Chem 400A Section 1 Quiz – Jan. 28, 2019 KEY

Answer the questions on a 5-answer scantron form. All questions are equally weighted. There are 25 questions in total. Read the questions carefully!

- What is the value of a <u>'food' Calorie (CAL)</u> in terms of <u>'scientific' joules</u>? B
 - a) 1000 J/CAL b) 4180 J/CAL c) 1 J/CAL d) 4.18 J/CAL e) 0.00418 J/CAL
- 2. 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
- 3. What is the main purpose of a <u>'reformer'</u> in petroleum refining? D
 - a) Decrease percentage of branched chain hydrocarbons
 - b) Shorten long chain hydrocarbons to C6-C10 chain length
 - c) Convert saturated hydrocarbons to alkenes
 - d) Increase the percentage of branched chain hydrocarbons
 - e) Hydrogenate aromatics to saturated hydrocarbons
- 4. Catalytic cracking is done using zeolite catalysts. A zeolite is: C
 - a) A porous metal framework
 - b) A transition metal catalyst
 - c) A rigid and porous aluminosilicate structure
 - d) Silica
 - e) An iron oxide
- 5. Vaseline or 'petroleum jelly' is comprised of what petroleum fraction? C
 - a) Polycyclic aromatic hydrocarbons
 - b) C11-C12 chains
 - c) Mostly > C25 chains
 - d) Comes from non-petroleum sources
 - e) Is the glycerine fraction
- 6. The most common gasoline anti-knock agent until about 1975 was: A
 - a) **Pb(CH₂CH₃)**₄ b) ethanol c) methanol d) benzene e) manganese

- 7. Syn gas is a major starting material for many industrial processes; what is it comprised of? B
 a) H₂
 b) CO + H₂
 c) CO
 d) H₂O + H₂
 e) H₂ + CO₂
- 8. What are the starting materials used in the steam reforming process? A

a) $CH_4 + H_2O$ b) $H_2 + CO$ c) $C + H_2O$ d) $CO_2 + H_2O$ e) $H_2 + H_2O$

- 9. Hydroformylation uses syn gas to do what transformation? E
 - a) Alkenes to aldehydes with the same number of carbons
 - b) Alkynes to aldehydes with the same number of carbons
 - c) Alkenes to aldehydes with one less carbon
 - d) Alkynes to aldehydes with one less carbon
 - e) Alkenes to aldehydes with one more carbon
- 10. Which of the following statements about hydraulic fracturing (fracking) is true? E
 - a) Uses mostly water as the fluid
 - b) Can trigger seismic activity
 - c) Fracture zone is far below ground water levels
 - d) Main non-water component in 'fracking fluid' is sand or ceramic powder
 - e) All of the above
- 11. What is <u>'dilbit'</u>? C
 - a) Oil and hot water mixture
 - b) Tar sands oil
 - c) Heavy tar sand oil mixed with naphtha
 - d) Refined oil
 - e) None of the above

12. Kerogen is converted to useful products by: D

- a) fracking b) steam extraction c) vacuum extracti
- c) vacuum extraction d) heating to 450 °C

e) catalytic cracking

13. <u>B-decay</u> involves decay of a radionuclide by emission of: **B**

- a) a 4_2 He nucleus **b)** an electron c) a gamma ray d) a positron
- e) none of the above

- 14. Most uranium is made of the ²³⁸U isotope. Which of the following statements about ²³⁸U is true? B
 - a) ²³⁸U is fissile
 - b) ²³⁸U is radioactive with a very long half life
 - c) ²³⁸U is not radioactive but can be made into radioactive ²³⁹Pu by exposure to neutrons
 - d) ²³⁸U slowly converts into ²³⁵U over time
 - e) None of the above

15. 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)

16. 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) Potassium in food and water
- d) Potassium in concrete, soil and stone
- e) Uranium ores
- 17. Which country currently leads the world in <u>uranium ore production</u>? D

| a) | France | b) US | c) Canada | d) Kazakhstan | e) South Africa |
|----|--------|-------|-----------|---------------|-----------------|
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| 18. Whi | ch of the foll | owing gases is a | precursor to ac | <u>id rain</u> ? <mark>C</mark> | |
|---------|----------------|------------------|--------------------|---------------------------------|----------------------|
| a) (| CO k |) CH4 | c) SO ₂ | d) ozone | e) none of the above |

19. 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

20. Scrubbers to remove SO2 gas take advantage of what feature of this molecule? A

a) It is acidic and reacts with base

- b) It is basic and reacts with acid
- c) It is easily charged and therefore removable by electrostatic methods
- d) It has very low volatility and can be condensed out
- e) None of the above

21. 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
- 22. Freon-12 has the formula: B
 - a) $CFCl_3$ b) CF_2Cl_2 c) $CHCl_3$ d) $CFCl_2CCl_3$ e) C_2F_4
- 23. **Ozone** in the stratosphere is consumed by a dark (*non-photochemical*) reaction with what? A
 - a) Cl atoms b) F atoms c) ClO d) intact CFC molecules e) none of the above
- 24. HCFC's differ from the original CFC's in what way? E
 - a) Contain double bonds
 - b) Contain no chlorine
 - c) Contain bromines
 - d) Contain no hydrogens
 - e) None of the above are strictly true
- 25. Which gas has the largest global warming potential at equal concentrations? C
 - a) CO_2 b) CH_4 c) N_2O d) N_2 e) O_2

END