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SAMPLE PAPER - 115

Time : 1 : 15 Hr. **Question : 60**

PHYSICS

01. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes:
(1) double (2) half
(3) four times (4) one-fourth

02. The frequency of the incident light falling on a photosensitive metal plate is doubled, the kinetic energy of the emitted photoelectron is
(1) Double the earlier value
(2) Unchanged
(3) More than doubled
(4) Less than doubled

03. The period of revolution of an electron in the ground state of a hydrogen atom is T. The period of revolution of the electron in the first excited state is
(1) 2T (2) 4T (3) 6T (4) 8T

04. As per Bohr model, the minimum energy (in eV) required to remove an electron from the ground state of doubly ionized Li atom (Z = 3) is
(1) 1.51 (2) 13.6 (3) 40.8 (4) 122.4

05. The fraction of atoms of a radioactive element that decays in 6 days is $\frac{7}{8}$. The fraction that decays in 10 days will be
(1) $\frac{77}{80}$ (2) $\frac{71}{80}$ (3) $\frac{31}{32}$ (4) $\frac{15}{16}$

06. If the radius of ^{27}Al nucleus is R_1, then the radius of $_{53}{}^{125}Te$ will be
(1) $\frac{5}{3}R_1$ (2) $\frac{3}{5}R_1$ (3) $\left(\frac{13}{53}\right)^{\frac{1}{2}}R_1$ (4) $\left(\frac{53}{13}\right)^{\frac{1}{3}}R_1$

07. In a reverse-biased diode when the applied voltage changes by 1 V, the current is found to change by 0.5 μA. The reverse bias resistance of the diode is
(1) $2\times10^5\Omega$ (2) $2\times10^6\Omega$
(3) 200Ω (4) $22\ \Omega$

08. The electron density of intrinsic semiconductor at room temperature is 10^{16} m^{-3}. When doped with a trivalent impurity, the electron density is decreased to 10^{14} m^{-3} at the same temperature. The majority carrier density is
(1) 10^{16} m^{-3} (2) 10^{18} m^{-3}
(3) 10^{21} m^{-3} (4) 10^{20} m^{-3}

09. Moment of inertia of a body about a given axis is 1.5 kg m^2. Initially the body is at rest. In order to produce a rotational kinetic energy of 1200 J, the angular acceleration of 20 rad/s^2 must be applied about the axis for a duration of:
(1) 2 s (2) 5 s (3) 2.5 s (4) 3 s

10. Consider the earth as uniform sphere of mass M and radius R. Imagine a straight smooth tunnel made through the earth which connects any two points on its surface. Determine the time that a particle a would take to go form one end to the other through the tunnel.
(1) $2\pi\sqrt{\frac{R^3}{GM}}$ (2) $\pi\sqrt{\frac{R^3}{GM}}$
(3) $\frac{\pi}{2}\sqrt{\frac{R^3}{GM}}$ (4) None of these

11. A block of mass 2 kg is attached to the spring of spring constant 50 N/m. The block Is pulled to a distance of 5 cm from Its equilibrium position (at x = 0) on a horizontal frictionless surface and released at t = 0 from rest. The expression for its displacement at anytime t is
(1) $5\sin(5t + \pi/2)$ (2) $\sin(5t + \pi/2)$
(3) $5\sin(5t + 3\pi/2)$ (4) $5\sin(t + \pi/2)$

12. Speed of sound wave in air
(1) is independent of temperature.
(2) increases with pressure.
(3) increases with increase in humidity.
(4) decreases with increase in humidity.

13. The fundamental frequency of a string stretched with a weight of 4 kg is 256 Hz. The weight required to produce Its octave is
(1) 16 kg – wt (2) 12 kg – wt
(3) 24 kg – wt (4) 8 kg – wt

14. A tuning fork of frequency 480 Hz is used in an experiment for measuring speed of sound (n) in air by resonance tube method. Resonance is observed to occur at two successive lengths of the air column, $l_1 = 30$ cm and $l_2 = 70$ cm. Then n is equal to:
(1) 332 ms^{-1} (2) 379 ms^{-1}
(3) 384 ms^{-1} (4) 338 ms^{-1}

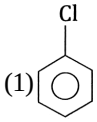
15. The self inductance L of a solenoid of length l and area of cross-section A, with a fixed number of turns N increases as
(1) l and A increase.
(2) l decreases and A increases.
(3) l increases and A decreases.
(4) both l and A decrease.

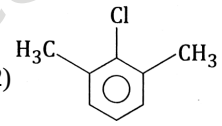
CHEMISTRY

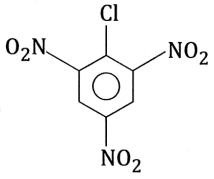
16. The d-electronic configuration of Cr^{2+}, Mn^{2+}, Fe^{2+} and Ni^{2+} are $3d^4$, $3d^5$, $3d^6$ and $3d^8$ respectively. Which one of the following aqua complexes will exhibit minimum paramagnetic behaviour?
(At. No. Cr = 24, Mn = 25, Fe = 26, Ni = 28)
(1) $[Fe(H_2O)_6]^{2+}$ (2) $[Ni(H_2O)_6]^{2+}$
(3) $[Cr(H_2O)_6]^{2+}$ (4) $[Mn(H_2O)_6]^{2+}$

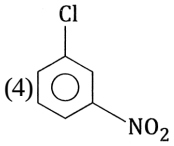
17. What kind of isomerism exists between $[Cr(H_2O)_6]Cl_3$ (violet) and $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ (green)?
(1) Linkage isomerism
(2) Solvate isomerism
(3) Ionisation isomerism
(4) Coordination isomerism

18. In which of the following cases the replacement of Cl by OH group is not possible?

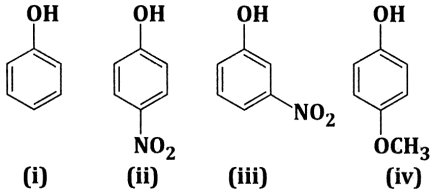
(1) 

(2) 

(3) 

(4) 

19. Mark the correct order of decreasing acid strength of the following compounds:



(1) iv > ii > i > iii (2) ii > iii > i > iv
(3) i > ii > iii > iv (4) iv > iii > ii > i

20. The most suitable reagent for the conversion of $R–CH_2–OH \longrightarrow RCHO$ is :
(1) $K_2Cr_2O_7$
(2) CrO_3
(3) PCC (Pyridinium chlorochromate)
(4) $KMnO_4$

21. Which of the following will not reduce Fehling solution?
(1) HCOOH (2) HCHO
(3) CH_3COOH (4) CH_3CHO

22. Which of the following shows the correct decreasing order of basic strength of
(I) $C_2H_5NH_2$, (II) $(C_2H_5)_2NH$, (III) $C_6H_5NH_2$, (IV) NH_3?
(1) I > II > III > IV
(2) II > I > IV > III
(3) II > I > III > IV
(4) I > II > IV > III

23. During electrolysis of H_2O, the molar ratio of H_2 and O_2 fromed is:
(1) 2 : 1 (2) 1 : 2 (3) 1 : 3 (4) 1 : 1

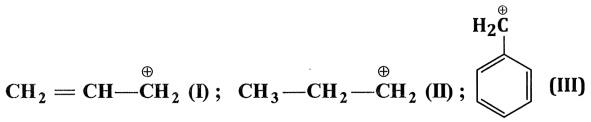
24. At room temperature, the reaction between NO and O_2 to give NO_2 is fast, while that between CO and O_2 is slow. It is due to:
(1) CO is smaller in size than that of NO
(2) CO is poisonous
(3) the activation energy for the reaction, $2NO + O_2 \longrightarrow 2NO_2$ is less than $2CO + O_2 \longrightarrow 2CO_2$
(4) none of the above

25. The electronegativity of the following elements increases in the order:
(1) C, N, Si, P (2) N, Si, C, P
(3) Si, P, C, N (4) P, Si, N, C

26. Which of the following is not an actinoid?
(1) Curium, (Z = 96) (2) Californium, (Z = 98)
(3) Uranium, (Z = 92) (4) Terbium, (Z = 65)

27. Atomic radii of C and H atoms are 77 pm (for single bond) and 37 pm respectively. The bond length of C–H bond is likely to be:
(1) 114 pm
(2) 40 pm
(3) more than 114 pm
(4) less than 114 pm

28. The order of stability of the following carbocations is:



(1) III > II > I (2) II > III > I
(3) I > II > III (4) III > I > II

29. How many chain isomers are represented by the formula C_5H_{12}?
(1) 2 (2) 3
(3) 4 (4) 1 only

30. Hex-1-ene reacts with HBr in the absence of peroxide to give 'A' and in the presence of peroxide to give 'B'. What are 'A' and 'B'?
(1) A–1-Bromohexane; B–2-Bromohexane
(2) A–2-Bromohexane; B–1-Bromohexane
(3) A–1-Bromohexane; B–1-Bromohexane
(4) A–2-Bromohexane; B–2-Bromohexane

BOTANY

31. Leaves of which of the following plant shows environmental heterophylly?
(1) Cotton (2) Coriander
(3) Larkspur (4) Buttercup

32. A trihybrid cross is made between two yeasts, both with genotypes AaBbCc. What proportion of the offspring will be genotype aabbcc?
(1) 0 (2) $\frac{1}{4}$ (3) $\frac{1}{16}$ (4) $\frac{1}{64}$

33. Operon unit consists of
(1) regulator, operator and repressive gene
(2) regulator, structure and operator gene
(3) regulator, structure, operator and promotor gene
(4) regulator, structural promotor gene

34. Match list-I (factors/enzyme) with list-II (activities) and select the correct answer using the codes given below the Lists.

	List-I (Factor/ Enzyme)		List-II (Activities)
A.	Sigma factor	1.	Termination of transcription
B.	Rho factor	2.	Removal of RNA primer from newly synthesized DNA strand
C.	DNA polymerase-I	3.	Correct initiation of transcription
D.	Amino-acyl synthetase	4.	Correct initiation of DNA replication
		5.	Attachment of amino acid to t-RNA

(1) A–2; B–5; C–4; D–1 (2) A–3; B–1; C–2; D–5
(3) A–2; B–1; C–4; D–5 (4) A–3; B–5; C–2; D–1

35. Semiconservative replication of DNA was first demonstrated in
(1) Streptococcus pneumoniae
(2) Salmonella typhimurium
(3) Drosophila melanogaster
(4) Escherichia coli

36. Spliceosomes are not found in cells of
(1) Plants (2) Fungi
(3) Animals (4) Bacteria

37. Cistron is functional unit of gene that
(1) specifies the synthesis of polypeptides
(2) specifies the mutations
(3) specifies the recombination
(4) All of the above

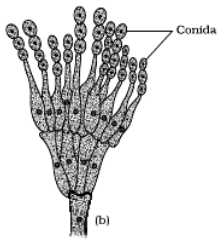
38. Match the following columns.

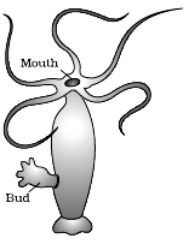
	Column-I		Column-II
A.	Test cross	1.	9 : 3 : 3 : 1
B.	Monohybrid cross	2.	T t × t t
C.	Back cross	3.	T t × T T
D.	Dihybrid cross	4.	3 : 1

(1) A–2; B–4; C–3; D–1
(2) A–2; B–4; C–1; D–4
(3) A–3; B–4; C–1; D–2
(4) A–1; B–4; C–1; D–4

39. For given figure select the correct option:

(A) 

(B) 

(C) 

(D) 

(1) D-Zoospore in Chlamydomonas, B-Conidia of Penicillium
(2) A-Zoospore in Chlamydomonas, B-Conidia of Penicillium
(3) C-Bud in Hydra, B-Conidia of sponge
(4) D-Gemmules in sponge, A-Zoospore in Hydra

40. A population of lotus plants in a pond is 450 in the starting of January 2014. It has a birth rate of 0.2/lotus plant/month. The number of plants after 2 months will be:
(1) 630 (2) 540
(3) 610 (4) 648

41. The anther wall consists of four wall layers where:
(1) Endothecium lies inner to middle layers
(2) Tapetum lies just inner to endothecium
(3) Tapetum lies next to epidermis
(4) Middle layers lie between endothecium and tapetum

42. Match the columns.

	Biological control agent		Pests
(A)	Lady birds	(i)	Butterfly caterpillar
(B)	Bacillus thuringiensis	(ii)	Mosquitoes
(C)	Dragon fly	(iii)	Jassids
(D)	Trichoderma	(iv)	Aphids
		(v)	Root pathogen

(1) (A)–(ii, iii); (B)–(i); (C)–(iv); (D)–(v)
(2) (A)–(iii, iv); (B)–(ii); (C)–(i); (D)–(v)
(3) (A)–(iv); (B)–(i); (C)–(v); (D)–(iii)
(4) (A)–(iv); (B)–(i); (C)–(ii); (D)–(v)

43. Match the column and select correct option:

	Column-I		Column-II
A.	Fragmentation	i.	Release of inorganic nutrients from humus by some microbes
B.	Leaching	ii.	Formation and accumulation of a dark coloured amorphous substance in soil
C.	Catabolism	iii.	Break down detritus into smaller particles
D.	Humification	iv.	Water soluble inorganic nutrients go down into the soil horizon
E.	Mineralisation	v.	Bacterial and fungal enzymes degrade detritus into simpler inorganic substances

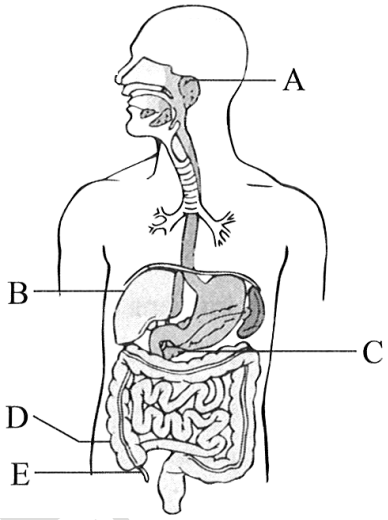
(1) (A)-(iii); (B)-(iv); (C)-(ii); (D)-(v); (E)-(i)
(2) (A)-(ii); (B)-(i); (C)-(iv); (D)-(v); (E)-(ii)
(3) (A)-(v); (B)-(ii); (C)-(iv); (D)-(i); (E)-(iii)
(4) (A)-(iii); (B)-(iv); (C)-(v); (D)-(ii); (E)-(i)

44. Which one is correct?
(1) India has more than 50,000 genetically different strains of rice and 1,000 varieties of mango
(2) Western Ghats have a greater amphibian species diversity than the Eastern Ghats
(3) India has a greater ecosystem diversity than a Norway
(4) All are correct

45. Select the correct percentages for the organism groups which are facing threat (with respect to all the organisms of their group)?
(1) Amphibia–32%, Gymnosperm–31%, Mammals–23%, Reptiles–12%
(2) Amphibia–32%, Gymnosperm–31%, Birds–3%, Reptiles–12%
(3) Amphibia–31%, Angiosperm–32%, Mammals–23%, Reptiles–12%
(4) Amphibia–32%, Gymnosperm–31%, Mammals–23%, Birds–12%

ZOOLOGY

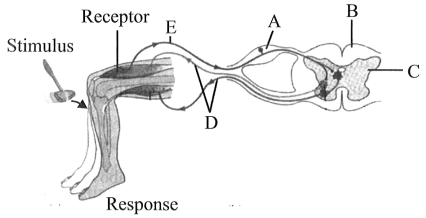
46. The given figure represents the human digestive system, Identify A, B, C, D and E.



(1) A–Parotid gland; B–Liver; C–Pancreas; D–Caecum; E–Vermiform appendix
(2) A–Parotid gland; B–Pancreas; C–Liver; D–Caecum; E–Vermiform appendix
(3) A–Parotid gland; B–Caecum; C–Pancreas; D–Liver; E–Vermiform appendix
(4) A–Parotid gland; B–Liver; C–Caecum; D–Pancreas; E–Vermiform appendix

47. Read the following statement and choose correct one.
(1) RBC have an average life span of 120 days after which these are destroyed in liver.
(2) Basophils secretes histamine, serotonin, heparin etc. and are involved in inflammatory reactions.
(3) Leucocytes are non-nucleated cells and are relatively lesser in number.
(4) Eosinophils are maximum among granulocytes and these infections.

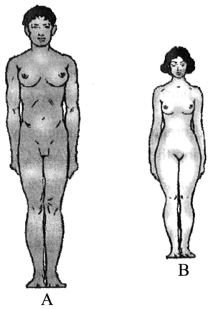
48. The given diagrammatic representation of reflex action shows knee jerk reflex.



Identify the parts labeled as A to E and select the correct option.

(1) A–Dorsal root ganglion; B–White matter; C–Gray matter; D–Afferent pathway; E–Efferent pathway
(2) A–Dorsal root ganglion; B–White matter; C–Gray matter; D–Efferent pathway; E–Afferent pathway
(3) A–Ventral root ganglion; B–Gray matter; C–White matter; D–Efferent pathway; E–Afferent pathway
(4) A–Ventral root ganglion; B–White matter; C–Gray matter; D–Efferent pathway; E–Afferent pathway

49. Identity the disease shown by the figure:



A (Tall stature with feminised character)
B (Short stature and underdeveloped feminine character)

(1) A–Down's syndrome; B–Turner's Syndrome
(2) A–Klinefelter's syndrome; B–Turner's syndrome
(3) A–Muscular dystrophy; B–Klinefelter's syndrome
(4) A–Turner's syndrome; B–Down's syndrome

50. L.S.D., Morphine and Bhang are respectively obtained from:
(1) Claviceps, Rauwolfia and Papaver
(2) Claviceps, Papaver and Cannabis
(3) Cannabis, Claviceps and Fusarium
(4) Claviceps, Cannabis and Rauwolfia

51. 2A + XO Drosophila is:
(1) sterile male (2) intersex
(3) fertile female (4) infertile female

52. Match the columns and find out the correct combination:

A.	Gastric inhibitory peptide	1.	Stimulate the exocrine cells of pancreas
B.	Gastrin	2.	Inhibit the secretion of gastric juice
C.	Cholecystokinin	3.	Secretion of bile juice
D.	Secretin	4.	Secretion of pepsinogen

(1) A–2; B–4; C–3; D–1
(2) A–2; B–1; C–3; D–4
(3) A–2; B–1; C–4; D–3
(4) A–1; B–2; C–3; D–4

53. The first menstruation which begins at puberty is called
(1) Menstrual cycle (2) Menarche
(3) Oogenesis (4) Ovulation

54. The structural and functional unit between the foetus and maternal blood is known as
(1) Inner cell (2) Placenta
(3) Trophoblast (4) Chorionic villi

55. In humans, at the end of the first meiotic division, the male germ cells differentiate into the
(1) Spermatids
(2) Spermatozonia
(3) Primary spermatocytes
(4) Secondary spermatocytes

56. Select the correct matching.
(1) Lepidopterans –Tobacco bud worm, armyworm
(2) Coleopterans – Beetles and bud worm
(3) Dipterans – Flies mosquitoes, spiders
(4) Aves – Lady bird, hummingbird

57. Production of human protein in bacteria by genetic engineering is possible because
(1) the human chromosome can replicate in bacterial cell
(2) the mechanism of gene regulation is identical in human and bacteria
(3) bacterial cell can carry out the RNA splicing reactions
(4) the genetic code is universal

58. Which of the following enzymes are used to join bits of DNA?
(1) ligase (2) primase
(3) DNA polymerase (4) endonuclease

59. Which one of the following groups of animals is bilaterally symmetrical and triploblastic?
(1) Aschelminthes (Roundworms)
(2) Ctenophores
(3) Sponges
(4) Coelenterates (Cnidarians)

60. The size of cockroach ranges from
(1) ¼" to 3" (2) 1 to 3"
(3) 2 to 3" (4) ¼" to ¾"