

Unit 1 - Energy sources

1. Define chemical fuels. Classify the fuels based on occurrence and physical state with examples.
2. Define calorific, gross and net calorific values.
3. Execute the Classification of fuels based on occurrence and physical state with examples.
4. Describe with a neat diagram the determination of calorific value of a fuel by bomb calorimeter method
5. Solve for the net and gross calorific values of a sample of coke from the following data: mass of coke = 0.795×10^{-3} kg; mass of water = 2.5 kg; water equivalent of calorimeter = 1.3 kg; specific heat of water = 4.187 kJ/kg/K; rise in temperature = 1.8K; % of hydrogen in coke = 2.5; latent heat of steam = 587 cal/g
6. Solve for gross and net calorific values: On burning 1.15 g of a fuel in a bomb calorimeter, the temperature of 3.5 kg of water increased from 26.5 °C to 28.5 °C. Water equivalent of calorimeter is 325 g, specific heat of water is 4.187 J/g/K, latent heat of steam is 2458 J/g and the fuel contains 4 % hydrogen.
7. Solve for the gross and net calorific values of a sample of coal from the following data: mass of coal = 0.98 g; mass of water = 2600 g; water equivalent of calorimeter = 368 g; specific heat of water = 4.187 J/g/K; rise in temperature = 2.8 K; % of hydrogen in coal = 5.8; latent heat of steam = 2454 J/g.
8. On burning 0.96×10^{-3} kg of a fuel in a bomb calorimeter, the temperature of 2.75 kg of water was increased by 2.7 °C. Water equivalent of calorimeter, specific heat of water and latent heat of steam are 0.385 kg, 4.187 kJ/kg/K and 2455 kJ/kg respectively. If the fuel contains 5% hydrogen, solve for its gross and net calorific values
9. Examine the role of fluidized bed catalyst in cracking process with a diagram
10. Illustrate the following: (a) octane number (b) cetane number
11. Explain the mechanism of knocking of gasoline in internal combustion engine.
12. Define anti-knocking agents and elaborate their role in minimising knocking
13. Define unleaded petrol and justify how anti-knocking properties are achieved in unleaded petrol.
14. Justify the use of anti-knocking agent in gasoline
15. Define: (a) petroleum cracking (b) knocking of petrol
16. Define power alcohol. Explain its production and list its advantages and disadvantages
17. Define bio-diesel. Explain the production of bio-diesel by trans-esterification of triglycerides. List its advantages
18. Define photovoltaic cell. Summarize the construction and working of a photovoltaic cell
19. Record the advantages and disadvantages of a photo-voltaic cell.
20. Display the Union Carbide process of production of solar grade silicon
21. Outline the process of production of solar grade silicon
22. Explain the purification of silicon by zone refining technique

One Mark Questions:

- i. Clarify why catalytic converters are used in automobiles?
It is used in the exhaust of automobiles to reduce the amount of pollutants
- ii. Justify why gross calorific value is always higher than its net caloric value?
GCV includes latent heat of steam hence it is always higher than NCV
- iii. Name the unit of calorific value of a solid fuel?
The unit of calorific value of a solid fuel is KJ/Kg
- iv. Select an example for secondary fuel?
- v. TEL is always used along with ethylene dibromide as an anti-knocking agent, justify
TEL is used to convert less volatile Pb and PbO into more volatile $PbBr_2$ which escape into air along with exhaust gases.
- vi. Clarify why solar grade silicon is preferred in solar cell
Silicon used for solar cells can tolerate higher concentration of impurities than in semiconductor grade without affecting the efficiency of the cell considerably and solar grade silicon works out cheap.
- vii. Clarify why TEL is added to gasoline
It increases the octane number, efficiency of the engine and minimizes the knocking
- viii. Define compression ratio of IC engine
The ratio of the gaseous volume in the cylinder at the end of suction stroke to the volume at the compression stroke of the piston
- ix. Tell what is 80 octane fuel
80 octane fuel is one which has same combustion characteristic as an 80:20 mixture of isooctane and n-heptane
- x. Clarify how TEL reduces knocking in IC engine
During the combustion TEL is converted into PbO , which reduces formation of peroxide molecules thereby slowing down the chain reaction.
- xi. Tell how octane rating can be increased in petrol
By adding TEL, MTBE etc.
- xii. Clarify why MTBE is preferred to convert leaded to unleaded petrol
It contains oxygen which supplies to combustion process to minimize peroxide molecules and avoid Pb pollution in the atmosphere.
- xiii. Explain the role of alkali is used in transesterification
It acts as catalysts by converting triglycerides into biodiesel
- xiv. Represent straight chain, aromatic and branched chain hydrocarbons in increasing order of their knocking tendency
Straight chain > branched chain > aromatic hydrocarbons
- xv. Power alcohol is preferred than petrol, Justify
Octane rating of power alcohol is about 90, while that of gasoline is 60-70
- xvi. Explain why octane number of 2,3-dimethyl pentane is higher than n-heptane

- 2,3-dimethyl pentane is a branched structure while n-heptane is straight chain
- xvii. In catalytic cracking process, used catalyst requires regeneration, clarify
During catalytic cracking process, catalyst used gets coated with carbon, loses its catalytic activity hence it is regenerated
- xviii. Clarify why diesel is preferred over petrol as a fuel
Diesel is more efficient, less expensive and produce only about one tenth of CO than petrol
- xix. Show what energy conversion takes place when fuel is burnt
Chemical energy is converted into heat and light
- xx. List the chemical process used to improve the efficiency of petrol
Cracking and reforming
- xxi. Clarify why octane number of gasoline is so important in automobiles
It indicates the rating of gasoline
- xxii. Name the compounds used to rise the cetane number of diesel
By adding ethyl nitrate, acetone and nitro naphthalene

DAYANANDA SAGAR COLLEGE OF ENGINEERING*(An Autonomous Institute Affiliated to VTU, Belagavi)*

ShavigeMalleshwara Hills, Kumaraswamy Layout, Bengaluru-560078

--	--	--	--	--	--	--	--	--	--

Model Question Bank 2018-19 Unit wise

Program: B.E.

Course: Engineering Chemistry

Semester: I/II

Course Code: 18CH1ICCHY/18CH2ICCHY

Q. No	Question Description	Marks	BL	COs
1.	i. Catalytic converters are used in automobiles, Clarify It is used in the exhaust of automobiles to reduce the amount of pollutants	1 Mark Each	2	CO1
	ii. Gross calorific value is always higher than its net caloric value, Justify, GCV includes latent heat of steam hence it is always higher than NCV		6	CO2
	iii. Name the unit of calorific value of a solid fuel? The unit of calorific value of a solid fuel is KJ/Kg		1	CO1
	iv. Select an example for secondary fuel?		1	CO1
	v. TEL is always used along with ethylene dibromide as an anti-knocking agent, justify TEL is used to convert less volatile Pb and Pbo into more volatile PbBr ₂ which escape into air along with exhaust gases.		6	CO2
	vi. Solar grade silicon is preferred in solar cell Clarify Silicon used for solar cells can tolerate higher concentration of impurities than in semiconductor grade without affecting the efficiency of the cell considerably and solar grade silicon works out cheap.		2	CO2
	vii. TEL is added to gasoline, Clarify it increases the octane number, efficiency of the engine and minimizes the knocking		1	CO1
	viii. Define compression ratio of IC engine The ratio of the gaseous volume in the cylinder at the end of suction stroke to the volume at the compression stroke of the piston		1	CO1
	ix. Tell what is 80 octane fuel, 80 octane fuel is one which has same combustion characteristic as an 80:20 mixture of isooctane and n-heptane		1	CO2
	x. Clarify how TEL reduces knocking in IC engine During the combustion TEL is converted into PbO, which reduces formation of peroxide molecules thereby slowing down the chain reaction.		2	CO2
	xi. Tell how octane rating can be increased in petrol By adding TEL, MTBE etc.		1	CO2
	xii. MTBE is preferred to convert leaded to unleaded petrol, Clarify It contains oxygen which supplies to combustion process to minimizes peroxide molecules and avoid Pb pollution in the atmosphere		2	CO1
	xiii. Explain the role of alkali used in trans- esterification It acts as catalysts by converting triglycerides into biodiesel		2	CO5
	xiv. Represent straight chain, aromatic and branched chain hydrocarbons in increasing order of their knocking tendency Straight chain > branched chain > aromatic hydrocarbons		2	CO2
	xv. Power alcohol is preferred than petrol, Justify Octane rating of power alcohol is about 90, while that of gasoline is 60-70		6	CO2,

	xvi. Explain why octane number of 2,3-dimethyl pentane is higher than n-heptane, 2,3-dimethyl pentane is a branched structure while n-heptane is straight chain		2	CO2
	xvii. In catalytic cracking process, used catalyst requires regeneration, clarify , During catalytic cracking process, catalyst used gets coated with carbon, loses its catalytic activity hence it is regenerated		1	CO2
	xviii. Diesel is preferred over petrol as a fuel, Clarify Diesel is more efficient, less expensive and produce only about one tenth of CO than petrol		2	CO4
	xix. Show what energy conversation takes place when fuel is burnt Chemical energy is converted into heat and light		1	CO1
	xx. List the chemical process used to improve the efficiency of petrol Cracking and reforming		1	CO1
	xxi. Octane number of gasoline is so important in automobiles, Clarify It indicates the rating of gasoline		2	CO2
	xxii. Name the compounds used to rise the cetane number of diesel By adding ethyl nitrate, acetone and nitro naphthalene		1	CO1
2	Define chemical fuels. Classify the fuels based on occurrence and physical state with examples.	8	2	CO1
3	Define gross and net calorific values.	4	1	CO1
4	Execute the Classification of fuels based on occurrence and physical state with examples.	6	3	CO1
5	Describe with a neat diagram the determination of calorific value of a fuel by bomb calorimeter method	8	1	CO6
6	Solve for the net and gross calorific values of a sample of coke from the following data: mass of coke = 0.795×10^{-3} kg; mass of water = 2.5 kg; water equivalent of calorimeter = 1.3 kg; specific heat of water = 4.187 kJ/kg/K; rise in temperature = 1.8K; % of hydrogen in coke = 2.5; latent heat of steam = 587 cal/g	6	4	CO3
7	Solve for gross and net calorific values: On burning 1.15 g of a fuel in a bomb calorimeter, the temperature of 3.5 kg of water increased from 26.5 °C to 28.5 °C. Water equivalent of calorimeter is 325 g, specific heat of water is 4.187 J/g/K, latent heat of steam is 2458 J/g and the fuel contains 4 % hydrogen.	6	4	CO3
8	Solve for the gross and net calorific values of a sample of coal from the following data: mass of coal = 0.98 g; mass of water = 2600 g; water equivalent of calorimeter = 368 g; specific heat of water = 4.187 J/g/K; rise in temperature = 2.8 K; % of hydrogen in coal = 5.8; latent heat of steam = 2454 J/g.	6	4	CO3
9	On burning 0.96×10^{-3} kg of a fuel in a bomb calorimeter, the temperature of 2.75 kg of water was increased by 2.7 °C. Water equivalent of calorimeter, specific heat of water and latent heat of steam are 0.385 kg, 4.187 kJ/kg/K and 2455 kJ/kg respectively. If the fuel contains 5% hydrogen, solve for its gross and net calorific values	6	4	CO3
10	Examine the role of fluidized bed catalyst in cracking process with a diagram	6	4	CO6
11	Illustrate the following: (a) octane number (b) cetane number	4	3	CO1
12	Explain the mechanism of knocking of gasoline in internal combustion engine.	4	2	CO2
13	Define anti-knocking agents and elaborate their role in minimizing knocking	4	1,5	CO2
14	Define unleaded petrol and justify how anti-knocking properties are achieved in unleaded petrol.	4	1,6	CO1
15	Outline the use of anti-knocking agent in gasoline	4	4	CO6
16	Define: (a) petroleum cracking (b) knocking of petrol	4	1	CO1

17	Define power alcohol. Explain its production and list its advantages and disadvantages	8	1,2	CO2
18	Define bio-diesel. Explain the production of bio-diesel by trans-esterification of triglycerides. List its advantages	6	1,2	CO2
19	Define photovoltaic cell. Summarize the construction and working of a photovoltaic cell	6	1,2	CO2
20	Record the advantages and disadvantages of a photo-voltaic cell.	4	1	CO1
21	Display the Union Carbide process of production of solar grade silicon	6	3	CO6
22	Outline the process of production of solar grade silicon	6	4	CO6
23	Explain the purification of silicon by zone refining technique	4	2	CO6