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SAMPLE PAPER - 127

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

PHYSICS

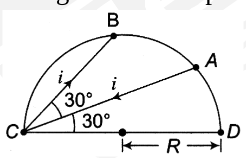
01. If a particle of charge 10^{-12} coulomb moving along the $\hat{x}$ –direction with a velocity 10^5 m/s experiences a force of 10^{-10} newton in $\hat{y}$ –direction due to magnetic field, then the minimum magnetic field is

(1) 6.25×10^3 tesla in +ve $\hat{z}$ –direction
(2) 10^{-15} tesla in –ve $\hat{z}$ –direction
(3) 6.25×10^{-3} tesla in +ve $\hat{z}$ –direction
(4) 10^{-3} tesla in –ve $\hat{z}$ –direction

02. 1 g of water, of volume 1 cm^3 at 100°C, is converted into steam at same temperature under normal atmospheric pressure (= 1×10^5 Pa). The volume of steam formed equals 1671 cm^3. If the specific latent heat of vaporisation of water is 2256 J/g, the change in internal energy is:

(1) 2423 J (2) 2089 J
(3) 167 J (4) 2256 J

03. A current carrying wire is placed in the grooves of an insulating semicircular disc of radius 'R', as shown. The current enters at point A and leaves from point B. Determine the magnetic field at point D.



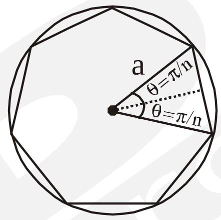
(1) $\frac{\mu_0 i}{8\pi R\sqrt{3}}$ (2) $\frac{\mu_0 i}{4\pi R\sqrt{3}}$

(3) $\frac{\sqrt{3}\mu_0 i}{4\pi R}$ (4) none

04. A ball is thrown horizontally from top of a tower 19.6 m high with speed 10 ms^{-1}. Find distance from foot of tower at which it strikes the ground.
($g = 9.8\ ms^{-2}$)

(1) 15 m (2) 20 m
(3) 25 m (4) None of these

05. A wire bent in the form of a regular polygon of n sides, is inscribed in a circle of radius a m. If i ampere is the current flowing in the wire, then the magnetic flux density at the centre of the circle is :



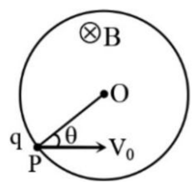
(1) $\frac{\mu_0 i}{2\pi a}\tan\frac{\pi}{n}$ (2) $\frac{\mu_0 ni}{2\pi a}\tan\frac{\pi}{n}$

(3) $\frac{2ni}{\pi a}\mu_0 \tan\frac{\pi}{n}$ (4) $\frac{ni}{2a}\mu_0 \tan\frac{\pi}{n}$

06. Two spheres of radius a and b respectively are charged and joined by a wire and separated. The ratio of electric field of the spheres at a distance r (r > a, r > b) is

(1) a/b (2) b/a
(3) a^2/b^2 (4) b^2/a

07. A particle of charge q and mass m is projected with a velocity V_0 towards a circular region having uniform magnetic field B perpendicular and into the plane of paper from point P as shown in the figure. R is the radius and O is the centre of the circular region. If the line OP makes angle θ with the direction of V_0, then the value of V_0 so that particle passes through O is:

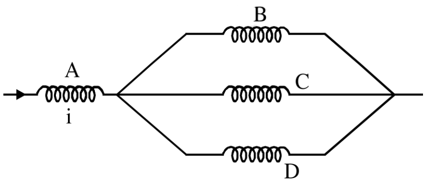


(1) $\frac{qBR}{m\sin\theta}$ (2) $\frac{qBR}{2m\sin\theta}$

(3) $\frac{2qBR}{m\sin\theta}$ (4) $\frac{3qBR}{2m\sin\theta}$

08. **Assertion:** Pressure has the dimensions of energy density.
Reason: Energy density = Energy /Volume
(1) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
(2) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
(3) Assertion is correct but Reason is incorrect.
(4) Assertion is incorrect but Reason is correct.

09. Four identical long solenoids A, B, C and D are connected to each other as shown in the figure. If the magnetic field at the center of A is 3T, the field at the center of C would be: (Assume that the magnetic field is confined with in the volume of respective solenoid).



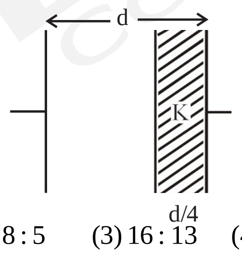
(1) 12 T (2) 6 T
(3) 9 T (4) 1T

10. 200 g of a solid ball at 20°C is dropped in an equal amount of water at 80°C. The resulting temperature is 60°C. This means that specific heat of solid is
(1) one fourth of water (2) one half of water
(3) twice of water (4) four times of water

11. A rigid diatomic ideal gas undergoes an adiabatic process at room temperature. The relation between temperature and volume of this process is TV^x = constant, then x is :

(1) $\frac{5}{3}$ (2) $\frac{2}{5}$ (3) $\frac{2}{3}$ (4) $\frac{3}{5}$

12. A parallel plate capacitor having cross-sectional area A and separation d has air in between the plates. Now an insulating slab of same area but thickness d/4 is inserted between the plates as shown in figure having dielectric constant K(= 4). The ratio of new capacitance to its original capacitance will be,

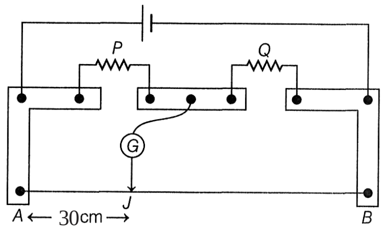


(1) 13 : 16 (2) 8 : 5 (3) 16 : 13 (4) 5 : 8

13. A conducting sphere of radius R is charged. The electric field at a distance r(r > R) from the centre of the sphere is E then, find V (= potential on the surface of the sphere)

(1) $\frac{RE}{r^2}$ (2) $\frac{Er^2}{R}$ (3) $\frac{rE}{R^2}$ (4) $\frac{R^2E}{r^3}$

14. In a meter bridge circuit shown in figure, the bridge is balanced when AJ = 30 cm. On interchanging P and Q, the balancing length shifts by



(1) Zero (2) 20 cm (3) 40 cm (4) 60 cm

15. Find the phase difference between two waves which are represented by
$y_1 = 10^{-6} \sin[100t + (x/50) + 0.5]$ m
$y_2 = 10^{-6} \cos[100t + (x/50)]$ m
[where x is expressed in meters and t is expressed in seconds]
(1) 1.07 radians (2) 2.07 radians
(3) 0.5 radians (4) 1.5 radians

CHEMISTRY

16. In the following, species behaving as Bronsted -Lowry base are.
$[Al(H_2O)_6]^{3+} + HCO_3^- \Leftrightarrow [Al(H_2O)_5OH]^{+2} + H_2CO_3$
(1) $[Al(H_2O)_6]^{3+}$, HCO_3^-
(2) HCO_3^-, H_2CO_3
(3) $[Al(H_2O)_6]^{+3}, H_2CO_3$
(4) $HCO_3^-, [Al(H_2O)_5OH]^{+2}$.

17. The molar solubility (in mol L^{-1}) of a sparingly soluble salt MX_3 is 's'. The corresponding solubility product is K_{sp}.'s' is given in terms of K_{sp} by the relation :
(1) $s = (K_{sp}/128)^{1/4}$ (2) $s = (K_{sp}/256)^{1/5}$
(3) $s = (27\,K_{sp})^{1/4}$ (4) $s = (128\,K_{sp})^{1/4}$

18. Equal volumes of two solutions of a strong acid having pH = 13 and pH = 14 are mixed together. The pH of the resulting solution will then be equal to
(1) 3.5 (2) 3.26
(3) 7 (4) 13.74

19. If the value of equilibrium constant for a particular reaction is 1.6×10^{12}, the at equilibrium the system will contain:
(1) mostly products
(2) similar amounts of reactants and products
(3) all reactants (4) mostly reactants

20. The limiting molar conductivities $\wedge^0$ for NaCl, KBr and KCl are 126, 152 and 150 S cm^2 respectively. The $\wedge^0$ for NaBr is :
(1) 128 S cm^2 mol^{-1} (2) 302 S cm^2 mol^{-1}
(3) 278 S cm^2 mol^{-1} (4) 176 S cm^2 mol^{-1}

21. The correct order of the mobility of the alkali metal ions in aqueous solution is :
(1) $Li^+ > Na^+ > K^+ > Rb^+$
(2) $Na^+ > K^+ > Rb^+ > Li^+$
(3) $K^+ > Rb^+ > Na^+ > Li^+$
(4) $Rb^+ > K^+ > Na^+ > Li^+$

22. Given the standard electrode potentials.
$E^\circ_{Fe^{2+}/Fe} = -0.44\ V$
and $E^\circ_{H^+/O_2/H_2O} = 1.23\ V$
Calculate the E°_{cell} of the corrosion.
(1) –0.79 V (2) –1.67 V
(3) 1.67 V (4) +0.79 V

23. Le-Chatelier principle is not applicable to:
(1) $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$
(2) $Fe(s) + S(s) \rightleftharpoons FeS(s)$
(3) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(4) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

24. $\underset{\displaystyle CH_3}{H_3C-\underset{|}{CH}}-CH=CH_2 + HBr \rightarrow (A)$,
(A) predominantly is:
(1) $CH_3-CH_2-\underset{\underset{\displaystyle CH_3}{|}}{CH}-CH_2Br$
(2) $CH_3-\underset{\underset{\displaystyle CH_3}{|}}{CH}-\underset{\underset{\displaystyle Br}{|}}{CH}-CH_3$
(3) $CH_3-\underset{\underset{\displaystyle CH_3}{|}}{CH}-CH_2CH_2Br$
(4) $CH_3-\overset{\overset{\displaystyle Br}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}}-CH_2CH_3$

25. The end product of the reaction is:
$C_2H_5OH \xrightarrow{PCl_5} (A) \xrightarrow{KCN} (B) \xrightarrow{H_3O^+} (C)$
(1) propanal (2) propanoic acid
(3) propanamide (4) none of these

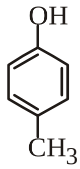
26. The solubility products of MA, MB, MC and MD are 1.8×10^{-10}, 4×10^{-3}, 4×10^{-8} and 6×10^{-5} respectively. If a 0.01 M solution of MX is added drop wise to a mixture containing A,B, C and D ions then the one to be precipitated first will be:
(1) MA (2) MB (3) MC (4) MD.

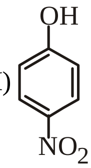
27. Dissociation constants of CH_3COOH and NH_4OH in aqueous solution are 10^{-5}. If pH of a CH_3COOH solution is 3, What will be the p^{OH} of NH_4OH ?
(1) 3.0 (2) 4.0 (3) 10.0 (4) 11.0

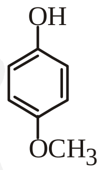
28. Find out the solubility of $Ni(OH)_2$ in 0.01 M NaOH. Given that the ionic product of $Ni(OH)_2$ is 2×10^{-15}.
(1) 2×10^{-13} M (2) 2×10^{-8} M
(3) 1×10^{-11} M (4) 1×10^{8} M

29. Arrange the following compounds in order of decreasing acidity?

(I) 

(II) 

(III) 

(IV) 

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

30. $CH_3CH_2COOH \xrightarrow[Red\ P]{Cl_2} (A) \xrightarrow{Alc.\ KOH} (B)$
The compound (B) is:
(1) $CH_3-\underset{\underset{\displaystyle OH}{|}}{CH}COOH$ (2) $\underset{\underset{\displaystyle OH}{|}}{CH_2}CH_2COOH$
(3) $CH_2=CHCOOH$ (4) $ClCH_2CH_2COOH$

BOTANY

31. **Assertion (A):** The Pteridophytes are limited and restricted to narrow geographical regions.
Reason (R): Prothallus is unicellular, free-living, mostly photosynthetic thalloid gametophyte which requires cool, damp, shady places to grow.
(1) Both A and R are true but R is not the correct explanation of A.
(2) A is true, but R is false.
(3) A is false, but R is true.
(4) Both A and R are true and R is the correct explanation of A.

32. **Assertion (A):** RuBisCO is the most abundant protein found in the world.
Reason (R): RuBisCO is found in both C_3 and C_4 plants.
(1) Both A and R are true but R is not the correct explanation of A.
(2) A is true, but R is false.
(3) A is false, but R is true.
(4) Both A and R are true and R is the correct explanation of A.

33. From following example. DNA, tRNA, rRNA, ribose, Deoxyribose and Uridine.
How many are nucleic acid.
(1) Four (2) Three
(3) Five (4) Six

34. Backbone of polynucleotide chain is made up of.
(1) Sugar
(2) Nitrogenous base and phosphate
(3) Sugar and Nitrogenous base
(4) Sugar and Phosphate

35. Which of the amino acid rich in histone-
(1) Lysine and arginine (2) Lysine and seriene
(3) Histidine and glycine (4) All

36. Phenotypic and genotypic ratio is similar in case of
(1) complete dominance (2) incomplete dominance
(3) over dominance (4) epistasis.

37. **Assertion:** Communities that comprise of more species tend to be more stable.
Reason: A higher number of species results in less annual variation in total biomass.
(1) If both assertion and reason are true and the reason is a correct explanation of the assertion.
(2) If both assertion and reason are true but reason is not a correct explanation of the assertion.
(3) If the assertion is true but reason is false.
(4) If both the assertion and reason are false.

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

	Column-I		Column-II
a.	Synaptonemal complex	1.	Pachytene
b.	Crossing over	2.	Diakinesis
c.	Chaismata formation	3.	Diplotene
d.	Nuclear envelope breaks down	4.	Zygotene

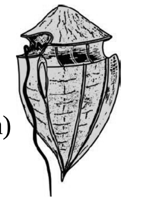
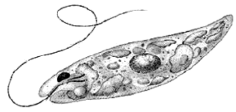
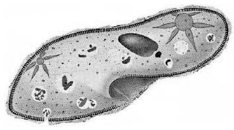
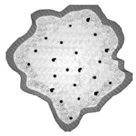
(1) a–2; b–4; c–1; d–3 (2) a–4; b–1; c–3; d–2
(3) a–4; b–1; c–2; d–3 (4) a–1; b–4; c–3; d–2

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

	Column-I		Column-II
a.	Stroma of chloroplast	1.	Nucleoprotein
b.	Cytoskeleton	2.	Flat, disc-shaped cisternae
c.	Ribosome	3.	Contains enzymes required for synthesis of proteins
d.	Golgi apparatus	4.	Help in motility and mechanical support

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

40. Recognise the figure and select the correct combination given below.

(a) 
(b) 
(c) 
(d) 

(1) a–Euglena, b–Slime mould, c–Paramoecium, d–Dinoflage Hates
(2) a–Dinoflagellates, b–Euglena, c–Paramoecium, d–Slime mould
(3) a–Euglena, b–Dinoflagellates, c–Paramoecium, d–Slime mould
(4) a–Paramoecium, b–Dinoflagellates, c–Euglena, d–Slime mould

41. Exchange of paternal and maternal chromosome material during cell division is
(1) Dyad formation (2) Bivalent formation
(3) Crossing over (4) Synapsis

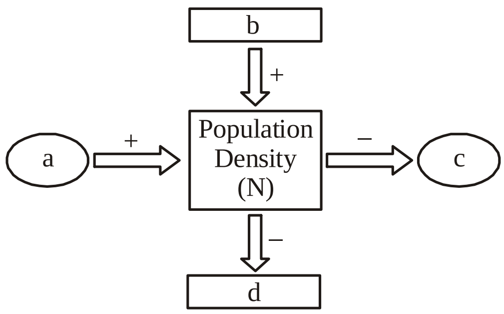
42. Hydrolytic enzymes of lysosomes function at
(1) Acidic pH (2) Alkaline pH
(3) Neutral pH (4) Both (2) and (3)

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

	Column-I		Column-II
a.	Morrels	1.	Deuteromycetes
b.	Smut	2.	Ascomycetes
c.	Bread mould	3.	Basidiomyctes
d.	Imperfect fungi	4.	Phycomycetes

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

44. Recognise the figure and find out the correct matching.



(1) a–B, b–I, c–D, d–E (2) a–D, b–E, c–B, d–I
(3) a–D, b–I, c–B, d–E (4) a–B, b–E, c–D, d–I

45. Which statement is incorrect?
(1) Every chromosome essentially has a primary constriction or the centromere on the sides of which disc shaped structure called kinetochores
(2) Centromere holds four chromatids of a chromosome
(3) The metacentric chromosome has middle centromere forming two equal arm of the chromosome
(4) Telocentric chromosome has a terminal centromere

ZOOLOGY

46. One function of parasympathetic nervous system is
(1) Contraction of hair muscles
(2) Stimulation of sweat glands
(3) Acceleration of heart beat
(4) Constriction of pupil

47. Which of the following are characteristics of cyclostomata?
(1) 6-15 pairs of gill slits for respiration.
(2) Sucking and circular mouth without jaws.
(3) Body is devoid of scales and paired fins.
(4) All of these

48. Which of the following are marine bony fishes?
(1) Exocoetus (2) Hippocampus
(3) Both (1) and (2) (4) Sawfish (Pristis)

49. Which cartilage is present at the end of long bones?
(1) Calcified cartilage (2) Hyaline cartilage
(3) Elastic cartilage (4) Fibrous cartilage

50. Which of the following is commonly known as posterior pituitary?
(1) Pars distalis (2) Pars intermedia
(3) Pars nervosa (4) All of these

51. Which of these statements is incorrect about embryo development?
(1) After one month of pregnancy the heart is formed.
(2) By the end of first trimester most of the major organ systems are formed.
(3) First movement of foetus is observed in the seventh month.
(4) At the end of second trimester, the body is covered with fine hair, eyelids separate and eye lashes are formed.

52. Under ZIFT procedure, zygote or embryos, with up to 8 blastomeres can be transferred into the
(1) Uterus (2) Placenta
(3) Fallopian tube (4) Cervix

53. Suture joints are found between
(1) Parietals of skull
(2) Humerus and radio-ulna
(3) Glenoid cavity and pectoral girdle
(4) Thumb and metatarsal

54. Axoplasm have which of the following in polarized state?
(1) High K^+ ion
(2) Low Na^+ ion
(3) Negatively charged proteins
(4) All of these

55. Which of the following is true for Arthropoda?
(1) Development may be direct or indirect.
(2) Open circulatory system.
(3) Excretion takes place by green gland, coxal gland and Malpighian tubules.
(4) All the above

56. Identify the incorrect statements.
I. Each kidney has a notch on its inner convex surface side called hilum through which ureter, blood vessels and nerves enter.
II. Around 99 per cent of the glomerular filtrate has to be reabsorbed by the renal tubules through the process called reabsorption.
III. The ascending limb of loop of Henle is permeable to water, but allows transport of electrolytes actively or passively.
IV. An increase in body fluid volume can switch off the osmoreceptors and suppress the ADH release to complete the feedback.
(1) I, III and IV (2) I and III
(3) I and IV (4) I, II and IV

57. Which of the following statements are correct about the mechanism of muscle contraction?
I. Acetylcholine is released when the neural signal reaches the motor-end plate.
II. Muscle contraction is initiated by signal sent by CNS via a sensory neurons.
III. Repeated activation of the muscles lead to accumulation of lactic acid.
IV. M-line is a fibrous membrane in the middle of A-band.
Choose the correct answer from the options given below
(1) I, III and IV (2) II, III and IV
(3) I and III (4) III and IV

58. Which of the following statements are correct?
I. Formation of sperm continues even in old men, but formation of ovum ceases in women at a certain age.
II. Semen is composed of seminal plasma along with sperms.
III. Females produce only one ovum every month.
IV. Antrum is a characteristic feature of tertiary follicle.
V. Levels of both LH and FSH peak during the follicular phase. (14^{th} day)
Choose the most appropriate answer showing the correct statements from the options given below
(1) I, II, III and IV (2) I, III and IV
(3) I, III, IV and V (4) I, II, III, IV and V

59. When a patient with defective ADA is treated, which of the following steps are performed for gene therapy?
(A) Lymphocytes are obtained from the patients.
(B) Lymphocytes are transferred to culture dishes.
(C) Lymphocytes are transected with normal ADA genes.
(D) The transected cells are returned to the patients.
(1) All the above
(2) Only C and D
(3) Only D
(4) SCID cannot be treated

60. Select the true statements from the following.
(1) Insulin from animal source, may develop allergy in some patients.
(2) C-peptide is not present in mature insulin.
(3) Recombinant therapeutics do not induce unwanted immunological response.
(4) Insulin can be administered orally to diabetic patients
(1) 1 and 3 only (2) 1 and 2 only
(3) 3 and 4 only (4) 1, 2 and 3 only