



General Instructions

- (i) **Duration:** The total duration of the examination is 120 minutes.
- (ii) **Incorrect Answer:** There will be negative marking of 25%.

1. An elliptical arch of a bridge has a horizontal span of 50 ft and a maximum height of 20 ft at the center. The bridge road is constructed 4 ft above the highest point of the arch.

If a point on the arch is 15 ft away from the center horizontally, find the vertical distance of this point from the bridge road.

- (A) 5 ft
- (B) 8 ft
- (C) 10 ft
- (D) 24 ft
- (E) None of these

2. In summer, when an air cooler is used, the room temperature decreases. What is the primary thermodynamic process responsible for cooling?

- (A) Conduction
- (B) Convection
- (C) Evaporation
- (D) Radiation

3. For maximum cooling efficiency, an air cooler should be placed:

- (A) Facing the window
 - (B) Away from the window
 - (C) In the center of the room
 - (D) Near the ceiling
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4. Two children observe soap bubbles in sunlight. Initially the bubble appears bluish, but after some time it turns yellowish.

Which of the following statements are correct?

- I. The colour shifts towards higher wavelength.**
- II. Blue/violet colours disappear earlier than red.**
- III. For sufficiently thick bubbles, the bubble appears white.**

- (A) I and II only
 - (B) II and III only
 - (C) I and III only
 - (D) I, II and III
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5. There are rooms numbered from 1 to 99 in an apartment. A mathematician notices that the sum of all room numbers before his room is equal to the sum of all room numbers after his room. Find his room number.

- (A) 20
 - (B) 35
 - (C) 49
 - (D) 50
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6. When an air cooler is used in a closed room, air is pulled through the cooler pads. Which thermodynamic process does the air approximately undergo?

- (A) Isothermal
 - (B) Adiabatic
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- (C) Isochoric
 - (D) Isoenthalpic
 - (E) Isentropic
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7. An air cooler will work most efficiently under which condition?

- (A) Cooler facing window, no salt in water
 - (B) Cooler facing away from window, no salt
 - (C) Cooler facing window, salt added in water
 - (D) Cooler facing away from window, salt added
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8. Rice boils in about 10 minutes at sea level. What happens to the boiling time at mountains?

- (A) Time increases due to lower boiling point
 - (B) Time decreases
 - (C) No change
 - (D) Cannot be predicted
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9. Air blown out by an air cooler in a closed room approximately undergoes which process?

- (A) Isothermal
 - (B) Adiabatic
 - (C) Isoenthalpic
 - (D) Isobaric
 - (E) None
-

10. To increase cooling efficiency of an air cooler, which setup is best?

- (A) Fan towards open window, no salt in water
- (B) Fan away from window, no salt
- (C) Fan towards window, salt added
- (D) Fan away from window, salt added

11. As the thickness of a soap bubble increases under sunlight, which colour appears later?

- (A) Violet
 - (B) Blue
 - (C) Green
 - (D) Red
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12. Aryan and Mira are playing with soap bubbles in sunlight. Aryan notices that the bubble appears purple, which is unusual. A scientist explains the phenomenon and gives the following statements:

- I. The colour is due to interference of light in a thin film.**
- II. As the bubble thickness increases, the reflected colour shifts towards higher wavelength.**
- III. Purple colour appears because shorter wavelengths undergo constructive interference first.**
- IV. The colour is due to absorption of light by soap.**

Which of the above statements correctly explain the observation?

- (A) I and II only
 - (B) I, II and III only
 - (C) II and IV only
 - (D) I and IV only
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13. In summer, an air cooler is used in a room. To achieve maximum cooling efficiency, which of the following setups is best?

- (A) Cooler fan facing the window, no salt in water
 - (B) Cooler fan facing away from window, no salt
 - (C) Cooler fan facing window, salt added to water
 - (D) Cooler fan facing away from window, salt added
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14. Rice takes about 10 minutes to boil on Earth in open conditions. If the same experiment is

performed on Mars, what will happen?

- (A) Rice will boil in the same time
 - (B) Rice will boil faster
 - (C) Rice will take more time to boil
 - (D) Rice will not boil properly
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15. In a group of 50 family members, three medicines are given to fight a virus.

- 40 members received medicine A
- 30 received medicine B
- 20 received medicine C
- 10 received all three medicines

How many members received at least two medicines?

16. There are 49 houses in a row, numbered consecutively. A scientist finds a magical house number such that the sum of house numbers on its left is equal to the sum on its right. Find the magical house number.

17. In a company hierarchy:

- 1 CEO at the top
- Below him are 2 senior managers
- Below them are some normal workers

If the total number of people excluding the CEO is 14, and the lowest level has 8 workers, what fraction of the total workforce are normal workers?

18. For a solar eclipse to last longer, which condition must be satisfied?

- (A) Moon should be farther away from Earth
 - (B) Earth stops rotating about its axis
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- (C) Moon moves closer to Earth
 - (D) Sun moves farther from Earth
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19. For an air cooler to work at maximum efficiency:

- (A) Placed away from window & water has salt
 - (B) Placed away from window & no salt in water
 - (C) Placed towards window & water has salt
 - (D) Placed towards window & no salt in water
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20. Water takes 10 minutes to boil on Earth. If the boiling point of water is lower on Mars, it would take _____ than 10 minutes.

- (A) Less
 - (B) Same
 - (C) More
 - (D) Cannot boil properly
-

21. If you shrink to one billionth of your size, how would the world appear?

- (A) Radiant and shiny
 - (B) Jagged landscape
 - (C) Wet
 - (D) Frozen lake
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22. Houses are numbered from 1 to 49. Find the house number such that the sum of numbers before it equals the sum after it.

- (A) 24
- (B) 25
- (C) 26
- (D) 49

23. How would you distinguish between sugar solution and salt solution?

- (A) Pour on floor; ants gather near sugar
- (B) Boil both; sugar chars
- (C) Add lemon; sugar turns yellow
- (D) Drop wooden block; sinks more in water

24. In a company hierarchy (CEO → managers → workers), entry-level employees are approximately what fraction of total employees?

- (A) 1/2
- (B) 1/4
- (C) 1/3
- (D) 2/3

25. Egg yolk solidifies upon heating because:

- (A) Water evaporates
- (B) Proteins denature and coagulate
- (C) Salt formation
- (D) Oxidation

26. Earth's magnetic field protects life by:

- (A) Increasing gravity
- (B) Blocking visible light
- (C) Deflecting harmful solar radiation
- (D) Reducing ozone

27. Ozone protects Earth because:

- (A) $O_3 \leftrightarrow O_2 + O$ cycle absorbs UV
- (B) Higher molecular weight

- (C) Reflects sunlight
 - (D) Blocks IR rays
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28. Air flow in an air cooler follows which process?

- (A) Isobaric
 - (B) Carnot
 - (C) Isoenthalpic
 - (D) Isentropic
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29. 6 years ago, α was three times β . 8 years from now, β is one-third of γ . If present age of γ is s , find present age of α .

- (A) $(s-6)$
 - (B) $(s+6)$
 - (C) $(3s)$
 - (D) $(s/3)$
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30. Eight points in 3-D space with some pairwise distances known. How many coordinates are required to determine full orientation?

- (A) 6
 - (B) 9
 - (C) 12
 - (D) 24
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31. A company adds storage: 2^4 TB (1st month), 2^5 (2nd), 2^6 (3rd)... Total additional storage from 4th to n -th month is:

- (A) $2^n - 2^4$
 - (B) $2^{n+1} - 2^4$
 - (C) $2^n - 16$
 - (D) 2^{n+1}
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32. In a cryptic language system, each alphabet is substituted with its opposite letter in the English alphabet, such that $A \leftrightarrow Z$, $B \leftrightarrow Y$, $C \leftrightarrow X$, and so on. Using this logic, decode the phrase: “RMWZR RH NB XLFMGIB”. What does the original English sentence say?

- (A) INDIA IS MY COUNTRY
- (B) INDIA IN MY POULTRY
- (C) BRIBE IN MY POULTRY
- (D) BRIBE IS MY COUNTRY
- (E) None of these

33. In a reverse-alphabet code, each letter is replaced by its opposite counterpart ($A \leftrightarrow Z$, $B \leftrightarrow Y$, ...). You are given the string: “XOZ I TVO ZMTFZTV NL WVO”. After decoding the underlined parts, which meaningful English words are obtained?

- (A) LARGE, MODEL
- (B) SMALL, MODEL
- (C) LARGE, DESIGN
- (D) SIMPLE, MODEL
- (E) None of these