SCH3UI

Name: ANSWERS

Matter and Chemical Bonding Practice Test

75 /75

Part A - True or False (20 marks)

For each of the following questions, select "A" for TRUE and "B" for FALSE. Transfer your answers to the SCANTRON provided.

1. John Dalton's major contribution to the atomic model was that all atoms are identical.
   a) True (b) False

2. The gold foil experiment demonstrated that gold contains densely packed electrons.
   a) True (b) False

3. The number of protons → e^- is responsible for the similar chemical and physical properties of elements in the same group?
   a) True (b) False

4. Potassium has an average atomic mass of 39.10 u. It has 18 neutrons.
   a) True (b) False

5. An unknown element has two isotopes 45 and 46 and has an atomic mass of 45.45 u. There is a greater percentage of isotope 46.
   a) True (b) False

6. The ability of a substance to be hammered into a sheet refers to ductility. malleability
   a) True (b) False

7. The solution fills a 250mL beaker, and the solution is clear is a qualitative observation.
   (a) True b) False

8. When bread is placed in a toaster and toasted, this is an example of a physical change.
   a) True (b) False

9. The ancient Greeks believed that all matter was made up of only four elements.
   (a) True b) False

10. All elements in the same period contain the same number of energy levels.
    (a) True b) False

11. Calcium belongs to the Alkali metals.
    a) True (b) False

12. The oxygen ion would be classified as a cation.
    a) True (b) False

13. Isotopes of the same element can have different physical properties.
    (a) True b) False

14. Boron is in group 13 of the periodic table and therefore its' Lewis dot diagram should have 13 dots.
    a) True (b) False

15. Group 2 contains the most reactive metals.
    a) True (b) False

16. A particle has 16 protons, 18 neutrons, and 18 electrons. Therefore, it has a charge of 2+.
    a) True (b) False

17. Oxygen is a smaller atom than Chlorine
    (a) True b) False

18. Generally, as the atomic radii of the elements decrease, the ionization energies increase.
    (a) True b) False

19. A molecule that contains non-polar covalent bonds is always a polar molecule.
    a) True (b) False

20. A compound that is soluble in water, and conducts electricity, likely is malleable and a good conductor of heat and electricity in the solid state.
    a) True (b) False

Part B - Multiple Choice (20 marks)

For each of the following questions, choose the best answer. Transfer your answers to the SCANTRON provided.

21. Which of the following conversions is correct? 3.13 has = _____???
    a) 0.00000000313Ms
    b) 3.13 s
    c) 3.13×10^{-5} ms
    (d) 313000 ms

    ha da b d c m

22. If you round 2.852×10^3 to two significant digits, what is the answer?
    a) 2.95×10^3
    b) 2.8×10^3
    c) 2800
    (d) 2900

23. Considering significant digits, what is the correct answer for the following calculation?
3.954 - 0.03 - 2.6
a) 1.324
b) 1.3
c) 1.32
d) 1

24. What is the correct answer for the following calculation?
3.654 cm ÷ 2.6 cm x 12.005 L
a) 16.872 cm^2/L
b) 16.8 L
c) 1.7×10^1 cm^2/L
d) 1.7×10^1 L

25. The implied uncertainty of a measurement, 3.0×10^8 cm is:
a) 0.1 cm
b) 1 cm
c) 1000000 cm
d) 1.0×10^7 cm
e) 1.0×10^7 m

26. Liquid Gatorade is an example of a:
a) Mechanical mixture
b) Compound
c) Homogeneous mixture
d) Heterogeneous mixture
e) Pure substance

27. Identify the subatomic particle that has a positive charge.
a) Proton
b) Neutron
c) Electron
d) Ion

28. The mass number of magnesium is:
a) 12
b) 24.31
c) 24
d) +2
e) 1.31

29. How many electrons, protons, and neutrons are in $[^{38}_{17}Cl]^{-1}$?
a) 17 electrons, 17 protons, and 21 neutrons
b) 18 electrons, 18 protons, and 20 neutrons
c) 18 electrons, 17 protons, and 21 neutrons
d) 16 electrons, 17 protons, and 21 neutrons

30. Which ion is isoelectric with argon?
a) Cl^{-1}
b) Mg^{2+}
c) Br^{-1}
d) Na^{+1}
e) Al^{+3}

31. An element has a high negative electron affinity and a high first ionization energy. What is it most likely to be?
a) A halogen
b) An alkali metal
c) A noble gas
d) A Group 16 (VIA) element

32. In which pair of elements is the element with the larger atomic size listed first?
a) fluorine, oxygen
b) sodium, magnesium
c) beryllium, lithium
d) helium, neon

biggest smallest

33. From ~~smallest~~ to ~~biggest~~ place the following atoms in terms of ionization energy:
chlorine, fluorine, oxygen, nitrogen.
a) Cl, F, O, N
b) F, O, N, Cl
c) N, O, F, Cl
d) O, F, Cl, N

34. A white powder was found to have a high melting point and a low conductivity of electricity when dissolved with water, the substance can be classified as:
a) ionic
b) metallic
c) ~~They are liquids at room temperatures~~ covalent
d) ~~They have a high melting point~~ alloys

35. Which element is correctly matched to both its group and its period?

	Element	Group	Period
a)	Si	3	4
b)	Sr	5	2
c)	Ga	13	4
d)	Pd	10	6

36. Which molecule is pyramidal?
a) CH_4
b) Cl_2
c) H_2S
d) PI_3

37. Which bond is least polar?
a) H-O 3.44 - 2.20 = 1.24
b) I-Br 2.96 − 2.66 = 0.30
c) F-Cl 3.98 − 3.16 = 0.82
d) O-S 3.44 - 2.58 = 0.86

38. Which of the following isotopes do you believe is the most common version of tin?
a) $^{50}_{50}Sn$
b) $^{169}_{50}Sn$
c) $^{118}_{50}Sn$
d) $^{119}_{50}Sn$
e) $^{69}_{50}Sn$

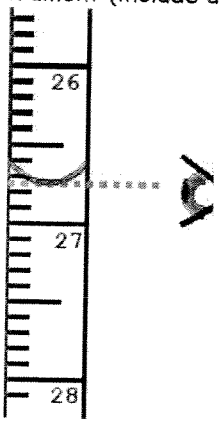
39. During pure covalent bonding, electrons are...
a) shared equally between two non-metal atoms
b) shared unequally between two non-metal atoms
c) free to move within an electron pool around positively charged metal atoms
d) pulled from one atom to another to create anions and cations

40. Ionization energy is a measure of _____.
a) the ion-forming ability of an atom
b) the electron-attracting ability of an atom
c) the electron-repelling ability of an atom
d) the energy needed to remove an outer electron

Part C - Short Answer (35 marks)

Answer the following questions in the space provided.

41. Record the volume of liquid in the 50 ml burette to an appropriate precision for the calibration of the instrument (include units). (2 mark)



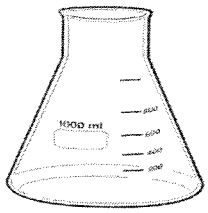
23.25 ml ✓ ✓

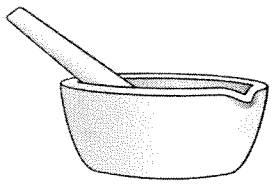
$V_{beaker} = V_{total} - V_{reading}$

$= 50 - 26.75$

$= 23.25$ ml

42. Name the following pieces of lab equipment in the space provided. (2 marks)

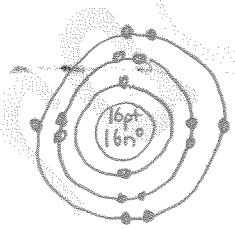




a) Erlenmeyer flask

b) mortar & pestle

43. Draw the Bohr-Rutherford diagram for sulphur. (2 marks)



OR

16pt — 6e⁻
16n° — 8e⁻
2e⁻

✓ - nucleus
• 5 - # of shells
• 5 - e⁻ placement

44. Calculate the average atomic mass of nickel if it has five isotopes with the following abundances: (3)

Isotope	Relative abundance
Ni-58	68.1%
Ni-60	26.3%
Ni-61	1.1%
Ni-62	3.6%
Ni-64	0.9%

avg atomic mass = (m Ni-58)(% Ni-58) + (m Ni-60)(% Ni-60) + (m Ni-61)(% Ni-61) + (m Ni-62)(% Ni-62) + (m Ni-64)(% Ni-64)

$= (58)(0.681) + (60)(0.263) + (61)(0.011) + (62)(0.036) + (64)(0.009)$

$= 58.76$ u

∴ the average atomic mass is 58.76u

✓ eq'n
✓ answer w units
✓ ∴

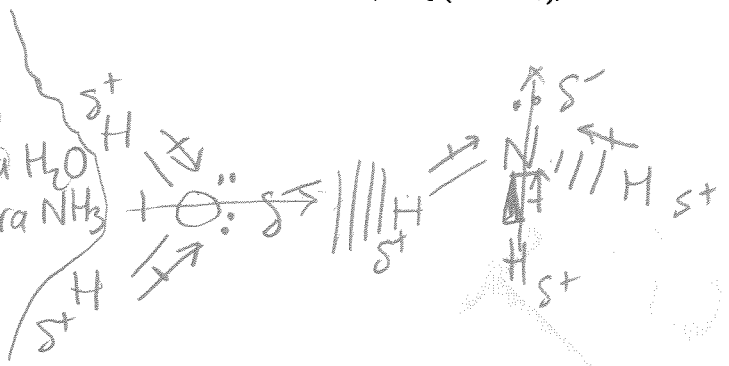
45. Explain **how** and **why** atomic size changes as you move across a period and down a group in the Periodic Table. (2 marks)

✓ • Across a period atomic size ↓ due to #p+ ↑ in nucleus which causes Zeff ↑ thus pulling valence e⁻ closer = smaller size.

✓ • Down a group atoms get bigger as the valence e⁻ are in larger & larger energy levels

46. With use of a **diagram**, NAME and DRAW the intermolecular and intramolecular forces involved between a water molecule, H_2O and ammonia, NH_3 (4 marks).

✓ - diagram
✓ - ΔEN & intra H_2O
✓ - ΔEN & intra NH_3
✓ - inter



Inter
H-bonding
dipole-dipole
dispersion

H_2O intra
ΔEN
O 3.44
H 2.20
1.24 = polar covalent

NH_3 intra
ΔEN
N 3.04
H 2.20
0.84 - polar covalent

47. Using electronegativity values, determine the **type of bond** (ionic, pure, non-polar or polar) that exists between the following atoms. Show your ΔEN calculations. (4 marks)

a) Na-Cl
ΔEN
Cl 3.16
Na 0.93
2.23
ionic

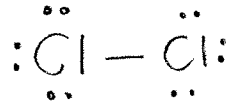
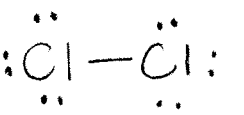
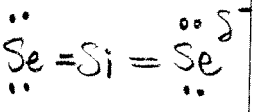
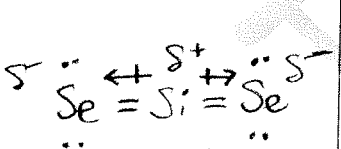
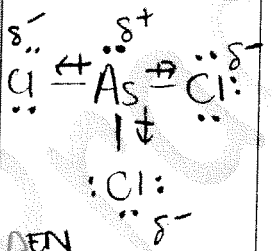
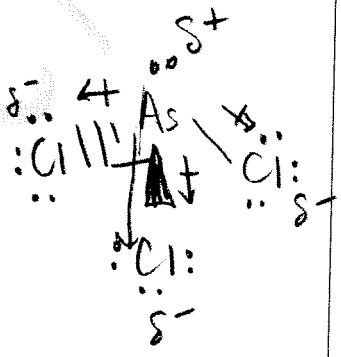
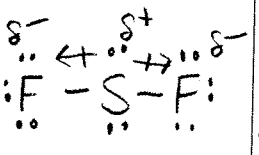
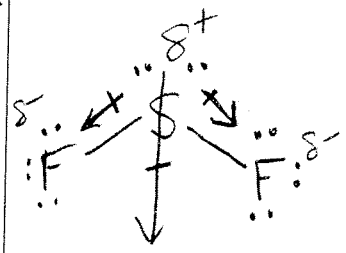
b) N-N
ΔEN
N 3.04
N 3.04
0
pure covalent

c) C-O
ΔEN
O 3.44
C 2.55
0.89
polar covalent

d) P-Si
ΔEN
P 2.19
Si 1.90
0.29
non-polar covalent

0.5 for ΔEN
0.5 for bond } x 4

48. Complete the following chart: (16 marks)

Compound	Lewis Diagram	3-D Structural Formula (show partial charges if present)	Name of Molecular Shape	Polarity of Molecule (polar/non)
Cl_2	 ΔEN Cl 3.16 Cl 3.16 0		linear	non-polar molecule
$SiSe_2$	 ΔEN Se 2.55 Si 1.90 0,65		linear	non-polar molecule
$AsCl_3$	 ΔEN Cl 3.16 As 2.18 0.98		pyramidal	polar molecule
SF_2	 ΔEN F 3.98 S 2.58 1.40		bent	polar molecule