Monthly Progressive Test (Solution)

Class: XI

Subject: PCMB

Academic Excellence Programme TECHNO ACE

Test Booklet No.: MPT08 **Test Date:** 20122024

Physics

1. Ⓓ
Hook's law : Stress ∝ strain, within elastic limit.

2. Ⓒ
Stress = $k \cdot$ strain
$k \Rightarrow$ constant of proportionality $\Rightarrow$ Modulus of elasticity.

3. Ⓐ
Material to material, stress—strain curves vary.

4. Ⓑ
It is called permanent set.

5. Ⓒ
If ultimate strength and fracture point are close, then the material is brittle.

6. Ⓓ
Equation of continuity is $A_1 \cdot V_1 = A_2 \cdot V_2$

7. Ⓓ
$p_1 + \frac{1}{2}pv_1^2 + pgh_1 = p_2 + \frac{1}{2}pv_2^2 + pgh_2$
Put $v_1 = v_2 = 0$ $\therefore\ p_1 - p_2 = pg(h_2 - h_1)$

8. Ⓑ
Torricelli's law :
$v = \sqrt{2gh}$ = speed of efflux
$\therefore\ v^2 = 2gh$

9. Ⓐ
Air flows with large speed in order to reduce the pressure drastically.

10. Ⓓ
Dynamic lift is due to Magnus effect.

11. ©

$$\frac{Q}{t} = kA\frac{(T_2 - T_1)}{l}$$

Watt = $(K)\frac{m^2 k}{m}$

Unit of $K = \text{w m}^{-1}\text{k}^{-1}$

12. ©

$$\frac{Q}{t} = \frac{k_1 A(T_1 - T_0)}{l} = \frac{k_2 A(T_0 - T_2)}{l}$$

$$k_1 T_1 - k_1 \cdot T_0 = k_2 \cdot T_0 - k_2 T_2$$

$$T_0(k_1 + k_2) = k_1 T_1 + k_2 T_2$$

$$T_0 = \frac{k_1 T_1 + k_2 T_2}{k_1 + k_2}$$

13. Ⓓ

$$\frac{2L}{k} = \frac{L}{k_1} + \frac{L}{k_2}$$

$$k = \frac{2k_1 k_2}{k_1 + k_2}$$

14. Ⓐ

$$k'(A + A) = kA + 2kA = 3kA$$

$$k' = 1.5kA$$

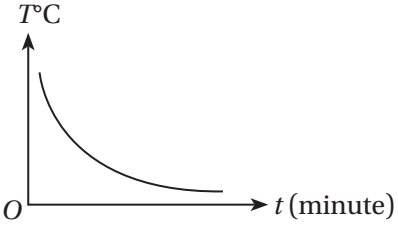
15. Ⓑ

Temperature at $D = \theta$

$$\frac{Q}{t} = \frac{kA(0 - \theta)}{l} = \frac{kA}{l}(\theta - 90°) + \frac{kA}{l}(\theta - 90°)$$

$$-\theta = 2\theta - 180° \quad \Rightarrow 3\theta = 180° \quad \therefore \theta = 60°$$

16. ©



(As per Newton's cooling law)

17. Ⓓ

$$\left(-\frac{dQ}{dt}\right) \propto (T - T_0)$$

This is called Newton's cooling law.

18. Ⓒ

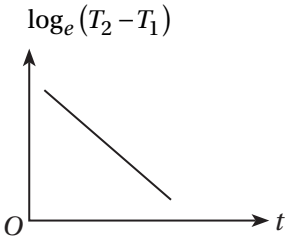
Loss of heat by radiation depends upon—(i) the nature of the surface of the body (ii) the area of the exposed surface.

19. Ⓐ

$Q = msT_2 \quad \Rightarrow dQ = msdT_2$

$\therefore \frac{dQ}{dt} = (ms)\frac{dT_2}{dt}$

20. Ⓐ



21. Ⓐ

In conduction, heat flows without any flow of matter.

22. Ⓑ

Assertion is true

Reason is true

But reason is not the correct explanation of assertion.

23. Ⓐ

As $T = 273.15 + T°C$

24. Ⓑ

$Q = 3(\text{kg})(2100)(12) \quad \Rightarrow \; 3(\text{kg}) \times \frac{25200}{1000} = 75.6 \text{ kJ}$

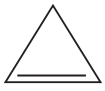
25. Ⓓ

Specific heat capacity of water is 4186 $J\,kg^{-1}\,k^{-1}$

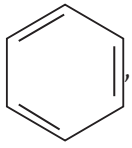
Chemistry

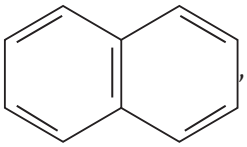
26. Ⓒ

For aromaticity Huckel's rule $(4n + 2)$ π e's should obey.



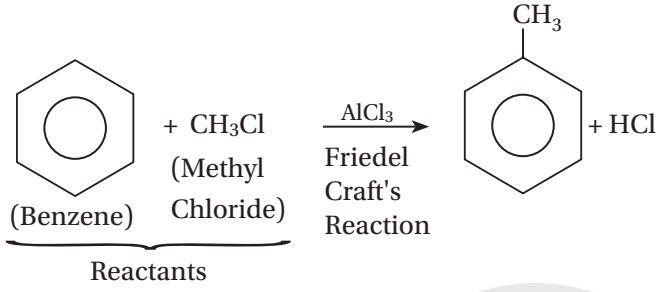
is not planar.

In  , $n = 1$, $(4n + 2)$ π e's = 6 π e's is obeyed

In  , $n = 2$, $(4n + 2)$ π e's = 10 π e's is obeyed

In  , $n = 0$, $(4n + 2)$ π e's = 2 π e's is obeyed and it is planar

27. Ⓒ



28. Ⓒ

In ethane (II) C—C bond length = 1.54 $\mathring{A}$

In benzene (I) C—C bond length = 1.39 $\mathring{A}$

In ethylene (III) C—C bond length = 1.34 $\mathring{A}$

In acetylene (IV) C—C bond length = 1.20 $\mathring{A}$

So, II > I > III > IV

⟶ bond length decreases.

29. Ⓓ

For a compound to be aromatic it

Ⓐ Obey $(4n + 2)$ π electron Huckel rule

Ⓑ Molecule must be planar with sp^2 hybridisation

Ⓒ High resonance energy

Thus answer is Ⓓ

30. Ⓑ

The gas used for the artificial ripening of fruits is C_2H_2 (acetylene)

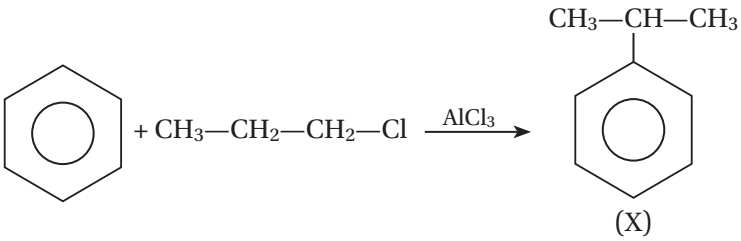
31. Ⓓ

Kolbe's electrolysis reaction goes through free radical intermediate.

32. Ⓐ

$CH_3—C \equiv CH \longrightarrow CH_3CH_2CH_3$, reaction take place by I. H_2/Ni or II. H_2/Pd only

33. Ⓓ



(X)

34. Ⓑ

$CH_3—CH_2—CH_2—CH_3 \xrightarrow[HBr]{AlCl_3} CH_3—\underset{CH_3}{CH}—CH_3$

Isomerisation

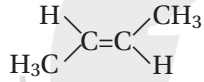
35. Ⓐ

Acetylene gives white ppt with $AgNO_3$ and red ppt with Cu_2Cl_2

36. Ⓒ

1, 1, 2, 2—tetra bromo ethane on heating with Zn powder in alcohol finally gives ethyne.

37. Ⓒ

$CH_3—C\equiv C—CH_3 \xrightarrow{Li/Liquid\ NH_3}$ 

(2-butyne) (trans–2–butene)

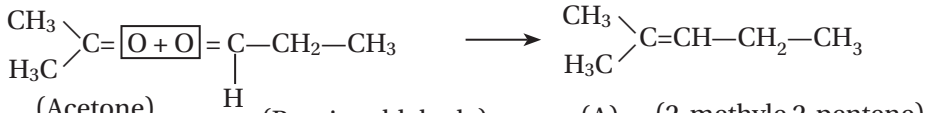
38. Ⓓ

Alkynes can be reduced to alkenes by hydrogenation in presence of Lindlar's catalyst.

39. Ⓓ

The reaction of an aromatic halogen compound with an alkyl halide in presence of sodium in ether is called Wurtz-Fitting reaction.

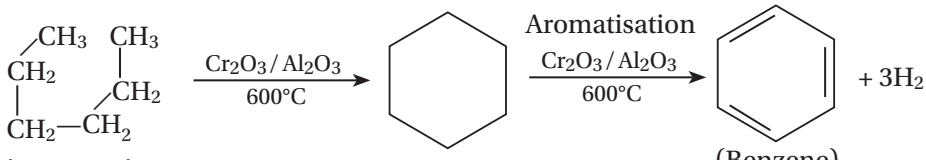
40. Ⓓ

Retroreaction : 

(Acetone) (Propionaldehyde) (A) (2-methyle 2-pentene)

41. Ⓒ

When n-hexane/n-heptane is passed through Cr_2O_3 supported over alumina at 600°C gives benzene and toluene.



(n-hexane) (Benzene)

42. ©

Oxidation number of Cr in K_3CrO_8 = +5

All oxygen are in peroxide linkage

$\therefore\ 3(+1) + x + 8(-1) = 0 \quad \Rightarrow x - 5 = 0 \quad \Rightarrow x = +5$

43. Ⓐ

Both assertion and reason are correct and reason is the correct explanation of assertion.

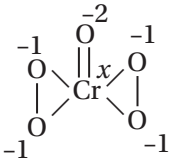
44. Ⓐ

Both assertion and reason are correct and reason is the correct explanation of assertion.

45. Ⓑ

Both assertion and reason are correct but reason is not the correct explanation of assertion.

46. Ⓓ

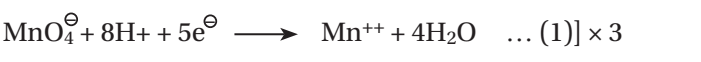


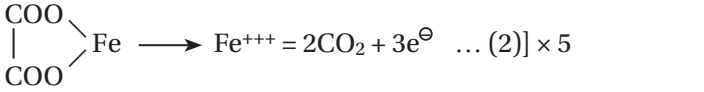
$x + 4(-1) + (-2) = 0 \quad \Rightarrow x - 4 - 2 = 0 \quad \Rightarrow x = +6$

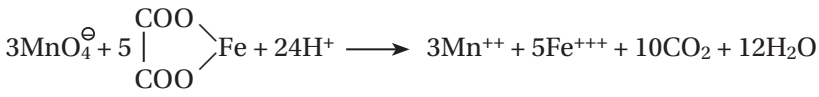
47. ©

$Fe_{0.94}O \qquad 0.94x + 1(-2) = 0 \qquad \Rightarrow x = +\frac{200}{94}$

48. ©



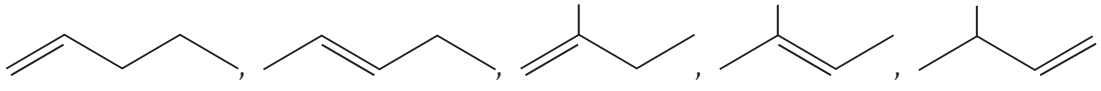


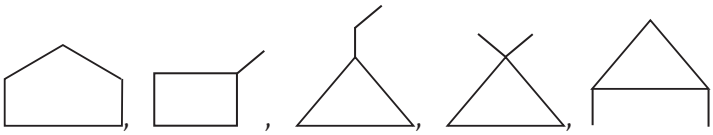


1 mole ferrous oxalate = $\frac{3}{5}$ mole MnO_4^-

49. Ⓓ

Total number of structural isomers of C_5H_{10} = 10





50. Ⓓ

'N' is more electronegative than 'C'
So, 'H' attached with 'N'-atom is more acidic.

Mathematics

51. Ⓒ

$X \cap (\overline{X \cup Y})$

$= X \cap (\overline{X} \cap \overline{Y})$ (by De Morgans law)

$= (X \cap \overline{X}) \cap \overline{Y}$

$= \phi \cap \overline{Y}$

$= \phi$ ($\because \phi$ is a subset of any set)

52. Ⓓ

$x - |x| > 0$

$\Rightarrow x > |x|$ impossible as $|x| > x$.

$\therefore\ x \in \phi$.

53. Ⓑ

$y = f(x) = \sqrt{3-x} + \sqrt{2+x}$

$\Rightarrow\ y^2 = 5 + 2\sqrt{(3-x)(2+x)}$

$0 \leq \quad \leq \frac{5}{2}$

$y^2_{min} = 5$

$y^2_{max} = 5 + 2 \times \frac{5}{2} = 10$

$5 \leq y^2 \leq 10$

$\Rightarrow \sqrt{5} \leq y \leq \sqrt{10}$

54. Ⓐ

$ae = 2$

$a \times \frac{1}{2} = 2$

$= a = 4$

$a^2 = 16$

$\frac{x^2}{16} = \frac{y^2}{12} = 1$

$b^2 = a^2(1 - e^2)$

$= 16\left(1 - \frac{1}{4}\right)$

$= 16 \times \frac{3}{4}$

$b^2 = 12$

55. Ⓑ

$$\frac{2b^2}{a}=\frac{1}{\cancel{2}}.\cancel{2}a \quad \Rightarrow\ 2b^2=a^2$$

$$\Rightarrow\ \frac{b^2}{a^2}=\frac{1}{2}$$

$$e^2=1-\frac{b^2}{a^2}$$

$$=1-\frac{1}{2}$$

$$=\frac{1}{2}\ \ \therefore\ e=\frac{1}{\sqrt{2}}$$

56. Ⓑ

$$\frac{(x-1)^2}{16}+\frac{(y-2)^2}{9}=\sin^2\theta+\cos^2\theta=1$$

$$\Rightarrow\ \frac{(x-1)^2}{16}+\frac{(y-2)^2}{9}=1$$

57. Ⓓ

$$e^2=1-\frac{b^2}{a^2}=1-\frac{9}{16}=\frac{7}{16}$$

$$\Rightarrow\ e=\frac{\sqrt{7}}{4}\ \Rightarrow \text{None of these}$$

58. Ⓐ

$$e_1^2=1+\frac{b^2}{a^2}=\frac{a^2+b^2}{a^2}\ \Rightarrow\ \frac{1}{e_1^2}=\frac{a^2}{a^2+b^2}$$

$$e_2^2=\frac{a^2+b^2}{b^2} \qquad \Rightarrow\ \frac{1}{e_2^2}=\frac{b^2}{a^2+b^2}$$

$$\frac{1}{e_1^2}+\frac{1}{e_2^2}=\frac{a^2+b^2}{a^2+b^2}=1$$

59. Ⓑ

$$e^2=1+\frac{a^2}{a^2}=1+1=2\ \ \therefore\ e=\sqrt{2}$$

60. Ⓓ

$$\frac{x}{a}=\frac{1}{2}\left(t+\frac{1}{t}\right)$$

$$\frac{y}{b}=\frac{1}{2}\left(t-\frac{1}{t}\right)$$

$$\left(\frac{x}{a}\right)^2-\left(\frac{y}{b}\right)^2=\frac{1}{4}\left[\left(t+\frac{1}{t}\right)^2-\left(t-\frac{1}{t}\right)^2\right]=\frac{1}{4}\times 4\times\cancel{t}\times\frac{1}{\cancel{t}}=1$$

$\Rightarrow \frac{x^2}{a^2}-\frac{y^2}{b^2}=1$

61. Ⓑ

$e^2=1+\frac{b^2}{a^2}=1+\frac{3^2}{4^2}=\frac{25}{16}=\frac{5^2}{4^2}$

$\Rightarrow e=\frac{5}{4}$

$y=\pm\frac{a}{e}=\pm\frac{4}{\frac{5}{4}}=\pm\frac{16}{5}$

62. Ⓒ

$\frac{x^2}{(\frac{12}{5})^2}=\frac{y^2}{(\frac{9}{5})^2}=1\Rightarrow e=\sqrt{1+\frac{b^2}{a^2}}=\sqrt{1+\frac{81}{144}}=\sqrt{\frac{225}{114}}=\frac{15}{12}$

$(ae,0)=\left(\frac{12}{5}\times\frac{15}{12},0\right)=(3,0)$ focus of the hyperbola.

Focus of the ellipse (ae, 0) = (4e, 0)

$\therefore\ 4e=3\ \Rightarrow\ e=\frac{3}{4}$

Now, $b^2=a^2(1-e^2)=16\left(1-\frac{9}{16}\right)=16\times\frac{7}{16}=7$

$\therefore\ b^2=7.$

63. Ⓓ

$16x^2-3y^2-32x+12y-44=0$

$\Rightarrow 16(x-1)^2-3(y-2)^2=48$

$\Rightarrow \frac{(x-1)^2}{3}-\frac{(y-2)^2}{16}=1$

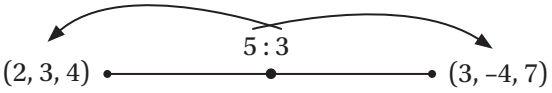
(A) transverse axis $=2\sqrt{3}$

(B) conjugate axis = 8

(C) centre = (1, 2)

(D) ecentricity $=e=\sqrt{\frac{19}{3}}$

64. Ⓒ



$\left(\frac{15+6}{5+3},\frac{-20+9}{5+3},\frac{35+12}{5+3}\right)$

$=\left(\frac{21}{8},\frac{-11}{8},\frac{47}{8}\right)$

65. Ⓓ

$P = (1, 2, 3),\ Q = (-1, -1, -1),\ R = (3, 5, 7)$

$PQ = \sqrt{(1+1)^2 + (2+1)^2 + (3+1)^2} = \sqrt{4+9+16} = \sqrt{29}$

$QR = \sqrt{16+36+64} = \sqrt{116} = 2\sqrt{29}$

$PR = \sqrt{4+9+16} = \sqrt{29}$

$\boxed{PQ + PR = QR} \Rightarrow$ P,Q,R Collinear

66. Ⓐ

$2x + 3y + 5z - 1$

$$-\frac{2\times1+3\times0+5\times(-3)-1}{2\times1+3\times-5+5\times7-1}$$

$$= -\frac{2-15-1}{2-15+35-1}$$

$$= -\left(\frac{-14}{21}\right)$$

$$= \frac{2}{3}$$

67. Ⓐ

Equation of x axis in 3D : $y = 0 = z$

68. Ⓓ

$(2, 1, 5),\ (3, 4, 5)$

$2x + 2y - 2z - 1$

$$-\left(\frac{2\times2+2\times1-2\times5-1}{2\times3+2\times4-2\times5-1}\right)$$

$$= -\left(\frac{4+2-10-1}{6+8-10-1}\right)$$

$$= -\left(\frac{-5}{3}\right)$$

$= 5 : 3$

69. Ⓐ

$$9 = \frac{5K+3}{K+1}$$

$$\Rightarrow K = -\frac{3}{2}$$

70. Ⓒ

distance $= (3\sin\theta - 4\cos\theta)$

Max value $= \sqrt{3^2 + (-4)^2} = 5$

71. Ⓓ

(A): $\frac{d}{dx}(x^3) = 3x^2$ False

(R): $\frac{d}{dx}\left(\frac{1}{x^3}\right) = \frac{-3}{x^4}$ True

72. Ⓐ

(A): $\lim_{n\to\infty}(\cos A \cos 2A \ldots\ldots \cos 2^{n-1}A)$, Let, $\frac{x}{2^n} = A$

$= \lim_{n\to\infty} \frac{\sin 2^n A}{2^n \sin A}$

$= \lim_{n\to\infty} \frac{\sin 2^n \cdot \frac{x}{2^n}}{2^n \cdot \sin\left(\frac{x}{2^n}\right)}$

$= \lim_{n\to\infty} \frac{\sin x}{x \cdot \frac{\sin\left(\frac{x}{2^n}\right)}{\left(\frac{x}{2^n}\right)}}$

$= \frac{\sin x}{x}$ True

(R) : True

73. Ⓐ

Centre : (–1, 0) $\frac{(x-2y+1)^2}{36} + \frac{(2x+y+2)}{20} = 1$

$\left.\begin{matrix} x-2y+1=0 \\ 2x+y+2=0 \end{matrix}\right\}$ Solving $x = -1, y = 0$

74. Ⓑ

$2x + y + 2 = 0$

75. Ⓓ

Minor axis $= 2\sqrt{20} = 4\sqrt{5}$

Mathematics

76. Ⓑ

Hastening ripening of fruits

Ethylene causes softening due to enzymatic breakdown of the cell walls, starch hydrolysis and sugar accumulation.

77. Ⓑ

Plant development is dependent on the environment

Cont.. 12

78. Ⓐ
2

79. Ⓒ
Oxygen
Molecular oxygen is a strong oxidising agent, and so an excellent electron acceptor

80. Ⓓ
Acetyl CoA
The three substrates have to be first broken down to Acetyl CoA before entering mitochondria

81. Ⓒ
A is true but R is false
Lipids can also be used as a respiratory substrate

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

83. Ⓑ
Both A and Rare true but R is not the correct explanation of A
The free energy released by the hydrolysis of ATP and GTP is the same. However, GTP is the main energy currency for ribosome biogenesis and function

84. Ⓒ
A is true but R is false
Apical dominance is the suppression of growth of lateral buds to promote the growth of apical buds

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

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

87. Ⓐ
Formation of new protoplasm
New protoplasm causes formation of new cells, which includes subsequent formation of cell wall and vacuole.

88. Ⓐ
B
One daughter cell remains meristematic while the other differentiates and matures

89. Ⓒ
Lag phase

90. Ⓒ
Linear graph
One daughter cell remains meristematic while the other differentiates and matures

91. Ⓒ

Three

Pyruvic acid is a 3C compound

92. Ⓐ

10, 2 and 8

10 molecules of ATP are formed in glycolysis out of which, 2 molecules of ATP are required to transport the NADH produced during glycolysis to the mitochondrion. Hence, the net gain of ATP in glycolysis is 8.

93. Ⓑ

ABA

94. Ⓑ

ABA

95. Ⓑ

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

96. Ⓐ

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

97. Ⓒ

A is true but R is false

The ripe bananas produce ethylene

98. Ⓐ

Oxidative phosphorylation

99. Ⓒ

ATP synthase

100. Ⓐ

1