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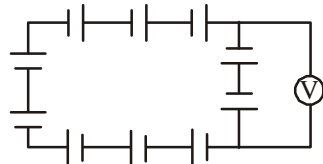
SAMPLE PAPER - 47

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

PHYSICS

01. The ratio of the weight of a man in a stationary lift and when it is moving downwards with uniform acceleration a is 3 : 2 then the value of a is

    (1) $\dfrac{3}{2}g$ (2) $\dfrac{g}{3}$ (3) g   (4) $\dfrac{2}{3}g$

02. A block of mass 10 kg is moving horizontally with a speed of 1.5 ms^{-1} on a smooth plane. If a constant vertical force 10 N acts on it, the displacement of the block from the point of application of the force at the end of 4 second is

    (1) 5 m   (2) 20 m   (3) 12 m   (4) 10 m

03. A body of mass m rests on a horizontal floor, with which it has a coefficient of static friction μ. It is desired to make the body move by applying the minimum possible force F. The magnitude of F is

    (1) μmg   (2) $\dfrac{\sqrt{1+\mu^2}}{\mu}mg$

    (3) $\mu\sqrt{1+\mu^2}\,mg$ (4) $\dfrac{\mu\,mg}{\sqrt{1+\mu^2}}$

04. Two men with weights in the ratio 4 : 3 run up a staircase in time in the ratio 12 : 11. The ratio of power of the first to that of second is

    (1) $\dfrac{4}{3}$ (2) $\dfrac{12}{11}$ (3) $\dfrac{48}{33}$ (4) $\dfrac{11}{9}$

05. A 5 kg shell kept at rest suddenly splits up into three parts. If two parts of mass 2 kg each are found flying due north and east with a velocity of 5 m/s each, what is the velocity of the third part after explosion ?

    (1) 10 m/s due north-east

    (2) $\dfrac{10}{\sqrt{2}}$ m/s due south-east

    (3) $10\sqrt{2}$ m/s due south-west

    (4) $10\sqrt{2}$ m/s due south-east

06. Two bodies of masses 2 kg and 4 kg are moving with velocities 20 ms^{-1} and 10 m s^{-1} towards each other due to mutual gravitational attraction. What is the velocity of their centre of mass ?

    (1) 5.3 m s^{-1} (2) 6.4 m s^{-1} (3) zero   (4) 8.1 m s^{-1}

07. A body of mass 0.5 kg travels in a straight line with velocity v = a x$^{3/2}$ where a = 5 m$^{-1/2}$s^{-1}. The work done by the net force during its displacement from x = 0 to x = 2 m is

    (1) 1.5 J   (2) 50 J

    (3) 10 J   (4) 100 J

08. Which of the following statement is true about the flow of electrons is an electric circuit?

    (1) Electrons always flow from lower to higher potential

    (2) Electrons always flow from higher to lower potential

    (3) Electrons always flow from lower to higher potential except through power sources.

    (4) Electrons flow from higher to lower potential except through power sources.

09. In a conductor, the current flows due to drifting of mobile charge carriers, ie, electrons (charge e and mass m). The mobility of charge carriers is

    (1) independent of m

    (2) directly proportional to m^2

    (3) inversely proportional to m

    (4) directly proportional to m

10. 10 electric cells each of emf E and internal resistance r are connected as shown in figure. The reading of an ideal voltmeter connected across two such cell is

    (1) 2E   (2) E   (3) zero   (4) 10E

11. In the circuit shown below, the current that flows from A to B when the switch S is closed is
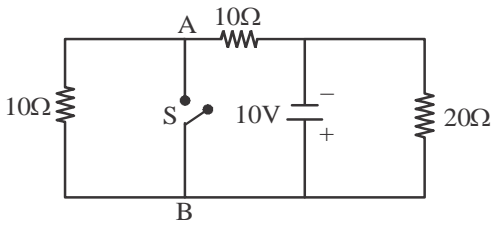
(1) –1.5 A (2) –1.0 A (3) +1.0 A (4) +1.5 A

12. A point performs simple harmonic oscillation of period T and the equation of motion is given by $x = a \sin\left(\omega t + \dfrac{\pi}{6}\right)$. After the elapse of what fraction of the time period the velocity of the point will be equal to half of its maximum velocity ?

(1) $\dfrac{T}{12}$ (2) $\dfrac{T}{8}$ (3) $\dfrac{T}{6}$ (4) $\dfrac{T}{3}$

13. The figure shows position time graph of a particle executing SHM. If the time period of SHM is 2 second, then the equation of SHM is
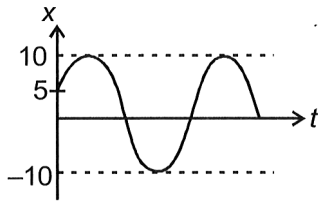

(1) $x = 10 \cos \pi t$ (2) $x = 5 \sin\left(\pi t + \dfrac{\pi}{3}\right)$

(3) $x = 10 \sin\left(\pi t + \dfrac{\pi}{3}\right)$ (4) $x = 10 \sin\left(\pi t + \dfrac{\pi}{6}\right)$

14. Gravitational potential in a region is given by V = – (x+y+ z) J/kg. Find the gravitational intensity at (2, 2, 2).

(1) $(\hat{i} + \hat{j} + \hat{k})\, N/kg$ (2) $2(\hat{i} + \hat{j} + \hat{k})\, N/kg$

(3) $3(\hat{i} + \hat{j} + \hat{k})\, N/kg$ (4) $4(\hat{i} + \hat{j} + \hat{k})\, N/kg$

15. The moment of inertia of a uniform circular disc about its diameter is l. Its moment of inertia about an axis parallel to its plane and passing through a point on its rim will be

(1) $3l$ (2) $4l$ (3) $5l$ (4) $6l$

CHEMISTRY

16. For the reaction $CO_{(g)} + Cl_{2(g)} \rightleftharpoons COCl_{2(g)}$, the K_p/K_c is equal to

(1) 1.0 (2) RT
(3) $\sqrt{RT}$ (4) 1/RT

17. pOH of 0.002 M HNO_3 is
(1) $11 + \log 2$ (2) $11 - \log 2$
(3) $-3 + \log 2$ (4) none of these

18. If 20 mL of 0.1 M NaOH is added to 30 mL of 0.2 M CH_6COOH ($pK_a = 4.74$), the pOH of the resulting solution is
(1) 4.44 (2) 9.56 (3) 8.96 (4) 9.26

19. The precipitate Ag_2CrO_4 ($K_{sp} = 1.9 \times 10^{-12}$) is obtained when equal volumes of the following are mixed:
(1) $10^{-4}\,M\,Ag^+ + 10^{-4}\,M\,CrO_4^{2-}$
(2) $10^{-2}\,M\,Ag^+ + 10^{-3}\,M\,CrO_4^{2-}$
(3) $10^{-5}\,M\,Ag^+ + 10^{-3}\,M\,CrO_4^{2-}$
(4) $10^{-4}\,M\,Ag^+ + 10^{-5}\,M\,CrO_4^{2-}$

20. The pH of 0.1 M CH_3COOH is 2.873. What is pH of 0.1 M NH_4OH? $K_a(CH_3COOH) = 1.8 \times 10^{-5}$ and $K_b(NH_4OH) = 1.8 \times 10^{-5}$.
(1) 11.127 (2) 2.873
(3) 7 (4) 9.53

21. The structure of isobutyl group in an organic compound is:
(1) $CH_3 - CH_2 - CH_2 - CH_2 -$

(2) $CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} -$

(3) $\begin{matrix} CH_3 \\ CH_3 \end{matrix}\!\!\!>\!CH - CH_2 -$

(4) $CH_3 - \overset{|}{CH} - CH_2 - CH_3$

22. Which of the following pairs of compounds are enantiomers?
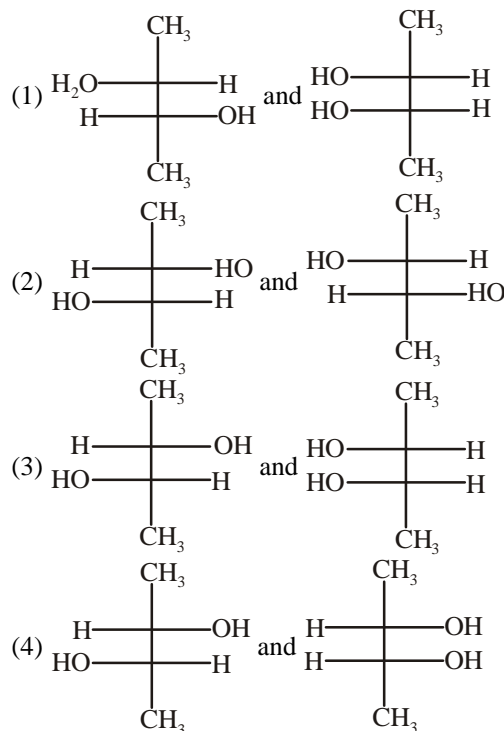
23. Among the following which one can have a meso form?
(1) $CH_3 - CH(OH) - CHCl - CH_3$
(2) $CH_3 - CH(OH) - CH(OH) - CH_3$
(3) $C_2H_5 - CH(OH) - CH(OH) - CH_3$
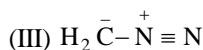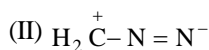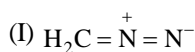(4) $HO - CH_2 - CH(Cl) - CH_3$

24. Maximum enol content is in:

(1)   (2)

(3)   (4)
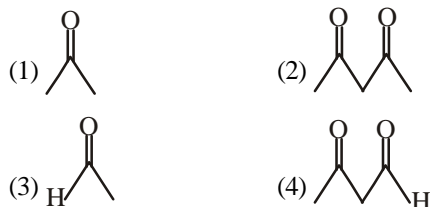
25. Which of the following is not an electrophile?
(1) Cl^+ (2) Na^+
(3) H^+ (4) BF_3

26. The correct stability order of the following resonance structures is

(I) $H_2C = \overset{+}{N} = N^-$

(II) $H_2 \overset{+}{C} - N = N^-$

(III) $H_2 \overset{-}{C} - \overset{+}{N} \equiv N$
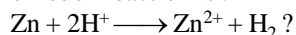
(IV) $H_2 \overset{-}{C} - N = \overset{+}{N}$
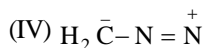
(1) (I) > (II) > (IV) > (III)
(2) (I) > (III) > (II) > (IV)
(3) (II) > (I) > (III) > (IV)
(4) (III) > (I) > (IV) > (II)

27. The bond dissociation energy of B – F in BF_3 is 646 kJ mol^{-1} whereas that of C – F in CF_4 is 515 kJ mol^{-1}. The correct reason for higher B – F bond dissociation energy as compared to that of C – F is
(1) smaller size of B-atom as copared to that of C-atom
(2) stronger σ-bond between B and F in BF_3 as compared to that between C and F in CF_4
(3) significant pπ–pπ interaction between B and F in BF_3 whereas there is no possibility of such interaction between C and F in CF_4
(4) lower degree of pπ–pπ interaction between B and F in BF_3 than that between C and F in CF_4

28. What type of redox reaction is :
$$Zn + 2H^+ \longrightarrow Zn^{2+} + H_2 ?$$
(1) Double decomposition reaction
(2) Displacement reaction
(3) Combination reaction
(4) None of these

29. When CO_2 is dubbled through a solution / suspension of barium peroxide in water
(1) O_2 is released   (2) carbonic acid is formed
(3) H_2O_2 is formed   (4) no reaction occurs

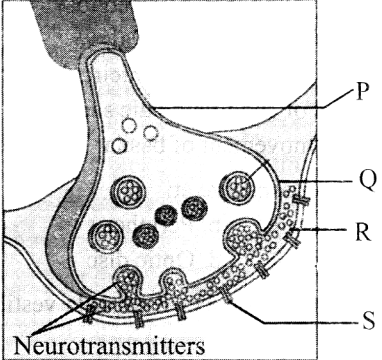30. Match the facts of Column–I with those of Column–II and select the correct choice.

	Column–I		Column–II
(p)	$Mg(HCO_3)_2 \xrightarrow{\Delta} Mg(OH)_2 \downarrow + 2CO_2$	(i)	Calgon method
(q)	$Mg(HCO_3)_2 + 2Ca(OH)_2 \rightarrow Mg(OH)_2 + 2CaCO_3 + 2H_2O$	(ii)	Clark's method
(r)	$Mg^{2+} + Na_2[Na_4(PO_3)_6] \rightarrow 4Na^+ + [Na_2Mg(PO_3)_3^{2-}]$	(iii)	Ion exchange method
(s)	$Mg^{2+} + 2NaZ \rightarrow 2Na^+ + MgZ$	(iv)	Boiling

(1) p–(i); q–(ii); r–(iii); s–(iv)
(2) p–(iv); q–(i); r–(ii); s–(iii)
(3) p–(iv); q–(ii); r–(iii); s–(i)
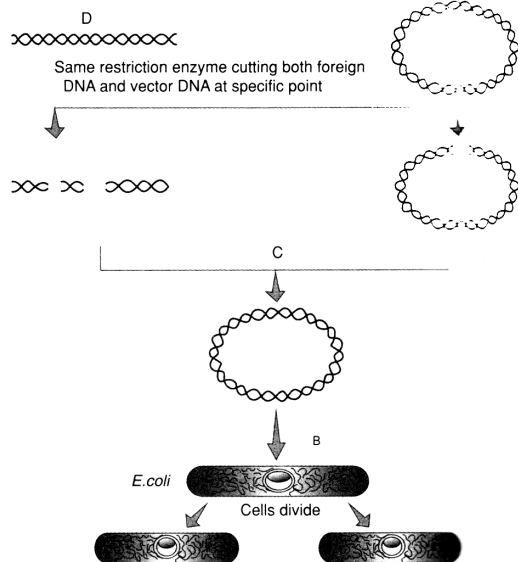(4) p–(iv); q–(ii); r–(i); s–(iii)

BOTANY

31. Kinetin is chemically
(1) Indole-3-acetic acid
(2) Terpenes
(3) N^6–furfurylamino purine
(4) Carotenoid

32. During mid-1960s, three independent researchers reported the purification and chemical characterization of three different kinds of inhibitors: inhibitor–B, abscission II and dormin. Later all the three were proved to be chemically identical. It was named
(1) Indole acetic acid
(2) Indole butyric acid
(3) Naphthalene acetic acid
(4) Abscisic acid

33. What would be happen if GA_3 is applied to rice seedlings?
(1) Plant show extra elongation
(2) Length of the plant decreases
(3) Bolting takes place
(4) Both (1) and (3)

34. Fill in the blanks:
1. Spraying sugarcane crop with ...A... increases in the length of the stem, thus increasing the yield by as much as ...B... tonnes per acre.
2. ...C... does not occur naturally in plants.
3. Search for natural substances with cytokinin like activities led to the isolation of ...D.. from corn kernels and coconut milk.
(1) A–auxins, B–10, C–NAA, D–zeatin
(2) A–gibberellins, B–20, C–zeatin, D–kinetin
(3) A–gibberellins, B–10, C–zeath, D–kinetin
(4) A–gibberellins, B–20, C–kinetin, D–zeatin

35. Apical dominance is caused by
(1) Abscisic acid in lateral bud
(2) Cytokinin in leaf tip
(3) Gibberellin in lateral buds
(4) Auxin in shoot tip

36. Physiologically active form of phytochrome is
(1) P_{730}/P_{fr} (2) P_{660}/P_r
(3) P_{700} (4) P_{680}

37. In five kingdom classification system of classification organism divided into:
(1) Monera, protista, algae, fungi and animalia
(2) Archia, protista, fungi, plantae and animalia
(3) Monera protista, fungi, plantae and animalia
(4) None of the above

38. The meristem that occurs in the mature regions of roots and shoots in many plants, particularly those that produce woody axis and appear later than primary meristem is called
(1) Lateral meristem   (2) Secondary meristem
(3) Cylindrical meristem   (4) All of the above

39. Bacteria are the member of:
(1) Kingdom Monera   (2) Kingdom Protista
(3) Kingdom Fungi   (4) Kingdom Plantae

40. Red tides is due to:
(1) Gonyaulax
(2) Red dinoflagellates
(3) Tricodesmium
(4) More than one is correct

41. Which is true about virus?
(1) These lack cell organelle
(2) They have both DNA and RNA
(3) These can be facultative parasite also
(4) All of the above

42. Phylloclade is found in:
(1) Hydrophytes   (2) Halophytes
(3) Sciophytes   (4) Xerophytes

43. In China rose the flowers are:
(1) Actinomorphic, hypogynous with twisted aestivation
(2) Actinomorphic, epigynous with valvate aestivation
(3) Zygomorphic, hypogynous with imbricate aestivation
(4) Zygomorphic, epigynous with twisted aestivation

44. False septum not found in:
(1) Mustard   (2) Argemone
(3) Primrose   (4) Both (1) and (2)

45. Placenta develop at the base of ovary and a single ovule is attached to it is called:
(1) Marginal   (2) Axile
(3) Partial   (4) Basal

ZOOLOGY

46. Scala tympani is connected to scala vestibuli by means of:
(1) Stapes
(2) Basilar membrane
(3) Helicotrema
(4) Tectorial membrane

47. Which of the following is incorrect w.r.t synapse ?

(1) Q-Pre-synaptic membrane
(2) S - Receptors
(3) P - Axon terminal
(4) R - Synaptic Knob

48. Human eyeball consists of three layers and it encloses:
(1) Lens, iris, sclera
(2) Lens, aqueous humor and vitreous humor
(3) Cornea, lens, iris
(4) Corenea, lens, optic nerve

49. Which is a bridge between nervous system and endocrine system ?
(1) Thalamus   (2) Hypothalamus
(3) Limbic system   (4) Parietal lobe

50. Movement of tongue muscle is controlled by
(1) facial nerve   (2) trigeminal nerve
(3) hypoglossal nerve   (4) vagus nerve

51. A gymnast is able to balance his body upside down even in the total darkness because of
(1) cochlea
(2) vestibular apparatus
(3) tectorial membrane
(4) organ of Corti

52. Protein found in eye lens is
(1) crystalline   (2) collagen
(3) opsin   (4) rhodopsin

53. Genetic engineering is possible because of the discovery of
(1) Transduction
(2) Transformation
(3) Restriction enzyme and DNA ligase
(4) Electron microscopy

54. What is 'B' in the figure

D
xxxxxxxxxxxx
Same restriction enzyme cutting both foreign
DNA and vector DNA at specific point

C

E.coli
Cells divide

B

(1) Transformation   (2) Transduction
(3) Conjugation   (4) Vector DNA

55. Which of the following DNA is undigested in this diagram?

A
DNA bands
B   C
Lane
1 2 3 4
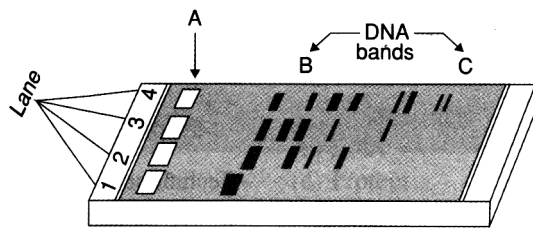
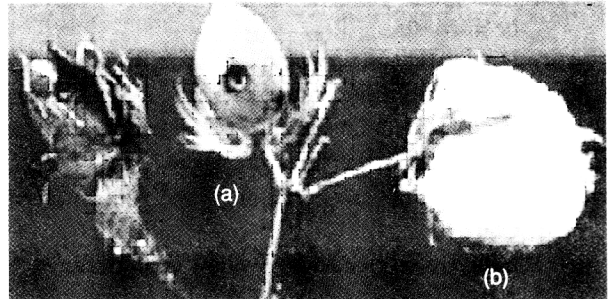(1) Lane 1   (2) Lane 2   (3) Lane 3   (4) Lane 4

56. By which method rDNA directly placed in nucleus of animal cell ?
(1) Gene gun (biolistics) (2) Heat shock
(3) $CaCl_2$ (4) Micro-injection

57. What is the maximum volume of culture that can be processed in bioreactors ?
(1) 10-100 litres
(2) 100 - 1000 litres
(3) 1 - 10 litres
(4) 1000 - 1,00,000 litres

58. Identify A and B in the diagram.

(1) A; A fully mature cotton boll, B; Destroyed by bollworms
(2) A; Destroyed by bollworms, B; Fully mature cotton boll
(3) A; Destroyed by virus, B; Immature cotton boll
(4) A; Immature normal cotton boll, B; Destroyed by virus

59. The conventional method of diagnosis involves
(1) Urine analysis   (2) ELISA
(3) PCR   (4) rDNA techonology

60. The use of bioresources by multinational companies and other organizations, without proper authorization from the countries and people concerned without compensatory payment, is called
(1) Bioethics   (2) Biopiracy
(3) Bioterror   (4) Bioweapon