting point.
 c) are highly reactive non-metals.
 d) as the molar mass increases, the melting point decreases.

5 3 . Elements are organized in the present periodic table according to....

- a) alphabetical sequence.
- b) their increasing activity.
- c) increasing atomic mass.
- d) increasing atomic number.

5 4 . Elements in the same chemical family tend to have similar... a) electron configurations.

- b) atomic numbers.
- c) atomic masses.
- d) numbers of electrons.

5 5 . Which of the following elements has the highest electronegativity?

- a) Te
- b) S
- c) O
- d) B

5 6 . Which of the following descriptions does not, fit the element? a)

- Ge, a metalloid
- b) Ca, an alkali metal
- c) Br, a halogen
- d) Au, a transition metal

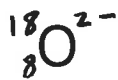
5 7 . The general reaction of any alkali metal. "M" with O₂ is...

- a) $2M + O_2 \rightarrow 2MO$
- b) $4M + O_2 \rightarrow 2M_2O$
- c) $M + O_2 \rightarrow M^+O_2^-$
- d) $4M + O_2 \rightarrow 2M_2O_2$

5 8 . An unlikely chemical combination is.... a)

- ArCl₂
- b) Si₁₁
- c) Al₂S₃
- d) CuSO₄ · 5H₂O

5 9 . The number of protons, neutrons , and electrons represented by the symbol



- a) 8 protons, 18 neutrons, 8 electrons
- b) 8 protons, 10 neutrons, 10 electrons
- c) 10 protons, 10 neutrons, 8 electrons
- d) 18 protons, 10 neutrons, 8 electrons

INSTRUCTIONS: *Show all work in the space provided.
 *Include units throughout your calculations and in your final answer.
 *Use significant figures in calculating numerical values.

1. Calculate the number of grams of CH_4 represented by 1.25×10^{24} molecules. (2mk)

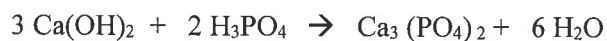
2. How many **hydrogen atoms** are present in 62.5 L of CH_4 at S.T.P.? (3mk)

3. Determine the % (by mass) of Cr in the compound $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$. (2mk)

4. How many grams of sugar ($\text{C}_{12}\text{H}_{22}\text{O}_{11} = 342 \text{ g/mol}$) are needed to make 4.00 L of a 0.250 molar (M) sugar solution? (2mk)

5. Determine the empirical formula of a compound that is 60.0% carbon, 13.3% Hydrogen, and 26.7% Oxygen. (3mk)

6. If we want to produce 300. g of $\text{Ca}_3(\text{PO}_4)_2$ by the reaction given below, how many grams of H_3PO_4 will be needed? (3mk)



7. Using 85.0 mL of 4.00 M HCl_(aq) with 30.5 g of Zn_(s) in the reaction below, (5mk)



- a) What kind of reaction is this? _____
- b) Which is the limiting reactant? _____
- c) What is the maximum litres of H₂ gas that can be produced?

8. You mix Ca(NO₃)_{2(aq)} with K₂SO_{3(aq)}. Predict and write the balanced : (3mk)

FORMULA EQUATION

COMPLETE IONIC EQUATION

NET IONIC EQUATION

9. For each of the following, list (6mk)

- a) an element that is both in the second family and the fifth period _____
- b) an element that will have similar properties to nitrogen _____
- c) an element that is in the same family as potassium but with a larger radius _____
- d) the most reactive element of the halogen family _____
- d) an example of an element with a oxidation state of +3 _____
- e) an element in the fourth period with the greatest ionization energy _____

10. Draw Lewis dot structures for: (4mk)

a) NH₃

b) H₂O₂

c) NH₄⁺

d) N₂

11. Draw the structural formula of: (2mk)

a) 2, 3 - dimethylbutane

b) 5 - bromo - 3 - hexyne

12. The following data was obtained during the titration of 25.0 mL of HNO₃ with 0.150 M Ca(OH)₂.

	<u>Titration 1</u>	<u>Titration 2</u>	<u>Titration 3</u>
Volume of NaOH	19.6 mL	22.5 mL	22.4 mL

a) Write the balanced neutralization reaction. (1mk)

b) What is the concentration of the acid? (3mk)

13. Use the lab data below, along with the balanced chemical equation to answer the following:



Mass of crucible and Al₂(CO₃)₃ 27.85 g

Mass of crucible only 25.81 g

Mass of crucible and AlI₃ 34.95 g

a) What mass of Al₂(CO₃)₃ was used? _____ g

b) What mass of AlI₃ was produced? _____ g

c) Theoretically, what should have been the mass of AlI₃ produced? (3mk)

d) Using the theoretical and actual values of AlI₃, calculate the % yield. (2mk)