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39 YEARS OF TEACHING EXCELLENCE

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// SAMPLE PAPER - 126 //
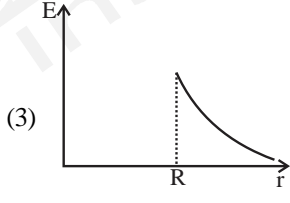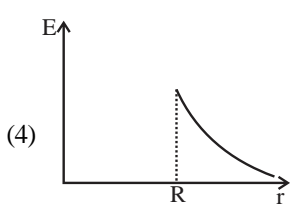
Time : 1 : 15 Hr.   **Question : 60**

// PHYSICS //

01. Consider an electron in a hydrogen atom, revolving in its second excited state (having radius 4.65 Å). The de-Broglie wavelength of this electron is:
(1) 12.9 Å   (2) 3.5 Å
(3) 9.7 Å   (4) 6.6 Å

02. A cylinder with fixed capacity of 67.2 lit contains helium gas at STP. The amount of heat needed to raise the temperature of the gas by 20°C is:
[Given that $R = 8.31 \text{ J mol}^{-1}\text{ K}^{-1}$]
(1) 748 J   (2) 374 J
(3) 350 J   (4) 700 J

03. A 60 HP electric motor lifts an elevator having a maximum total load capacity of 2000 kg. If the frictional force on the elevator is 4000 N, the speed of the elevator at full load is close to : (1 HP = 746 W, $g = 10 \text{ ms}^{-2}$)
(1) 1.7 ms^{-1} (2) 1.9 ms^{-1}
(3) 2.0 ms^{-1} (4) 1.5 ms^{-1}

04. A body is orbiting very close to the earth surface with kinetic energy K.E. The energy required to completely escape from it is
(1) $\sqrt{2}$ K.E.   (2) 2 K.E.
(3) K.E. $/\sqrt{2}$ (4) None of these

05. A planet is moving in an elliptic orbit. If T, V, E and L stand, respectively, for its kinetic energy, gravitational potential energy, total energy and angular momentum about the centre of force, then
(1) T is conserved   (2) V is always positive
(3) E is always negative
(4) magnitude of L is conserved but its direction changes continuously

06. Starting from the mean position a body oscillates simple harmonically with a period of 2 s. After what time will its kinetic energy be 50% of the total energy

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

07. The electric field due to a uniformly charged dielectric sphere of radius R as a function of the distance from its centre is represented graphically by

(1)

(2)

(3)

(4)

08. The resistance of a wire is 10 Ω. Its length is increased by 10% by stretching. The new resistance will now be
(1) 12.0 Ω   (2) 12.1 Ω
(3) 11.2 Ω   (4) 11 Ω

09. For a dipole $q = 2 \times 10^{-6}$ C and d = 0.01 m. Calculate the maximum energy for this dipole if $E = 5 \times 10^5$ N/C
(1) $1 \times 10^{-3} \text{ Nm}^{-1}$
(2) $10 \times 10^{-3} \text{ Nm}^{-1}$
(3) $1 \times 10^{-3} \text{ Nm}$
(4) $1 \times 10^2 \text{ Nm}^2$

10. The internal resistances of the two cells shown in the circuit are r Ω and 0.3Ω respectively. If the R = 0.2Ω and the potential difference across the cell B is zero. Find r :

(1) r = 0.1 Ω   (2) r = 0.2 Ω
(3) r = 0.3 Ω   (4) r = 0.01 Ω
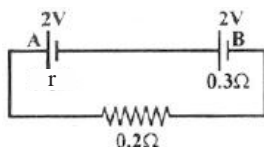
11. The ratio of frequencies of third harmonic produced by an closed pipe to that of open pipe having the same length is:
(1) 1:2   (2) 2:1
(3) 1:3   (4) 3:1

12. Two identical photocathodes receive the light of frequencies f_1 and f_2 respectively. If the velocities of the photo-electrons coming out are v_1 and v_2 respectively, then

(1) $v_1^2 - v_2^2 = \dfrac{2h}{m}[f_1 - f_2]$

(2) $v_1^2 + v_2^2 = \dfrac{2h}{m}[f_1 + f_2]$

(3) $v_1 + v_2 = \left[\dfrac{2h}{m}(f_1 + f_2)\right]^{\frac{1}{2}}$

(4) $v_1 - v_2 = \left[\dfrac{2h}{m}(f_1 - f_2)\right]^{1/2}$

13. A block is placed on a rough inclined plane with 37° inclination. If minimum force required to push the block up the incline is equal to 3 times the minimum force required to slide the block down the inclined plane, then find the value of coefficient of friction between block and incline?

(1) 1.2   (2) 1.0
(3) 1.5   (4) None of these

14. A particle of mass M is situated at the centre of a spherical shell of same mass and radius a. The magnitude of the gravitational potential at a point situated at a/4 distance from the centre, will be

(1) $\dfrac{5GM}{a}$ (2) $\dfrac{-5GM}{a}$
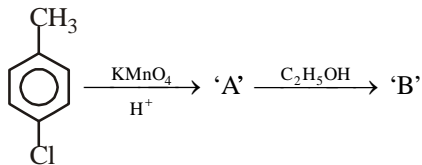
(3) $-\dfrac{2GM}{a}$ (4) $\dfrac{+2GM}{a}$

15. The period of a particle in SHM is 8 s. At t = 0 it is at the mean position. The ratio of the distances travelled by it in the third and the fourth second is
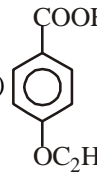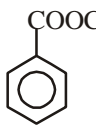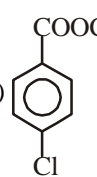
(1) $\dfrac{1}{\sqrt{2}-1}$ (2) $\dfrac{1}{\sqrt{2}}$

(3) $\sqrt{2}$ (4) $\sqrt{2}-1$

CHEMISTRY
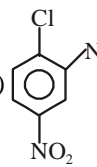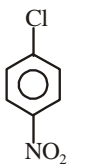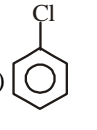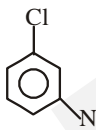
16. Which of the following solutions will have pH = 7 at 298 K :
(1) 1×10^{-10} M HCl solution
(2) 1×10^{-4} M NaOH solution
(3) 1×10^{-10} M NaOH solution
(4) Both (1) and (3).

17. A solute undergoes complex formation with ions of soluble salt, the solubility of salt :
(1) Increases   (2) Decreases
(3) Is unaffected   (4) Either of these.

18. In which of the following solvents is silver chloride most soluble?
(1) 0.1 mol dm^{-3} $AgNO_3$ solution
(2) 0.01 mol dm^{-3} HCl solution
(3) H_2O
(4) Aqueous ammonia

19. In the manufacture of NH_3 by Haber's process, the condition which would give maximum yield is:
$$N_2 + 3H_2 \rightleftharpoons 2NH_3 + Q \text{ kcal}$$
(1) High temperature, high pressure and high concentrations of the reactants
(2) High temperature, low pressure and low concentrations of the reactants
(3) Low temperature and high pressure
(4) Low temperature, low pressure and low concentration of H_2

20. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be
(1) Hydrogen gas   (2) Oxygen gas
(3) H_2S gas   (4) SO_2 gas

21. Which of the following compounds has the highest boiling point?
(1) $CH_3CH_2CH_2Cl$
(2) $CH_3CH_2CH_2CH_2Cl$
(3) $CH_3CH(CH_3)CH_2Cl$
(4) $(CH_3)_3C-Cl$

22. Identify 'B' in the following reaction:

$$\text{(p-Cl-toluene)} \xrightarrow[\text{H}^+]{\text{KMnO}_4} \text{'A'} \xrightarrow{\text{C}_2\text{H}_5\text{OH}} \text{'B'}$$
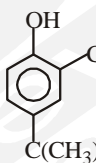
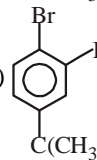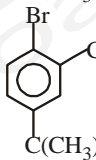(1) (COOH with OC₂H₅ para)

(2) (COOC₂H₅)
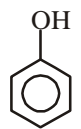
(3) (COOC₂H₅ with Cl para)
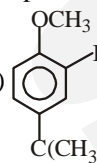
(4) none of these

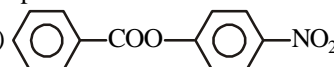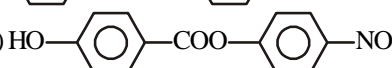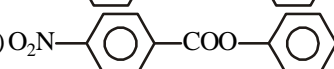23. The compound that reacts the fastest with sodium methoxide is:

(1)

(2)

(3)

(4)

24. Anisole $\xrightarrow[\text{AlCl}_3]{(\text{CH}_3)_3\text{C-Cl}} \xrightarrow{\text{Cl}_2/\text{FeCl}_3} \xrightarrow[\text{heat}]{\text{HBr}}$ (X)
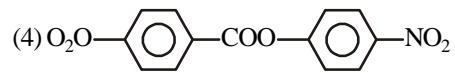
The product (X) in the above series of reaction is:

(1)

(2)

(3)

(4)

25. Phenol $\xrightarrow{\text{C}_6\text{H}_5\text{COCl/base}}$ 'X' $\xrightarrow{\text{Nitration}}$ 'Y' (major product)

The product 'Y' is:

(1) (benzene–COO–benzene–NO₂)

(2) HO——COO——NO

(3) O₂N——COO—

(4) O₂O——COO——NO₂

26. Which of the following acid is the strongest?
(1) CH_3COOH (2) $CH_2ClCOOH$
(3) $CHCl_2COOH$ (4) CCl_3COOH

27. Which of the following acid reduces Tollens reagent?
(1) Lactic acid (2) Formic acid
(3) Acetic acid (4) Oxalic acid

28. Salicylic acid when treated with zinc dust, gives:
(1) phenol (2) salicylaldehyde
(3) benzene (4) benzoic acid

29. 'X' $\xrightarrow{\text{Cl}_2}$ Benzotrichloride $\xrightarrow{\text{Hydrolysis}}$ 'Y'
'X' and 'Y' respectively are:
(1) benzene and benzoic acid
(2) benzene and benzaldehyde
(3) toluene and benzoic acid
(4) toluene and benzaldehyde

30. Products of the following reaction:
$$CH_3 - C \equiv C - CH_2CH_3 \xrightarrow[\text{(ii) Hydrolysis}]{\text{(i) O}_3} \text{? are:}$$
(1) $CH_3COOH + CO_2$
(2) $CH_3COOH + HOOCCH_2CH_3$
(3) $CH_3CHO + CH_3CH_2CHO$
(4) $CH_3COOH + CH_3COCH_3$

BOTANY

31. Match List-l with List-II.

	List-I		List-II
A.	Branched stem	I.	Pinus
B.	Unbranched stem	II.	Cycas
C.	Needle-like leaf	III.	Sequoia
D.	Giant redwood tree	IV.	Conifer

Choose the correct answer from the options given below.
(1) A–II, B–IV, C–I, D–III
(2) A–I, B–II, C–IV, D–III
(3) A–II, B–I, C–IV, D–III
(4) A–IV, B–III, C–II, D–I

32. Which of the following statements are correct?
I. Tripalmitin is a carbohydrate and its RQ is 07.
II. RQ is less than 1 when fats are used as respiratory substrate.
III. Glycerol enters the amphibolic pathway after being converted of PGAL.
IV. In fermentation, NADH is oxidised to NAD⁺ vigorously.
(1) I and II (2) II and III
(3) I and IV (4) II and IV

33. **Statement I:** Avery, MaCarty and MacLeod gave the unequivocal proof that DNA is the genetic material.
Statement II: RNA can express itself in the form of Mendelian character more easily than DNA.
(1) Both Statements I and II are incorrect.
(2) Statement I is correct, but statement II is incorrect.
(3) Statement I is incorrect, but statement II is correct.
(4) Both Statements I and II are correct.

34. In a polynucleotide chain consisting 20 Phosphodiester bonds have Nitrogenous bases.
(1) 21   (2) 20   (3) 10   (4) 19

35. Which of the following is a test cross?

(1) WW × WW
(2) Ww × Ww
(3) ww × ww
(4) Ww × ww
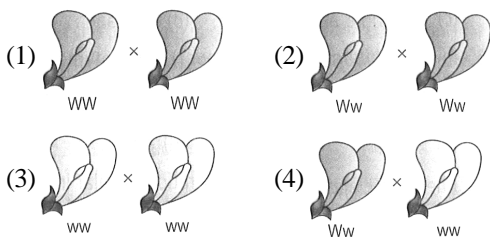
36. Which of the following is correct for the condition when plant YyRr is back crossed with the double recessive parent?
(1) 9 : 3 : 3 : 1 ratio of phenotypes only
(2) 9 : 3 : 3 : 1 ratio of genotypes only
(3) 1 : 1 : 1 : 1 ratio of phenotypes only
(4) 1 : 1 : 1 : 1 ratio of phenotypes and genotypes

37. A tree species in Mauritius failed to reproduce because of the extinction of a fruit-eating bird. Which one of the following was that bird?
(1) Dove   (2) Dodo
(3) Condor   (4) Skua

38. Match the Column-I with Column-II, and choose the correct combination from the options given below.

	Column-I		Column-II
a.	Marginal placentation	1.	Marigold
b.	Axile placentation	2.	Dianthus
c.	Parietal placentation	3.	Argemone
d.	Free central placentation	4.	Chinarose
e.	Basal placentation	5.	Pea

(1) a–5; b–4; c–3; d–1   (2) a–4; b–5; c–2; d–1
(3) a–5; b–4; c–2; d–3   (4) a–1; b–5; c–4; d–2

39. The word 'systematics' refers to
(1) Diversity of kinds of organisms and relationships among them
(2) Identification and Classification of organisms
(3) Identification and Nomenclature of organisms
(4) Nomenclature and Identification of organisms

40. Match the Column-I with Column-II, and choose the correct combination from the options given.

	Column-I		Column-II
a.	Breed only once in life time	1.	Bird and mammals
b.	Breed many times in their lifetime	2.	Oysters and pelagic fishes
c.	Produce large number of small sized offsprings	3.	Bamboo
d.	Produce small number of large-sized offsprings	4.	Pacific salmon fish

(1) a–3; b–1; c–2; d–4
(2) a–4 ; b–1; c–4; d–3
(3) a–3; b–4; c–2; d–1
(4) a–3,4; b–1; c–2; d–1

41. Which of the following statements are correct?
I. Ray parenchymatous cells conduct water radially.
II. Companion cells and sieve tube elements are inter-connected by pit fields present between their common transverse walls.
III. Trichomes are the epidermal hairs on the stem, which help in preventing water loss due to transpiration.
IV. The monocot stem has a large, conspicuous ground tissue and parenchymatous hypodermis.
(1) I and III
(2) II and IV
(3) I and IV
(4) I, II and IV

42. Match List-I with List-II.

	List-I		List-II
A.	3C	I.	Acetyl Co-A
B.	2C	II.	Pyruvate, DHAP, PGAL
C.	4C	III.	Alpha-KGA
D.	5C	IV.	OAA, malic acid, succinic acid
E.	6C	V.	Citric acid, glucose

Choose the correct answer from the options given below.
(1) A–III, B–I, C–IV, D–II, E–V
(2) A–II, B–I, C–IV, D–III, E–V
(3) A–I, B–III, C–IV, D–II, E–V
(4) A–II, B–IV, C–V, D–III, E–I

43. Statement I: If the nucleosome is 200 bp, total number of nucleosome beads in a mammalian cell having total DNA of 6.6×10^9 bp will be 3.8×10^7 nucleosome.
Statement II: Heterochromatin is the darkly stained part of chromatin that is considered transcriptionally active.
(1) Both Statements I and II are incorrect.
(2) Statement I is correct, but statement II is incorrect.
(3) Statement I is incorrect, but statement II is correct.
(4) Both Statements I and II are correct.

44. Fill in the blanks:
1. More than ...a... per cent of all the species recorded are animals, while plants (including algae, fungi, bryophytes, gymnosperms and angiosperms) comprise no more than ...b... per cent of the total.
2. Among animals, insects making up more that ...c.. per cent of the total.
3. Out of every 70 animals on this planet, ...d... are insects.
4. The number of ...e... species in the world in more than all the ...f... species combined.
(1) a–70; b–12; c–22; d–7; e–vertebrate, f–fungi
(2) a–70; b–22; c–70; d–7; e–fungi, f–vertebrate
(3) a–70; b–22; c–70; d–49; e–fungi, f–vertebrate
(4) a–67; b–12; c–70; d–49; e–vertebrate, f–fungi

45. Match the Column-I with Column-II, and choose the correct combination from the options given.

	Column-I 'r' values		Column-II Organism
a.	0.12	1.	Human population in India in 1981
b.	0.015	2.	Norway rat
c.	0.0205	3.	Flour beetle

(1) a–1; b–2; c–3
(2) a–3; b–1; c–2
(3) a–3; b–2; c–1
(4) a–2; b–3; c–1

ZOOLOGY

46. Which of the following statements are correct?
I. In synapses always neurotransmitter Nor-adrenaline is secreted.
II. At electrical synapses, the membrane of pre- and post-synaptic neurons are in very close proximity.
III. Chemical synapses are rare in human system.
IV. Receptors are present on the post-synaptic membrane.
Choose the correct answer from the options given below.
(1) I and III
(2) II and IV
(3) I and II
(4) III and IV

47. The association area in cerebral cortex is responsible for
(1) Intersensory association
(2) Memory
(3) Communication
(4) All of these

48. Which of the following junctions facilitate the cells to communicate with each other by connecting the cytoplasm of adjoining cells?
(1) Tight junction
(2) Adhering junction
(3) Gap junction
(4) Both (2) and (3)

49. During ventricular systole, oxygenated blood is pumped into the
(1) Aorta and deoxygenated blood is pumped into the pulmonary artery.
(2) Pulmonary artery and deoxygenated blood is pumped into the artery.
(3) Aorta and deoxygenated blood is pumped into pulmonary vein.
(4) Pulmonary vein and deoxygenated blood is pumped into pulmonary artery.

50. For the treatment of cancer, biological response modifiers such as _____ are given.
(1) β-interferons
(2) γ-interferons
(3) α-interferons
(4) δ-interferons

51. If regular dose of drugs/alcohol is abruptly discontinued it causes _____.
(1) Hallucinations
(2) Withdrawal syndrome
(3) Diversion to criminal activities
(4) Severe depression

52. Menstrual flow occurs due to lack of :
(1) Progesterone
(2) FSH and LH
(3) FSH
(4) Estrogen

53. Primary oocyte grows in size and completes its first meiotic division inside the
(1) Primary follicle
(2) Secondary follicle
(3) Tertiary follicle
(4) All of these

54. Find the true statement.
(1) Ori means origin of transcription.
(2) Some bacterial cell may have copy number of plasmid that varies from 15-100.
(3) Vector should have many recognition sites for commonly used restriction enzymes so that alien DNA can attach to any one of the sites easily.
(4) TetR gene in pBR322 can be cleaved by Pvul and PstI.

55. 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

56. _____ of total cell mass is formed by ions.
(1) 1 %
(2) 2 %
(3) 3 %
(4) 4 %

57. Which of the following glucose transporters is insulin-dependent?
(1) GLUT II
(2) GLUT III
(3) GLUT IV
(4) GLUT I

58. The enzyme essential for transport of CO_2 as bicarbonate in blood is
(1) Carboxypeptidase
(2) Succine dehydrogenase
(3) Carbonic anhydrase
(4) Thrombokinase

59. Which of the following is incorrect about glucocorticoids?
(1) Inhibit cellular uptake and utilization of amino acids.
(2) Maintains cardiovascular system as well as kidney function.
(3) Anti-inflammatory and suppresses the immune response.
(4) Glucocorticoids stimulates gluconeogenesis, lipogenesis and proteolysis.

60. W. bancrofti infects which part of the human body?
(1) Blood vessels of upper limbs
(2) Lymph vessels of lower limb
(3) Blood vessels of lower limb
(4) Lymph vessels of upper limb