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BSF HC RO (Radio Operator) 2016 Official Paper

Total Time: 2 Hour **Total Marks:** 200

Instructions

Sl No.	Section Name	No. of Question	Maximum Marks	Negative Marks	Positive Marks
1	Physics	25	50	0.5	2
2	Mathematics	25	50	0.5	2
3	Chemistry	25	50	0.5	2
4	English & GK	25	50	0.5	2

1.) A total of 120 minutes is allotted for the examination.

2.) The server will set your clock for you. In the top right corner of your screen, a countdown timer will display the remaining time for you to complete the exam. Once the timer reaches zero, the examination will end automatically. The paper need not be submitted when your timer reaches zero.

3.) There will, however, be sectional timing for this exam. You will have to complete each section within the specified time limit. Before moving on to the next section, you must complete the current one within the time limits.

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Physics

1. A given quantity of an ideal gas is at pressure P and absolute temperature T. The isothermal bulk modulus of the gas is **(+2, -0.5)**

   a. $\frac{2}{3}P$

   b. P

   c. $\frac{3}{2}P$

   d. 2P

---

2. A closed organ pipe and an open organ pipe of the same length produce four beats in their fundamental mode when sounded together. If the length of the open organ pipe increases, then the number of beats will **(+2, -0.5)**

   a. Increase

   b. Decrease

   c. Remain constant

   d. may increase or decrease

---

3. A source of the sound of frequency 600 Hz is placed inside water. The speed of sound in water is 1500 m/s and in air, it is 300 m/s . The frequency of sound recorded by an observer who is standing in air is **(+2, -0.5)**

   a. 200 Hz

   b. 3000 Hz

   c. 120 Hz

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d. 600 Hz

---

4. Two sound waves move in the same direction. If the average power transmitted across a cross-section by them are equal while their wavelengths are in the ratio of $1:2$. Their pressure amplitudes would be in the ratio of **(+2, -0.5)**

a. 1

b. 2

c. 4

d. $\frac{1}{2}$

---

5. In the process PV = constant, the pressure (P) versus density (ρ) graph of an ideal gas is **(+2, -0.5)**

a. a straight line parallel to P-axis

b. a straight line parallel to ρ -axis

c. a straight line passing through origin

d. a parabola

---

6. The quantity $\frac{PV}{kT}$ (k = Boltzmann's constant) represents **(+2, -0.5)**

a. number of moles of the gas

b. total mass of the gas

c. number of molecules in the gas

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d. density of the gas

---

7. How much heat energy should be added to a mixture of 10 g of hydrogen and 40g of He to change the temperature by 50° C kept in a closed vessel? **(+2, -0.5)**

a. 2500 cal

b. 2750 cal

c. 2000 cal

d. None of these

---

8. A hollow convex lens of glass will behave like a- **(+2, -0.5)**

a. convex lens

b. concave lens

c. glass plate

d. mirror

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---

9. Angle of minimum deviation is equal to the angle of prism A of an equilateral glass prism. The angle of incidence at which minimum deviation will be obtained is **(+2, -0.5)**

a. 60 °

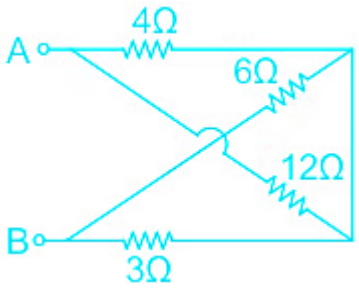
b. 30 °

c. 45 °

d. sin -1 (2/3)

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10. In the given network, the equivalent resistance between A and B is **(+2, -0.5)**



a. 6Ω

b. 16 Ω

c. 7 Ω

d. 5 Ω

11. A piece of copper and another of germanium are cooled from room temperature to 80 K. The resistance of **(+2, -0.5)**

a. each of them increases

b. each of them decreases

c. copper increases and germanium decreases

d. copper decreases and germanium increases

12. The minimum electrostatic force between two charged particles placed at a distance of 1 m is, **(+2, -0.5)**

a. 2.3 × 10 −28 N

b. 6.2 × 10 −34 N

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c. 1.02 × 10 −26 N

d. 4.2 × 10 −27 N

---

13. A capacitor is connected to a battery, The force of attraction between the plates when the separation between them is halved **(+2, -0.5)**

a. remains the same

b. becomes eight times

c. becomes four times

d. becomes two times

---

14. A charge q is placed at the center of the line joining two equal charges Q. The system of the three charges will be in equilibrium if q is equal to. **(+2, -0.5)**

a. $-\frac{Q}{2}$

b. $-\frac{Q}{4}$

c. $+\frac{Q}{4}$

d. $+\frac{Q}{2}$

---

15. A copper wire of diameter 1.6 mm carries a current i. The maximum magnetic field due to this, wire is 5×10^{-3} T . The value of i is **(+2, -0.5)**

a. 40 A

b. 5 A

c. 20 A

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d. 2 A

---

16. A man weighing 70 kg is coming down in a lift. If the cable of the lift breaks suddenly, the weight of the man would become. **(+2, -0.5)**

a. 70 kg

b. 35 kg

c. 140 kg

d. Zero

---

17. The S.I. Unit of acceleration is **(+2, -0.5)**

a. ms -1

b. ms -2

c. cms -2

d. kms -2

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---

18. Two particles are released from the same height at an interval of 1 s. How long after the first particle begins to fall will the two particles be 10 m apart? ($g = 10\ m/s^2$) **(+2, -0.5)**

a. 1.5 s

b. 2 s

c. 1.25 s

d. 2.5 s

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19. A 15 g ball is shot from a spring gun whose spring has a force constant of 600 N/m. The spring is compressed by 5 cm. The greatest possible horizontal range of the ball for this compression is (g = 10 m/s 2) **(+2, -0.5)**

a. 6.0 m

b. 12.0 m

c. 10.0 m

d. 8.0 m

---

20. Kinetic energy of a particle moving in a straight line varies with time t as K = 4t 2 . The force acting on the particle **(+2, -0.5)**

a. is constant

b. is increasing

c. is decreasing

d. first increases and then decreases

---

21. A particle of mass 1 kg is projected at an angle of 30 ° with horizontal velocity v = 40 m/s . The change in linear momentum of the particle after time = 1 s will be (g = 10 m/s 2) **(+2, -0.5)**

a. 7.5 kg-m/s

b. 15 kg-m/s

c. 10 kg-m/s

d. 20 kg-m/s

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22. A particle moves in a circle with constant angular velocity ω about a point P on its circumference. The angular velocity of the particle about the center C of the circle is (+2, -0.5)

a. 2ω

b. $\frac{\omega}{2}$

c. ω

d. Not constant

23. A particle on the earth's surface is given a velocity equal to its escape velocity. Its total mechanical energy will be. (+2, -0.5)

a. Negative

b. Positive

c. Zero

d. Infinite

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24. A planet has a mass of eight-time the mass of the earth and its density is also equal to eight times the average density of the earth. If g be the acceleration due to earth's gravity on its surface, then the acceleration due to gravity on the planet's surface will be (+2, -0.5)

a. 2g

b. 4g

c. 8g

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d. 16g

---

25. Two identical spherical masses are kept at some distance as shown. Potential energy when a mass m is taken from the surface of one sphere to the other **(+2, -0.5)**



a. increases continuously

b. decreases continuously

c. first increases then decreases

d. first decreases then increases

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Mathematics

26. If a, b, c are different and **(+2, -0.5)**

$$\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$$

then x is equal to

a. a

b. b

c. c

d. 0

---

27. The number of 3 × 3 non-singular matrices with four entries as 1 and all other entries as 0 is **(+2, -0.5)**

a. <4

b. 5

c. 6

d. at least 7

---

28. The value of cos 10 ° - sin 10 ° is **(+2, -0.5)**

a. positive

b. negative

c. 0

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d. 1

---

29. Which of the following is correct? **(+2, -0.5)**

a. $\sin 1° > \sin 1$

b. $\sin 1° < \sin 1$

c. $\sin 1° = \sin 1$

d. $\sin 1° = \frac{\pi}{180} \sin 1$

---

30. The value of $\sin 20° \sin 40° \sin 60° \sin 80°$ is equal to **(+2, -0.5)**

a. -3/16

b. 5/16

c. 3/16

d. -5/16

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---

31. At point 15 metres away from the base of a 15 metres high house, the angle of elevation of the top **(+2, -0.5)**

a. 45 °

b. 30 °

c. 60 °

d. 90 °

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32. In an isosceles triangle of which on angle 120°, circle of radius $\sqrt{3}$ is inscribed, then the area of the triangle is: **(+2, -0.5)**

a. 4π sq. units

b. $(12 - 7\sqrt{3})$ sq. units

c. $(12 + 7\sqrt{3})$ sq. units

d. $(7 + 12\sqrt{3})$ sq. units

---

33. $\int \frac{e^x(1+\sin x)}{(1+\cos x)} dx$ is equal to **(+2, -0.5)**

a. log tan x

b. e x tan (x/2)

c. sin log x

d. e x cot x

---

34. The value of $\int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{(\sin x)}+\sqrt{(\cos x)}} dx$ is **(+2, -0.5)**

a. 0

b. π/2

c. π/4

d. None of these

---

35. Solution of the differential equation cos x dy = y (sin x - y) dx, $0 < x < \frac{\pi}{2}$ is **(+2, -0.5)**

a. sec x = (tan x + c)y

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b. $y \sec x = \tan x + c$

c. $y \tan x = \sec x + c$

d. $\tan x = (\sec x + c).y$

---

36. A sample of 35 observations has the mean 80 and s.d. 4. A second sample of 65 observations from the same population has mean 70 and s.d. 3. The s.d. of the combined sample is **(+2, -0.5)**

a. 5.85

b. 37.2

c. 5.58

d. none of these

---

37. If the average of the number, 1, 2, 3, ... 98, 99, x is 100 x then the value of x is **(+2, -0.5)**

a. $\frac{51}{100}$

b. $\frac{50}{99}$

c. $\frac{50}{101}$

d. $\frac{51}{99}$

---

38. An aeroplane is flying horizontally with a velocity of 600 km/h and at a height of 1960 m. When it is vertically at a point A on the ground a bomb is released from it. The bomb strikes the ground at point B. The distance AB is **(+2, -0.5)**

a. 1200 m

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b. 0.33 km

c. 3.33 km

d. 33 km

---

39. Two ships are sailing in the sea on the two sides of a lighthouse. The angle of elevation of the top of the lighthouse is observed from the ships are 30 ° and 45 ° respectively: If the lighthouse is 100 m high, the distance between the two ships is: **(+2, -0.5)**

a. 173 m

b. 200 m

c. 273 m

d. 300 m

---

40. The angle of elevation of the sun, when the length of the shadow of a tree √3 times the height of the tree, is: **(+2, -0.5)**

a. 30 °

b. 45 °

c. 60 °

d. 90 °

---

41. The ratio between the length and the breadth of a rectangular park is 3 : 2 . If a man cycling along the boundary of the park at the speed of 12 km/hr completes one round in 8 minutes, then the area of the park (in sq. m) is: **(+2, -0.5)**

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a. 15360

b. 153600

c. 30720

d. 307200

---

42. (935421 × 625) = ? **(+2, -0.5)**

a. 575648125

b. 584638125

c. 584649125

d. 585628125

---

43. The distance between the point P (2m, 3m, 4 m) and the x-axis is **(+2, -0.5)**

a. $\sqrt{29}$ m

b. 5 m

c. $\sqrt{13}$ m

d. $\sqrt{20}$ m

---

44. The sum of 40 terms of an A.P. whose first term is 2 and common difference 4, will be **(+2, -0.5)**

a. 3200

b. 1600

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c. 200

d. 2800

---

45. If a, b, c, d are in H.P., then the value of $\left(\frac{1}{a^2}-\frac{1}{d^2}\right)\left(\frac{1}{b^2}-\frac{1}{c^2}\right)^{-1}$ is: **(+2, -0.5)**

a. 1

b. 2

c. 3

d. 4

---

46. A person is to count 4500 currency notes. Let a n denote the number of notes he counts in the n th minute. If a 1 = a 2 = ... = a 10 = 150 and a 10, a 11 ..... are in an A.P. with common difference - 2, then the time taken by him to count all notes is **(+2, -0.5)**

a. 24 minutes

b. 34 minutes

c. 125 minutes

d. 135 minutes

---

47. If 2, 3 be the roots of $2x^3 + mx^2 - 13x + n = 0$ then the values of m and n are respectively **(+2, -0.5)**

a. -5, -30

b. -5, 30

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c. 5, 30

d. none

---

48. The number of terms in the expansion of $(x + y + z)^{10}$ is **(+2, -0.5)**

a. 11

b. 33

c. 66

d. None of these

---

49. If the coefficients of x^7 and x^8 in $\left(2+\frac{x}{3}\right)^n$ are equal, then n is **(+2, -0.5)**

a. 56

b. 55

c. 45

d. 15

---

50. If each element of a determinant of third order with value A is multiplied by 3, then the value of newly formed determinant is **(+2, -0.5)**

a. 3A

b. 9A

c. 27A

d. none of these

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Chemistry

51. The number of elements present in fifth period is: **(+2, -0.5)**

a. 18

b. 32

c. 8

d. 24

---

52. The correct order of increasing atomic radius of the following elements is: **(+2, -0.5)**

a. S < O < Se < C

b. O < C < S < Se

c. O < S < Se < C

d. C < O < S < Se

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53. Dipole moment of NF 3 is smaller than: **(+2, -0.5)**

a. NH 3

b. CO 2

c. BF 3

d. CCl 4

---

54. Which of the following anion has the smallest radius? **(+2, -0.5)**

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a. H^-

b. F^-

c. Cl^-

d. Br^-

---

55. Which of the following compounds has the lowest boiling point? **(+2, -0.5)**

a. HF

b. HCl

c. HBr

d. HI

---

56. Solid NaCl is a bad conductor of electricity because: **(+2, -0.5)**

a. in solid NaCl there are no ions

b. solid NaCl is covalent

c. in solid NaCl there is no mobility of ions

d. in solid NaCl there are no electrons

---

57. Equal masses of oxygen, hydrogen and methane are kept under identical conditions. The ratio of the volumes of gases will be **(+2, -0.5)**

a. 2 : 16 : 2

b. 2 : 16 : 1

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c. 1 : 16 : 2

d. 1 : 1 : 1

---

58. The formula, C 6 H 5 -CO-CH 3 represents **(+2, -0.5)**

a. Acetone

b. Acetic acid

c. Acetophenone

d. Phenyl acetate

---

59. A gaseous oxide contains 30.4% of nitrogen, one molecule of which contains one nitrogen atom. The density of the oxide relative to oxygen is **(+2, -0.5)**

a. 0.94

b. 1.44

c. 1.50

d. 3.0

---

60. How many grams are contained in 1 gram-atom of Na? **(+2, -0.5)**

a. 13 g

b. 23 g

c. 1 g

d. $\frac{1}{23}$ g

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61. 5 moles of a gas in a closed vessel was heated from 300 K to 600 K. The pressure of the gas doubled. The number of moles of the gas will be **(+2, -0.5)**

a. 5

b. 2.5

c. 10

d. 20

62. 2.76 g of silver carbonate on being strongly heated yields a residue weighing **(+2, -0.5)**

a. 2.16 g

b. 2.48 g

c. 2.32 g

d. 2.64 g

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63. For the reaction A + 2B → C, 5 moles of A and 8 moles of B will produce **(+2, -0.5)**

a. 5 moles of C

b. 4 moles of C

c. 8 moles of C

d. 13 moles of C

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64. The time required for a current of 3 amp to decompose electrolytically 18 g of H 2 O is (+2, -0.5)

a. 18 hours

b. 36 hours

c. 9 hours

d. 18 seconds

---

65. The maximum number of covalent formed by nitrogen is (+2, -0.5)

a. 1

b. 2

c. 3

d. 4

---

66. The molecular formula of phosphorous is (+2, -0.5)

a. P 1

b. P 2

c. P 3

d. P 4

---

67. In homologous series, the molecular mass of two consecutive members differ by: (+2, -0.5)

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a. 12

b. 13

c. 14

d. 15

---

68. How many σ- bonds are present in the given compound? **(+2, -0.5)**



a. 6

b. 12

c. 18

d. 24

---

69. Which is the strongest base? **(+2, -0.5)**

a. LiOH

b. CH 3 Li

c. LiNH 2

d. LiF

---

70. Which of the following is strongest acid? **(+2, -0.5)**

a. CH 3 NH

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b. CH 3 OH

c. CH 3 SH

d. CH 3 Cl

---

71. Rank the following compound in order of increasing acidic strength: **(+2, -0.5)**

(i) CH 3OH

(ii) CH 3 - NH 2

(iii) CH 3 - CH 3

a. i < ii < iii

b. iii < ii < i

c. i < iii < ii

d. ii < i < iii

---

72. The most electropositive element possesses the electronic configuration:- **(+2, -0.5)**

a. [He]2S 1

b. [Ne]3S 2

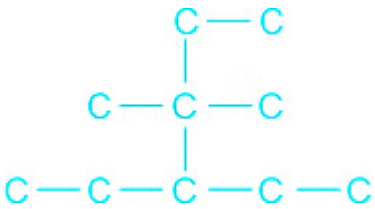
c. [Xe]6S 1

d. [Xe]6S 2

---

73. How many carbons are present in longest carbon chain of given compound? **(+2, -0.5)**

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a. 4

b. 5

c. 6

d. 7

---

74. The most stable ion is: **(+2, -0.5)**

a. [Fe(C 2 O 4) 3] 3-

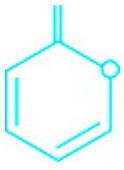
b. [Fe(C N) 6] 3-

c. [Fe(C N) 6] 4-

d. [Fe(H 2 O) 6] 3+

---

75. How many pi (π) electrons are there in the following molecule? **(+2, -0.5)**



a. 4

b. 6

c. 8

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d. 10

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English & GK

76. Select the antonym of the given word. **(+2, -0.5)**

COMMISSIONED

a. Started

b. Closed

c. Finished

d. Terminated

---

77. Read the passage and answer the questions below. **(+2, -0.5)**

I felt the wall of the tunnel shiver. The master alarm squeals through my earphones. Almost simultaneously, Jack yelled down to me that there was a warning light on. Fleeting but spectacular sights snapped into ans out of view, the snow, the shower of debris, the moon, looming close and big, and the dazzling sunshine for once unfiltered by layers of air. The last twelve hours before re-entry were particularly bone-chilling. During this period, I had to go up into the command module. Even after the fiery re-entry splashing down in 81° water in the south pacific, we could still see our frosty breath inside the command module.

The word 'Command Module' used twice in the given passage indicates perhaps that it deals with

a. an alarming journey

b. a commanding situation

c. a journey into outer space

d. a frightful battle.

---

78. Read the passage and answer the questions below. **(+2, -0.5)**

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I felt the wall of the tunnel shiver. The master alarm squeals through my earphones. Almost simultaneously, Jack yelled down to me that there was a warning light on. Fleeting but spectacular sights snapped into ans out of view, the snow, the shower of debris, the moon, looming close and big, and the dazzling sunshine for once unfiltered by layers of air. The last twelve hours before re-entry were particularly bone-chilling. During this period, I had to go up into the command module. Even after the fiery re-entry splashing down in 81° water in the south pacific, we could still see our frosty breath inside the command module.

Which one of the following reasons would one consider as more as possible for the warning lights to be on?

a. There was a shower of debris.

b. Jack was yelling.

c. A catastrophe was imminent.

d. The moon was looming close and big.

---

79. Read the passage and answer the questions below. **(+2, -0.5)**

I felt the wall of the tunnel shiver. The master alarm squeals through my earphones. Almost simultaneously, Jack yelled down to me that there was a warning light on. Fleeting but spectacular sights snapped into ans out of view, the snow, the shower of debris, the moon, looming close and big, and the dazzling sunshine for once unfiltered by layers of air. The last twelve hours before re-entry were particularly bone-chilling. During this period, I had to go up into the command module. Even after the fiery re-entry splashing down in 81° water in the south pacific, we could still see our frosty breath inside the command module.

The statement that the dazzling sunshine was "for once unfiltered by layers of air" means

a. that the sun was very hot

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b. that there was no strong wind

c. that the air was unpolluted

d. none of above

---

80. Select the synonym of the given word. **(+2, -0.5)**

BRIEF

a. Limited

b. Small

c. colossal

d. Short

---

81. Choose the synonym of **"AUGUST"** **(+2, -0.5)**

a. Common

b. Ridiculous

c. Dignified

d. Petty

---

82. Arrange the words to make a meaningful sentence. **(+2, -0.5)**

1. left
2. the
3. House
4. he
5. suddenly

a. 12435

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b. 21354

c. 45123

d. 52341

---

83. Arrange the words to make a meaningful sentence. **(+2, -0.5)**

1. tea
2. have
3. That
4. some
5. before

a. 43251

b. 24315

c. 24153

d. 52431

---

84. Select one word for the following sentence. **(+2, -0.5)**

A person pretending to be somebody he is not

a. Magician

b. Rogue

c. Liar

d. Imposter

---

85. Select the correct option to improve the sentence. **(+2, -0.5)**

The small child does whatever his father was done.

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a. has done

b. did

c. does

d. had done

---

86. **Select the correct option to improve the sentence.** **(+2, -0.5)**

I need not offer any explanation regarding this incident - my behaviour is speaking itself.

a. will speak to itself

b. speaks for itself

c. has been speaking

d. speaks about itself

---

87. Rabindranath Tagore's 'Jana Gana Mana' has been adopted as. India's Nationál Anthem. How many stanzas of the said song were adopted? **(+2, -0.5)**

a. Only the first stanza

b. The whole song

c. Third and Fourth stanza

d. First and Second stanza

---

88. Choose best course of Action: **(+2, -0.5)**

Statement: Severe drought is reported to have set in several parts of the country.

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Courses of Action:

(I) Government should immediately make arrangement for providing financial assistance to those affected.

(II) Food, water, and fodder should immediately be sent to all these areas to save the people and cattle.

a. Only I follows

b. Only II follows

c. Either I or II follows

d. Neither I nor II follows

---

89. In the last one decade, which one among the following sectors has attracted the highest foreign direct investment inflows into India? **(+2, -0.5)**

a. Chemicals other than fertilizers

b. Services sector

c. Food processing

d. Telecommunication

---

90. The present Lok Sabha is the **(+2, -0.5)**

a. 13th Lok Sabha

b. 14th Lok Sabha

c. 15th Lok Sabha

d. 16th Lok Sabha

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91. The members of the Rajya Sabha are elected for a term **(+2, -0.5)**

a. of six years

b. determined by the state legislative assembly of a state

c. of four years

d. None of the above

---

92. Which of the following is NOT written by Munshi Premchand? **(+2, -0.5)**

a. Gaban

b. Godan

c. Guide

d. Manasorovar

---

93. The refineries are Mathura, Digboi and Panipat are set up by **(+2, -0.5)**

a. Indian Oil Corporation Ltd.

b. Hindustan Petroleum Corporation Ltd.

c. Bharat Petroleum Corporation Ltd.

d. Crude Distillation unit of Madras Refineries Ltd.

---

94. The Radcliffe line is a boundary between **(+2, -0.5)**

a. India and Pakistan

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b. India and China

c. India and Myanmar

d. India and Afghanistan

---

95. The mass number of an atom is equal to **(+2, -0.5)**

a. the number of protons

b. the number of protons and electrons

c. the number of nucleons

d. the number of neutrons

---

96. The metal that is usually extracted from sea water is **(+2, -0.5)**

a. Ca

b. Na

c. K

d. Mg

---

97. The inert gases are _____ in water **(+2, -0.5)**

a. sparingly soluble

b. insoluble

c. soluble

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d. None of these

---

98. The names of the scientists, Newlands, Mendeleev, and Meyer are associated with the development of (+2, -0.5)

a. atomic structure

b. Metallurgy

c. periodic table of contents

d. discovery of elements

---

99. Rain is falling vertically downwards. To a man running east-wards, the rain will appear to be coming from (+2, -0.5)

a. east

b. west

c. northeast

d. southeast

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100. Natural radioactivity was discovered by: (+2, -0.5)

a. Marie Curie

b. Ernest Rutherford

c. Henri Becquerel

d. Enrico Fermi

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