



# STUDY MATERIAL FOR BOILER OPERATION ENGINEER EXAMS

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## MCQ: TYPES OF BOILERS

### WARM UP QUESTIONS

1. What is the primary function of a steam boiler?

- (a) To generate electricity directly
- (b) To produce steam by heating water\*
- (c) To compress air for industrial use
- (d) To cool water for processing

Explanation: A steam boiler heats water to produce steam, which is used for heating, power generation, or industrial processes.

2. Which of the following is a fire-tube boiler?

- (a) Babcock and Wilcox boiler
- (b) Benson boiler
- (c) Cornish boiler\*
- (d) LaMont boiler

Explanation: Cornish boiler is a fire-tube boiler where hot gases pass through a single large tube surrounded by water. The others are water-tube boilers.

3. In a water-tube boiler, where does the heat transfer occur?

- (a) Inside the tubes
- (b) In the chimney
- (c) In the furnace
- (d) Outside the tubes\*

Explanation: In water-tube boilers, water flows inside the tubes, and hot gases pass outside, transferring heat to the water.

4. Which type of boiler is best suited for high-pressure applications?

- (a) Fire-tube boiler
- (b) Water-tube boiler\*
- (c) Cochran boiler
- (d) Locomotive boiler

Explanation: Water-tube boilers can handle high pressures (up to 200 bar or more) due to their robust tube design, unlike fire-tube boilers.

5. What is a key advantage of fire-tube boilers?

- (a) High-pressure capability
- (b) Simple and compact design\*
- (c) Rapid steam generation
- (d) High thermal efficiency

Explanation: Fire-tube boilers are simple, compact, and cost-effective, making them suitable for low to medium-pressure applications.

6. Which boiler is an example of a vertical fire-tube boiler?

- (a) Lancashire boiler
- (b) Benson boiler
- (c) Stirling boiler
- (d) Cochran boiler\*

Explanation: Cochran boiler is a vertical fire-tube boiler, compact and widely used for small-scale steam production.

7. What is a major limitation of fire-tube boilers?

- (a) Complex maintenance
- (b) Limited pressure capacity\*
- (c) High fuel consumption
- (d) Slow heat transfer

Explanation: Fire-tube boilers are limited to low to medium pressures (up to 20 bar) due to the thickness required for the shell.

8. Which boiler is classified as a once-through boiler?

- (a) Benson boiler\*
- (b) Scotch marine boiler
- (c) Lancashire boiler
- (d) Locomotive boiler

Explanation: Benson boiler is a once-through boiler where water passes through the tubes in a single cycle, converting directly to steam without recirculation.

9. Which boiler is specifically designed for railway locomotives?

- (a) Stirling boiler
- (b) LaMont boiler
- (c) Locomotive boiler\*
- (d) Babcock and Wilcox boiler

Explanation: Locomotive boilers are fire-tube boilers designed for mobility and high steam output in railway locomotives.

10. Which boiler uses forced circulation of water?

- (a) Cornish boiler
- (b) LaMont boiler\*
- (c) Cochran boiler
- (d) Lancashire boiler

Explanation: LaMont boiler employs a pump for forced circulation, enhancing heat transfer and steam generation efficiency.

11. What is the typical pressure range for a fire-tube boiler?

- (a) 1–20 bar\*
- (b) 20–100 bar
- (c) 100–200 bar
- (d) Above 200 bar

Explanation: Fire-tube boilers operate at low to medium pressures (1–20 bar) due to structural limitations of the shell.

12. Which boiler is commonly used in marine applications?

- (a) Benson boiler
- (b) Scotch marine boiler\*
- (c) Stirling boiler
- (d) LaMont boiler

Explanation: Scotch marine boiler is a fire-tube boiler designed for marine vessels due to its compact size and reliability.

13. What is a defining feature of a Cornish boiler?

- (a) Single large fire tube\*
- (b) Multiple fire tubes
- (c) High-pressure operation
- (d) Forced circulation

Explanation: Cornish boiler features a single large fire tube running through the cylindrical shell, surrounded by water.

14. Which boiler is designed for supercritical steam generation?

- (a) Lancashire boiler
- (b) Benson boiler\*
- (c) Cochran boiler
- (d) Locomotive boiler

Explanation: Benson boiler operates at supercritical pressures (above 221 bar), where water transitions to steam without a distinct boiling phase.

15. What is the core component of a steam generator?

- (a) Turbine
- (b) Heat exchanger\*
- (c) Compressor
- (d) Condenser

Explanation: The heat exchanger in a steam generator transfers heat from a source (e.g., nuclear or combustion) to water to produce steam.

16. Which boiler is classified as externally fired?

- (a) Locomotive boiler
- (b) Babcock and Wilcox boiler
- (c) Cochran boiler
- (d) Lancashire boiler\*

Explanation: Lancashire boiler is externally fired, with the furnace located outside the boiler shell, unlike internally fired boilers like locomotive or Cochran.

17. What is a unique feature of a Velox boiler?

- (a) Low-pressure operation
- (b) Gas turbine integration\*
- (c) Single fire tube
- (d) Natural circulation

Explanation: Velox boiler integrates a gas turbine to compress combustion air, achieving high heat transfer rates and rapid steam generation.

18. Which boiler is suitable for small-scale industrial applications?

- (a) Babcock and Wilcox boiler
- (b) Cochran boiler\*
- (c) Benson boiler
- (d) Stirling boiler

Explanation: Cochran boiler is compact and ideal for small-scale industries requiring moderate steam output.

19. What distinguishes a steam generator from a conventional boiler?

- (a) Steam generators produce no steam

(b) Steam generators use external heat sources\*

(c) Boilers have no furnace

(d) Steam generators are always low-pressure

Explanation: Steam generators typically use external heat sources (e.g., nuclear reactors), while boilers have integrated furnaces for combustion.

20. Which boiler relies on natural circulation of water?

(a) LaMont boiler

(b) Benson boiler

(c) Babcock and Wilcox boiler\*

(d) Velox boiler

Explanation: Babcock and Wilcox boiler uses natural circulation driven by density differences between hot and cold water.

21. What is a disadvantage of water-tube boilers?

(a) Low efficiency

(b) High maintenance cost\*

(c) Limited pressure range

(d) Slow steam generation

Explanation: Water-tube boilers have complex designs, leading to higher maintenance costs compared to fire-tube boilers.

22. Which type of steam generator is used in nuclear power plants?

(a) Fire-tube boiler

(b) Locomotive boiler

(c) Lancashire boiler

(d) Nuclear steam generator\*

Explanation: Nuclear steam generators produce steam using heat from nuclear fission, typically in pressurized water reactors (PWRs).

23. What is the primary fuel for a locomotive boiler?

(a) Natural gas

(b) Coal\*

(c) Oil

(d) Biomass

Explanation: Locomotive boilers traditionally use coal burned in the firebox to generate steam for locomotive propulsion.

24. Which boiler has a horizontal cylindrical shell?

(a) Cochran boiler

(b) Lancashire boiler\*

(c) Benson boiler

(d) Stirling boiler

Explanation: Lancashire boiler has a horizontal cylindrical shell, making it suitable for stationary low-pressure applications.

25. What is the role of a superheater in a steam boiler?

(a) To preheat feedwater

(b) To condense steam

(c) To cool exhaust gases

(d) To increase steam temperature\*

Explanation: A superheater raises the temperature of steam above its saturation point, improving the efficiency of steam-driven systems.

1. What is the primary principle of a fluidized bed combustion boiler?

(a) Burning fuel in a fixed bed

(b) Suspending fuel particles in an upward flow of air\*

(c) Compressing fuel for combustion

(d) Cooling fuel during combustion

Explanation: In FBC boilers, fuel particles are suspended in a bed of inert material (e.g., sand) by an upward flow of air, creating a fluid-like state for efficient combustion.

2. Which of the following is a key component of an FBC boiler?

(a) Superheater

(b) Turbine

(c) Condenser

(d) Bed material\*

Explanation: The bed material (e.g., sand, limestone) is essential in FBC boilers to support the fluidized combustion process and absorb heat.

3. What is the main advantage of fluidized bed combustion boilers?

(a) High fuel consumption

(b) Ability to burn low-grade fuels\*



- (c) Complex maintenance
- (d) Low thermal efficiency

Explanation: FBC boilers can efficiently burn low-grade fuels like coal, biomass, or waste due to the turbulent mixing and uniform temperature in the fluidized bed.

4. Which type of FBC boiler operates at atmospheric pressure?
- (a) Pressurized Fluidized Bed Combustion (PFBC)
  - (b) Atmospheric Fluidized Bed Combustion (AFBC)\*
  - (c) Circulating Fluidized Bed Combustion (CFBC)
  - (d) Bubbling Fluidized Bed Combustion (BFBC)

Explanation: AFBC boilers operate at atmospheric pressure, while PFBC boilers use pressurized conditions to improve efficiency.

5. What is the role of limestone in an FBC boiler?
- (a) To reduce sulfur dioxide emissions\*
  - (b) To increase fuel combustion
  - (c) To cool the combustion chamber
  - (d) To increase ash production

Explanation: Limestone is added to the bed to react with sulfur dioxide ( $\text{SO}_2$ ), forming calcium sulfate and reducing emissions.

6. Which fuel is commonly used in FBC boilers?
- (a) Natural gas
  - (b) Coal\*
  - (c) Diesel
  - (d) Nuclear fuel

Explanation: Coal, especially low-grade or high-ash coal, is commonly used in FBC boilers due to their ability to handle diverse fuels.

7. What is a characteristic of a bubbling fluidized bed combustion (BFBC) boiler?
- (a) High gas velocity
  - (b) No bed material
  - (c) Low gas velocity\*
  - (d) Pressurized operation

Explanation: BFBC boilers use low gas velocity to create a bubbling effect in the

bed, keeping the bed material in a fluid-like state without significant carryover.

8. Which FBC boiler type is suitable for large-scale power generation?
- (a) Atmospheric Fluidized Bed Combustion (AFBC)
  - (b) Circulating Fluidized Bed Combustion (CFBC)\*
  - (c) Bubbling Fluidized Bed Combustion (BFBC)
  - (d) Fixed Bed Combustion

Explanation: CFBC boilers are preferred for large-scale power generation due to their higher efficiency and ability to handle high gas velocities.

9. What is a disadvantage of FBC boilers?
- (a) High erosion of bed tubes\*
  - (b) Low fuel flexibility
  - (c) High  $\text{SO}_2$  emissions
  - (d) Low heat transfer rate

Explanation: The turbulent motion of bed material in FBC boilers can cause erosion of bed tubes, requiring regular maintenance.

10. What is the typical temperature range in an FBC boiler?
- (a) 500–600°C
  - (b) 800–900°C\*
  - (c) 1000–1200°C
  - (d) Above 1500°C

Explanation: FBC boilers operate at 800–900°C, which is lower than conventional boilers, reducing  $\text{NO}_x$  formation and improving fuel combustion.

11. Which gas is primarily reduced in FBC boilers due to lower combustion temperatures?
- (a) Carbon dioxide ( $\text{CO}_2$ )
  - (b) Sulfur dioxide ( $\text{SO}_2$ )
  - (c) Nitrogen oxides ( $\text{NO}_x$ )\*
  - (d) Carbon monoxide ( $\text{CO}$ )

Explanation: The lower combustion temperature (800–900°C) in FBC boilers reduces the formation of nitrogen oxides ( $\text{NO}_x$ ).

12. What is the purpose of the cyclone separator in a CFBC boiler?

- (a) To preheat feedwater
- (b) To separate ash and bed material\*
- (c) To cool exhaust gases
- (d) To compress combustion air

Explanation: The cyclone separator in CFBC boilers recycles unburned particles and bed material back to the combustion chamber, improving efficiency.

13. Which of the following is a feature of a pressurized fluidized bed combustion (PFBC) boiler?

- (a) Uses a gas turbine for power generation\*
- (b) Operates at atmospheric pressure
- (c) Low fuel efficiency
- (d) No bed material

Explanation: PFBC boilers operate under pressure and integrate a gas turbine to generate additional power, improving overall efficiency.

14. What is the typical efficiency of a modern FBC boiler?

- (a) 60–70%
- (b) 80–90%\*
- (c) 50–60%
- (d) Above 95%

Explanation: Modern FBC boilers achieve efficiencies of 80–90% due to improved heat transfer and fuel flexibility.

15. Which type of FBC boiler uses high gas velocity to circulate bed material?

- (a) Bubbling Fluidized Bed Combustion (BFBC)
- (b) Atmospheric Fluidized Bed Combustion (AFBC)
- (c) Circulating Fluidized Bed Combustion (CFBC)\*
- (d) Pressurized Fluidized Bed Combustion (PFBC)

Explanation: CFBC boilers use high gas velocities to circulate bed material and fuel particles, enhancing combustion efficiency.

16. What is a key environmental benefit of FBC boilers?

- (a) High CO<sub>2</sub> emissions
- (b) High fuel consumption
- (c) Increased ash production
- (d) Reduced SO<sub>2</sub> and NO<sub>x</sub> emissions\*

Explanation: FBC boilers reduce SO<sub>2</sub> (via limestone) and NO<sub>x</sub> (via low combustion temperatures), making them environmentally friendly.

17. What is the role of the air distributor in an FBC boiler?

- (a) To cool the bed material
- (b) To distribute air uniformly across the bed\*
- (c) To collect ash
- (d) To superheat steam

Explanation: The air distributor ensures uniform air flow through the bed, maintaining the fluidized state and efficient combustion.

18. Which industry commonly uses FBC boilers?

- (a) Automotive
- (b) Power generation\*
- (c) Food processing
- (d) Textile

Explanation: FBC boilers are widely used in power generation due to their fuel flexibility and high efficiency.

19. What is a challenge in operating FBC boilers?

- (a) Low fuel flexibility
- (b) Bed agglomeration\*
- (c) High NO<sub>x</sub> emissions
- (d) Simple maintenance

Explanation: Bed agglomeration, caused by the clumping of bed material at high temperatures, can disrupt the fluidization process.

20. Which component improves heat transfer in an FBC boiler?

- (a) Economizer
- (b) Fluidized bed\*
- (c) Condenser
- (d) Superheater

Explanation: The fluidized bed enhances heat transfer due to the turbulent mixing of fuel and bed material, ensuring uniform heat distribution.

21. What is the primary difference between BFBC and CFBC boilers?

- (a) BFBC uses no bed material
- (b) CFBC operates at lower temperatures
- (c) CFBC uses higher gas velocities\*
- (d) BFBC is pressurized

Explanation: CFBC boilers use higher gas velocities to circulate bed material, while BFBC boilers operate with lower velocities, creating a bubbling bed.

22. Which fuel can be co-fired in FBC boilers?

- (a) Biomass\*
- (b) Natural gas
- (c) Diesel
- (d) Nuclear fuel

Explanation: Biomass can be co-fired with coal in FBC boilers, leveraging their ability to handle diverse fuels.

23. What is a feature of an AFBC boiler?

- (a) High-pressure operation
- (b) Simple design and operation\*
- (c) No limestone use
- (d) Low fuel flexibility

Explanation: AFBC boilers have a relatively simple design and operate at atmospheric pressure, making them easier to maintain.

24. What is the role of the heat exchanger in an FBC boiler?

- (a) To burn fuel
- (b) To collect ash
- (c) To transfer heat to water or steam\*
- (d) To compress air

Explanation: The heat exchanger transfers heat from the fluidized bed to water or steam, producing steam for power or heating.

25. Why are FBC boilers preferred for waste-to-energy plants?

- (a) High maintenance cost
- (b) Ability to burn low-calorie waste\*
- (c) Low efficiency
- (d) Complex operation

Explanation: FBC boilers can efficiently burn low-calorie waste materials, making them ideal for waste-to-energy applications.

## QUESTIONS FROM BOE EXAMS

For Shell type boilers considering the ageing effect on boilers, the working pressure shall be reduced after 35 years to

- (a) 30%
- (b) 90%\*
- (c) 95%
- (d) 75% (NPC BOE 2020)

Hint: After 25 years, it is 95%.

For Shell type boilers, thickness of plain furnace shall be

- (a) Between 7 mm to 22 mm\*
- (b) Between 8 mm to 25 mm
- (c) Between 10 mm to 30 mm
- (d) Between 12 mm to 32 mm (NPC BOE 2018, 2020)

Reheater receives steam from

- (a) Superheater
- (c) Economizer
- (b) Deaerator
- (d) High pressure turbine outlet\* (CBB 2021)

Hint: In a steam turbine plant, the steam is first expanded in the high-pressure turbine. After expanding, the steam, now at a lower pressure and temperature, is reheated before being sent to the intermediate-pressure turbine.

Which of the following boilers is most efficient in combustion?

- (a) Fluidized bed combustion boiler\*
- (b) Lancashire boiler
- (c) Stoker fired boiler
- (d) Chain grate boiler (CBB 2021)

Hint: Fluidized bed combustion (FBC) boilers are known for their high combustion efficiency, often exceeding 90%, due to the efficient mixing of fuel particles with air in a fluidized bed, allowing for complete combustion and optimal heat transfer.

Power boiler is generally

- (a) Fire tube boiler
- (b) Mixed tube boiler
- (c) Water tube boiler\*
- (d) Both (a) and (c) (CBB 2021)

Hint: Water tube boilers are commonly used in power generation due to their ability to operate at high pressures and temperatures, which are essential for efficient steam turbine operation.

Natural circulation is limited to \_\_\_\_

- (a) Subcritical boilers\*
- (b) Supercritical boilers
- (c) Both (a) and (b)
- (d) None of the above (CBB 2021)

Hint: Natural circulation relies on the density difference between hot and cold water/steam mixtures to create flow within a boiler. In supercritical boilers, the water transitions directly into superheated steam at high pressure without a distinct boiling phase. This eliminates the density difference that drives natural circulation. Therefore, natural circulation is only feasible in subcritical boilers where the water undergoes a distinct boiling process.

Bed coil tubes of a fluidized combustion boiler are studded \_\_\_\_

- (a) To increase heat transfer.
- (b) To minimize erosion of tubes
- (c) Both a & b\* (Maharashtra BOE 2025)

Hint:

- **Increased heat transfer:** The studs create additional surface area on the tubes, allowing for better contact with the fluidized bed material, leading to more efficient heat transfer.
- **Minimization of erosion:** The studs can help to disrupt the flow of the fluidizing particles, reducing the impact and wear on the tube surface, thereby mitigating erosion

In once through boiler \_\_\_\_

- (a) Flue gas pass only in one direction
- (b) Steam is sent out only in one direction
- (c) Air is sent through same direction
- (d) There is no recirculation of water\* (Maharashtra BOE 2025)

Hint: A once-through boiler is named for the fact that the water passes through the boiler tubes only once, without recirculating back to the boiler drum. This is in contrast to

other boiler types where the water circulates multiple times

Supercritical Technology is more sensitive to \_\_\_\_

- (a) Fuel quality
- (b) Power generated
- (c) Water chemistry\*
- (d) Environment (Maharashtra BOE 2024)

Hint: Supercritical technology, particularly in applications like supercritical water oxidation (SCWO) or supercritical boilers, requires extremely high purity water to avoid issues like turbine blade deposits and corrosion. The properties of supercritical fluids, including their reactivity and solubility, are highly dependent on the specific water chemistry. Even slight variations in water composition can significantly impact the efficiency and performance of supercritical systems

What is the typical value for excess air supplied in bagasse fired boiler?

- (a) 15-20
- (b) 15-50
- (c) 25-35
- (d) 25-50\* (Maharashtra BOE 2024)

The difference between Mean solid velocity and Gas velocity in FBC Boiler is called \_\_\_\_

- (a) Settling velocity
- (b) Fluidization velocity
- (c) Slip velocity\*
- (d) None of the above

(Maharashtra BOE 2023)

Hint: In a Fluidized Bed Combustion (FBC) boiler, the solid particles (like sand or coal) are suspended in a rising stream of air. The solid particles move slower than the gas flow due to various factors like drag and particle size. This difference in velocity between the solid particles and the gas is termed "**slip velocity**".

The sulphur retention of Fluidized Bed Combustion boilers is dependent on

- (a) Temperature of Bed
- (b) Pressure of Bed
- (c) Porosity of sorption material employed
- (d) All of the above\* (Gujarat BOE 2024)



Supercritical Boiler is

- (a) Fire tube boiler
- (b) Natural circulation boiler
- (c) Both A & B
- (d) Once through Boiler\*

(Gujarat BOE 2024)

Hint: Supercritical boilers are also known as once-through boilers because water and steam flow through the tubes only once, with no recirculation or steam drum. They operate at pressures above the critical pressure of water (220 bar), where the distinction between liquid and gaseous states disappears.

Which material used in manufacturing of Economizer in Sub critical power Boiler.

- (a) SA 210 Gr-B
  - (b) SA 213 T12/T23\*
  - (c) SA 213 T-91
  - (d) None of the above
- (Gujarat BOE 2023, 2024)

Hint:

- SA 213 T12/T23 are alloy steel grades, known for their resistance to high temperatures and pressures. These grades are suitable for boiler components like economizers, superheaters, and reheaters in power plants.
- SA 210 Gr-B is a low-carbon steel and is also used in boiler applications, but its strength is lower than the alloy steels like SA 213 T12/T23.
- SA 213 T91 is a high-temperature alloy steel, more commonly used in high-pressure, high-temperature applications, like superheaters in supercritical power plants.

For Coal fired Boiler the Flame length is influenced by

- (a) Moisture
- (b) Volatile Matter\*
- (c) Fixed Carbon
- (d) Ash in fuel (Gujarat BOE 2021, 2024)

Hint: Volatile matter in coal consists of easily combustible gases that evaporate when heated. These gases quickly ignite and contribute significantly to the flame length.

A higher volatile matter content leads to a longer flame because of the faster burning of these volatile components.

During hot banking/Box up, boiler kept in

- (a) Depressurized Condition
  - (b) Slow firing condition\*
  - (c) High air flow condition
  - (d) Pressurized Condition
- (Gujarat BOE 2024)

Hint: This means the boiler is kept running at a reduced firing rate to maintain its temperature while not generating full steam output.

The low combustion temperature in FBC Boilers results in minimal formation of \_\_\_\_

- (a) SO<sub>x</sub>
- (b) NO<sub>x</sub>\*
- (c) CO<sub>2</sub>
- (d) CO (Gujarat BOE 2023)

Hint: NO<sub>x</sub> (nitrogen oxides) formation is highly dependent on combustion temperature, so lower temperatures in Fluidized Bed Combustion (FBC) boilers significantly reduce the production of this pollutant.

What is the steam pressure limit of natural circulation boilers

- (a) 650 bar
- (b) 400 bar
- (c) 180 bar\*
- (d) 550 bar (Gujarat BOE 2021)

Hint: Natural circulation boilers typically operate up to around 180 bar (180 atmospheres). Above this pressure, the density difference between water and steam becomes too small to effectively drive natural circulation, and other methods like forced circulation would be needed.

Cornish boiler has \_\_\_\_ flue tube whereas Lancashire boiler has \_\_\_\_ Flue tubes.

(Jharkhand BOE 2024)

Hint: A Cornish boiler has *one flue tube*, while a Lancashire boiler has *two flue tubes*.

The furnace is situated outside the boiler shell in case of a

- (a) locomotive boiler

(b) Cochran boiler  
 (c) Babcock and Wilcox boiler\*  
 (d) Cornish boiler (Jharkhand BOE 2024)  
 Hint: The furnace is situated outside the boiler shell in the case of an externally fired boiler. Examples of externally fired boilers include the Babcock and Wilcox boiler and the Stirling boiler. In contrast, internally fired boilers have the furnace located inside the boiler shell, like the Cochran, Lancashire, and locomotive boilers.

Cast iron boilers are used for \_\_\_\_ heating systems only.

- (a) Open, high-pressure
- (b) Closed, high-pressure
- (c) Open, low-pressure
- (d) Closed, low-pressure\* (Assam BOE 2023)

Hint: Cast iron boilers are designed for low-pressure heating systems. They are typically used in residential and small commercial settings. While a boiler can be considered closed or open depending on its design and the presence of a water feed system, cast iron boilers are almost always constructed as closed systems to prevent the escape of steam and maintain water circulation. High-pressure boilers are made from different materials like steel and are suitable for industrial applications. Cast iron cannot withstand the high temperatures and pressures associated with high-pressure systems. Open, low-pressure systems are also not ideal for cast iron boilers as they require a constant water feed to prevent overheating, which can stress the cast iron material.

\_\_\_\_ in the boiler keeps the boiler metal from being destroyed by the intense furnace heat.

- (a) Forced air
  - (b) Circulating water\*
  - (c) Circulating steam
  - (d) All of the above (Assam BOE 2023)
- Hint: In a boiler, hot gases from combustion are produced in the furnace. If the boiler metal were exposed directly to these high temperatures, it would quickly overheat and be destroyed. However, the continuous

circulation of water within the boiler tubes absorbs the heat from the furnace gases, effectively cooling the metal and preventing it from melting or warping. This water circulation is essential for safe boiler operation.

The original Stirling boiler is a water tube boiler with steam and water drum(s) on the top and a mud drum beneath.

- (a) One
- (b) Two
- (c) Three\*
- (d) Four (Assam BOE 2023)

The maximum capacity of a boiler is the

- (a) Area of the floor it occupies
- (b) Volume of water its shell will hold
- (c) Pounds of steam it will produce in 1 hr at a given pressure and temperature\*
- (d) Gallons of water required to produce a given amount of steam at a given pressure and temp (Assam BOE 2023)

In AFBC boilers, coal size used is

- (a) 1–10 mm\*
- (b) 10–15 mm
- (c) 5 cm
- (d) 3 cm (Assam BOE 2022)

13. The limestone or dolomite used in FBC plant removes

- (a) SO<sub>x</sub>
- (b) NO<sub>x</sub>
- (c) ash
- (d) sulphur (Assam BOE 2022)

Hint: In an FBC plant, limestone or dolomite is used to remove sulfur dioxide (SO<sub>x</sub>) from the combustion process. This is achieved by the reaction of SO<sub>2</sub> with calcium compounds in the sorbent, forming calcium sulfate.

Boiler parameters are expressed by

- (a) Tonnes/hr of steam
- (b) Pressure of steam in kg/cm<sup>2</sup>
- (c) Temperature of steam in °C
- (d) All of the mentioned\* (Assam BOE 2022)