4.COMBUSTION, FUELS AND FLAMES
SOLUTIONS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS

1. Burning a material in the presence of air is
A) combustion B) respiration C) photosynthesis D) explosion
Answer:A
Solution:Burning a material in the presence of air is called combustion.
2. Now a days ___ gas is used as fuel for cooking the food.
A) coal B) petrol C) LPG D) cow dung
Answer:C
Solution:Nowadays, LPG (Liquefied Petroleum Gas) is commonly used as fuel for cooking.
3. When materials burn in air ___ are produced.
A) heat B) light C) both A & B D) none
Answer:C
Solution:When materials burn in air, both heat and light are produced.
4. When we brought lighted stick closer to petrol, it will ____
A) catches fire B) stop burning C) both A & B D) none
Answer:A
Solution:When a lighted stick is brought closer to petrol, it will catch fire due to its low ignition temperature.
5. The materials which do not burn are called _____ materials.
A) combustible B) non-combustible C) flammable D) none
Answer:B
Solution:Materials that do not burn are called non-combustible materials.
6. _____ will support combustion.
A) nitrogen B) oxygen C) helium D) hydrogen
Answer:B
Solution:Oxygen supports combustion.
7. The lowest temperature at which a substance catches fire is called as
A) ignition temperature B) crictical temperature
C) thresold temperature D) none
Answer:A
Solution:The lowest temperature at which a substance catches fire is called its ignition temperature.
8. The Ignition temperature of a substance decides
A) quickness of catching fire B) slowness of catching fire C) both A & B D) none
Answer:C
Solution:how easily or slowly it catches fire
9. The substances which have very low ignition temperature easily catch fire is called _____ substances.
A) inflammable B) combustible C) non-combustible D) none

Answer:A
Solution:Inflammable substances are those that have a very low ignition temperature, meaning they can easily catch fire when exposed to a heat source.
10. Now a days the head of the safety match stick contains only
A) antimony trisulphide B) potassium chlorate
C) both A & B D) white phosphorous
Answer:C
Solution: The head of a safety match stick contains antimony trisulphide and potassium chlorate.
11. The sources of heat for domestic, automobile and industrial purposes are
A) wood & coal B) petrol & kerosene C) LPG & CNG D) all
Answer:D
Solution:Domestic purposes: Wood, coal, LPG, CNG
Automobile purposes: Petrol, diesel, CNG
Industrial purposes: Coal, petrol, kerosene, LPG, CNG
12. Out of solid, liquid & gaseous fuel, which is the best fuel
A) solid B) liquid C) gas D) none
Answer:C
Solution:Gaseous fuels (like LPG, CNG) are the best because they:
Burn completely (less pollution)
Have high calorific value.
Are easy to transport and control.
13. The amount of heat energy produced on complete combustion of 1 kg of fuel is called
A) calorific value B) threshold value C) limiting value D) ignition value
Answer:A
Solution:Calorific value is the heat energy produced when 1 kg of fuel is completely burned.
14. Units of calorific value is
A) KJ/Kg B) Kg/KJ C) KJ D) Kg
Answer:A
Solution:The unit of calorific value is kilojoules per kilogram (KJ/Kg).
15. The calorific value of coal is
A) 6000 KJ/Kg B) 8000 KJ/Kg. C) 25,000 KJ/Kg D) 50,000 KJ/Kg
Answer:C
Solution:The calorific value of coal is around 25,000 KJ/Kg.
16. The calorific value of Hydrogen is
A) 30,000 KJ/Kg B) 45,000 KJ/Kg C) 55,000 KJ/Kg D)1,50,000 KJ/Kg
Answer:D
Solution:Hydrogen has the highest calorific value among common fuels (~150,000 KJ/Kg).
17. Fire can be controlled by eliminating
A) supply of air B) combustible fuel C) high temperature D) all
Answer:D
Solution:Fire can be controlled by removing any one of the three essential

requirements for combustion:
Supply of air (oxygen) – Cutting off oxygen (e.g., using a fire blanket).
Combustible fuel – Removing flammable materials.
High temperature – Cooling the fuel below ignition temperature (e.g., using water).

JEE ADVANCED LEVEL QUESTIONS
Multi Correct Answer Type

18. When we burn the carbon compound it gives
A) CO_2 B) CO C) NO D) NO_2
Answer:A,B
Solution:Complete combustion of carbon compounds produces CO_2 (carbon dioxide).
Incomplete combustion (due to insufficient oxygen) produces CO (carbon monoxide).
NO & NO_2 are not typical products of carbon combustion (they form in high-temperature nitrogen reactions, like in engines).
19. Which are the following compound undergoes rapid combustion
A) Spirit B) petrol C) coal D) coke
Answer:A,B
Solution:Spirit (alcohol) and petrol have low ignition temperatures and burn rapidly.
Coal and coke burn slowly as they are solid fuels with higher ignition temperatures.
20. What is the hottest part of the candle flame
A) Outer most zone B) Luminus zone C) dark zone D) middle zone
Answer:A
Solution:The outermost zone is the blue, non-luminous region where complete combustion occurs, and it is the hottest part of the flame.
The luminous zone (middle) is yellow and moderately hot, while the dark zone is the least hot.
21. Which of the following are fire extinguishers
A) water B) CO_2 C) $NaHCO_3$ D) None
Answer:A,B,C
Solution:Water: Cools fires (used for wood/paper fires).
CO_2: Cuts off oxygen (used for electrical/flammable liquid fires).
$NaHCO_3$ (Baking soda): Releases CO_2 when heated (used in dry chemical extinguishers).
22. Which of the following are fuels
A) H_2 B) Coal C) Petrol D) None
Answer:A,B,C
Solution:H_2 (Hydrogen): High-energy fuel (used in rockets).
Coal: Solid fuel (used in power plants).
Petrol: Liquid fuel (used in vehicles).

Matrix Matching Type

23. Coloumn - 1	**Coloumn - 2**
a) Calorific value	1) highly inflammable
b) petrol	2) 7000 KJ/Kg
c) Cow dung	3) KJ/Kg
d) Plastic	4) non - combustible
	5) fire extinguisher

A) a-1, b-2, c-3, d-4 B) a-2, b-3, c-4, d-1
C) a-3, b-1, c-2, d-4 D) a-3, b-5, c-2, d-1

Answer:C

Solution:

Coloumn - 1	**Coloumn - 2**
a) Calorific value	3) KJ/Kg
b) petrol	1) highly inflammable
c) Cow dung	2) 7000 KJ/Kg
d) Plastic	4) non - combustible

Assertion and Reason Type:

A) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion.
B) Both Assertion and Reason are true, but Reason is NOT the correct explanation for Assertion.
C) Assertion is true, but Reason is false.
D) Assertion is false, but Reason is true.

24. A: Petrol & Diesel are inflammable substances.
R: Their ignition temperature is very low.

Answer:A

Solution:A is TRUE (Petrol and diesel are indeed inflammable/highly flammable substances).
R is TRUE (They have low ignition temperatures: petrol ~247°C, diesel ~210°C).
Is R the correct explanation for A?
Yes, their low ignition temperature is exactly why they are classified as inflammable (easily catch fire).

25. A: spirit and petrol catch fire easily
R: at room temperature they turn into gas

Answer:B

Solution:A is TRUE (Spirit (ethanol) and petrol are highly flammable and ignite easily).
R is PARTIALLY TRUE but misleading:
They volatilize (form vapors) at room temperature, but don't fully "turn into gas."
Their flammability is due to low ignition temperature and vapor formation, not because they become gases.
Is R the correct explanation for A?
No, the Reason inaccurately describes the science behind their flammability.

Comprehension Type:

Now a days the fuels like LPG we use to cook it will used as a compressed gas in cylinders by using this we can easily do our works. It has high calorefic value than petrole and it is a less polutant os we used it as a house hold fuel.

26. LPG stnads for

A) liqid petrolium gas B) liquid pump gas C) bio gas D) none

Answer:A

Solution:LPG stands for Liquefied Petroleum Gas, a mixture of propane and butane.

27. Why LPG used as a fuel for cooking

A) it has high calorific value B) less polutant C) less calorific value D) both 1& 2

Answer:D

Solution:A) High calorific value (~50,000 KJ/kg) $\rightarrow$ Produces more heat per unit mass compared to fuels like wood or coal.

B) Less polluting $\rightarrow$ Burns cleaner than petrol/diesel, releasing fewer pollutants (e.g., smoke, CO_2).

C) Incorrect $\rightarrow$ LPG does not have a "less calorific value"; it is energy-efficient.

LEARNERS TASK

JEE MAINS LEVEL QUESTIONS

28. The most common fire extinguisher is

A) water B) petrol C) sand D) none

Answer:A

Solution:Water is the most common extinguisher for Class A fires (wood, paper, cloth).

It works by cooling the fuel below its ignition temperature.

29. The excellent fire extinguisher is

A) water B) CO_2 C) Sand D) petrol

Answer:B

Solution:Carbon dioxide (CO2) is effective on electrical fires and flammable liquid fires, as it cuts off oxygen and leaves no residue.

30. What is mandatory for multi stored buildings to install

A) open hall B) fire extinguisher C) generator D) both A & B

Answer:B

Solution:Fire extinguishers are mandatory as per safety codes (e.g., NBC in India).

31. Why does kerosene oil & molten wax burn with flame.

A) becomes gas B) does not become gas C) both A & B D) none of these

Answer:A

Solution:Kerosene and molten wax vaporize on heating and the vapors burn with a flame.Only substances that vaporize on heating burn with a flame.

32. A fuel catches fire immediately if it is in the form of

A) solid B) liquid C) gas D) both A & B

Answer:C

Solution:Gaseous fuels mix readily with air and ignite quickly.

Solid and liquid fuels need more time to vaporize and ignite.
33. A wax candle burns with a _____ flame.
A) blue B) white C) green D) yellow
Answer:D
Solution:The luminous yellow flame is due to incandescent carbon particles in incomplete combustion.
34. The domestic gas burns with a _____ flame.
A) white B) blue C) green D) yellow
Answer:B
Solution:LPG undergoes complete combustion, producing a non-luminous blue flame (highest efficiency).
35. CO_2 can be stored as _____ in cylinder under high pressure.
A) solid B) liquid C) gas D) none
Answer:B
Solution:CO_2 is stored as a liquid under high pressure (~57 bar at room temperature).
On release, it expands into gas + solid (dry ice), making it effective for fire suppression.
36. A match stick is an example for
A) spontanoeus combustion B) rapid combustion C) both A & B D) none of these
Answer:B
Solution: A matchstick burns quickly when struck, making it an example of rapid combustion.
37. CNG stands for
A) compressed natural gas B) Coal with natural gas
C) combustible natural gas D) none
Answer:A
Solution: CNG stands for Compressed Natural Gas, which is mainly methane stored under high pressure.
38. The very high & long flame indicates
A) vaporised content is more B) non-sooty flame C) both A & B D) none of these
Answer:A
Solution: A very high and long flame indicates more vaporized fuel content is available for combustion. Non-sooty flame (B) is a separate characteristic.
39. Why phosphorous is preserved in water
A) its ignition is high B) its ignition temperature is low
C) It is non-combustible D) all
Answer:B
Solution:White phosphorus has an extremely low ignition temperature (~35°C) and can catch fire in air, so it's stored in water to prevent contact with oxygen.
40. What is the equipment we use to measure calorific value of a fuel
A) bomb calorimetre B) voltameter C) colorimetre D) galvnometre
Answer:A
Solution:A bomb calorimeter is specifically designed to measure the calorific value of fuels by complete combustion in a controlled environment.

41. Rate of combustion of a fuel depends upon
A) Amount of substance B) supply of air C) both D) none
Answer:C
Solution:: The rate of combustion depends on both the amount of substance and the supply of air (oxygen).
42. Lower the Ignition temperature the materials catches fire
A) easily B) tough C) slow D) moderate
Answer:A
Solution:Materials with lower ignition temperatures catch fire more easily as they require less heat to start burning.
43. When combustion of petrolium takes place in insufficient air..... is formed
A) CO_2 B) CO C) NO D) NO_2
Answer:B
Solution:In insufficient air, incomplete combustion of petroleum occurs, producing carbon monoxide (CO) instead of CO_2.
44. Which of the following does not result due to the burning of fossil fuels
A) global warming B) ecosystem imbalance C) green house effect D) Acid rains
Answer:B
Solution: While burning fossil fuels causes global warming (A), greenhouse effect (C), and acid rains (D), ecosystem imbalance is a consequence of these effects, not a direct result.
45. Increasing amounts of CO_2 leads to
A) decreased green house effect B) Ozone depleation
C) global warming D) decrease in humidity
Answer:C
Solution:Increased CO_2 enhances the greenhouse effect, leading to global warming. It doesn't directly cause ozone depletion (B).
46. Coal and petrolium have been formed from biomass in addition to carbon these contains
A) Hydrogen B) Hydrogen & Nitrogen
C) H_2 , N_2 & sulphur D) H_2 , N_2 , sulphur & Calcium
Answer:C
Solution:Coal and petroleum contain carbon along with hydrogen, nitrogen, and sulfur as common impurities.
47. Biotic resources are
A) living B) non living C) both A & B D) None
Answer:A
Solution:Biotic resources are derived from living organisms (e.g., forests, animals). Non-living resources are abiotic (e.g., minerals).
48. Inverting glass tumbler on burning candle flame goes off because
A) lack of O_2 B) lack of heat C) lack of CO_2 D) lack of N_2
Answer:A
Solution: The flame extinguishes due to oxygen deprivation when covered by the tumbler, as combustion requires O_2.
49. What is the compound present on the surface of match box
A) Red phosphorus B) White phosphorus C) KCl D) None
Answer:A

Solution:Matchbox striking surface has red phosphorus, which ignites the match head.

50. In which zone of the flame combustion will be occured

A) blue Zone B) dark Zone C) middle Zone D) outer most Zone

Answer:D

Solution:Complete combustion occurs in the outermost zone (blue) of the flame where oxygen supply is maximum, making it the hottest part.

JEE ADVANCED LEVEL QUESTIONS

Multi Correct Answer Type

51. If black dirt smoke is coming out from a flame, it indicates

A) carbon percentage is more B) sooty flame

C) non-combustible content is more D) none

Answer:A,B

Solution:Black smoke indicates incomplete combustion, leading to:

A) High carbon content (unburnt carbon particles form soot).

B) A sooty flame (visible as black smoke).

52. When there is no supply of electricity, we use the light from

A) petrol B) kerosene lamp C) bruning candle D) candle

Answer:B,C,D

Solution:Kerosene lamps and candles are common sources of light during power cuts.Petrol is not used for lighting due to its danger and volatility.

53. Examples of Inflammable substances are

A) petrol B) alcohol C) LPG D) none

Answer:A,B,C

Solution:Inflammable substances have low ignition temperature and catch fire easily.Petrol, alcohol, and LPG (Liquefied Petroleum Gas) are all highly inflammable.

54. A best fuel should have

A) high calorific value B) less pollution C) reasonable price D) none

Answer:A,B,C

Solution:A good fuel must:Produce more energy (high calorific value)

Cause minimum pollution

Be affordable and accessible

55. Why water is not suitable for fires involving oil and petrol

A) because water is heavier than oil B) it sinks below the oil.

C) oil keeps burning on the top of water surface D) none

Answer:A,B,C

Solution:Water cannot extinguish oil fires because:It is denser, sinks under oil.Oil floats and continues to burn, spreading the fire

Special fire extinguishers like foam or CO_2 are needed for oil/petrol fires.

56. Petrol, diesel are _____ energy sources,

A) renewable B) non renewable C) exhaustible D) inexhaustible

Answer:B,C

Solution:B) Non-renewable: Fossil fuels take millions of years to form.

C) Exhaustible: Finite supply (will deplete with use).

Matrix Matching Type:

57. a) Water 1) High calorific value
b) CO_2 2) Supports burning
c) O_2 3) solid
d) LPG 4) excellent fire extinguisher
5) universal solvent

A) a-1, b-2, c-3, d-4 B) a-5, b-4, c-2, d-1
C) a-4, b-3, c-1, d-5 D) a-4, b-3, c-2, d-1

Answer:B

Solution:

a) Water 5) universal solvent
b) CO_2 4) excellent fire extinguisher
c) O_2 2) Supports burning
d) LPG 1) High calorific value

58. a) outer most zone 1) oxygen
b) middle zone 2) hottest part
c) dark zone 3) moderately hot
d) combustion zone 4) least hot

A) a-1, b-2, c-3, d-4 B) a-2, b-3, c-4, d-1
C) a-4, b-3, c-1, d-5 D) a-4, b-3, c-2, d-1

Answer:B

Solution:

a) outer most zone 2) hottest part
b) middle zone 3) moderately hot
c) dark zone 4) least hot
d) combustion zone 1) oxygen

Assertion and Reason Type:

A) Both Assertion and Reason are true, and Reason is the correct explanation for Assertion.
B) Both Assertion and Reason are true, but Reason is NOT the correct explanation for Assertion.
C) Assertion is true, but Reason is false.
D) Assertion is false, but Reason is true.

59. Assertion : CO_2 is an excellent fire extinguisher
Reason : It covers the fire like a blanket, since the contact between the fuel & oxygen is cut off.

Answer:A

Solution:A is TRUE: CO_2 is widely used in fire extinguishers (especially for electrical/flammable liquid fires).
R is TRUE and explains A: CO_2 is heavier than air, forming a "blanket" that displaces oxygen, thereby smothering the fire.

60. Assertion : Calorific value is measured in KJ/Kg.
Reason : The calorific value of a diesel is 45,000 KJ/Kg.

Answer:B

Solution:A is TRUE: Calorific value is the energy per unit mass (SI unit: kJ/kg).
R is TRUE (diesel's calorific value ˜ 45,000 kJ/kg) but irrelevant to A. The unit (kJ/kg) is a standard definition, not dependent on diesel's specific value.

61. Assertion : Gases are best example for good fuels.
Reason : Coal is a gaseous fuel.

Answer:C

Solution:A is TRUE: Gaseous fuels (e.g., LPG, CNG) are ideal due to:
High calorific value.
Clean combustion (low pollution).
Easy control of flame.
R is FALSE: Coal is a solid fuel, not gaseous.

Comprehension Type:

Burning the fuel in precence of air is called cumbustion.On burning many types of compounds were produced like CO_2 , CO

62. The compounds which causes pollution
A) CO_2 B) NO_2 C) CH_4 D) CH

Answer:A,B,C,D

Solution:CO_2 is a greenhouse gas contributing to global warming
NO_2 causes acid rain and smog
CH_4 (methane) is a potent greenhouse gas (25x more effective than CO_2)
CH (methylidyne radical) – Highly reactive and contributes to photochemical smog in the atmosphere.
Major pollutant is NO_2

63. Which hydro carbon gives carbon dioxide and water on cumbustion
A) CH_4 B) CO_2 C)CH_3 D) CH_2

Answer:A

Solution:The complete combustion reaction for methane (CH_4):
$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

KEY

1	2	3	4	5	6	7	8	9	10
A	C	C	A	B	B	A	C	A	C
11	12	13	14	15	16	17	18	19	20
D	C	A	A	C	D	D	A,B	A,B	A
21	22	23	24	25	26	27	28	29	30
A,B,C	A,B,C	C	A	B	A	D	A	B	B
31	32	33	34	35	36	37	38	39	40
A	C	D	B	B	B	A	A	B	A
41	42	43	44	45	46	47	48	49	50
C	A	B	B	C	C	A	A	A	D
51	52	53	54	55	56	57	58	59	60
A,B	B,C,D	A,B,C	A,B,C	A,B,C	B,C	B	B	A	B
61	62	63							
C	A,B,C,D	A							