Solutions (Set-S)

Physics

1. Ⓐ

   As $P \to F/A$

2. Ⓒ

   As P $\propto$ depth of water

3. Ⓑ

   As density highest

4. Ⓐ

   $P \propto \dfrac{1}{A}$

5. Ⓒ

   $P \propto$ density $P \propto$ height of air column.

6. Ⓑ

   $P \propto \dfrac{1}{A}$

7. Ⓐ

   Barometer

8. Ⓓ

   1 atm = 10 m water column height

9. Ⓐ

   As $\rho = hd(g+a)$

10. Ⓐ

Blood pressure is balanced by atm. pressure

11. Ⓐ

A → true   R → true and correct explanation

12. Ⓐ

Air

13. Ⓑ

In absence of air

14. Ⓓ

Pressure acts in all direction

15. Ⓒ

Density of water = 1000 kg/m^3 = 1 g/cc

16. Ⓓ

$$\frac{100-25}{5} = 15 \text{ m/s}^2$$

17. Ⓑ

3 × 9.8 = 29.4 N

18. Ⓒ

Muscular and friction-force

19. Ⓐ

$\mu_{static} > \mu_{sliding}$

20. Ⓑ

10 × 2 = 20 N.s

21. Ⓐ

True

22. Ⓑ

Yes   as $\text{Pressure} \propto \dfrac{1}{\text{area of contact}}$

23. Ⓒ

True $P \propto \dfrac{1}{A}$

24. Ⓑ

25. Ⓑ

Safe

Chemistry

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26. Ⓓ

For proper combustion, very much necessary conditions are the presence of combustible substances and attainment of its ignition temperature. Presence of the supporter of combustion like oxygen is another important factor.

27. Ⓒ

Carbon dioxide is the fire extinguisher and nitrogen is a very stable molecule which does not help to support combustion. Oxygen is the most important which is the support of combustion.

28. Ⓓ

Petrol, diesel, alcohol all have low ignition temperature and hence they are inflammable substances.

29. Ⓒ

The hottest part of the candle flame is the outermost zone as the combustible substances receive the maximum amount of oxygen here.

30. Ⓐ

Carbon monoxide, sulphur dioxide, nitrogen oxides are gaseous pollutants while suspended particulate matter (SPM) is a solid pollutant.

31. Ⓒ

Calorific value is defined as the amount of heat released at the time of complete combustion of a unit mass of a fuel. Higher calorific value is the indication of a good fuel. Now the general order of calorific value is gaseous fuel > liquid fuel > solid fuel. So, the correct order of calorific value of the fuels given in thee question is Hydrogen > CNG > Petrol > Coal. Mass of hydrogen is lower than CNG and hence it has higher calorific value.

32. Ⓐ

Middle zone is yellow in colour an luminous as insufficient oxygen is there and hence burning is insufficient.

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33. Ⓒ

Carbon dioxide causes green house effect in the earth. Oxides of sulphur and nitrogen mix with water to produce acidic solutions which causes acid rain. Compressed natural gas (CNG) is used as a fuel in place of petrol and diesel as the products formed after burning of CNG are less polluting.

34. Ⓐ

In the given experiment, due to high temperature, wax vapour rise up in the glass tube and it is an inflammable substance. So, when a burning match stick is kept very close to it, a flame is developed.

35. Ⓒ

The correctly matched columns are

Column I (Part)	Column II (Zone)	Column III (Colour)
P. Hottest part	(iii) Outermost zone of complete wax vapours	(x) Blue
Q. Moderately hot part	(ii) Middle zone of unburnt combustion	(z) Yellow
R. Least hot part	(i) Innermost zone of partial combustion	(y) Black

36. Ⓓ

Sulphuric acid is present in soda–acid type fire extinguishers. The correct equation of the reaction is

$Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + CO_2 + H_2O$
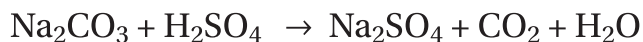
Produced carbon dioxide disconnects the burnt body from exygen and thus fire comes under control.

37. Ⓓ

Fire fighters use musk to save themselves from harmful gases otherwise death may cause due to suffocation.

38. Ⓓ

Surface area of the burning system was very high as crude oil was floating over the sea surface and hence high amount of oxygen came contact with the inflammable materials. Thus it became close to impossible to extinguish that fire. (It was one of the great man-made environmental disasters in the world).

39. Ⓒ

As LPG is gaseous fuel hence it is better fuel than diesel and have higher calorific value.

40. Ⓒ

Carbon dioxide is a harmful pollutant and global warming is caused by methane, water vapour, sulphur oxides, etc.

41. Ⓑ

PCRA is Petroleum Conservation and Research Association, established in India in the year 1978.

42. Ⓐ

Coal is formed due to carbonization and it is slow process. Now, more time is given then the percentage of carbon increases. Hence the correct process is

Wood—Peat—Lignite—Bituminus coal—Anthracite coal

43. Ⓐ

[Carbon monoxide + nitrogen] mixture is known as producer gas and it is used to generate high amount of heat energy.

44. Ⓒ

Coal is formed due to carbonization and it is slow process.

45. Ⓐ

Hottest zone of a candle flame is non-luminous zone.

46. Ⓐ

Calorific value is defined as the amount of heat released at the time of complete combustion of a unit mass of a fuel. Higher calorific value is the indication of a good fuel. Now the general order of calorific value is gaseous fuel > liquid fuel > solid fuel. So, the correct order of calorific value of the fuels given in thee question is LPG > Bio-gas > Petrol > Kerosene.

47. Ⓒ

When the person's body is covered by woolen blanket then the connection between the burnt body and oxygen gas disrupts and hence the person is saved.

48. Ⓑ

LPG—Liquefied Petroleum Gas and CNG—Compressed Natural Gas.

49. Ⓐ

The correctly matched columns are

Column I	Column II
LPG	Cooking gas
Iron nails	Non-combustible
Candle	Flame
Wood	Deforestation

50. Ⓑ

For the given fuels P, Q, R the correct order of flamability is R > Q > P. So, 'Q' will undergo spontaneous combustion without any external influence.

Mathematics

51. Ⓐ

$$(a + b)(a^2 + b^2)(a^4 + b^4) = \frac{(a-b)(a+b)}{(a-b)}\left(a^2 + b^2\right)\left(a^4 + b^4\right)$$

$$= \frac{(a^2 - b^2)(a^2 + b^2)(a^4 + b^4)}{(a-b)} = \frac{\left(a^4 - b^4\right)\left(a^4 + b^4\right)}{(a-b)} = \frac{a^8 - b^8}{(a-b)}$$

52. Ⓐ

$$a + \frac{1}{a} = 2 \quad \Rightarrow a^2 + 1 = 2a \quad \Rightarrow a^2 - 2a + 1 = 0 \quad \Rightarrow (a-1)^2 = 0 \quad \Rightarrow a = 1$$

$$\therefore a^2 + \frac{1}{a^2} = 2 \quad \Rightarrow a^4 + \frac{1}{a^4} = 2 \quad \therefore a^2 + \frac{1}{a^2} = a^4 + \frac{1}{a^4}$$

53. Ⓑ

$$a^2 - 4b^2 = (a + 2b)(a - 2b)$$

54. Ⓓ

$$a^2 - b^2 + ca - cb = (a + b)(a - b) + c(a - b) = (a - b)(a + b + c)$$

55. Ⓒ

Let the number be x. $\quad \therefore x + \frac{45}{200} \times x = 98 \quad \Rightarrow \frac{49x}{40} = 98 \quad \Rightarrow x = 80$

56. Ⓒ

$$242x^2 - 162b^2 = 2(121x^2 - 81b^2) = 2[(11x)^2 - (9b)^2] = 2(11x + 9b)(11x - 9b)$$

57. Ⓒ

$$3x + 6 = 15$$

58. Ⓓ

$(A): \left(\dfrac{1}{p}+q\right)\left(\dfrac{1}{p}-q\right)=\dfrac{1}{p^2}-\dfrac{1}{q^2}$ False

as $\left(\dfrac{1}{p}+q\right)\left(\dfrac{1}{p}-q\right)=\dfrac{1}{p^2}-q^2$

$(R): (a+b)(a-b)=a^2-b^2$ True

59. Ⓐ

$(A): \dfrac{x+1}{x+2}=\dfrac{x+5}{x+7}$ $\Rightarrow x^2+8x+7=x^2+7x+10$ $\Rightarrow x=3$ True

$(R):$ True

60. Ⓐ

₹930 – ₹440 = ₹490

61. Ⓑ

$\dfrac{490}{440}\times100\%=111.36\%$

62. Ⓒ

$₹\dfrac{440}{14}=₹31.43$

63. Ⓐ

$\dfrac{x}{5}=\dfrac{x-32}{9}$ $\Rightarrow 9x=5x-160$ $\Rightarrow 9x-5x=-160$ $\Rightarrow 4x=-160$ $\Rightarrow x=-\dfrac{160}{4}=-40$

64. Ⓓ

$a^2+\sqrt2 a+1=0$ $\Rightarrow a^2+1=-\sqrt2 a$ $\Rightarrow a+\dfrac{1}{a}=-\sqrt2$ $\Rightarrow a^2+\dfrac{1}{a^2}+2=2$ $\Rightarrow a^2+\dfrac{1}{a^2}=0$

$\dfrac{a^4+a^2+1}{a^2}=a^2+\dfrac{1}{a^2}+1=0+1=1$

65. Ⓓ

$\dfrac{x}{y}=\dfrac{3}{4}$ $\Rightarrow 4x=3y$ $\Rightarrow \boxed{y=\dfrac{4}{3}x}$

$y-x=\dfrac{4}{3}x-x=\dfrac{1}{3}x$

$\dfrac{\frac{1}{3}x}{x}\times100\%=\dfrac{100}{3}\%=33\dfrac{1}{3}\%$

66. Ⓐ

$4^3 \times 5^3 = (20)^3$

67. Ⓑ

$(-2)^{m+1} \times (-2)^4 = (-2)^6 \quad \Rightarrow (-2)^{m+5} = (-2)^6 \quad \Rightarrow m+5 = 6 \quad \therefore \boxed{m=1}$

68. Ⓐ

$\sqrt[3]{\dfrac{343 \times 125}{0.064}} = \left(\dfrac{7^3 \times 5^3}{(0.4)^3}\right)^{1/3} = \dfrac{7 \times 5}{0.4} = \dfrac{35 \times 10}{4} = \dfrac{175}{2} = 87.5$

69. Ⓑ

$2^2 + 3^2 \neq 4^2$

$6^2 + 8^2 = 10^2$

$5^2 + 7^2 \neq 9^2$

70. Ⓐ

$653 * 47$

Sum of odd places digits = $6 + 3 + 4 = 13$

Sum of even places digits = $5 + * + 7 = 12 + *$

Sum of odd places digits = Sum of the even places digits

or

Their difference is a multiple of 11.

$12 + * = 13 \quad \boxed{* = 1}$

71. Ⓐ

(A) : $x^4 - 16 = (x^2)^2 - 4^2 = (x^2 + 4)(x^2 - 4) = (x^2 + 4)(x^2 - 2^2) = (x^2 + 4)(x + 2)(x - 2)$ True

(R) : $a^2 - b^2 = (a + b)(a - b)$ True

72. Ⓒ

(A) : $\dfrac{5}{21} \times \dfrac{1}{100} \times \dfrac{1}{3} \times \dfrac{1}{100} \times 126000 = 1$ True

(R) : $x\%$ of $y = 100xy$ False

because $x\%$ of $y = \dfrac{xy}{100}$

73. Ⓑ

$x + \dfrac{5}{6}x + \dfrac{2}{3}x = 150$

74. Ⓑ

$\dfrac{6x + 5x + 4x}{6} = 150 \quad \Rightarrow \dfrac{15x}{6} = 150 \quad \therefore x = 60$

75. Ⓒ

CP of 2$^{\text{nd}}$ prize $= ₹\dfrac{5}{6}x = ₹\dfrac{5}{6}\times 60 = ₹50$

CP of 3$^{\text{rd}}$ prize $= ₹\dfrac{2}{3}x = ₹\dfrac{2}{3}\times 60 = ₹40$

Difference $= ₹(50 - 40) = ₹10$

Biology

76. Ⓐ

Rhizobium

Symbiotic association with leguminous plants

77. Ⓑ

Yeast

78. Ⓐ

Bacteria

Lactobacillus

79. Ⓐ

Bacteria

80. Ⓒ

They break down dead organisms and organic matter

81. Ⓓ

Small pox

82. Ⓐ

Malaria

83. Ⓑ

Fermentation

84. Ⓒ

It turns milky

The released CO_2 turns the lime water milky

85. Ⓐ

Sugar $\xrightarrow{\text{Yeast}}$ Alcohol + Carbon dioxide

86. Ⓓ

Brewery

As alcohol is produced in the process.

87. Ⓐ

Unicellular fungi

88. Ⓒ

A is true but R is false

89. Ⓑ

Both A and R are true but R is not the correct explanation of A.

90. Ⓐ

Both A and R are true and R is the correct explanation of A.

Spores are tough structures which release the microbes only upon reaching a favourable environment.

91. Ⓑ

Sowing

92. Ⓒ

Drip Irrigation

93. Ⓒ

Zaid crop

94. Ⓒ

Milk

It contains almost all the nutrients required by us.

95. Ⓐ

Birds

96. Ⓒ

A is true but R is false

Yeast is a unicellular fungi.

97. Ⓑ

Both A and R are true but R is not the correct explanation of A.

98. Ⓑ

Denitrification

99. Ⓓ

All

The MMR vaccine offers protection from all the three diseases.

100. Ⓒ

Lactose