

22-8-2008

## RACS 2008 – multiple-choice self evaluation test

1. What will the use of Raoult's law show about the soil air composition at sources with hydrocarbon mixtures?
  - a. That the gas concentration may increase for semi-volatile compounds during ageing of the source
  - b. That the gas concentration will be higher for a compound in a multi-compound source in comparison to a single compound source
  - c. That the compound is not volatilizing
2. If there is a free phase present consisting of a single compound, the soil gas concentration in equilibrium with the source
  - a. will constantly decrease
  - b. will be constant and at saturation
  - c. will depend on the sorption to the soil and the water content
3. The diffusional flux in the air phase is higher
  - a. in clay soils
  - b. in dry sandy soils
  - c. in wet sandy soils
4. Degradation in the unsaturated zone can lower the soil air intrusion into buildings especially for
  - a. chlorinated aliphatic compounds
  - b. BTEX
  - c. PAHs
5. If there is not a free phase present the diffusional flux away from the source will
  - a. be insignificant
  - b. be constant in time
  - c. decrease with time
6. To estimate the total mass of an organic contaminant in an aquifer, the following formula is given:  $M = C_o (\theta_w + \rho_b K_d) V$ . This equation accounts for
  - a. dissolved aqueous contaminant only
  - b. only contaminant sorbed on the solid phase
  - c. contaminant distributed between the solid and aqueous phases
  - d. contaminant distributed between the solid, gas and aqueous phases

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7. Calculations of mass flux downstream of a contaminated site often employ a mixing depth. In this context, a mixing depth is

- a. a quantity that accounts for the amount of background ground water that is mixed with contaminated water leaching from a site
- b. the depth of soil over which a contaminant source is distributed
- c. the length of well screen over which a contaminant is measured
- d. the depth of water required for a groundwater sample

8. Ground water wells are most often placed

- a. on hilltops, nearest the water source where the water is cleanest
- b. in permeable alluvial valleys, where there are shallow water tables
- c. near forests, where groundwater recharge is high
- d. where they are best regulated by the EU Water Framework Directive

9. Flux based risk assessment in ground water

- a. measures the LD<sub>50</sub>, or the dose of contaminant that kills 50% of a rat population
- b. determines the volatile contaminant airflow in buildings
- c. measures the growth rate of indicator organisms in soil
- d. determines the mass of contaminant flowing past a control plane over a given time

10. A PAH-compound has the following physical-chemical data:

Molecular weight:  $M_w = 252.3$  g/mole

Water solubility:  $S = 0.003$  mg/l

Vapor pressure:  $p_a = 5 \cdot 10^{-7}$  mmHg

Its mobility in soil is

- a. high
- b. medium
- c. low
- d. immobile

11. The volatility of the compound mentioned in the previous question can be characterized as

- a. less volatile than water
- b. slow rate of volatilization
- c. significant rate of volatilization
- d. volatile

(1 atm = 760 mm Hg)

12. How would you expect a higher fat content in a fish to influence the bioaccumulation of organic chemicals?

- a. Increase bioaccumulation
- b. No influence on bioaccumulation
- c. Decrease bioaccumulation

13. Which of the following factors may reduce the toxicity of an organic chemical in a fish toxicity test?

- a. Increased hardness of the water
- b. Laboratory air humidity
- c. Fish food in the water

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14. An endocrine disrupting chemical is a compound that
- disturbs the vision of crustaceans
  - disrupts the hormonal systems in animals
  - disrupts nerve impulses
15. Can sorption to colloids enhance contaminant mobility?
- Yes
  - No
16. Which heavy metal, when present in soil, is most suspected of contaminating human diet?
- Gold
  - Cadmium
  - Silver
  - Lead
17. Which type of organic compounds is best translocated from soil to leaves?
- Lipophilic and volatile compounds (high  $\log K_{ow}$ , high  $K_{aw}$ )
  - Lipophilic, degradable compounds (high  $\log K_{ow}$ , rapid degradation)
  - Water soluble (hydrophilic) non-volatile compounds (low  $\log K_{ow}$ , low  $K_{aw}$ )
  - Water soluble (hydrophilic) and volatile compounds (low  $\log K_{ow}$ , high  $K_{aw}$ )
18. Which compounds are mainly taken up from air?
- Lipophilic and volatile compounds (high  $\log K_{ow}$ , high  $K_{aw}$ )
  - Lipophilic, degradable compounds (high  $\log K_{ow}$ , rapid degradation)
  - Water soluble (hydrophilic) non-volatile compounds (low  $\log K_{ow}$ , low  $K_{aw}$ )
  - Water soluble (hydrophilic) and volatile compounds (low  $\log K_{ow}$ , high  $K_{aw}$ )
19. Which medium has the strictest legal standards for pesticides?
- Drinking water
  - Food
  - Soil
20. ADI means
- Acceptable Daily Intake
  - Applicable Daily Input
  - Alternative Dietary Intake
  - Astronomic Discovery Instrument
21. Is trichloroethylene degraded under aerobic conditions in groundwater?
- Yes
  - No
22. The dispersion process in groundwater will cause
- mass removal
  - dilution
  - enhanced volatilization

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23. Redox zonation will be generated by

- a. an electron acceptor
- b. precipitation of iron oxides
- c. an electron donor

24. In degradation bacteria will use BTEX compounds as

- e. electron acceptor
- f. electron donor
- g. nutrient

25. The soil adsorption of cationic metals is most likely to

- a. decrease
  - b. increase
  - c. not change
- with increasing pH in the pH range 4 to 9.

26. Addition of a strong complexing ligand to a heavy metal-contaminated soil and solution system will

- a. decrease
  - b. increase
  - c. not change
- the  $K_d$  of the heavy metals in the soil-solution system.

27. The PTWI (mg metal/kg body weight) for Cd is

- a. smaller than
  - b. higher than
  - c. the same as
- that of Fe.

Signature \_\_\_\_\_

SCORE: