

Physical Science A Final Exam Review Packet ^{w/} Marked off Answers



Short Answer

Clearly write your responses in the space provided. If you need more room, you may attach another sheet of paper & explicitly identify the location of each response.

1. You and a friend are baking cookies. You ask how much water she added to the batter, and she says "15." What is wrong with her answer?
no units
2. The SI units of kilogram, kilometer, and kilowatt all use the same prefix, "kilo." What does "kilo" mean?
1,000

Mass vs. Volume of 3/8" Hexnuts

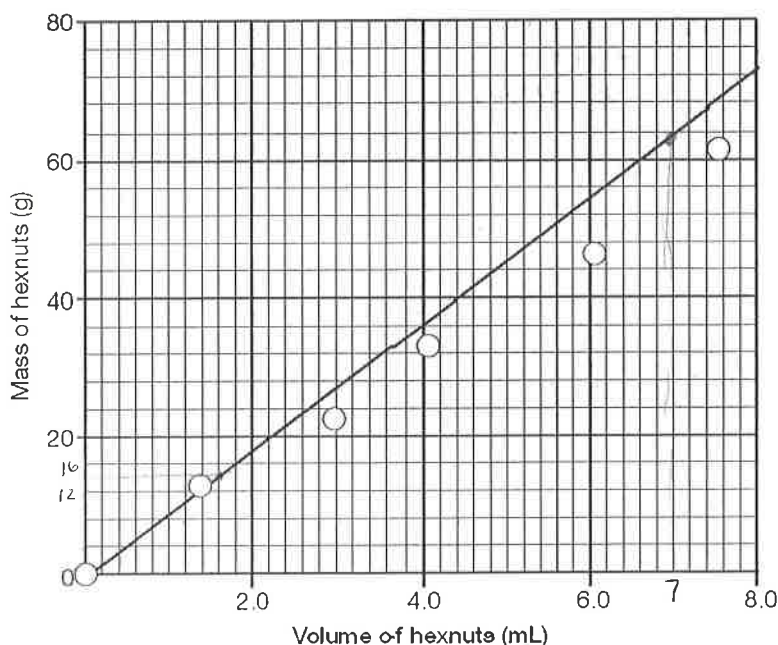


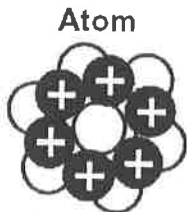
Figure 1-3

3. Using the Mass vs. Volume graph in **Figure 1-3**, estimate the **volume** of 14 grams of hex nuts.
~1.6 mL
4. Using the Mass vs. Volume graph in **Figure 1-3**, predict the **mass** of 7 mL of hex nuts.
~64g
5. What is the **independent variable** for the Mass vs. Volume graph in **Figure 1-3**?
Volume
6. What type of relationship exists between the mass and volume in the graph in **Figure 1-3**?
direct

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7. What happens to the **mass** as the volume increases in **Figure 1-3**? $m \uparrow$
8. Think about the relationship between the amount of gas you have in your car and how far you can travel on it.
- Which is the **dependent variable** and where would you plot it on a graph? *distance = dep = y-axis*
 - Which is the **independent variable** and where would you plot it on a graph? *gas = I - x axis*
9. What makes a good **hypothesis**? *testable / falsifiable*
10. Why is it important to change only one experimental variable at a time in an experiment? *know that change due to ind. variable*
11. Bonita set up an experiment to test the effect of salt water on the germination of plant seeds. She used 4 different concentrations of salt water to water seeds in different plant pots, along with one plant pot she watered with plain water, and counted how many seeds sprouted in each pot.
- What is the **experimental variable** in this experiment? *conc. of salt*
 - Name two **control variables** in this experiment. *# of seeds, soil, temp, water*
 - Write a **hypothesis** for what Bonita may be testing. *If salt concentrations are beyond a threshold, seeds will not germinate.*
12. Which represents a higher temperature, 20° Fahrenheit or 20° Celsius?
13. Which represents a higher temperature, 20° Fahrenheit or 20 Kelvin?
14. Which represents a lower temperature, negative 40° Fahrenheit or negative 40° Celsius? *same temp.*
15. Name the property that makes water a good cooling agent. *high specific heat*
16. Name the two conditions must be met in order for **heat conduction** to take place between two objects. *in contact & of diff temps*
17. What is the general relationship between the specific heat of a substance and the amount of heat needed to raise the temperature of the substance? *higher specific heat requires more heat to raise temp.*
18. For the nucleus shown below, do the following:



6 protons *carbon*
7 neutrons

- Name the element.
- Give the mass number. *13*
- Give the number of electrons in an electrically neutral atom. *6*

19. Describe the reason the atomic mass of magnesium is listed as 24.31 amu when magnesium has 3 stable isotopes: Mg^{24} , Mg^{25} , and Mg^{26} . Which isotope is most commonly found on Earth?
average mass
20. What is the evidence that electrons in atoms are only allowed to have specific amounts of energy?
colors given off - relate to energy
21. Which electrons in an atom interact with other atoms to form chemical bonds?
valance
22. In which group are the halogens found? *17*
23. In which group(s) are the transition elements found? *3-12*
24. Identify three alkali metals. *Li, Na, K, Rb, Cs, Fr*
25. In which group are the inert gases located? *18*
noble
26. Name the element with the smallest atomic number whose electrons fill the level one and level two energy levels.
Neon

Use the portion of the periodic table pictured below to answer the following.

10.811	12.011	14.007	15.999	18.998	20.180
10, 11	12, 13	14, 15	16, 17, 18	19	20, 21, 22
B	C	N	O	F	Ne
5	6	7	8	9	10
26.982	28.086	30.974	32.065	35.453	39.948
27	28, 29, 30	31	32, 33, 34, 36	35, 37	36, 38, 40
Al	Si	P	S	Cl	Ar
13	14	15	16	17	18

Figure 12-2

27. What is the atomic number of fluorine? *9*
28. How many electrons are contained in an electrically neutral atom of oxygen? *8*
29. How many energy levels would be completely filled in an atom of chlorine (Cl)? How many electrons would be left over?
2 filled, 7 v.e.
30. Which element(s) have stable isotopes with a mass number of 36?
Ar, S
31. What two factors determine the properties of a compound?
ratio of atoms / structure
32. Which type of bond, ionic or covalent, will NOT form molecules?
single entities

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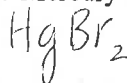
33. What are the numbers of the two most active groups of elements on the periodic table?
1, 17
34. Predict the oxidation numbers for potassium (K) and chlorine (Cl).
+1, -1
35. Predict the chemical formula of the compound formed when the two elements, K and Cl, combine.

36. Name the ionic compound formed by combining K and Cl.
KCl
potassium chloride
37. What is the oxidation number of manganese (Mn) in the compound, MnO_2 , if oxygen (O) has an oxidation number of 2-?
+4

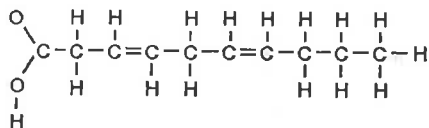
38. Barium has an oxidation number of 4+ and oxygen has an oxidation number of 2-.

- a. What is the chemical formula for barium oxide? *BaO₂*
- b. What is the total charge for barium oxide?
0

39. What is the formula for mercury bromide? Mercury (Hg) has an oxidation number of 2+ and bromine (Br) has an oxidation number of 1-.



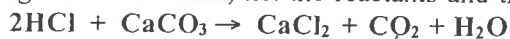
- ~~40.~~ Would the fat represented below by the structural diagram be considered saturated or unsaturated?



41. Your teacher mixes two clear liquids in a beaker. Name three changes in the mixture that would provide evidence that a chemical reaction had occurred.

bubble, new color, temp change, precipitate

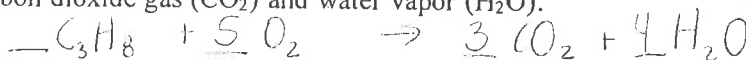
42. For the following antacid reaction, list the reactants and the products.



reactants *products*

43. Write the balanced equation for the following reaction:

The fuel used in gas grills is called propane (C_3H_8). Propane reacts with oxygen gas (O_2) found in the air to produce carbon dioxide gas (CO_2) and water vapor (H_2O).



Answer the following questions based on dissolving ammonium nitrate in water. The balanced equation is given below.



44. Based on the information given in the ammonium nitrate chemical equation, what temperature change would you expect in the reaction? Why would you expect this?
temp ↓

45. Is the ammonium nitrate reaction shown above an endothermic or exothermic reaction?

Answer the following questions based on the balanced combustion reaction given below.
 $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{energy}$

46. Based on the information given in the balanced combustion chemical equation, what temperature change would you expect in the reaction? Why would you expect this? *temp ↑*
47. Is the balanced combustion reaction an endothermic or exothermic reaction?
48. Name 3 examples of radiation that you might encounter in your environment.

X-ray, banana, radio waves

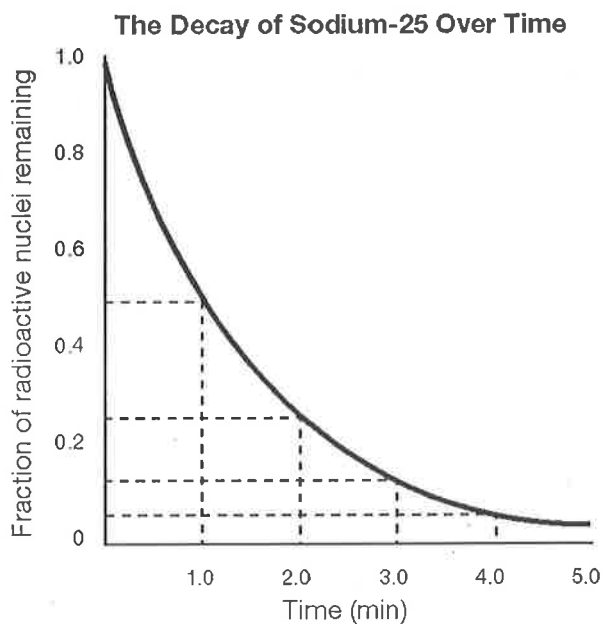


Figure 14-1

49. Based on **Graph 14-1**, what is the half-life of sodium-25? *1.0 min.*
50. Based on **Graph 14-1**, at time 0, what percent of the radioactive nuclei are present? *100%*
51. Based on **Graph 14-1**, after 2 minutes, what percent of the original nuclei are still radioactive?

25%

Carbon-14 undergoes beta decay to become another element.

52. What is the product of the radioactive decay? ${}^6_{14}C \rightarrow {}^0_{-1}e + {}^7_{14}N$
53. What is the new element? *electron + energy*
nitrogen-14
54. What types of substances are most soluble in water?

polar compounds / ionic compounds

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- 55. What causes a molecule to be polar? *unequal sharing of electrons*
- ~~56.~~ List three properties of acids. *sour, pH < 7.0, corrosive*
- ~~57.~~ List three properties of bases. *bitter, pH > 7.0, corrosive*

Problem

Clearly write & justify your responses in the space provided. If you need more room, you may attach another sheet of paper & explicitly identify the location of each response. Show work when appropriate.

- 58. Convert 150 milligrams to grams. $150 \text{ mg} \times \frac{1 \text{ g}}{1000 \text{ mg}} = 0.15 \text{ g}$
- ~~59.~~ Betelgeuse is a star approximately 700 light years away from Earth. Which year did Betelgeuse give off the light you see today?
- ~~60.~~ The star, Regulus, is approximately 77 light years away from Earth. What is this distance in parsecs? A parsec is equal to about 3.26 light years.
- 61. The temperature in Lisbon, Portugal is given as 25°C and is given as 25°F in New York City.
 - (a) Which reading represents a higher temperature?
 - (b) Measured on the Fahrenheit scale, what is the difference between the temperature readings?
 $T_F = \frac{9}{5}(25^\circ\text{C}) + 32 = 77^\circ\text{F}$ $77^\circ\text{F} - 25^\circ\text{F} = 52^\circ\text{F}$
- 62. Near a temperature of 0 Kelvin, several elements become special material known as Bose-Einstein Condensate (BEC), which some scientists consider another phase of matter. At what temperature does this change occur on the Fahrenheit scale? $0 \text{ K} = -273^\circ\text{C} \approx -459^\circ\text{F}$

The three diagrams below represent the same substance in three phases: solid, liquid and gas. Answer the questions below using the diagrams and your knowledge of temperature and intermolecular forces.

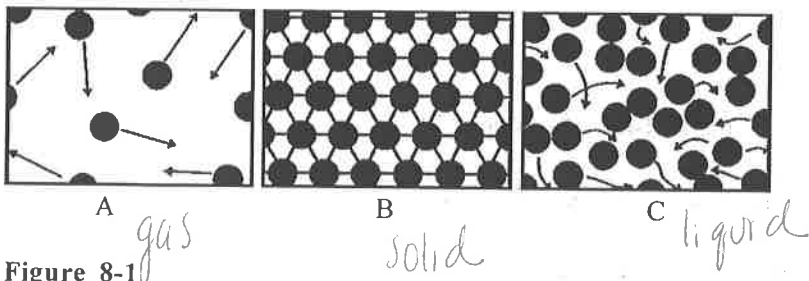


Figure 8-1

- 63. Identify each phase in Figure 8-1.
- 64. List the phases shown in Figure 8-1 in order of their temperatures from highest to lowest. *A, C, B*
- 65. List the strength of the intermolecular forces between molecules shown in Figure 8-1 in order of strongest to weakest. *B, C, A*

66. It takes 504 joules to raise the temperature of 2.00 kilograms of a substance from 10.8°C to 15°C. What is the specific heat of the unknown substance?

$$Q = mc_p \Delta t \quad c_p = \frac{Q}{m \Delta t} = \frac{504 \text{ J}}{2 \text{ kg} (15^\circ\text{C} - 10.8^\circ\text{C})} = \frac{60 \text{ J}}{\text{kg}^\circ\text{C}} = c_p$$

67. Calculate the volume of a small iceberg with a mass of 200,000 kilograms. (density of ice = 920 kg/m³)

$$D = \frac{m}{V} \quad V = \frac{m}{D}$$

$$\frac{200,000 \text{ kg}}{920 \text{ kg/m}^3} = 217 \text{ m}^3$$

68. Lithium has an atomic mass of 6.941. What is the mass in grams of Lithium's most stable isotope?

7.0 grams

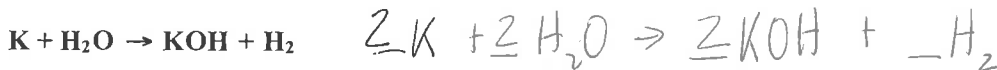
69. If an iron atom loses 2 electrons, what is the oxidation number for the ion that is formed?

+2

70. Balance the following chemical equation:



71. Balance the following equation:



72. Balance the following chemical equation:



73. Carbon-14 (C¹⁴) decays into nitrogen-14 (N¹⁴) with a half life of 5,700 years. How many years would it take a sample of C¹⁴ to decay so much that only 1/8 of the atoms were still C¹⁴?

$$\frac{1}{8} = \frac{1}{2^3} \quad (5,700 \text{ yr}) (3) = 17,100 \text{ yrs}$$

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Essay

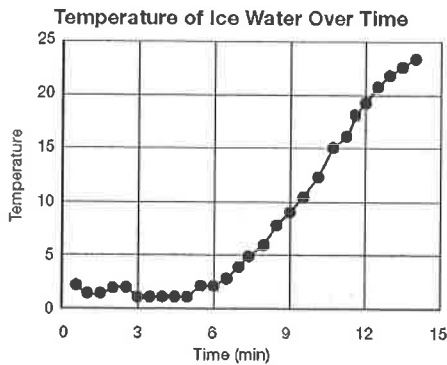


Figure 8-2

A group of students have recorded and graphed the temperature of crushed ice in a beaker. After three minutes, the beaker containing ice is placed in a warm water bath, and the students continue taking temperature readings. Answer the following questions based on the graph.

74. Based on Figure 8-2, why does the temperature in the ice bath remain constant for several minutes after placing the beaker in the warm water bath? *phase change / temp change*
75. Based on Figure 8-2, at time equals 6 minutes, what observations would the students make regarding the state of the ice in the beaker and the temperature of the ice? *NO ice melted, liquid temp ↑*
76. The neon atom pictured below does not bond with other atoms frequently. Why?



complete outer shell / orbital

77. Explain how knowing the element lithium's oxidation number (1^+) helps to determine what compounds it will form. *will combine w/ - ions to become neutral*
78. State fluorine's oxidation number and its number of valence electrons. Explain the significance of each. *7 v.e. -1 oxidation takes on 1 electron to become stable*
79. What determines whether atoms will form covalent or ionic bonds? *tendency to lose or gain electrons - if similar then will share*
80. Briefly explain the difference between ionic and covalent bonding.

*ions attracted ← shared e⁻
+/- charges non-metals
metal + non-metal*