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SKD New Standard Coaching Institute

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39 YEARS OF TEACHING EXCELLENCE

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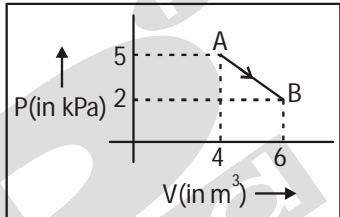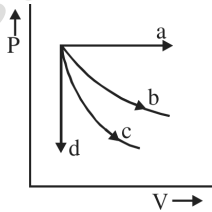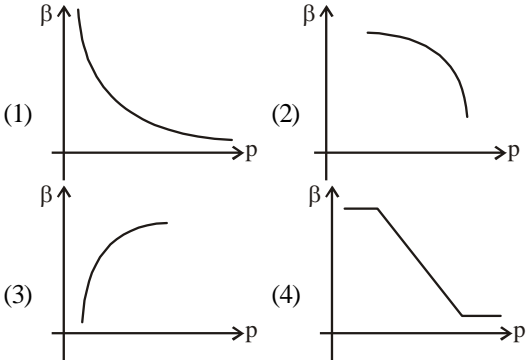
SAMPLE PAPER - 114

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

PHYSICS

01. The rays of the sun are focused on a piece of ice through a lens of diameter 5 cm, as a result of which 10 g ice melts in 10 minutes. The amount of heat received from the sun per unit area per minute is
(1) $4 \, cal \, cm^{-2} \, min^{-1}$ (2) $40 \, cal \, cm^{-2} \, min^{-1}$
(3) $4 \, J \, cm^{-2} \, min^{-1}$ (4) $400 \, cal \, cm^{-2} \, min^{-1}$

02. We wish to observe an object which is 2.5Å in size. The minimum energy photon that can be used us
(1) $5 \, keV$ (2) $8 \, keV$ (3) $10 \, keV$ (4) $12 \, keV$

03. In a hydrogen like atom, electron makes transition from an energy level with quantum number n to another with quantum number (n–1). If n>>1, the frequency of radiation emitted is (almost) proportional to
(1) $\dfrac{1}{n^3}$ (2) $\dfrac{1}{n}$ (3) $\dfrac{1}{n^2}$ (4) $\dfrac{1}{n^4}$

04. A radioactive material decays by simultaneous emission of two particles with half-lives 1620 yr and 810 yr respectively. The time (in yr) after which one-fourth of the material remains, is
(1) 4860 yr   (2) 3240 yr   (3) 2340 yr   (4) 1080 yr

05. Visible light of wavelength 6000×10^{-8} cm falls normally on a single slit and produces a diffraction pattern. It is found that the second diffraction minimum is at 60° from the central maximum. If the first minimum is produced at θ_1, then θ_1 is close to
(1) 20°   (2) 30°   (3) 25°   (4) 45°

06. A body moving with uniform acceleration describes 40 m in the first 5 s and 70 m in the next 5 s. Its initial velocity will be
(1) $4 \, ms^{-1}$ (2) $2.5 \, ms^{-1}$ (3) $5 \, ms^{-1}$ (4) $11 \, ms^{-1}$

07. A bullet of mass 10 gm is fired from a gun of mass 1 kg. If the recoil velocity of the gun is 5 m/s, what is the velocity of the bullet?
(1) 0.05 m/s   (2) 5 m/s   (3) 50 m/s   (4) 500 m/s

08. One mole of an ideal diatomic gas undergoes a transition from A to B along a path AB as shown in the figure,

The change in internal energy of the gas during the transition is:
(1) 20 kJ   (2) –20 kJ   (3) 20 J   (4) –12 kJ

09. The given diagram shows four processes i.e., isochoric, isobaric, isothermal and adiabatic. The correct assignment of the processes, in the same order is given by :

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

10. Of the following graphs, the one that correctly represent the variation of $\beta = -\dfrac{dV/dp}{V}$ with p, for an ideal gas at constant temperature, is

11. For a given gas at 1 atm pressure, r.m.s speed of the molecule is 200 m/s at 127°C. At 2 atm pressure and at 227°C, the r.m.s speed of the molecules will be:
(1) 80 m/s
(2) $100\sqrt{5}$ m/s
(3) $80\sqrt{5}$ m/s
(4) 100 m/s

12. The energy associated with electric field is (U_E) and with magnetic field is (U_B) for an electromagnetic wave in free space. Then :
(1) $U_E = \dfrac{U_B}{2}$
(2) $U_E < U_B$
(3) $U_E = U_B$
(4) $U_E > U_B$

13. A plane electromagnetic wave travels in free space along the x-direction. The electric field component of the wave at a particular point of space and time is $E = 6$ V m^{-1} along y-direction. Its corresponding magnetic field component, B would be:
(1) 6×10^{-8} T along z-direction
(2) 6×10^{-8} T along x-direction
(3) 2×10^{-8} T along z-direction
(4) 2×10^{-8} T along y-direction

14. Three rays of light, namely red (R), green (G) and blue (B) are incident on the face PQ of a right angled prism PQR as shown in figure.
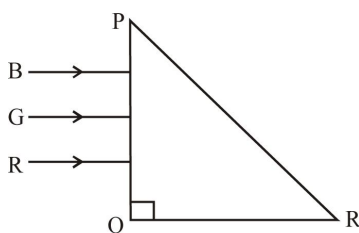
The refractive indices of the material of the prism for red, green and blue wavelength are 1.27, 1.42 and 1.49 respectively. The colour of the ray(s) emerging out of the face PR is:
(1) green
(2) red
(3) blue and green
(4) blue

15. Light of wavelength 5000 Å is incident over a slit of width 1 μm. The angular width of central maixma will be:
(1) 30°
(2) 60°
(3) 90°
(4) 120°

CHEMISTRY

16. Among the following which one does not act as an intermediate in Hofmann rearrangement
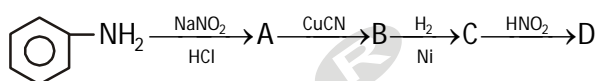(1) RNCO
(2) RCO $\ddot{N}$
(3) RCONHBr
(4) RNC

17. Compound A' , $C_8H_{10}O$, is found to react with NaOI (produced by reacting X with NaOH) and yields a yellow precipitates with characteristics smell.
A' and X are respectively :
(1) H$_3$C—⟨O⟩—CH$_2$OH and I$_2$
(2) ⟨O⟩—CH$_2$–CH$_2$OH and I$_2$
(3) ⟨O⟩—CH(OH)–CH$_3$ and I$_2$
(4) H$_3$C—⟨O⟩(CH$_3$)—OH and I$_2$

18. Aniline in a set of reactions yielded a product D.

⟨O⟩—NH$_2$ $\xrightarrow[\text{HCl}]{\text{NaNO}_2}$ A $\xrightarrow{\text{CuCN}}$ B $\xrightarrow[\text{Ni}]{\text{H}_2}$ C $\xrightarrow{\text{HNO}_2}$ D

The structure of the product D would be
(1) $C_6H_5NHCH_2CH_3$
(2) $C_6H_5CH_2NH_2$
(3) $C_6H_5CH_2OH$
(4) C_6H_5NHOH

19. It is because of inability of ns^2 electrons of the valence shell to participate in bonding that
(1) Sn^{2+} is reducing while Pb^{4+} is oxidising
(2) Sn^{2+} is oxidising while Pb^{4+} is reducing
(3) Sn^{2+} and Pb^{2+} are both oxidising and reducing
(4) Sn^{4+} is reducing while Pb^{4+} is oxidising

20. The correct order of ionic radii of Y^{3+}, La^{3+}, Eu^{3+} and Lu^{3+} is
(1) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$
(2) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$
(3) $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$
(4) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

21. In a gaseous reaction of the type $aA + bB \longrightarrow cC + dD$, which is wrong?
(1) a litre of A combines with b litre of B at same P & T to give C and D
(2) a mole of A combines with b mole of B to give C and D
(3) a g of A combines with b g of B to give C and D
(4) a molecules of A combines with b g of B to give C and D

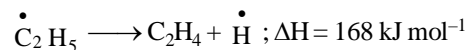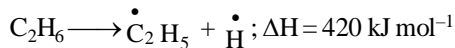22. The quantum numbers of the last electron in an atom are n = 3, l = 1 and m = –1. The atom is :
(1) Al
(2) Si
(3) Mg
(4) C

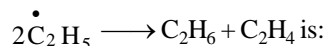23. The compressibility factor for H_2 is greater than one:
(1) at low P and T
(2) at high P and T
(3) at low P and high T
(4) at all pressure and temperature

24. The heat of formation of methane $C(s) + 2H_2(g) \rightarrow CH_4(g)$ at constant pressure is 18500 cal at 25ºC. The heat of reaction at constant volume would be:
(1) 19096 cal (2) 18798 cal
(3) 1802 cal (4) 17904 cal

25. The data given below are for vapour phase reactions at constant pressure.

$C_2H_6 \longrightarrow \overset{\bullet}{C_2}H_5 + \overset{\bullet}{H}$; $\Delta H = 420$ kJ mol^{-1}

$\overset{\bullet}{C_2}H_5 \longrightarrow C_2H_4 + \overset{\bullet}{H}$; $\Delta H = 168$ kJ mol^{-1}

The enthalpy change for the reaction

$2\overset{\bullet}{C_2}H_5 \longrightarrow C_2H_6 + C_2H_4$ is:
(1) $+250$ kJ mol^{-1} (2) $+588$ kJ mol^{-1}
(3) -252 kJ mol^{-1} (4) -588 kJ mol^{-1}

26. An increase in temperature on the reaction, $N_2 + O_2 \rightleftharpoons 2NO$; $\Delta H = 43.2$ kcal will :
(1) increase the yield of NO
(2) decrease the yield of NO
(3) not effect the yield of NO
(4) not help the reaction to proceed in forward direction

27. Hydrogen ion concentration in mol/L in a solution of pH = 5.4 will be:
(1) 3.98×10^8 (2) 3.88×10^6
(3) 3.68×10^8 (4) 3.98×10^{-6}

28. The oxidation number of an element in a compound is evaluated on the basis of certain rules. Which of the following rules is not correct in this respect?
(1) The oxidation number of hydrogen is always +1.
(2) The algebraic sum of all the oxidation numbers in a compound is zero.
(3) An element in the free or the uncombined state bears oxidation number zero
(4) In all its compounds, the oxidation number of fluorine is -1.

29. Iodine molecules are held in the crystals lattice by:
(1) London forces
(2) dipole-dipole interactions
(3) covalent bonds
(4) coulombic forces

30. The ratio of closed packed atoms to tetrahedral holes in cubic close packing is:
(1) 1 : 1 (2) 1 : 2 (3) 1 : 3 (4) 2 : 1

BOTANY

31. Arrange the following events of meiosis in correct sequence:
I. Crossing over
II. Synapsis
III. Terminalisation of chiasmata
IV. Complete disappearance of nucleolus

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

32. Standing crop is
(1) All photosynthetic living forms of an area
(2) Amount of living matter in a component of population at any time
(3) All living forms
(4) All crop plants in an area

33. Statin is used for
(1) Lowering cholesterol
(2) Lipid digestion during ripening of cheese
(3) Detergents
(4) Flavouring edibles

34. Match the crop in Column–I with the disease resistant variety in Column–II.

	Column–I		Column–II
(A)	Wheat	(p)	Pusa Sadabahar
(B)	Brassica	(q)	Pusa Komal
(C)	Cowpea	(r)	Pusa Swarnim
(D)	Chilli	(s)	Himgiri

(1) A $\rightarrow$ (q); B $\rightarrow$ (p); C $\rightarrow$ (r); D $\rightarrow$ (s)
(2) A $\rightarrow$ (s); B $\rightarrow$ (p); C $\rightarrow$ (q); D $\rightarrow$ (r)
(3) A $\rightarrow$ (s); B $\rightarrow$ (r); C $\rightarrow$ (q); D $\rightarrow$ (p)
(4) A $\rightarrow$ (s); B $\rightarrow$ (r); C $\rightarrow$ (p); D $\rightarrow$ (q)

35. The egg apparatus of angiosperm comprises
(1) An egg cell and two antipodals
(2) An egg cell and two synergids
(3) An egg cell and two polar nuclei
(4) An egg cell and the central cell

36. The biflagellate pear-shaped zoospores are characteristics of
(1) Red algae (2) Green algae
(3) Brown algae (4) All of these

37. The dominant stage of gametophyte of mosses consists of
(1) Protonema which develops from the lateral bud
(2) A leafy stage developing from a spore
(3) Both (1) and (2)
(4) A leafy stage developing from secondary protonema

38. The zygote of pteridophyte
(1) Undergoes reduction division just after formation
(2) Produces multicellular gametophyte
(3) Produces multicellular sporophyte
(4) Remains dormant

39. Select the correct sequence of true and false statements from the following.
(a) Epidermis is usually single-layered.
(b) Epidermal cells are parenchymatous cells with abundant cytoplasm.
(c) Vessel members of xylem are interconnected through

perforation in their common walls.
(d) Sclerenchyma provides mechanical support to organs.
(1) TTTT (2) TFFT (3) TFTT (4) FFTT

40. The following features belong to which option?
(I) Epidermis may bear trichom and few stomata.
(II) Cortex is divided into three sub–zones.
(III) Hypodermis is made up of collenchyma.
(IV) Starch sheath
(V) Pericycle is above phloem in the form of semilunar patches of sclerenchyma.
(1) Dicot root   (2) Dicot stem
(3) Monocot root   (4) Monocot stem

41. The continuity of water column in xylem is maintained due to
(1) Presence of air bubbles
(2) Cohesive property of water
(3) Evaporation power of water
(4) None of these

42. Which of the following element generally activates carboxylase enzyme?
(1) Mo   (2) Mn   (3) Mg   (4) Zn

43. Calvin cycle is termed as dark reaction because it
(1) It is not dependent on light for CO_2 fixation in stroma
(2) Occurs in dark
(3) Is by convention only
(4) Requires light

44. In Z-scheme, Z shape is formed when
(1) Carriers are placed uphill
(2) Carriers are placed downhill
(3) Carriers are placed in sequence on a redox potential scale
(4) None of the above

45. Respiratory pathway is best defined as
(1) Catabolic pathway   (2) Anabolic pathway
(3) Amphibolic pathway   (4) None of these

ZOOLOGY

46. Which of the following is not a ciliary movement?
(1) Food gathering in paramecium
(2) Removal of dust particles in trachea
(3) Passage of ova through female reproductive tract
(4) Movement of macrophages and leucocytes

47. Hormones secreted by the placenta to maintain pregnancy are
(1) hCG, hPL, progestogens, prolactin
(2) hCG, hPL, progestogens, estrogens
(3) hCG, hPL, estrogens, relaxin, oxytocin
(4) hCG, progestogens, estrogens, glucocorticoids

48. Which of the following sexually transmitted disease is not completely curable?
(1) Genital warts   (2) Genital herpes
(3) Chlamydiasis   (4) Gonorrhoea

49. In Hardy – Weinberg equation, the frequency of heterozygous individual is represented by
(1) 2pq   (2) pq   (3) q^2 (4) p^2

50. Stirred-tank bioreactors have been designed for
(1) Addition of preservatives to the product
(2) Availability of oxygen throughout the process
(3) Ensuring anaerobic conditions in the culture vessel
(4) Purification of the product

51. What will happen if the secretion of peptic cells of gastric glands is blocked with an inhibitor ?
(1) In the absence of HCl secretion, inactive pepsiongen is not conveted into active enzyme pepsin
(2) Enterokinase will not be released from the duoduenal mucosa and so trypsinogen is not converted to trypsin
(3) Gastric juice will be deficient in chymotrypsin
(4) Gastric Juice will be deficient in pepsinogen

52. Arteries are best defined as the vassels which:
(1) Carry blood away from the heart to different organs
(2) Break up into capillaries which reunite to form a vein
(3) Carry blood from one visceral organ to another
(4) Supply oxygenated blood to different organs

53. Given below is a diagrammatic cross-section of a single loop of human cochlea-
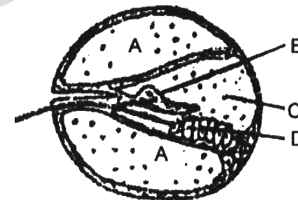
Which one of the following options correctly represents the names of three different parts?
(1) D: Sensory hair cells, A : endolymph, B: tectorial membrane
(2) A: perilymph, B: tectorial membrane, C: endolymph
(3) B: tectorial membrane, C: perilymph, D: secretory cells
(4) C: endolymph, D: sensory hair cells, A: serum

54. Which of the following statements are True (T) and which are False (F)? Choose the correct option.
I. Amphibians have metanephric kidneys.
II. The skull of mammals is dicondylic.
III. In Reptiles fertilization in internal.
IV. Voice is produced in Aves by a syrinx.
V. In commonly called flying fox macropus.
(1) II, IV and V are true, I and III are false
(2) II, III and IV are true, I and V are false
(3) II and V are true, I, III and V are false
(4) I, II and V are true, III and IV are false

55. Fill up the blanks by option for the correct combination of A to E.
   I. Endocrine glands secrete .....A......
   II. The columnar epithelium is composed of single layer of .....B..... and ....C....... cells.
   III. .....D..... covers dry surfaces of the skin.
   IV. ....E.... performs the function of connecting cells to keep neighbouring cells together.
   (1) A-mucous, B-cuboidal, C-flattened, D-Compound epithelium, E-Tight junction
   (2) A-hormones, B-tall, C-slender, D-Compound, epithelium, E-Adhering junction
   (3) A-oil and sweat, B-oval, C-round, D-Squamous epithelium, E-Gap junction
   (4) A-saliva, B-rounded, C-tall, D-Cuboidal epithelium, E-Mucous

56. Which of the following structures or regions is incorrectly paired with its function?
   (1) Medulla oblongata : controls respiration and cardiovascular reflexes
   (2) Limbic system : consists of fibre tracts that interconnect different regions of brain; controls movement
   (3) Hypothalamus : production of releasing hormones and regulation of temperature, hunger and thirst
   (4) Corpus callosum : band of fibres connecting left and right cerebral hemispheres

57. Choose the correct statement.
   (1) The T-wave in an ECG represents excitation of ventricles
   (2) The sum of P and T waves in a given time period can determine the heart beat rate of an individual
   (3) The end of the P-wave marks the end of the systole
   (4) In a standard ECG, a person is connected to the machine with three electrical leads

58. Identify the correct option w.r.t. given pedigree analysis
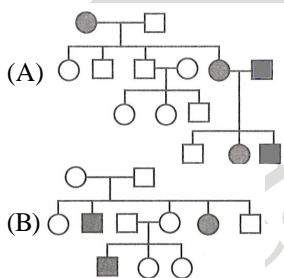
Select the correct option-
   (1) A–represents autosomal dominant trait while; B–represents autosomal recessive trait
   (2) A–represent Y-linked trait while; B–represents X-linked trait
   (3) A–represents autosomal recessive trait while; B–represents X-linked dominant trait
   (4) A–represents autosomal recessive trait while; B–represents autosomal dominant trait

59. The base of semicircular canals is swollen and is called _____ which contains projecting ridges called _____ that has sensory cells.
   (1) Papilla, macula ampullaris
   (2) Ampulla, crista ampullaris
   (3) Ampulla, macula, ampullaris
   (4) Macula, crista ampullaris

60.
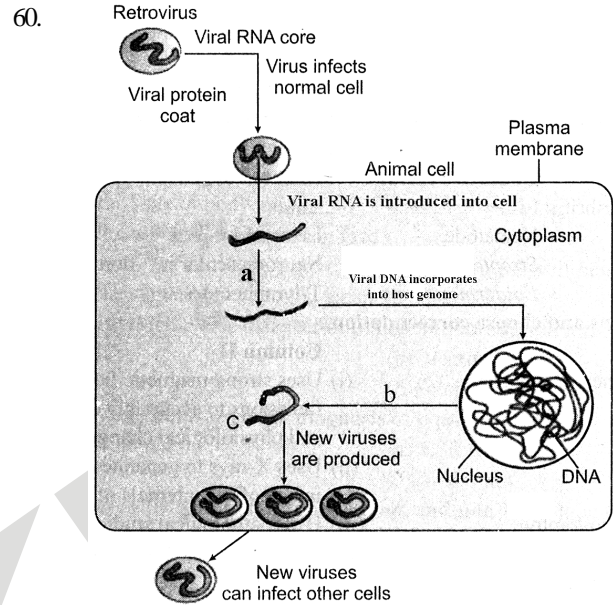
What is indicated by 'a' in the figure?
   (1) Viral RNA produced by RNA polymerase
   (2) Viral DNA produced by DNA polymerase
   (3) Viral DNA produced by reverse transcriptase
   (4) Viral RNA produced by reverse transcriptase