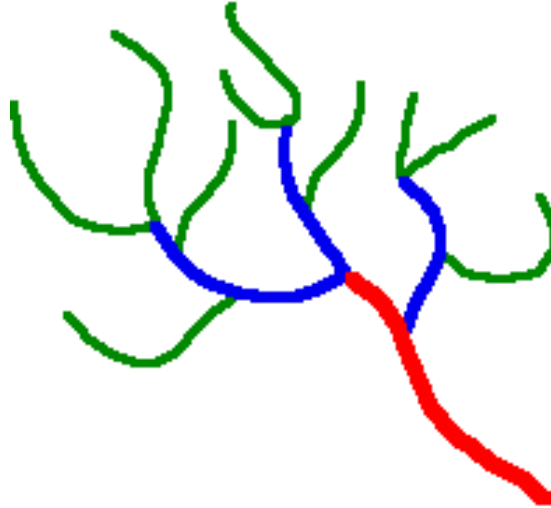


WSM 468/568

Test 1

Feb. 8 2002

Your Name (2 pts) _____



1) Put the correct stream order numbers on the above diagram AND fill in the table below (2 pts.)

Order	# of Segments	Bifurcation Ratio
1	10	3
2	3	3
3	1	3

2) (3 pts.) Name 2 characteristics (each) of a;

Small Channel: Steep gradient, step-pool formation, large grain size (cobble, boulders)

Intermediate Channel: pool-riffle-bar sequence, width of no more than 20-30 m

Large Channel: sinuous, gradients follow valley gradients, relatively fine sediments.

3) At which temperature (°C) is water the most dense? (1 pt) 4

4) Fill in the table below with the specific name of the process being described and whether energy is either gained (+) or lost (-) during the process (6 pts.)

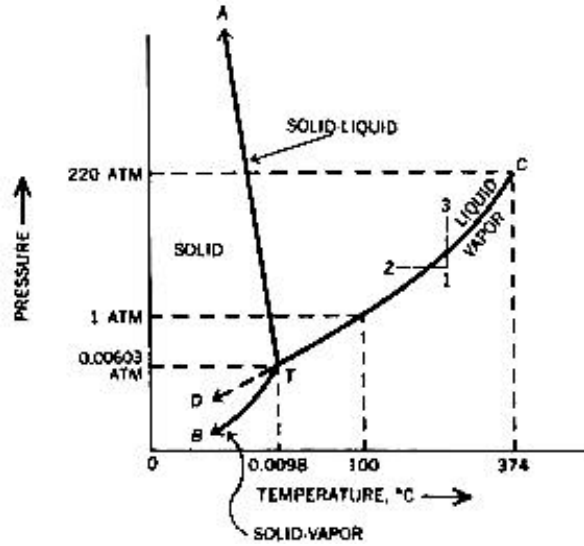
From	To	Process	Energy gained or lost (+/-)
Vapor	Liquid	condensation	+
Vapor	Ice	deposition/frost formation	+
Liquid	Vapor	evaporation	-
Liquid	Ice	freezing	+
Ice	Liquid	melting	-
Ice	Vapor	sublimation	-

5) a) Given the phase diagram below, at which combination of temperature and pressure will water simultaneously melt, evaporate, and sublime? (1 pt.)

Temperature: **0.0098 C**

Pressure: **0.00603 atm**

b) What is this point called? (1 pt.) **Triple Point**



6) Finish the table below (3 pts.)

Percent	-----	per hundred	10^2
Milligram	mg/L	per million	10^6
Microgram	$\mu\text{g/L}$	per billion	10^9
Nanogram	ng/L	per trillion	10^{12}

7) A Froude number is the ratio between 2 forces. What are they? (2 pts.)

Inertia & Gravity

8) Viscosity is stated as $-u = FA/vd$. What do F, A, v, and d stand for? (2 pts.)

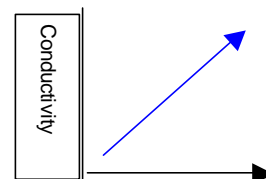
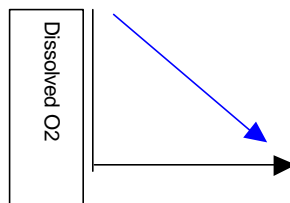
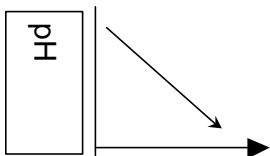
F = **Force**

A = **Area**

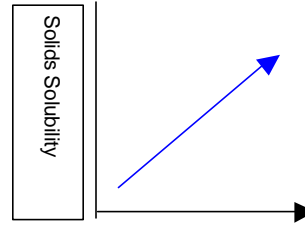
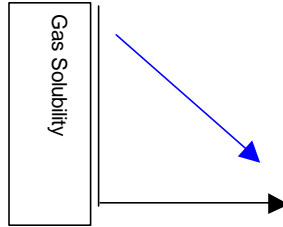
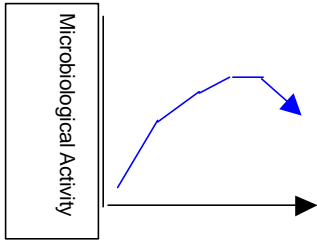
v = **Velocity**

d = **Distance**

9) Place an arrow (\nearrow , \searrow , or \rightarrow) to describe the effect of temperature on the parameters listed along the Y axis. Assume that temperature is on the X axis of all graphs. The first one is done for you. (4 pts.)



9) (cont)



10) Complete the following sentences regarding temperature/solubility. (2 pts.)

If the dissolution process absorbs energy, then solubility will increase with increasing temperature.

If the dissolution process releases energy, then solubility will decrease with increasing temperature.

11) How much does the viscosity of water decrease with every 1°C increase in water temperature? (1 pt.)

- a) 30%
- b) 13%
- c) 5%
- d) 3%
- e) 18%

12) In the determination of a habitat suitability index for fish (in regards to any water quality parameter), which life stages should be taken into consideration? (1 pt.)

- a) fry
- b) juveniles
- c) adults
- d) a & b
- e) b & c
- f) a, b, and c

13) The solubility of oxygen (or most gasses) into water depends primarily upon 2 things (circle the *best* choice). (1 pts.)

- a) viscosity and temperature
- b) temperature and partial pressure
- c) partial pressure and viscosity
- d) partial pressure and altitude
- e) altitude and attitude

14) Write the formula for Henry's Law and state what each variable represents. (2 pts.)

$c = K * p$
c = concentration of gas **p = partial pressure**
K = solubility constant (diff. for each gas)

15) Suppose the concentration of oxygen is 0.28g O₂/ 100 mL under a partial pressure of 180 mmHg. What is the concentration of O₂ if the partial pressure decreases to 90 mmHg? (2 pts.)

0.14g O₂/ 100 mL (1/2 the partial pressure = 1/2 the conc.)

16) For every 100m in elevation, how much does the O₂ concentration decline? (1 pt.)

1.4%

17) List 2 sources and 2 sinks of oxygen in water.(2 pts.)

Source

Sink

photosynthesis

microbial decomposition

turbulence

respiration

18) What are daily (e.g., day vs. night) fluctuations in dissolved oxygen concentration called? Briefly explain the cause. (2 pts.)

**Diel Pattern – Photosynthesis during the day results in a net increase in DO and CO₂ depletion
Respiration at night results in net increase in CO₂ and decrease in DO**

19) In the following equation; $Zn + 2HCl \rightarrow Zn^{2+} + H_2 + 2Cl^-$

a) Identify what is being reduced and what is being oxidized (2 pts.)

Zn is oxidized, Cl and H⁺ reduced

b) What is/are the oxidizing agent(s)? (1 pt.)

Cl is oxidizing agent

c) What is/are the reducing agent(s)? (1 pt.)

Zn is reducing agent

20) Which of the following would more likely be found in an anoxic hypolimnion? (2 pts.)

Fe⁺⁺⁺ or Fe⁺⁺? Fe⁺⁺ SO₄⁻⁻⁻ or S⁻⁻⁻? S⁻⁻⁻ NO₃⁻ or NH₃? NH₃

21) What does ORP measure (specifically)? (1 pts.)

The potential of a solution to either become more oxidized or more reduced upon introduction of a new chemical species

22) Name the major sources of suspended sediment to water and *briefly* describe each one. (3 pts.)

Natural Erosion – erosion of continents by wind, water, or ice

Autochthonous – algae, POM, etc...

Anthropogenic – human-caused. Mining, deforestation, road-building

23) Name and briefly define the 2 main modes of sediment transport. (3 pts.)

Bedload – sediment carried at or near the stream bed

Suspended Load – sediment carried in suspension but has some interaction with the bed

24) Define stream *competence* and *capacity*. (2 pts.)

Competence – The largest grain size a stream can carry

Capacity – The total load (bed + suspended) a stream is capable of carrying

25) List 4 ways to measure suspended sediment. (2 pts.)

Depth-Integrated

Bedload

Point-Integrated

Bed Material

26) In the following equation;

$$I_z = I_0 \hat{a}^{kw} + I_0 \hat{a}^{kp} + I_0 \hat{a}^{kc}$$

a) What do kw, kp, and kc represent? (1 pt.)

kw = absorption coefficient of pure water kp = absorption coefficient of suspended particles

kc = absorption coefficient of dissolved substances

b) What is the above equation called? (1 pt.)

Total Coefficient of Absorption

27) Secchi Disk Transparency (Z_{sd}) is a measure of: (circle the best answer) (1 pt.)

a) the amount of algae in the water

c) primary production

b) water clarity and/or transparency

d) secondary production

28) Briefly describe how to measure Secchi disk transparency. (1 pt.)

On the shady side of a boat between 10 am – 2 pm. Lower into water using calibrated line and record depth at which disk is no longer visible.

29) The area in the water column where most of the light for photosynthesis is still available is called (circle the best answer) (1 pt.)

a) epilimnion

c) zone of transmittance

b) euphotic zone

d) coefficient of extinction

30) What range of wavelengths are considered photosynthetically active radiation? (1 pt.)

a) 400 - 700 nm

c) 475 – 600 nm

b) 200 – 800 nm

d) 350 – 900 nm

31) Give 2 consequences of stratification of lakes and reservoirs for water quality in the water body. (2 points)

1) Possible DO depletion in the hypolimnion.

2) Reducing conditions may lead to mobilization of some nutrients from the sediment

32) What is the difference between "eutrophication" and "cultural eutrophication?" (2 points)

Eutrophication – The natural accumulation of nutrients and increasing trophic state. Usually takes longer that....

Cultural Eutrophication – Human-caused. Due to direct or indirect activities contributing an influx of nutrients to a water body.

33) If you were monitoring water quality within a reservoir, what parts of the reservoir would you be sure to sample, and why pick those areas? (4 points)

Riverine, Transitional, and Lacustrine Zones.

Different processes related to incoming nutrients and sediment transport which may result in differences in primary production.

34) In summer most lakes and reservoirs stratify (vertical layers form) primarily because (1 pt.)

a) surface waters absorb much of the incident sun light

c) deep water is protected from the wind

b) warm, surface water is much less dense than deeper water

d) a & b

e) a, b, & c

35) In the following equation;

$$E = hv$$

a) What do E , h , and v represent? (2 pts.)

E = energy present in given photon of light.

h = Plancks constant as expressed by Avogadros # (6.6255×10^{-25})

v = wave frequency

b) What is the name of this equation? (1 pt.)

Planck's Quantum Theory

Essay Questions

1) In the reading by Hall et al. (1999) they examined fossil assemblages (via a core sample) of a variety of organisms. What were these organisms and why do you believe they were chosen? What were some of the conclusions drawn from their work? (25 pts. for undergrads, 10 pts. for grads)

Be as concise as possible (in other words don't use the shotgun approach to answering)

Graduate Student questions

1) In the paper by Hall et al., they found that even though in-coming nutrients from the watershed had been diminished or diverted, Pasqua Lake is still considered eutrophic. Why is this? (7 pts.)

2) In the paper we discussed by Forrester, Dudley, and Grimm, the authors stated that "the decrease in herbivory caused an increase in the growth and biomass of primary producers (algae) in areas containing fish". Does their data support this statement? Why or why not? They also state "nutrient-enriched areas (with high algal biomass) also supported greater populations of herbivores because they either grew faster in these areas or emigrated less frequently from them." What's an alternative explanation for increased population numbers of herbivores and increased emigration of them from these areas? (8 pts.)

