**Answers to the Topics in Chem Midterm Reviews 2024**

There are two sets of answers to the review sheets. The first is in the table below, which shows the answer for each question, followed by an explanation (if needed) and a description of what the question generally implies you should know. You’ll note that the numbering restarts about halfway through – that’s because the multiple choice study guide draws from two different multiple choice tests.

After this are the answers to the short answer questions. Enjoy!

**Answers to multiple choice midterm review**

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| Number | Answer | Explanation | What it implies you should know |
| 1 | a | Protons = electrons = atomic number | How to calculate the atomic mass, the atomic number, the number of protons, the number of neutrons, and number of electrons |
| 2 | c | protons + neutrons = atomic mass | same as #1 |
| 3 | d | a and b are both correct, while answer c is nonsense | Be familiar with isotopes – what they are, how their masses are found, etc. |
| 4 | b | Each line corresponds to a certain energy of light | Understand how light is emitted from an atom when energy is added. Understand what line spectra are good for. |
| 5 | d | It’s where electrons live! | What are the parts of the atom and what particles go into which? |
| 6 | b |  | Understand how light is emitted from an atom when energy is added. Understand how the resulting spectrum can be used in spectroscopy to identify unknown elements. |
| 7 | d | a describes the first step of getting a line spectrum (but isn’t the whole answer), b and c make no sense | Same as #6 |
| 8 | d |  | You should be familiar with each of the different models of the atom. |
| 9 | b | There’s a lot of fancy sounding stuff here. Read questions like this carefully | Be familiar with the scientific method and what it’s used for. |
| 10 | a | hypotheses are just predictions/guesses about how a problem can be solved | same as #9 |
| 11 | c | I’d love to see a class of students wearing beakers. | Understand principles of both equipment and safety. |
| 12 | c |  | Be familiar with SI units |
| 13 | a | These prefixes are good to know | ← This |
| 14 | a | People sometimes get metallic bonding mixed up with ionic bonding. If you remember that metallic bonding involves the electron sea theory, you’ll be in good shape | Understand ionic bonding and metallic bonding. You should be able to tell how they’re different. |
| 15 | b | Answers a and d) describe precision, answer c) doesn’t mean anything | Understand what accuracy and precision are and how they differ from one another |
| 16 | NA | These actually all look correct to me. I guess I made a mistake | Dalton’s laws! Know them! Love them! |
| 17 | c | There’s no nucleus in Rutherford’s plum pudding model | You should be familiar with each of the main models of the atom |
| 18 | b | Answer a) is nonsense, while c) and d) are faulty explanation of Rutherford’s gold foil experiment | Same as #17 |
| 19 | b | Actinides are radioactive, which makes them ideal | You should be familiar with the properties of each group of elements in the periodic table |
| 20 | a |  | Be familiar with the properties and locations of the elements on the periodic table |
| 21 | d | a) and b) are nonsense, c) is what is formed when an atom gains an electron | Understand how ions are formed and how they form ionic compounds |
| 22 | b |  | Understand how the bonding between cations and anions in an ionic compounds |
| 23 | c | a) and b) don’t make any sense, and d) is complete nonsense | You should be able to explain how the bonding in ionic compounds leads to their properties |
| 24 | d | a) is a better explanation of a family/group, b) is something we never discussed, c) is a family. | Know how the periodic table is set up and where each group of elements is. |
| 25 | d | a) and b) are exactly the opposite of the octet rule and c) describes noble gases wanting to lose electrons, which they would never do. Overall, when elements gain electrons to be like the nearest noble gas, they embody the octet rule | You should know how the octet rule works |
| 26 | b | Electricity can be conducted when charged things move around. This can be electrons (as in the electron sea theory metals experience) or when you melt/dissolve an ionic compound. | Understand how the properties of ionic compounds is caused by their bonding. |
| 27 | b | Only b even mentions ionic compounds | Same as #26 |
| 28 | b |  | You should understand what spectroscopy is and how it uses line spectra to identify unknown materials. |
| 29 | d | Metals conduct and iron is a metal. Metalloids conduct only under high temperature or voltage. | You should be familiar with the relative properties of metals, nonmetals, and metalloids |
| 30 | b | We love the octet rule! In this case, a and c both involve having something that wants electrons to lose those electrons. | Be able to explain how ionic bonding occurs. |
| 31 | NA | We never talked about atomic radii. But that’s the answer. Sorry about that. It won’t happen on the midterm. | You should be familiar with the properties of the elements in different groups of the periodic table. |
| 32 | c or d | I’d say either is good. Some isotopes are radioactive while others aren’t. And there’s nothing inherent about isotopes that makes them radioactive | Understand what isotopes are. |
| 33 | c | Electrons weigh essentially nothing. For those of you curious about nucleons, that’s just a general term referring to either protons or neutrons. | Be familiar with the particles in an atom and their locations. |
| 34 | a | Only metals conduct electricity as solids. If you said ionic compound, that would only be true if it were a liquid or dissolved in water. | Be familiar with why different things conduct electricity, and under what conditions they do so |
| 1 | a | protons = atomic number = electrons | You should be able to calculate the numbers of protons, neutrons, electrons, the atomic mass, and the atomic number of an element. |
| 2 | b | protons + neutrons = atomic mass  94 + x = 245  x = 149 | Same as #1 |
| 3 | b | protons + neutrons = atomic mass  44 + 56 = 100 | Same as #1 and 2 |
| 4 | a | Neutrons exist to keep protons away from each other. | Be familiar with isotopes |
| 5 | c |  | More like 1 and 2 |
| 6 | d | “average atomic mass” always comes with the term “weighted average” somewhere. | Understand what an average atomic mass is and be generally familiar with how you can find it |
| 7 | d |  | You should know the difference between a continuous and line spectrum |
| 8 | a | b) is the nucleus and c) is “ionization”, which we’ve never discussed | You should know the parts of an atom and where they are located |
| 9 | a |  | Understand how the movement of an electron from a ground state and excited state (and back) works to cause the emission of light. |
| 10 | b | Orbitals NEVER hold 3 electrons | Same as #9 |
| 11 | b | His orbitals could hold various numbers of electrons (2, 8, 18...) | You should know the difference between the Bohr model of the atom and other models. |
| 12 | a | Quantitative refers to “quantity” and all of the other answers refer to descriptions, which is a description of qualitative data. | What quantitative and qualitative are, and how they differ from each other |
| 13 | d | a) doesn’t have a reasonable cause and effect, so is wrong. b) and c) both have an excellent cause and effect relationship | Know the different parts of the scientific method and how they work in an experiment. |
| 14 | d |  | Be familiar with safety rules |
| 15 | a |  | Be familiar with SI units |
| 16 | b |  | Be familiar with SI units |
| 17 | NA | These are all wrong. Sorry |  |
| 18 | d | a) is accuracy; b) isn’t anything; c) doesn’t make sense | Understand what precision and accuracy are |
| 19 | d | Pretty much everything that can happen validates the law of conservation of mass | Understand the law of conservation of mass |
| 20 | b | Electrons didn’t get “invented” until Thomson did so | Be familiar with Dalton’s laws |
| 21 | b |  | Understand what each model of the atom says about how the atom is put together |
| 22 | c | Yep. Reactive | You should be familiar with the properties of the groups of the periodic table |
| 23 | a | Halogens are great at killing stuff | Same as #22 |
| 24 | b | Copper doesn’t really do stuff in terms of valence electrons, gallium has 3, and sulfur has 6. | You should understand how many electrons things want to gain/lose to be like the nearest noble gas. |
| 25 | a | Nonmetals have different properties than metals | You should understand the properties of metals, nonmetals, and metalloids |
| 26 | a | cations are + ions, anions are – ions, polyatomic ions are ions that have more than one atom (and can have either + or – charge), and if something neutral loses an electron it will be an anion. | Understand how the gaining and losing of electrons will cause it to have + or – charge |
| 27 | d | Ionic compounds don’t burn because they don’t contain carbon or hydrogen | Understand the properties of ionic compounds and how the bonding in these compounds is responsible for them. |
| 28 | a | b and d aren’t true, for c) the hardness isn’t related to melting point | Same as #27 |
| 29 | NA | It’s c, but we never really talked about this | You should know about the octet rule and why it causes atoms to either gain or lose electrons |
| 30 | a | b is a “period”, c and d aren’t anything | Understand the structure of the periodic table |
| 31 | b | Though we didn’t talk about some of these things, it should be clear that gaining electrons doesn’t make things become cations and lose electrons to become anions. Even so, I wouldn’t put this on the midterm | Same as #29 |
| 32 | NA | The correct answer, that beryllium is an alkaline earth metal so is less reactive than lithium (an alkali metal) wasn’t here. My mistake. | You should be familiar with the properties of each family in the periodic table. |
| 32 ½ | a | The other answers are silly | You should understand why both metals and ionic compounds conduct |
| 33 | d | Other properties are largely irrelevant. It’s the strong relationship between the cations and anions that matters | See #27 above |
| 34 | NA | We didn’t talk about this | Oh well. |
| 35 | a |  | See #27 above |
| 36 | NA | We didn’t talk about this either | I should edit these better |

Short answer questions:

1) Five laws

* Atoms are tiny, indestructible spheres (F)
* Atoms of the same element have the same properties (F, isotopes)
* Atoms of different elements have different properties (T)
* Atoms obey the law of conservation of mass (T)
* Atoms obey the law of multiple proportions (T)

2) You’ve got this in a million sheets I’ve given you. Check those out, or Google it. I’d do it, but it’s pretty hard to do on a computer.

3) Three steps:

* Atom absorbs energy
* Electron jumps from low energy ground state to high energy excited state
* When electron falls back to ground state, it gives off the energy difference as light

4) Spectroscopy is when comparing the spectrum of an unknown element to those of known element allows you to identify them. This happens because all elements have unique line spectra.

5) Octet rule: All elements want to be like the nearest noble gas. Some elements want to gain electrons to do this while others want to lose electrons to do this – when an element that wants to gain electrons comes into contact with an element that wants to lose electrons, they transfer electrons to form ions, which form an ionic compound.

6) Electricity can only be conducted when things with charge move around. As a solid, the ions in an ionic compound are locked in place and can’t move. When it is dissolved or melted, the ions can move and the materials can conduct electricity.

**What material can I ask you on the midterm?**

EVERYTHING. Anything that I’ve talked about in class is fair game. I’ve done my best to represent the material from the midterm on the review sheets, but it’s possible I’ve forgotten something big. Some general things to know about the midterm good rule of thumb is that:

* Things we learned second quarter are more likely to be on the midterm than the stuff we learned first quarter.
* Things we spent a lot of time on will be represented more on the midterm.
* I’m not going to ask any trick questions, so relax.