

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

First Semester 2022-2023(5-11-2022)

Mid-Semester Test **PART A: (CB) 32 marks, suggested time 50 min**

Course No. : CHE F422

Total time: 90 min

Course Title: PETROLEUM REFINING TECHNOLOGY

Total Marks: 50

Name:

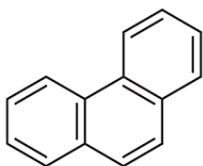
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INSTRUCTIONS: 1. Answer all questions of Part A on the question paper itself, and only in the space provided just under the question (*otherwise It will not be evaluated*), **ANSWER TO THE POINT.**

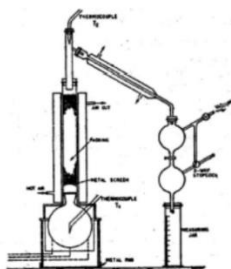
2. Part B must be answered in supplementary answer booklet provided only after Part A is submitted. Part B is OB, notes/print out of graphs are allowed.

4. Exam malpractice will immediately be communicated to AUGSD

Q1[1+1+2]. (a) name the 'sub-class of compounds' to which compound in Figure below belongs. Name the crude fraction to which it might belong. If we cannot *directly* detect this compound in a particular crude, how else might we predict its presence?



Q2[2+2]. The data obtained from laboratory equipment (a) is used for design of industry scale (b). **What justification is there for basing the design of (b) on the data from (a)?** How many trays might be needed to get 'exact' distillation in (b) as in (a) **Justify graphically?**



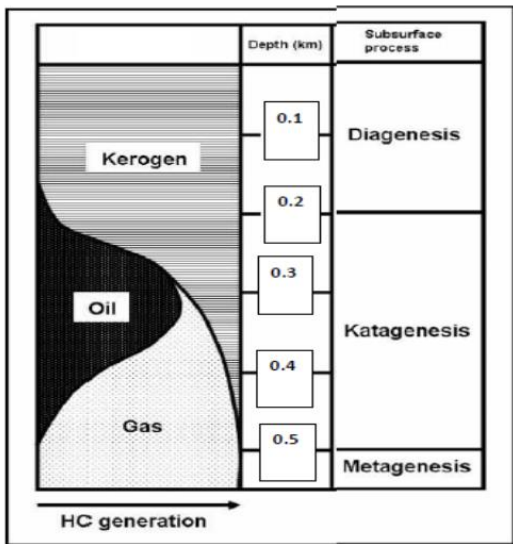
(a)



(b)

Q3[3+1]. If only four hydrocarbons (of sufficiently differing molecular weight) were mixed, draw the resulting **TBP and ASTM** boiling point curves on same graph (qualitatively). State the reason why *this* TBP curve is different from that of a typical whole crude TBP curve.

Q4[4]. Imagine this scenario: In another galaxy recently discovered, scientists found a new planet ‘Ω’, appearing on the surface (biosphere & atmosphere) as similar to earth in every way. Scientists were able to estimate Katagenesis data on planet Ω as given below. **Does the organic theory (currently held on our planet) hold as the explanation for this scenario also? Justify for or against with reasoning.**



Q5[4] (a) Once oil is confirmed to exist by a drill bore test, which exploration method/s can estimate the **‘quantity’** of oil present and based on what?

Q6[2+2]. Name the two factors that Packie related to the 'F-factor' of a section in distillation tower (F-factor for a section = Reflux× number of trays) Briefly explain *How* each factor will vary with F and give the reason *why* in each case.

Q7. [8] Two crudes were recently drilled at different locations in your state. The only information we have about them is as follows:

Crude name	TBP curve can be approximated to a straight line (except for 2% extremes). Slope (°C / %)	t _{50%} °F
A	7	550
B	10	505

Which would be better/ easier to refine? Give your point wise analysis as a refiner. Comparing the two crudes comment qualitatively on i) API of first three cuts ii) gasoline yield iii) middle distillates yield iv) bottom product API

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First Semester 2022-2023(5-11-2022)

Mid-Semester Test PART B: (OB) 18 marks, suggested time 40 min

Course No. : CHE F422

Total time: 90 min

Course Title: PETROLEUM REFINING TECHNOLOGY

Total Marks: 50

Instructions: *After you submit part A, Answer Part B only in the booklet provided,
 Name all data sources.
 Show all calculations.*

Q1. For the following crude (Table-1) the whole crude API is 31.6°. Taking cut range as 200° F find (all symbols have their usual meaning):

- (a) Find ASTM (5-95) Gap in ° F for the **first 2 cut sections** given in Table 2 and check for separation criteria. If criteria is *not* satisfied, comment on what can be done [8+2]
- (b) Convert the ASTM (5-95) Gap for the **first 2 cuts** into TBP overlaps and report values. Plot the TBP data and the TBP overlaps on same graph by assuming that the overlaps are symmetric about the TBP cut temperatures [8]

Table-1

Vol. %	0	5	10	20	30	40	50	60	70	80
TBP, ° F	-130	148	213	327	430	534	639	747	867	1013

Table-2

Sl. No	Cut Section	TBP Cut Temperatures for section in ° F	'F' for section
1	LN-HN	200	30
2	HN-LD	350	28
3	LD-HD	500	8
4	HD-AGO	600	5.6
5	AGO-Bottoms	800	4

*****End of Part B*****

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--- (Do rough-work below) ---