

Chem 300A Quiz KEY

Answer the questions on a 5-answer scantron form. Read the questions carefully and give the **best** answer for each! There are 22 questions in total; all questions are equally weighted.

1. As of 2017, what is the **single biggest source of energy** used in the US? **C**
a) nuclear fission b) natural gas **c) petroleum** d) coal e) solar
2. Which of the following fuels has the **highest energy content** in kJ/g? **C**
a) ethanol b) gasoline **c) hydrogen** d) methane e) wood
3. What does the term '**cracking**' mean with respect to petroleum refining? **D**
a) An increase in the amount of branching for carbon chains
b) A decrease in the amount of branching for carbon chains
c) An increase in the average length of the carbon chains
d) A decrease in the average length of the carbon chains
e) A decrease in the number of double bonds in the carbon chains
4. **Gasoline** is comprised of what petroleum fraction? **C**
a) Polycyclic aromatic hydrocarbons
b) Mostly 12-18 carbon chains
c) Mostly 6 to 10 carbon chains
d) Comes from non-petroleum sources
e) Is the glycerine fraction
5. Which of the following is true of '**knocking**'? **D**
a) Caused by multiple ignition points during combustion
b) Is decreased by increased branching in the carbon chains
c) Can be lowered by tetraethyl lead
d) All of the above
e) None of the above

6. **Fischer-Tropsch (C1) Chemistry** refers to a process for: **D**
- a) making coal
 - b) extracting oil from kerogen
 - c) reforming petroleum fractions
 - d) **making synthetic gasoline**
 - e) none of the above
7. What is '**dilbit**'? **C**
- a) Oil and hot water mixture
 - b) Tar sands oil
 - c) **Heavy tar sand oil mixed with naphtha**
 - d) A special type of bit used to drill oil wells
 - e) None of the above
8. **Kerogen** is converted to useful products by: **E**
- a) water extraction
 - b) steam extraction
 - c) vacuum extraction
 - d) catalytic cracking
 - e) **heating to high temperatures**
9. **β -decay** involves decay of a radionuclide by emission of: **B**
- a) a ${}^4_2\text{He}$ nucleus
 - b) **an electron**
 - c) a gamma ray
 - d) a positron
 - e) none of the above
10. What happens when a **positron collides with an electron**? **B**
- a) nothing
 - b) **they destroy each other and emit gamma rays**
 - c) they combine to form a neutron
 - d) they form a stable hydrogen atom
 - e) they combine to form a proton
11. Most uranium is made of the ${}^{238}\text{U}$ isotope. **Which of the following statements about ${}^{238}\text{U}$ is true?** **B**
- a) ${}^{238}\text{U}$ is fissile
 - b) **${}^{238}\text{U}$ is radioactive with a very long half life**
 - c) ${}^{238}\text{U}$ is not radioactive but can be made into radioactive ${}^{239}\text{Pu}$ by exposure to neutrons
 - d) ${}^{238}\text{U}$ slowly converts into ${}^{235}\text{U}$ over time
 - e) None of the above

12. Which of the following is **NOT** related to the **absorbed radiation dose**? **D**
a) Gray (Gy) b) Roentgen (Rg) c) REM **d) Becquerel (Bq)** e) Sievert (Sv)
13. What is the **main source of natural background radiation** for people living at sea level? **B**
a) Gamma rays from space
b) Radon gas
c) Stone, brick or concrete buildings
d) Potassium in drinking water
e) Uranium ores
14. Which country currently leads the world in **uranium ore production**? **D**
a) France b) US c) Canada **d) Kazakhstan** e) South Africa
15. **The defining feature of Breeder reactors** is that they generate their own fuel from non-fissile isotopes: **a) True** or b) False ?
16. **The defining feature of Candu reactors** is that they use **heavy water (D₂O)** as their **fuel**:
a) True or **b) False** ?
17. Which of the following gases is a **precursor to acid rain**? **C**
a) CO b) CH₄ **c) SO₂** d) ozone e) none of the above
18. **Photochemical smog**, particularly the brown haze seen over major cities, is mainly due to: **A**
a) High NO₂ and ozone concentrations
b) Condensation
c) Methane
d) CO
e) None of the above

19. The main source of carbon monoxide (CO), nitrogen dioxide and volatile organic compounds (like methane) in the United States is due to which of the following? **A**
- a) **automobiles**
 - b) natural sources
 - c) heavy industry (manufacturing)
 - d) electrical power generation
 - e) waste disposal
20. CFC's are (or were): **E**
- a) Chlorofluorocarbons
 - b) Used as refrigerants
 - c) Used as aerosol propellants in spray cans
 - d) Believed to be responsible for destruction of the stratospheric ozone layer
 - e) **All of the above**
21. What does ozone in the stratosphere protect us from? **B**
- a) Infrared radiation
 - b) **All short and some medium wavelength ultraviolet radiation (UVA and UVB) ***
 - c) Gamma rays
 - d) Positrons
 - e) Chlorine gas
- * This answer should have said UVC and UVB but it is clearly the only sensible answer*
22. Which gas has the largest global warming potential at equal concentrations? **C**
- a) carbon dioxide
 - b) methane
 - c) **nitrous oxide (N₂O)**
 - d) nitrogen
 - e) oxygen

END