

BPSC TEST-04—FULL LENGTH

Date: 12 August, 2018

ANSWERS

1. (d)	26. (c)	51. (c)	76. (c)	101. (d)	126. (d)
2. (c)	27. (b)	52. (b)	77. (b)	102. (a)	127. (c)
3. (a)	28. (a)	53. (d)	78. (c)	103. (b)	128. (c)
4. (b)	29. (d)	54. (b)	79. (c)	104. (d)	129. (c)
5. (d)	30. (c)	55. (d)	80. (a)	105. (a)	130. (c)
6. (c)	31. (b)	56. (b)	81. (b)	106. (d)	131. (b)
7. (a)	32. (a)	57. (a)	82. (c)	107. (c)	132. (c)
8. (b)	33. (c)	58. (b)	83. (a)	108. (c)	133. (c)
9. (d)	34. (b)	59. (c)	84. (c)	109. (a)	134. (d)
10. (c)	35. (a)	60. (d)	85. (a)	110. (a)	135. (a)
11. (a)	36. (d)	61. (d)	86. (c)	111. (a)	136. (c)
12. (b)	37. (c)	62. (a)	87. (c)	112. (d)	137. (b)
13. (d)	38. (b)	63. (b)	88. (d)	113. (c)	138. (a)
14. (c)	39. (a)	64. (a)	89. (a)	114. (c)	139. (b)
15. (a)	40. (d)	65. (c)	90. (c)	115. (d)	140. (c)
16. (b)	41. (c)	66. (c)	91. (b)	116. (a)	141. (a)
17. (d)	42. (b)	67. (b)	92. (c)	117. (c)	142. (b)
18. (c)	43. (a)	68. (c)	93. (b)	118. (a)	143. (a)
19. (b)	44. (d)	69. (a)	94. (c)	119. (b)	144. (c)
20. (a)	45. (c)	70. (c)	95. (a)	120. (a)	145. (a)
21. (d)	46. (b)	71. (a)	96. (b)	121. (b)	146. (a)
22. (c)	47. (a)	72. (a)	97. (b)	122. (b)	147. (a)
23. (b)	48. (d)	73. (c)	98. (c)	123. (c)	148. (c)
24. (a)	49. (c)	74. (a)	99. (c)	124. (b)	149. (b)
25. (d)	50. (b)	75. (c)	100. (c)	125. (a)	150. (c)

BPSC TEST-04—FULL LENGTH SOLUTIONS

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1. (d)

Viswanathan Anand is an Indian chess Grandmaster and former World Chess Champion.

He was the first Indian to win the FIDE World Chess Championship in 2000 and has won this Championship in 2007, 2008, 2010 and 2012.

He remained the undisputed World Champion from 2007 to 2013.

2. (c)

Foreign Portfolio Investment (FPI) is the securities and other financial assets held by foreign investors.

It lets an investor purchase stocks, bonds or other financial assets in a foreign country.

3. (a)

India has a mixed economy. A mixed economy is the economy that combines features of both capitalism and socialism.

Under this type of economy, private property is protected and allowed economic freedom in the use of capital, and also governments are allowed to interfere in economic activities to achieve social aims.

4. (b)

5. (d)

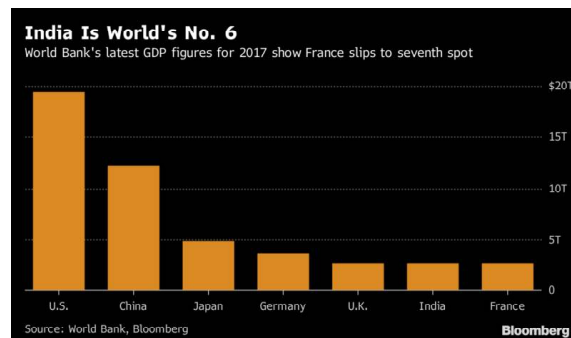
Fakhar Zaman is a Pakistani cricketer who scored his first double hundred One Day International match in July 2018 against Zimbabwe. He is also the first Pakistani to achieve this feat.

6. (c)

7. (a)

India overtakes France to become the World's Sixth-Largest Economy.

India is now a \$2.597 trillion economy and is higher than France (\$2.582 trillion). It will be the world's fourth-largest economy by 2022, according to International Monetary Fund projections.



8. (b)

The seven union territories of India are: Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Lakshadweep, Puducherry, Andaman and Nicobar Islands and National Capital Territory of Delhi.

9. (d)

Nalanda Open University (NOU) is the only university (Patna) of Bihar state, India which provides education through distance and open education. It was established in March, 1987.

10. (c)

Pingali Venkayya was an Indian freedom fighter and the designer of the flag on which the Indian national flag was based.

11. (a)

12. (b)

13. (d)

Biharbandhu (1872) was the first Hindi newspaper published from Bihar. It was started by Maharashtrian Brahman named Madan Mohan Bhatta, who settled in Biharsharif.

14. (c)

Lalit Narayan Mithila University is a public university which was established in 1972 and is located at Darbhanga (Bihar) in India.

15. (a)

Jeevika is the Rural Livelihoods Project of Bihar which was launched with the assistance from World Bank.

Its main objective is to enhance social and economic empowerment of the rural poor in Bihar.

16. (b) Sania Mirza is an Indian professional tennis player who is from Hyderabad (Telangana), India. She was a former world No. 1 in doubles and has won 6 Grand Slam titles in her career.
17. (d) BRICS is an association of five major emerging national economies: Brazil, Russia, India, China and South Africa.
18. (c) National Highway 44 (NH 44) is the longest-running National Highway in India, starting from Srinagar and ends in Kanyakumari. Its total length is 3745 km.
It passes through the states of Jammu & Kashmir, Punjab, Haryana, Delhi, Uttar Pradesh, Madhya Pradesh, Maharashtra, Telangana, Andhra Pradesh, Karnataka, and Tamil Nadu.
19. (b)
20. (a) The Loo is a strong, dusty, hot and dry summer wind which blows over the North Indian states such as Punjab, Bihar, Uttar Pradesh, Rajasthan, Haryana, Jharkhand etc.
21. (d)
22. (c) It is a wireless technology developed to exchange data (messages, video, audio, pdf etc) over short distances (100 meters) from fixed and mobile devices
23. (b) Captain Amarinder Singh (Congress) is currently the 26th Chief Minister of Punjab and an elected Member of the Legislative Assembly from Patiala.
24. (a) Neeraj Chopra is a track and field athlete from India who competes in the javelin throw.
25. (d)
26. (c) Harivansh Narayan Singh is an Indian journalist and the current Deputy Chairman of the Rajya Sabha (2018). He was born in Ballia, Uttar Pradesh and is from Janta Dal (United) based in Bihar.
27. (b) BJP's performance in Lok Sabha elections since 1984:
- | | | |
|------|----------------|-----------|
| 1984 | 8th Lok Sabha | 2 seats |
| 1989 | 9th Lok Sabha | 85 / 545 |
| 1991 | 10th Lok Sabha | 120 / 545 |
| 1996 | 11th Lok Sabha | 161 / 545 |
| 1998 | 12th Lok Sabha | 182 / 545 |
| 1999 | 13th Lok Sabha | 182 / 545 |
| 2004 | 14th Lok Sabha | 138 / 543 |
| 2009 | 15th Lok Sabha | 116 / 543 |
| 2014 | 16th Lok Sabha | 282 / 543 |
28. (a)
29. (d) The Nobel Peace Prize 2017 has been awarded to International Campaign to Abolish Nuclear Weapons (ICAN) for its work to draw attention to the catastrophic humanitarian consequences of any use of nuclear weapons and for its ground-breaking efforts to achieve a treaty-based prohibition of such weapons.
30. (c) Pratibha Rao Patil is an Indian politician from Congress, who was the 12th and only women President of India (2007-2012).
31. (b) The name of World's first Hindi-speaking robot is 'Rashmi' and it has been developed by Ranchi-based software developer.
The robot can also speak Marathi and Bhojpuri, English and Hindi.
It is equipped with facial expressions and systems; thus can recognize and respond to spoken commands.
32. (a)
33. (c) The current President of People's Republic of China is Xi Jinping.
Li Keqiang is the current Premier of the People's Republic of China.

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34. (b)

The Panchayat Raj system was first adopted by Rajasthan in Nagaur district on 2nd Oct 1959, followed by Andhra Pradesh.

Panchayati Raj system was finally introduced as a law by the 73rd constitutional amendment in 1992 and came into force on 24th April 1993 with minor modifications.

35. (a)

The winter solstice is an astronomical phenomenon and has the shortest day and longest night of the year. It happens every year on December 22.

36. (d)

State	Capital	Statehood
Arunachal Pradesh	Itanagar	1987
Assam	Dispur	1947
Manipur	Imphal	1971
Meghalaya	Shillong	1971
Mizoram	Aizawl	1987
Nagaland	Kohima	1963
Sikkim	Gangtok	1975
Tripura	Agartala	1971

37. (c)

The International Solar Alliance (ISA) was unveiled by Prime Minister Narendra Modi and then French President Francois Hollande at the U.N. Climate Change Conference in Paris on November 30, 2015. It has currently 121 members.

The main aim was to form a coalition of solar resource-rich countries to collaborate on addressing the identified gaps in their energy requirements through a common approach.

The target to be achieved is of 1 TW of solar energy by 2030, which would require \$1 trillion.

38. (b)

10 Twin Cities in India:

1. Ahmedabad-Gandhinagar, Gujarat
2. Cuttack-Bhubaneswar, Odisha
3. Hyderabad-Secunderabad, Andhra Pradesh
4. Pune-Pimpri Chinchwad, Maharashtra
5. Kolkata-Howrah, West Bengal

6. Kochi-Ernakulam, Kerala
7. Hubli-Dharwad, Karnataka
8. Durg-Bhilai, Chhattisgarh
9. Ranchi-Hatia, Jharkhand
10. Tirunelveli-Palayamkottai, Tamil Nadu

39. (a)

Lord Mahavira was the twenty-fourth and last Jain Tirthankara and was born in 599 B.C at Kundagrama, Vaishali (Bihar).

40. (d)

41. (c)

The filament is the part of the light bulb that produces light and is made of tungsten, because it has a higher melting point than any other non-alloy that exists.

42. (b)

Mughal Empire was founded by Babur in 1526, by defeating Ibrahim Lodi, the last ruler of the Delhi Sultanate, in the First Battle of Panipat.

43. (a)

CBI is Central Bureau of Investigation and is the main investigating agency of India, with a dual responsibility to investigate grievous cases and provide leadership and direction in fighting corruption to the Police force across the country.

44. (d)

45. (c)

The Indira Gandhi Canal is the longest canal in India and is 649 km long.

It is also the largest irrigation project in the world.

46. (b)

47. (a)

Article 75 of Indian constitution states that, the total number of Ministers, including Prime Minister, can't be more than 15% of the total number of Lok Sabha members.

48. (d)

49. (c)

The first major newspaper of India was The Bengal Gazette (1780). It was started by James Augustus Hickey who is called the father of the Indian Press.

50. (b)

Oxytocin is a hormone secreted by the pituitary gland in human and plays an important function in reproduction, child birth and lactation and social interaction in humans.

51. (c)

52. (b)

Let $X = P + Q$
 $Y = P - Q$
 $R^2 = X^2 + Y^2 + 2 \times Y \cos \theta$
 Or $3P^2 + Q^2 = P^2 + Q^2 + P^2 + Q^2 + 2(P^2 - Q^2) \cos \theta$
 or, $(P^2 - Q^2) = 2(P^2 - Q^2) \cos \theta$
 or, $\cos \theta = \frac{1}{2}$
 $\therefore \theta = 60^\circ$

53. (d)

Coefficient of restitution
 $= \frac{\text{relative speed after impact}}{\text{relative speed before impact}}$
 $= \frac{\sqrt{2 \times g \times 0.75}}{\sqrt{2 \times g \times 3}} = 0.5$

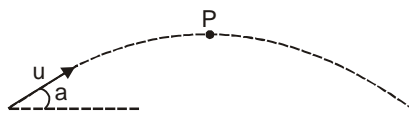
54. (b)

55. (d)

56. (b)

$R^2 = P^2 + P^2 + 2P^2 \cos \theta$
 $= 2P^2(1 + \cos \theta) = 2P^2 \times \cos^2\left(\frac{\theta}{2}\right)$
 $\therefore R = 2P \cos \frac{\theta}{2}$

57. (a)



Time to reach 'P' = t_1
 $t_1 = \frac{u \sin \alpha}{g}$
 Total time of flight = $2 t_1$
 $\therefore t = 2u \frac{\sin \alpha}{g}$

58. (b)

Longitudinal stress = $\frac{Pd}{4t}$
 Hoop stress = $\frac{Pd}{2t}$
 $\therefore \text{Ratio} = \frac{Pd/4t}{Pd/2t} = 2/4 = 1/2$

59. (c)

$\Rightarrow V^2 = U^2 + 2as$
 or, $0 = 40^2 + 2 \times a \times 80$
 $a = -\frac{40 \times 40}{2 \times 80}$
 $a = -10 \text{ m/sec}^2$
 $\Rightarrow V = u + at$
 $0 = 40 - 10 \times t$
 $t = 4 \text{ second}$

60. (d)

61. (d)

A horizontal plane is normal to the direction of gravity

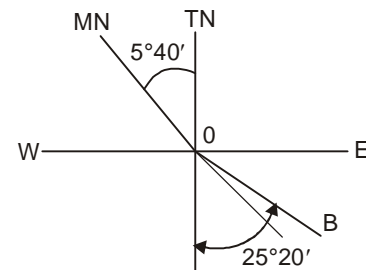
62. (a)

Correct length = $\left(\frac{\text{measured length}}{\text{nominal length of tape}} \right) \times \text{actual length of tape}$
 or, $200 \text{ m} = \frac{200.8}{20} \times l'$
 $\therefore l' = 19.92 \text{ m}$

63. (b)

$C_{\text{sag}} = -\frac{w^2 L}{24 T^2}$

64. (a)



M.B of OB = $S19^\circ 40'E$

65. (c)

$$\begin{aligned} \text{LABC} &= \text{F.B of BC} - \text{BB of AB} \\ &= 100^\circ - 220 + 360^\circ = 240^\circ \end{aligned}$$

66. (c)

67. (b)

$$C = 0.0673 d^2$$

C'd' is in km.

$$C = 0.0673 \times (1.4)^2 = 0.132 \text{ m}$$

68. (c)

$$A = \pi r^2$$

$$\begin{aligned} dA &= 2\pi r dr = 2\pi \times 80 \times \pm \frac{0.05}{2} \\ &= \pm 12.56 \text{ m}^2 \end{aligned}$$

69. (a)

$$\text{Mid ordinate} = R \left(1 - \cos \frac{\Delta}{2} \right)$$

$$\text{Long chord} = L = 2R \sin \frac{\Delta}{2}$$

$$60 = 2 \times 50 \times \sin \frac{\Delta}{2}$$

$$\frac{\Delta}{2} = 36.87^\circ$$

$$\therefore M = 50(1 - \cos 36.87^\circ) = 10 \text{ m}$$

70. (c)

$$A_1 = 6 \times 4 = 24 \text{ m}^2$$

$$A_2 = 4 \times 2 = 8 \text{ m}^2$$

$$A_m = \left(\frac{6+4}{2} \right) \times \left(\frac{4+2}{2} \right) = 15 \text{ m}^2$$

$$V = \frac{d}{3} (A_1 + A_2 + 4A_m)$$

$$= \frac{3}{3} (24 + 8 + 4 \times 15) = 92 \text{ m}^3$$

71. (a)

72. (a)

73. (c)

Cement can be manufactured either from natural cement stones or artificially by using calcareous and argillaceous materials.

Argillaceous	Calcareous
Shale and clay	Limestone
Cement rock	Chalk
Blast furnace slag	marine shells
Mark	

74. (a)

75. (c)

Le chatelier's method detects unsoundness due to free lime only.

Autoclaur test is sensitive to both free magnesia and free lime.

76. (c)

Weight of magnesia should not exceed 6% for all grade of cement.

77. (b)

78. (c)

79. (c)

80. (a)

81. (b)

82. (c)

83. (a)

84. (c)

$$d_{\text{mean}} = \frac{40 + 50}{2} = 45 \text{ mm}$$

For elongation index,

$$\begin{aligned} \text{Slot length} &= 1.8 \times d_{\text{mean}} = 1.8 \times 45 \text{ mm} \\ &= 81 \text{ mm} \end{aligned}$$

85. (a)

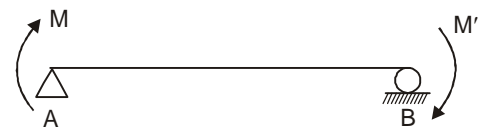
$$E = 2G(1 + \mu)$$

$$E/G = 2(1 + 0.2) = 2.4 = 12/5$$

86. (c)

87. (c)

Let additional moment be M



Due to 'M' moment, slope at B

$$= \frac{ML}{6EI} \text{ (anti-clockwise)}$$

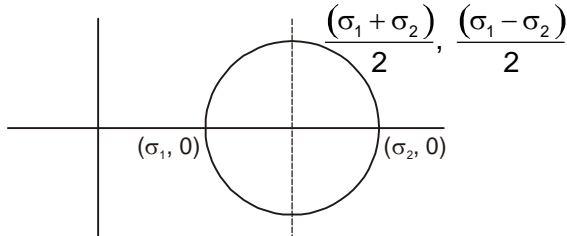
Due to 'M' moments

$$\text{Slope at B} = + \frac{M'L}{3EI} \text{ (clockwise)}$$

$$\text{For } \frac{M'L}{3EI} = \frac{ML}{6EI}$$

$$\Rightarrow M' = \frac{M}{2}$$

88. (d)



89. (a)

$$\tau_{\max} = \frac{\sigma_1 - \sigma_2}{2}$$

$$\therefore \frac{\tau_{\max}}{\sigma_1 - \sigma_2} = \frac{1}{2}$$

90. (c)

91. (b)

$$\frac{M}{I} = \frac{\sigma}{y}$$

$$\begin{aligned} \sigma &= \frac{M}{I} \times y = \frac{4 \times 10^7 \times 12}{100 \times 2003} \times 100 \\ &= \frac{4 \times 12 \times 10}{2 \times 10} = 60 \text{ MPa} \end{aligned}$$

92. (c)

$$M/I = E/R$$

$$\begin{aligned} R &= \frac{EI}{M} = \frac{2 \times 10^5 \times 10^6}{10^7} \\ &= 2 \times 10^4 \text{ mm} = 20 \text{ m} \end{aligned}$$

93. (b)

94. (c)

$$N = 150 \text{ rpm}$$

w = angular velocity

$$= \frac{2\pi N}{60} = \frac{\pi \times 150 \times 2}{60} = 5\pi$$

$$\text{Power} = 7 \times w = \frac{20 \times 10^3 \times 5\pi}{1000} \text{ kW}$$

$$= 100\pi \text{ kW}$$

95. (a)

96. (b)

97. (b)

98. (c)

$$t_o = 4 \text{ days}$$

$$t_m = 11 \text{ days}$$

$$t_p = 12 \text{ days}$$

$$\begin{aligned} t_e &= \frac{t_o + 4t_m + t_p}{6} = \frac{4 + 4 \times 11 + 12}{6} \\ &= 10 \text{ days} \end{aligned}$$

99. (c)

100. (c)

101. (d)

102. (a)

In resource levelling, the activities are rescheduled such that maximum demand of resources does not exceed the available resources.

Resources are linked.

103. (b)

104. (d)

$$\text{FDB} = 1 - \left(\frac{C_s}{C_1} \right)^{1/n} = 1 - \left(\frac{2000}{6000} \right)^{1/3} = 0.5$$

105. (a)

106. (d)

Rolling resistance to be overcome = 15 (55 - 45) = 150 kg

(It is based on the assumption that road surface has rolling resistance of 55 kg/tonne)

107. (c)

Dynamic viscosity

$$\mu = 0.06 \text{ poise,} = 0.06 \text{ g 1cm-sec}$$

$$\rho = 0.9 \text{ g/cm}^3$$

$$\therefore \nu = \frac{\mu}{\rho} = \frac{0.06 \text{ g/cm-sec}}{0.9 \text{ g/cm}^3} = 0.067 \text{ strokes.}$$

108. (c)

$$\text{Bulk modulus} = \frac{dp}{\left(-\frac{dv}{v} \right)} = \frac{2 \times 10^5}{\left(\frac{0.01}{100} \right)} = 2 \times 10^9 \text{ N/m}^2$$

109. (a)

110. (a)

$$\text{For free vortex, } V = \frac{C}{r}$$

∴ as radius ↑, velocity ↓

111. (a)

$$\phi = 3xy$$

$$U = \frac{\partial \phi}{\partial x} = -3y$$

$$v = -\frac{\partial \phi}{\partial y} = -3x$$

∴ at (1, 3) point

$$U = -3 \times 3 = -9$$

and $v = -3 \times 1 = -3$

112. (d)

Force exerted by jet in the direction normal to the plate

$$\begin{aligned} &= \rho a(V-U)^2 \\ &= 1000 \times 100 \times 10^{-4} \times (20-10)^2 \\ &= 1000 \text{ N} \end{aligned}$$

113. (c)

$$t = \text{dia of pipe} = 10 \text{ cm}$$

$$v = 0.25 \text{ stokes}$$

$$= 0.25 \times 10^{-4} \text{ m}^2/\text{sec}$$

$$Re = \frac{VD}{v}$$

$$\text{or, } 2000 = \frac{V \times 0.1}{0.25 \times 10^{-4}}$$

$$v = 0.5 \text{ m/sec}$$

114. (c)

At the point of boundary layer separation,

$$\left. \frac{dv}{dy} \right|_{y=0} = 0$$

115. (d)

Shear velocity V is given by $\sqrt{\frac{\tau_0}{\rho}}$

where, τ_0 = boundary shear stress

ρ = density of the fluid.

116. (a)

$$V_r = \sqrt{L_r}$$

$$Q_R = L_r 2.5$$

$$\text{or, } \frac{Q_m}{Q_p} = L_r 2.5$$

$$\frac{5}{Q_p} = \left(\frac{1}{4}\right)^{2.5}$$

$$Q_p = 5 \times 4^{2.5} = 160 \text{ m}^3/\text{sec}$$

117. (c)

118. (a)

Overall efficiency = Hydraulic efficiency
× mechanical efficiency

$$\text{or, } 0.7 = x \times 0.85$$

$$x = 0.824$$

∴ Hydraulic efficiency ≈ 82%

119. (b)

$$N_s = \frac{N\sqrt{Q}}{H^{3/4}}$$

$$N'_s = \frac{N\sqrt{Q/2}}{H^{3/2}}$$

$$\therefore N'_s = \frac{N_s}{\sqrt{2}}$$

120. (a)

$$\frac{ND}{\sqrt{H}} = \text{constant}$$

$$\frac{D_1^2}{H_1} = \frac{D_2^2}{H_2}$$

$$\frac{H_2}{H_1} = \left(\frac{D_2}{D_1}\right)^2$$

$$H_2 = 10 \times \left(\frac{9}{10}\right)^2 = 8.1 \text{ m}$$

121. (b)

$$pH = 10 \times \left(\frac{9}{10}\right)^2 = 8.1 \text{ m}$$

$$8 = \log_{10} \left[\frac{1}{[H^+]} \right]$$

$$10^8 = \frac{1}{[H^+]}$$

$$[H^+] = 10^{-8} \text{ mol/L}$$

122. (b)

123. (c)

124. (b)

125. (a)

Length of the rectangular grit chamber
= velocity × detention time
= 0.25 × 60 = 15 m

126. (d)

Ultimate BOD measures only biodegradable organic matter.

COD measures total organic matter, both biodegradable and non-biodegradable

∴ non-biodegradable = COD – BOD_u organic matter

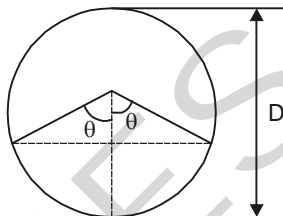
127. (c)

128. (c)

$$D/4 = \frac{D}{2}(1 - \cos\theta)$$

$$\cos\theta = \frac{D/4}{D/2} = \frac{1}{2}$$

$$\theta = 60^\circ = \frac{\pi}{3}$$



$$\text{Welded perimeter} = \frac{\pi D}{2\pi} \times \frac{2\pi}{3} = \frac{\pi D}{3}$$

129. (c)

130. (c)

131. (b)

132. (c)

133. (c)

134. (d)

135. (a)

136. (c)

137. (b)

138. (a)

139. (b)

140. (c)

141. (a)

142. (b)

Rayleigh number : dimensionless number
= Thermal energy Liberated by Buoyancy / Energy dissipated by conduction and viscous force.

143. (a)

Peclet number = Reynolds number × Prandtl number

144. (c)

145. (a)

146. (a)

Work itself is a high grade energy and work transfer doesn't degrade the quality of energy.

147. (a)

Change in value of property for point functions is always same irrespective of path.

148. (c)

For constant volume process,

$$\frac{P_2}{P_1} = \frac{T_2}{T_1}$$

$$\Rightarrow \frac{30}{10} = \frac{T_2}{27 + 273}$$

$$\Rightarrow T_2 = 900 \text{ k}$$

149. (b)

Applying steady flow energy equation for turbine

$$W_{\text{output}} = h_i - h_f = (3580 - 2780) \text{ kJ/kg} \\ = 800 \text{ kJ/kg}$$

150. (c)