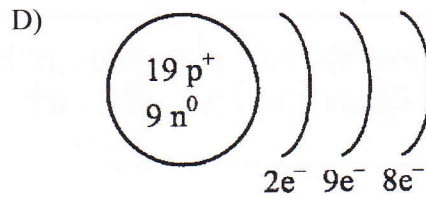
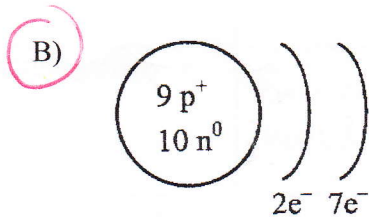
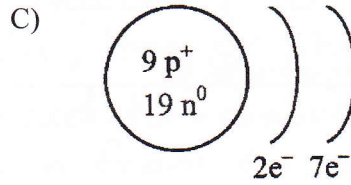
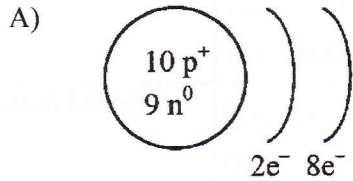
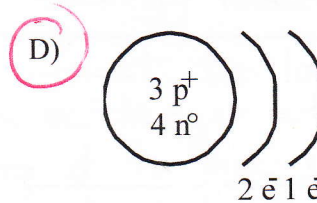
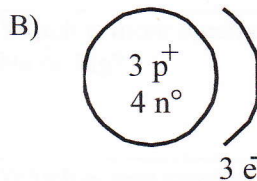
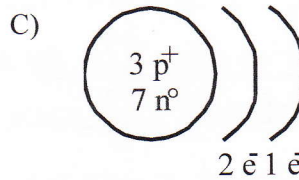
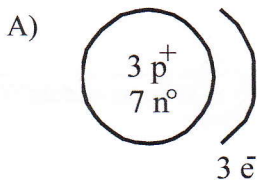


Simplified Atomic Model, Trends, Isotopes, Radiation and Nuclear Transformations

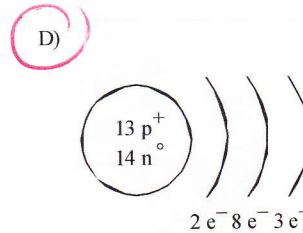
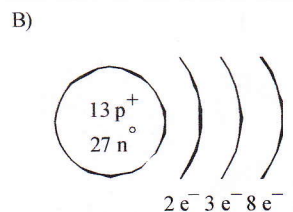
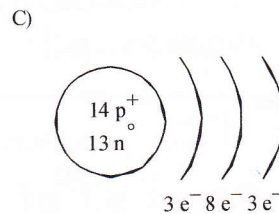
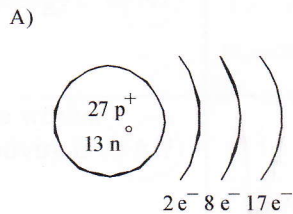
1. The atomic number of fluorine (F) is 9 and its mass number is 19.
Which of the following diagrams correctly represents the simplified model (Rutherford-Bohr) of a fluorine atom?








2. The mass number of lithium (Li) is 7 and its atomic number is 3.
Which of the following diagrams represents the simplified atomic model of a lithium atom?



3. Which of the following best represents the aluminum (Al) atom according to the Rutherford-Bohr model?



4. Give the definition and trend for the following:

	Definition	Trend
Atomic radius	distance between nucleus + outer-most electron of an atom	
Reactivity	speed / force with which an atom reacts (to either gain, lose or share electrons)	metals  non-metals 
Ionization Energy	Energy needed to remove an electron from an atom	
Electronegativity	Energy with which an atom holds on to its electrons	

5. Answer the following questions on trends and explain each answer.

Which is bigger Al or Si?	less protons in nucleus \therefore less force pulling e^- s "in" (both have 3 energy levels)
Which is smaller N or P?	N \rightarrow 2 energy levels P \rightarrow 3 energy levels
Which is more reactive Na or Mg?	metals want to lose electrons Na has a larger atomic radius \therefore easier for it to lose its outermost electrons (also only has 1 to lose)
Which is less reactive Cl or Br?	Br is a larger atom, will not gain e^- as easily \therefore less reactive
Which has a greater ionization energy C or N?	N is smaller \therefore more energy is needed to remove an e^- from atom
Which has a weaker electronegativity B or Al?	Al is larger, It does not hold on to its e^- s as well

6. What is an isotope? *Atoms that have the same # of protons but a different # of neutrons*

7. Phosphorus has 3 isotopes: P-30, P-31 and P-32. How many neutrons does each of the isotopes have?

P = 15 protons
P-30 → 15P + 15N
P-31 → 15P + 16N
P-32 → 15P + 17N

8. Bromine has three possible isotopes: Br 78, Br 79 and Br 80. Determine which form of bromine is most abundant.

relative atomic mass from periodic table = 79.90
∴ closest to "80" ∴ Br 80 is most common

9. Element «X» has two isotopes.

Isotope	Mass number	Atomic number
I	63	29
II	65	29

→ 34n 69.1%
→ 36n 30.9%

The isotope with 36 neutrons has an abundance of 30.9%.
 What is the average atomic mass for this element?

- A) 29.00 μ
- B) 34.62 μ
- C) 63.62 μ**
- D) 64.38 μ

** most have a mass # of 63*
→ answer must be between 63 + 65 but closer to 63.

10. A soft, malleable, ductile, grey-coloured metal has four stable isotopes, as shown in the table below.

Z	Isotope	% abundance
82	²⁰⁴ Pb	1.5
82	²⁰⁶ Pb	24.1
82	²⁰⁷ Pb	22.1
82	²⁰⁸ Pb	52.3

100 - 1.5 - 24.1 - 22.1 = 52.3%

According to the data above, what is the atomic mass of the unknown metal?

- A) 82.00 u
- B) 206.25 u
- C) 207.24 u**
- D) 208.00 u

** most have a mass # of 208*
∴ answer between 204 + 208, closer to 208.

14. Calculate the time it would take to have less than 4.0 g of tellurium if its half-life is 7 days and you begin with 25.0 g of the substance.

time (days)	mass (g)
0	25.0 g
7	12.5
14	6.25
21	3.125

between 14 + 21 days

15. Carbon-14's half-life is 5 770 years. How old is a bone that contains only 10% of carbon-14? Show your work.

time (years)	%
0	100
5770	50
11540	25
17310	12.5
23080	6.25

Between 7310 + 23080 years.

16. Explain what is meant by each of the following:

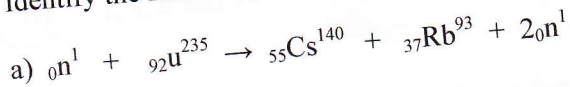
a) nuclear fission

one larger nucleus broken down into 2 or more lighter nuclei

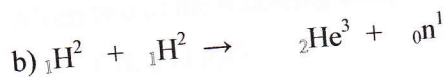
b) nuclear fusion

2 or more nuclei combine to form a larger nucleus

17. Identify the following as fission or fusion reactions



fission

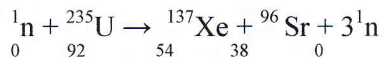


fusion

18. a) Identify the following equation as a nuclear fusion or fission reaction. Justify your choice.

fission

b) There are over 200 pairs of isotopes that have been discovered to form during this reaction. Explain why Xe and Sr could be one of these pairs. (Cr 3)



atomic mass

$$1 + 235 = \underline{\underline{236}}$$

atomic mass

$$137 + 96 + 3 = \underline{\underline{236}}$$

atomic #

$$92 = 54 + 38$$

(92)

19. True or false

- a- Sodium is bigger than magnesium because it has less valence electrons. **F**
- b- Chlorine has more electronegativity than Argon because it has less valence electrons. **F**
- c- Nuclear fusion is a source of energy used today. **F**
- d- During nuclear fission, a heavier nucleus becomes 2 lighter nuclei. **T**
- e- During nuclear fusion, a heavier nucleus becomes 2 heavier nuclei. **F**
- f- An element with the two isotopes will have the same number of protons. **T**

20. Which of the following compounds are made up of covalent bonds?

- | | |
|-----------------------------|----------------------------|
| 1. Na_2CO_3 | 5. Ca_3N_2 |
| 2. C_3H_8 | 6. P_2O_5 |
| 3. Al_4C_3 | 7. PBr_5 |
| 4. Si_3N_4 | 8. Mg_3P_2 |

A) 1, 3, 5 and 8

B) 1, 3, 6 and 8

C) 2, 4, 5 and 7

D) 2, 4, 6 and 7

21. Which two of the following compounds are formed by ionic bonds?

A) CH_4 and P_2O_3

C) CaO and P_2O_3

B) CH_4 and Na_2S

D) CaO and Na_2S

22. For each compound, draw a Lewis diagram representing the compound and give the molecular formula.

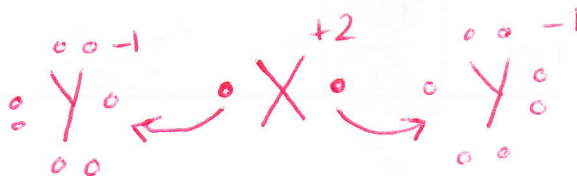
	Lewis diagram	Molecular formula
Aluminum fluoride		$Al^{+3} F^{-1}$ 3×1 AlF_3
Phosphorus trichloride		PCl_3
Chlorine gas		Cl_2
Carbon dioxide		CO_2
Calcium chloride		$Ca^{+2} Cl^{-1}$ 2×1 $CaCl_2$

23. An element 'X' from group II and an element 'Y' from group VII form a compound.

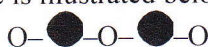
a) Write the molecular formula for this compound.



b) Illustrate with a diagram how these elements transfer electrons from their last shell to respect the Octet Rule.



24. The molecular model of a substance is illustrated below.



● represents the atom whose second energy level contains 5 valence electrons.

○ represents the atom having three orbitals and forming a -2 ion.

→ N = 2

→ S = 3

Which substance is represented by this molecular model?

A) Nitrogen trisulfide, N₂S₃

C) Dinitrogen trisulfide, N₃S₂

B) Dinitrogen trisulfide, N₂S₃

D) Trinitrogen sulfide, N₃S₂

25. Give the molecular formula for the following.

Beryllium sulfide	Be ⁺² S ⁻² 2 X 2 Be ₂ S ₂ → BeS	Hydrogen fluoride	H ⁺¹ F ⁻¹ 1 X 1 HF
Sodium oxide	Na ⁺¹ O ⁻² 1 X 2 Na ₂ O	Dihydrogen sulfide	H ₂ S
Diphosphorus trisulfide	P ₂ S ₃	Iodine gas	I ₂
Carbon tetrachloride	CCl ₄	Aluminum sulfide	Al ⁺³ S ⁻² 3 X 2 Al ₂ S ₃

26. Name the following molecules.

Na ₃ P (i)	sodium phosphide	SCl ₂ (c)	sulfur dichloride
NaCl (i)	sodium chloride	PF ₃ (c)	phosphorus trifluoride
NH ₃ (c)	nitrogen trihydride	C ₂ S ₄ (c)	dicarbon tetrasulfide
O ₂ (c)	oxygen (gas)	BeCl ₂ (i)	beryllium chloride

27. Name the following polyatomic ions.

OH^-	hydroxide
NO_2^-	nitrite
NO_3^-	nitrate
SO_4^{2-}	sulphate
SO_3^{2-}	sulphite
NH_4^+	ammonium

28. Name the following compounds. Circle the polyatomic ions in each compound if present.

KSO_4	potassium sulfate
MgOH	magnesium hydroxide
CaS	calcium sulfide
CO	carbon monoxide
$(\text{NH}_4)_3\text{PO}_4$	ammonium phosphate