

M. TECH. ENVIRONMENTAL BIOTECHNOLOGY 1ST SEM. EXAM 2024

Subject: INTRODUCTION TO ENVIRONMENTAL SCIENCE

Full Marks: 100

Answer any 10 of the following questions

10*10=100

1. What is solar geoengineering? What is the necessity of solar geoengineering? Write the pros and cons of solar geoengineering 10
2. Match the following 10

1. Increased levels of radon	a. Oil spill
2. Potentiometric surface	b. Groundwater overdraft
3. Boom and burning	c. Poisonous gas without a triggering eruption
4. Lake Nyos, Cameroon	d. Absorbs neutron
5. CO ₂ emission neutral	e. Lowering of ocean pH
6. Global warming	f. Predictive indicator of earthquake
7. Stromatolites	g. Age of fishes
8. Devonian	h. Colonial cyanobacteria
9. Control rods	i. Confined aquifer
10. Cone of depression	j. Bagasse

3. What are the two largest extinctions in the geological time scale? What caused these two extinctions? 10
4. Calculate the gross and net calorific value of a coal sample having the following composition- carbon 75%, hydrogen 8%, oxygen 4%, sulphur 4.5%, nitrogen 3.5% and ash 5.1%.

Use the equation derived for carbon dating, $N(t) = N_0 e^{-0.0001216 t}$, to answer the following question. Half-life of ¹⁴C is 5700 years. Approximately what percentage of an initial sample of ¹⁴C remains after 33,450 years? 5 + 5 = 10

5. Write in one/several words (any 10) 10
- Type of well where water flows freely without pumping -
 - Impermeable type of soil -
 - Indicates how freely water passes through open spaces within sediment -
 - One of the earthquake-resistant features is a motion-absorbing technology called -
 - Water management (irrigation) system for the paddy fields on Bali island, Indonesia. It was developed in the 9th century -
 - General term for the solid rock that underlies the soil-
 - Slow, imperceptible movement of soil and rock downslope -
 - Radon is an odorless, colorless, radioactive gas that comes from the natural decay of -
 - The location below the earth's surface where the earthquake starts is called -

[Turn over

- j. The most efficient water and nutrient delivery system for growing crops. It delivers water and nutrients directly to the plant's roots zone, in the right amounts -
- k. A body of rock that can store and allow water to flow –

6. Answer in brief

5x2=10

- a. Write any two secondary and tertiary effect of volcanism.
- b. What are the four basic ingredients for landslides?
- c. Mention four warning sign of landslide.
- d. Write one advantage and one disadvantage of boom and burning method of oil spill.
- e. Name two rock types that can be a significant source of radon. Explain your choices with reason.

7. What is ocean acidification? Explain with relevant chemical reactions. The pH of the polar oceans are higher than the equatorial ocean - Is the statement true or false? Justify your answer.

2+4+1+3=10

8. Multiple choice questions

10

- a. Which of the following is **NOT** a method of oil spill clean-up?
 - i. Tar balling
 - ii. Deploying booms
 - iii. Skimming
 - iv. Dispersants
- b. Dispersants serve what purpose in oil spill clean-up?
 - i. They help disperse the oil, which makes it thinner and lessens its effects
 - ii. They help keep the oil from dispersing, making it easier to clean up.
 - iii. They help speed up the natural breakdown of oil.
 - iv. They are helpful for cleaning oil of marine wildlife.
- c. What is hard engineering in coastal management?
 - i. Building artificial structures to control erosion
 - ii. Using technology to monitor erosion rates
 - iii. A natural approach to control erosion
 - iv. Building townships along the coast
- d. What is soft engineering in coastal management?
 - i. Building artificial structures to control erosion
 - ii. Using technology to monitor erosion rates
 - iii. A natural approach to control erosion
 - iv. Building townships along the coast
- e. DO levels fall during eutrophication because
 - i. It is used by bacteria to degrade organic matter.
 - ii. It reacts with hydrogen to form water
 - iii. It is used by algae during photosynthesis.
 - iv. Aquatic plants use it up for respiration.
- f. Which hard engineering technique reflects wave energy back to sea?
 - i. Sea wall
 - ii. Gabions
 - iii. Groynes
 - iv. Rock armour
- g. What are wooden barriers built out to sea known as?
 - i. Sea wall
 - ii. Gabions

- iii. Groynes
- iv. Rock armour
- h. Which management strategy redistributes sand on the beach?
 - i. Beach nourishment
 - ii. Dune nourishment
 - iii. Reprofiling
 - iv. Rock armour
- i. What is a disadvantage of dune nourishment?
 - i. It is expensive
 - ii. It can be damaged by storm waves
 - iii. It only works when wave energy is low
 - iv. It does not blend in with the natural beach
- j. What is eutrophication?
 - i. Nutrient enrichment of lakes and ponds
 - ii. Increase in water temperature of lakes and ponds
 - iii. Decrease in pH of lakes and ponds
 - iv. Nutrient depletion of lakes and ponds.

9. Match the items of **Column A** with those of **Column B**.

5

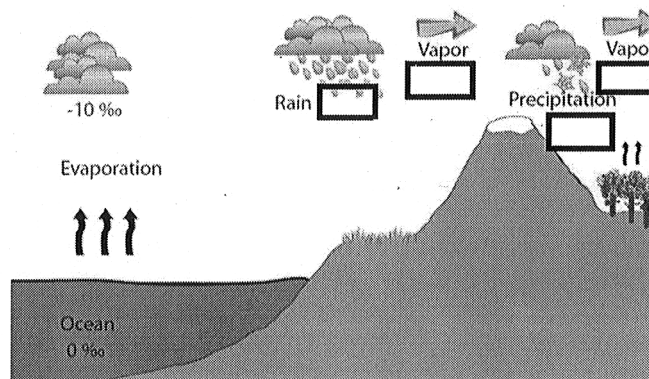
COLUMN A	COLUMN B
1. Coastal regulation zone IA	a. urban areas located in the coastal areas
2. Coastal regulation zone IB	b. area between low tide line and 12 nautical miles seaward
3. Coastal regulation zone II	c. intertidal zone in ecologically sensitive areas
4. Coastal regulation zone III	d. ecologically sensitive areas
5. Coastal regulation zone IV	e. Rural and urban area that are not substantially developed

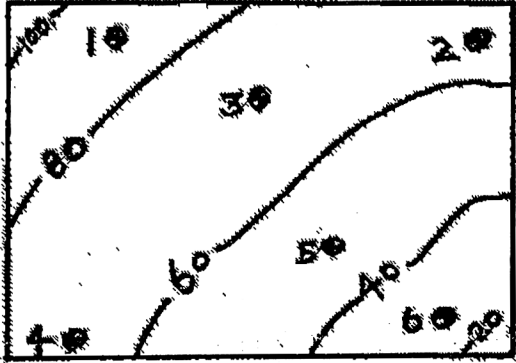
Explain with figures (where necessary) how acid mine drainage can be treated.

5

10. In the boxes write the oxygen isotope ($\delta^{18}\text{O}$) composition of rain, precipitation and the two vapors from the following choices -3‰, -5‰, -15‰, -18‰. Also provide an explanation for your choices.

5





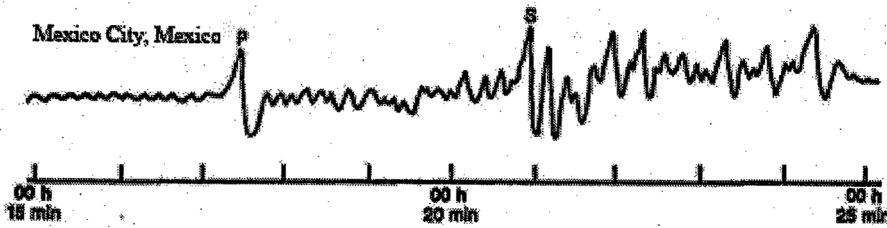
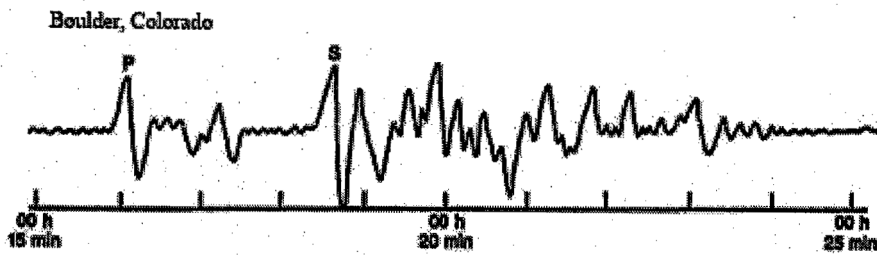
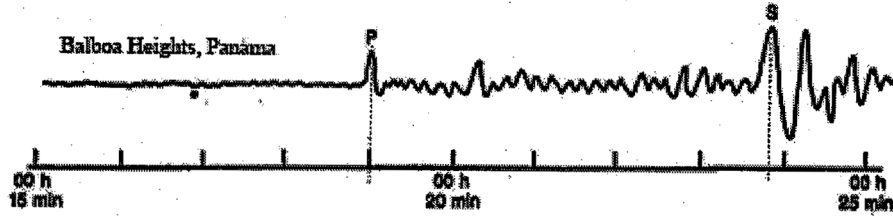
In the contour map above there are 6 wells cutting an unconfined aquifer that are marked 1 to 6. The following data are collected from the 6 wells. Write the water table elevation for each well and mark the direction of water flow. Explain your answer. 5

Well No	Surface Elevation	Depth to water table	Water Table Elevation
1	90 m	20 m	
2	65 m	15 m	
3	70 m	18 m	
4	68 m	16 m	
5	50 m	14 m	
6	30 m	10 m	

11. The natural atmosphere has about 380 parts per million, or ppm, of CO₂, with $\Delta^{14}\text{C}$ of +45‰. If we add 5 ppm of fossil fuel CO₂, with a $\Delta^{14}\text{C}$ of -1000‰, then the new $\Delta^{14}\text{C}$ value in the atmosphere will be _____ 5

Classify different types of earthquake waves along with their properties. 5

12. Find the epicentre of the earthquake given the P and S wave receiving times in each station. 10



Data Table

City	P-wave Arrival Time	S-wave Arrival Time	Difference Between P-wave and S-wave	Distance to Epicenter
Balboa Heights				
Boulder				
Mexico City				



Earthquake P-Wave and S-Wave Travel Time

