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1. (3)
   For $f = 0$, $x_c = \infty$, $z = \infty$
   For $f = \infty$, $x_L = \infty$, $z = \infty$

2. (2)
   $X_L = \omega L$
   $= 2\pi f L$

3. (2)
   $\tan \theta = \frac{X_L}{R}$
   $= \frac{2\pi f L}{R}$
   $= \frac{2 \times \pi \times 200}{300} \times \frac{1}{\pi}$
   $= \frac{4}{3}$

4. (4)
   $i_{\text{rms}}^2 = \int_0^T i^2 \frac{Rdt}{T} \Rightarrow \int_0^T i^2 dt = \frac{T^5}{5}$

5. (3)
   $V/4f = 512 \text{Hz}$
   $V/2f = 1024 \text{Hz}$

6. (3)
   All spokes are in parallel so emf will be same.

7. (3)
   By definition of time constant.

8. (2)
   $i = \frac{E}{R(1 - e^{-Rt/L})}$
   $i(t=1) = \frac{E}{R} (1 - e^{-R/2L})$
   $= \frac{E}{R} (1 - e^{-2})$
   $= \frac{E}{R} \left( \frac{e^2 - 1}{e^2} \right)$
   $i(t=\infty) = \frac{E}{R}$

9. (1)
   $\Delta Q_{AC} = W_{AC} + \Delta U_{AC}$
   $20 \text{ cal} = 50 \text{ J} + \Delta U$
   $84 \text{ J} - 51 \text{ J} = \Delta U$
   $\Delta U = 34 \text{ J}$

10. (2)
    $x = A \sin \frac{2\pi}{4} t$
    $\frac{A}{2} = A \sin \frac{2\pi}{4} \times t$
    $2\pi t = \frac{\pi}{6}$
11. (4)

Use FLH rule

12. (2)

While entering magnetic field emf = Blv and current anticlockwise while exiting magnetic field emf = Blv and current clockwise.

13. (3)

The front face of coil will behave like N-pole

14. (2)

\[ I_{\text{rms eq}}^2 = I_{\text{rms1}}^2 + I_{\text{rms2}}^2 \]

15. (2)

Let currents 4 \( \pi \) resistor be \( i_1 \) and in 5 \( \pi \) resistor be \( i_2 \)

then \( \frac{i_2^2}{2} \times 5 = 10 \)

\[ \therefore i_2 = \sqrt{2} \]

Now \( i_1(4 + 6) = i_2 \times 5 \)

\[ \therefore i_1 = \sqrt{2} \times \frac{5}{10} = \frac{\sqrt{2}}{2} \]

\[ \therefore H_{4\Omega} = i_1^2 \times 4 = 2 \frac{\sqrt{2}}{3} \]

16. (3)

For same brightness

\[ \epsilon_{\text{rms}} = 12V \]

\[ \therefore \epsilon_0 = 12\sqrt{2}V \]

17. (1)

\[ \cos \theta = \frac{1}{2} = \frac{R}{z} \]

\[ \therefore z = 200 \]

\[ \sqrt{R^2 + X_L^2} = 200 \]

\[ \therefore 100^2 + X_L^2 = 200^2 \]

\[ 2\pi fL = 100\sqrt{3} \]

\[ \therefore L = \frac{100\sqrt{3}}{2 \times \pi \times 50} \]

\[ \therefore L = \frac{\sqrt{3}}{\pi} \]

18. (1)

\[ \tan \theta = \frac{X_L}{R} \text{ or } \frac{X_e}{R} \]

\[ \therefore 1 = \frac{2\pi fL}{R} \text{ or } 1 = \frac{1}{2\pi fC R} \]

19. (2)
\[ E_B - E_A = \frac{\omega}{2} B ((\beta l/4)^2 - (1/4)^2) \]
\[ = \frac{\omega}{2} B \times \frac{1^2}{2} \]

20. (1)
On introducing iron rod \( \mu \) inc
\( \therefore \) L inc \( \therefore \) X\(_L\) inc \( \therefore \) Zinc
\( \therefore \) i\(_{dec}\) \( \therefore \) bulb will become dimmer

21. (1)
On introducing dielectric C inc \( \therefore \) X\(_C\) \( \therefore \) \( \therefore \) dec
\( \therefore \) l inc \( \therefore \) bulb will become brighter.

22. (1)

23. (2)

24. (1)

Since input is DC
\( \therefore \) output = 0

26. (1)
When the key is just closed inductor behaves as open circuit
\( \therefore \) \( i = 3/30 = 0.1A \)

27. (2)
\[ V_C = \frac{1}{2} U_{c_{max}} \]
\[ q^2 = \frac{Q^2}{2c} \]
\[ q = 0 / \sqrt{2} \]

28. (4)
\[ p_1 = 3600\omega = V_1I_1 \]
\( \therefore \) \( V_1 = 360V \)
\[ p_0 = \eta P_1 = 0.75 \times 3600 \]
\[ p_0 = 2700 = V_0I_0 \]
\( \therefore \) \( V_0 = 135V \)

29. (4)
\[ \varepsilon = NAB\omega \sin \omega t \]
\[ \varepsilon_{rms} = \frac{NAB\omega}{\sqrt{2}} = \frac{10 \times a^2 B\omega}{\sqrt{2}} \]

30. (4)
\[ |\varepsilon| = \frac{\Delta \phi}{\Delta t} \]
\[ = \frac{8 \times 10^{-4}}{0.4} \]
\[ = 20 \times 10^4 \]
\[ = 2 \times 10^{-3} \]

31. (4)
\[ \varepsilon_A = \varepsilon_B = \frac{1}{2} B l^2 \omega \]

32. (2)
\[ X_L = 2\pi fL \]
= 2\pi \times 50 \times 0.01
= 3.14\pi

33. (1)
\begin{align*}
i &= \frac{e}{R} = \frac{d\phi}{dt} = \frac{BdA}{dt} \\
&= \frac{B \int (r d\theta)(r)}{R} \\
i &= \frac{1}{2} \frac{Br^2 \omega}{R}
\end{align*}

34. (2)
The front face of coil will behave like N-pole motion responsible for induced emf.

35. (1)
\varepsilon_{\text{CD}} = 0 \text{ as } \vec{v} || \vec{\hat{i}}

Also i = 0, as \phi = \text{constant}

36. (3)
\begin{align*}
\varepsilon &= B_1 l_1 v_{\perp} \\
&= B(2l \sin \frac{\theta}{2})v
\end{align*}

37. (2)
Lenz’s law

38. (3)
\begin{align*}
\varepsilon &= B_\parallel v_\parallel \\
&= B_{\text{H}} \tan \delta l_\parallel v \\
\varepsilon &= 0.5 \times 10^{-4} \times \tan 60^\circ \times 10 \times 1.5 \times 330 \\
\varepsilon &= 0.43
\end{align*}

39. (1)
Use lenz’s law

40. (1)
\begin{align*}
[x] &= [B] = \text{L}^1 \\
\therefore [A] &= ([V] [x])/[x] \\
&= \frac{M^1 L^2 T^{-2}}{L^{1/2}} \cdot L^1 \\
&= M^1 L^{5/2} T^{-2}
\end{align*}

41. (1)
\begin{align*}
S_{AB} &= 20t + \frac{1}{2} \times 1 \times t^2 \\
&= 10t + \frac{1}{2} \times 2 \times t^2 \\
\Rightarrow 10 &= \frac{t^0}{2} \\
t &= \sqrt{20} \\
\therefore S_{AB} &= 20\sqrt{20} + \frac{1}{2} \times 1 \times 20^2 \\
&= 400 \times 200 \\
&= 600 \text{ m}
\end{align*}

42. (3)
\vec{v}_\text{net} = \vec{v}_\text{translatory} + \vec{v}_\text{rotatory}
\[ v_{\text{translatory}} = v_{\text{rotatory}} = R\omega \]

43. \( v_{\text{escape}} \sqrt{v_{\text{tangent}}} \)

\[ wR = \sqrt{\frac{2GM}{R}} \]

44. \( h \propto \frac{1}{r} \)

45. Contribution of fields are equal

**CHEMISTRY**

91. \( \text{(2)} \)

92. \( \text{(2)} \)

Chemical methods and conventional farming practices are not used in organic farming

93. \( \text{(3)} \)

Thuorside is extracted from *Bacillus thuringiensis*.

94. \( \text{(1)} \)

95. \( \text{(4)} \)

Nucleopolyhedrovirus are narrow spectrum insecticides, species-specific and not harmful to non-target insects.

96. \( \text{(2)} \)

97. \( \text{(3)} \)

*Aspergillus niger* is a producer of citric acid *Clostridium butylicum* is a producer of butyric acid.

98. \( \text{(3)} \)

99. \( \text{(1)} \)

100. \( \text{(2)} \)

Polyethylene glycol is used in fusion of the two naked protoplasts.

101. \( \text{(2)} \)

Somaclones are the plants which are genetically identical to the original plant from which they are grown.

102. \( \text{(3)} \)

SCP is a mass culture of both unicellular and multicellular microbes. It is time saving technique.

103. \( \text{(3)} \)

104. \( \text{(2)} \)

105. \( \text{(3)} \)

106. \( \text{(1)} \)

Back rot of crucifers is caused by *Xanthomonas campestris* (*Bacterium*). Rest all are fungal disease.

107. \( \text{(2)} \)

108. \( \text{(1)} \)

109. \( \text{(4)} \)

110. \( \text{(3)} \)

111. \( \text{(4)} \)

B-Template strand

A-Coding strand

C-Structural gene

112. \( \text{(2)} \)

RNA pol-III transcribes 5 Sr RNA only.

113. \( \text{(2)} \)

Sequences used for DNA fingerprinting generally do not code for any proteins.
114. (3) Less than two percent of the genome codes for protein
115. (3) Structural gene is polycistronic
   Allolactose is the inducer. Glucose and galactose are repressors
116. (3) Coupled transcription and translation occurs in prokaryotes
118. (3) A-DNA
   C-Histone octamer
119. (2) Split gene arrangements in eukaryotes probably represent a primitive feature of genome.
122. (2) Polycistronic structural genes are seen in bacteria.
124. (2) The DNA polymerase cannot initiate the process of replication on its own. It needs a free 3'-OH group to add the nucleotide which is provided by the primer.
126. (2) Auxins promote abscission of leaves and fruits at mature stages
   IAA is a natural auxin and 2, 4 D is a synthetic auxin.
130. (2) Oosphere (egg) - 10 chromosomes
   Embryo - 20 chromosomes
   Embryo sac - 10 chromosomes
   Tube nucleus 10 chromosomes
   Endosperm - 30 chromosomes
   Aleurone layer - 30 chromosomes
   Cotyledons - 20 chromosomes
132. (1) In Birds, ZW–ZZ sex determination is found. Therefore, female plays an important role in sex determination
134. (2) ♀ carrier for x-linked recessive trait
       Affected male
135. (4) ZOOLOGY
136. (3) Polio is a viral disease where as Tetanus & Diphtheria are bacterial diseases.
137. (3) Thyroid gland is an endocrine glands where as other are exocrine glands.
Papillary muscles are the muscular ridges in ventricles.

Cockroach is dioecious.

Ontogeny recapitulates phylogeny means developmental history of an animal repeats its evolutionary history.

As per Hardy-Weinberg equilibrium mating should be completely random.

Interferons are low molecular weight proteins which are produced by virus infected cells.

Histamine causes dilation of the capillaries.

B-lymphocytes are antibody factories.

Kidneys play role excretion an osmoregulation.

MRI is magnetic resonance imaging.

Morphine is extracted from latex of *Papaver somniferum*.

Amoebiasis and malaria are caused by protozoans

Malignant malaria is also called black water fever because hemoglobin appears in urine of the patient and urine turns black.

*Gambusia* fish feeds on mosquitoes larvae.
Cords of Billroth are present in the red pulp of spleen.