MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY BHOPAL

DEPARTMENT OF CHEMISTRY

Mid Term Examination (Nov 2024) Answer Key

B.Tech. (First Semester)

Course Code: CHY 24110 **Course: Environmental Science**

Section A

Q A1 Shifting cultivation or slash and burn agriculture is an agricultural system in which plots are cultivated temporarily, then abandoned and burnt while post-disturbance vegetation is allowed to freely grow while the cultivator moves on to another plot. In this process, the agriculture shifts from one plot to another a regular interval of time and therefore, a vast number of forests is destroyed.

When the livestock grazing on a grassland or pasture surpass the carrying capacity (maximum population that can be supported by it), the sustainability of the grazing lands fails due to overgrazing. Such process leads to deforestation.

Q A2(a) Cauvery Water Dispute:

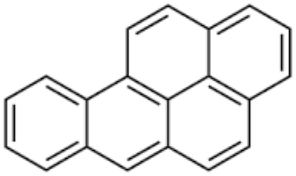
The Cauvery river water is a bone of contention between Tamil Nadu and Karnataka. Tamil Nadu occupies downstream region of the river and wants to use upstream, whereas Karnataka claims its primacy as upstream user. On June 2, 1990, the Cauvery Water Dispute Tribunal was set up and as an interim award, it directed Karnataka to provide 205 TMCF of water in Tamil Nadu's Mettur dam every year, till a settlement was reached.

Q A2(b) Destruction of Sariska Tiger Reserve:

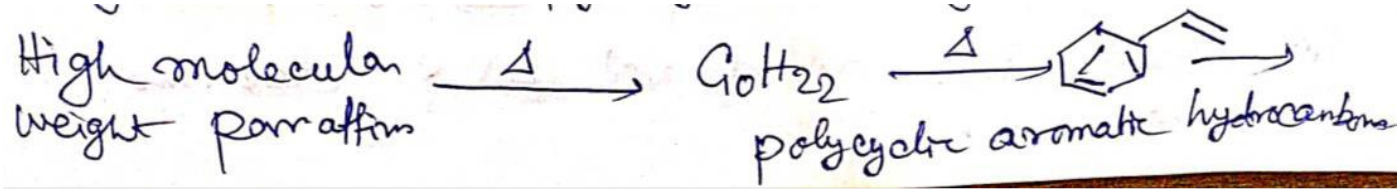
Sariska tiger reserve in Aravalli range has gentle slopy hills, vertical rocky valleys, flat plains as well as deep gorges and it is very rich in wild life and mineral reserves like quartzite, Schists, etc. Mining operations around the Sariska Tiger reserve makes the surrounding infertile and barren. Supreme Court on 31st December, 1991 has given a judgement that Centre and State Government of Rajasthan are directed to stop all mining activity within the park.

Q A2(c) Organic Particulate Matter:

Organic particulate matters (average size is 1 μ) are mainly polycycle (polynuclear) aromatic hydrocarbon (PAH) emitted from vegetation and automobile combustion of fuels. Benzo (α) pyrene is a well known PAH.



PAHs are generated from pyrolysis of higher parafins:



Soot is also considered as organic particulate matter, which is highly condensed product of PAHs consisting of several thousand interconnected crystallites. Due to large surface area, soot acts as a carrier for toxic organics.

Section B

Q B1 In nuclear fission, nucleus of certain isotopes with large mass numbers are split into lighter nuclei on bombardment by neutrons and a large amount of energy is released through a chain reaction:

$_{92}U^{235} + {}_{0}n^{1} \rightarrow {}_{36}Kr^{92} + {}_{56}Ba^{141} + 3{}_{0}n^{1} + \text{Energy}$

This energy can be used as a practical energy source for our livelihood.

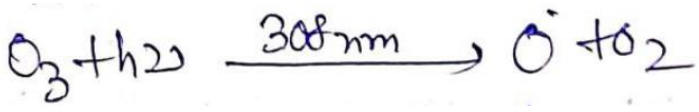
On the contrary, in nuclear fusion, two isotopes of a light element are forced together at extremely high temperatures (1 billion °C) fusing to form a heavier nucleus releasing enormous energy in the process:

$_{1}H^{2} + {}_{1}H^{2} \rightarrow {}_{3}He^{2} + {}_{0}n^{1} + \text{Energy}$

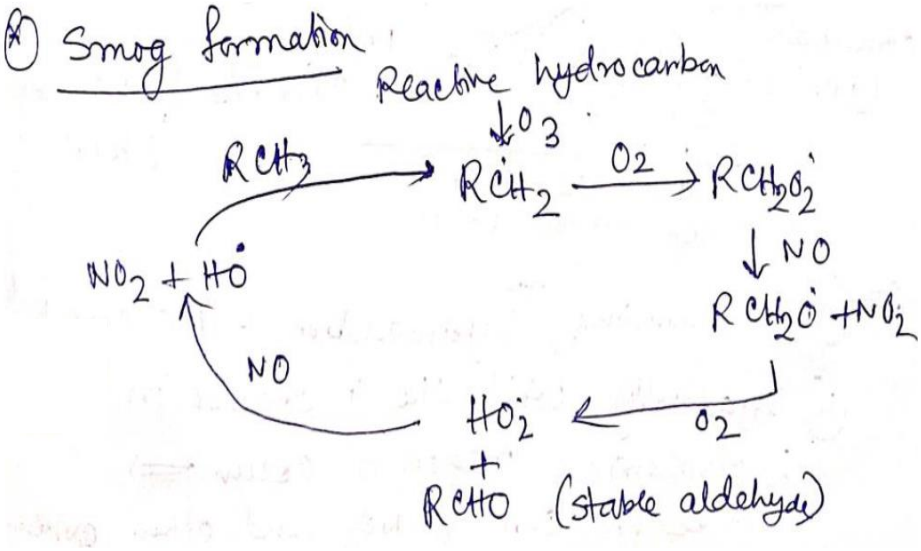
Since very high temperature (1 billion °C) is required to carry out nuclear fusion, it is not possible to use such process as a source of practical energy.

Q B2 O_3 serves as a rescuer of biosphere while present in stratosphere due to absorption of harmful UV rays (around 308 nm) generating O radical and O_2 molecule. On the other hand, it acts as a potent pollutant in troposphere, since it leads to formation of photochemical smog.

In stratosphere:

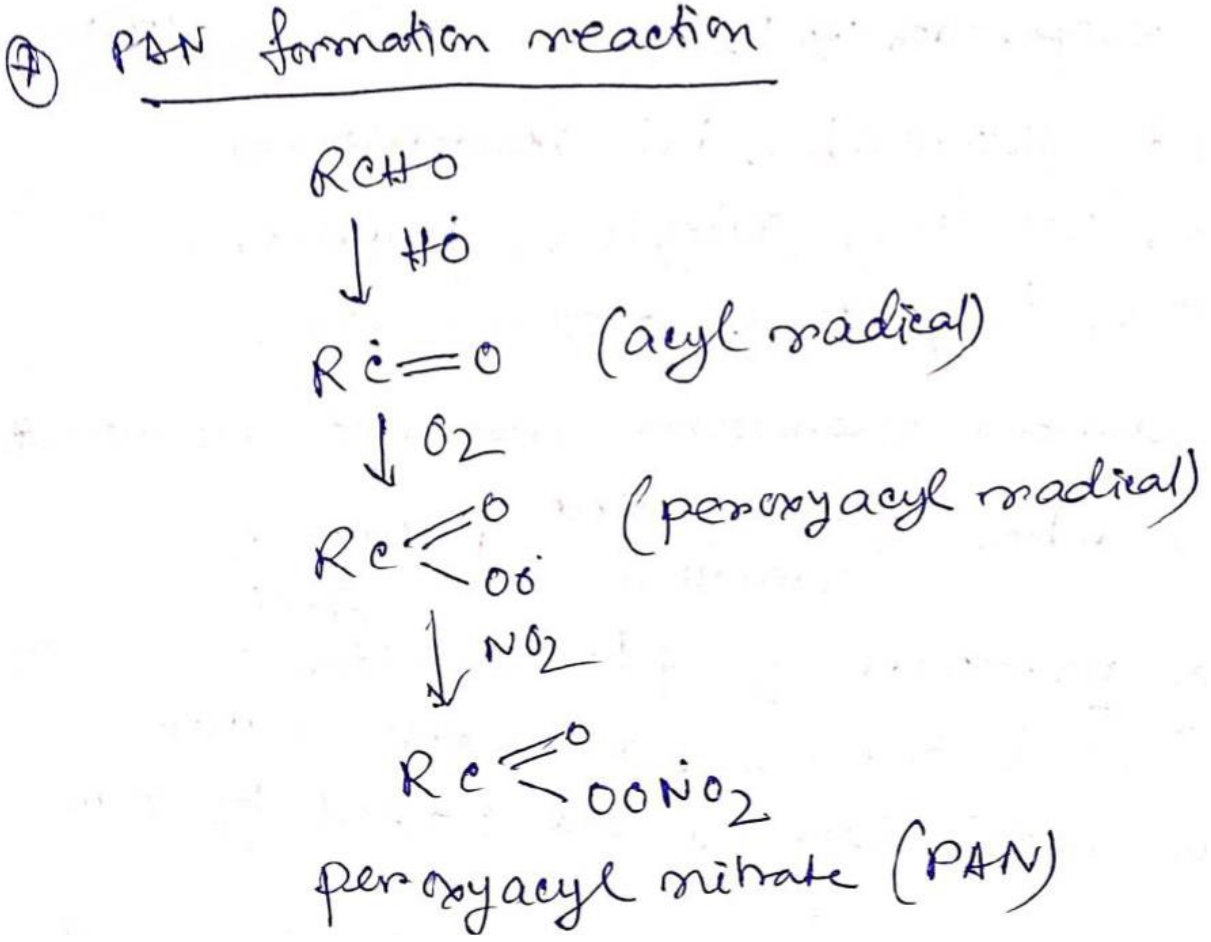


In troposphere:



Section C

Q C1 The PAN (peroxyacyl nitrate/peroxyacyl nitrite) formation reaction from aldehyde (RCHO) is as follows:



Q C2 In the stratospheric level, the reactions for generation of HNO_2 and HNO_3 are as follows: