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SAMPLE PAPER - 85

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

PHYSICS

01. If the temperature of the sun were to increase from T to 2T and its radius from R to 2R, the ratio of radiant energy received on earth to what it was previously, will be
(1) 4 (2) 16 (3) 32 (4) 64

02. Two identical conducting rods are first connected independently to two vessels, one containing water at 100°C and the other containing ice at 0°C. In the second case, the rods are joined end to end and connected to the same vessels. Let q_1 and q_2 gram per second be the rate of melting of ice in the two cases respectively. The ratio $\frac{q_1}{q_2}$ is
(1) $\frac{1}{2}$ (2) $\frac{2}{1}$ (3) $\frac{4}{1}$ (4) $\frac{1}{4}$

03. The total kinetic energy of a mixture of 4 g of H_2 and 4 g of He at 300 K is
(1) 1800 R (2) 1750 R
(3) 1950 R (4) 2500 R

04. A Carnot engine working between 300 K and 400 K has 800 J of useful work. The amount of heat energy supplied to the engine from the source is
(1) 2400 J (2) 3200 J
(3) 1200 J (4) 3600 J

05. Which statement is incorrect?
(1) All reversible cycles have same efficiency
(2) Reversible cycle has more efficiency than an irreversible one
(3) Carnot cycle is a reversible one
(4) Carnot cycle has the maximum efficiency in all cycles

06. An ideal gas heat engine operates in a Carnot's cycle between 227°C and 127°C. It absorbs 6×10^4 J at the higher temperature. The amount of heat converted into work is
(1) 1.6×10^4 J (2) 1.2×10^4 J
(3) 4.8×10^4 J (4) 3.5×10^4 J

07. An electromagnetic wave of frequency 1×10^{14} Hz is propagating along z-axis. The amplitude of the electric field is 4 V/m. If $\varepsilon_0 = 8.8 \times 10^{-12}$ $C^2/N\text{–}m^2$, then the average energy density of electric field will be
(1) 35.2×10^{-12} J/m^3 (2) 35.2×10^{-10} J/m^3
(3) 35.2×10^{-11} J/m^3 (4) 35.2×10^{-13} J/m^3

08. In the photoelectric effect, the K.E. of electrons emitted from the metal surface depends upon
(1) intensity of light
(2) frequency of incident light
(3) velocity of incident light
(4) both intensity and velocity of light

09. A photon of light enters a block of glass after travelling through vacuum. The energy of the photon on entering the glass block
(1) Increases because its associated wavelength decreases
(2) Decreases because the speed of the radiation decreases
(3) Stays the same because the speed of the radiation and the associated wavelength do not change
(4) Stays the same because the frequency of the radiation does not change

10. The number of revolutions done by an electron in one second in the first orbit of a hydrogen atom is
(1) 6.57×10^{15} (2) 6.57×10^{13}
(3) 6.57×10^{11} (4) 6.57×10^{14}

11. In each of the following atoms or ions, electronic transition from n = 4 to n = 1 take place. The frequency of the radiation emitted out will be minimum for
(1) Hydrogen atom (2) Deuterium atom
(3) He^+ ion (4) Li^{2+} ion

12. One milligram of matter converted into energy will give
(1) 9×10^7 J (2) 9×10^3 J
(3) 9×10^{10} J (4) 9×10^5 J

13. In a radioactive disintegration, the ratio of the initial number of atoms to the number of atoms present at an instant of time equal to its mean life is

(1) $\frac{1}{e^2}$ (2) $\frac{1}{e}$ (2) e (4) e^2

14. With forward bias mode, the p–n junction diode
(1) is one in which width of depletion layer increases
(2) is one in which potential barrier increases
(3) acts as closed switch
(4) acts as open switch

15. A transistor is used as an amplifier in common base mode with a load resistance of 5 kΩ. The current gain of the amplifier is 0.98 and the input resistance is 70 Ω, the voltage gain is
(1) 70 (2) 80 (3) 60 (4) 90

CHEMISTRY

16. A gaseous mixture contains CH_4 and C_2H_6 in equimolecular proportion. The weight of 4.48 litres of this mixture at NTP is
(1) 4.6 g (2) 2.3 g (3) 1.6 g (4) 23 g

17. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is
(1) 3 (2) 4 (3) 5 (4) 6

18. One mole of NaCl(s) on melting absorbed 30.5 kJ of heat and its entropy is increased by 28.8 JK^{-1}. The melting point of NaCl is
(1) 1059 K (2) 30.5 K (3) 28.8 K (4) 28800 K

19. The pH of 0.1 M CH_3COOH is 2.873. What is pH of 0.1 M NH_4OH? $K_a(CH_3COOH) = 1.8\times10^{-5}$ and $K_b(NH_4OH) = 1.8\times10^{-5}$
(1) 11.127 (2) 2.873
(3) 7 (4) 9.53

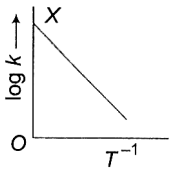
20. When trigonal void of an hcp layers lies over trigonal void of another hcp layer beneath, the new type of void formed is
(1) tetrahedral (2) inverted tetrahedral
(3) octahedral (4) Both (1) and (3)

21. Given, $E^o_{Ag^+/Ag} = 0.80\,V$, $E^o_{Mg^{2+}/Mg} = -2.37\,V$,

$E^o_{Cu^{2+}/Cu} = 0.34\,V$, $E^o_{Hg^{2+}/Hg} = 0.79\,V$

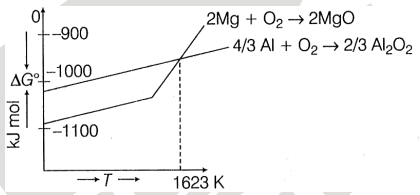
Which of the following statements is/are correct?
(1) $AgNO_3$ can be stored in copper vessel
(2) $Cu(NO_3)_2$ can be stored in magnesium vessel
(3) $CuCl_2$ can be stored in silver vessel
(4) $HgCl_2$ can be stored in copper vessel

22. Graph between log k and $\frac{1}{T}$ (k is rate constant in s^{-1} and T is the temperature in K) is a straight line. If OX = 5 and slope of the line $= -\frac{1}{2.303}$ then E_a is



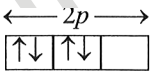
(1) 2.303×2 cal (2) $\frac{2}{2.303}$ cal
(3) 2 cal (4) None of these

23. Which of the following statements is correct wrt the following graph?



(1) Below 1623 K, Mg reduces Al_2O_3
(2) Above 1623 K, Al reduces MgO
(3) Both (1) and (2) are correct
(4) Both (1) and (2) are wrong

24. If the electronic structure of oxygen atom is written as



$1s^2$, $2s^2$ it would violate–
(1) Hund's rule
(2) Pauli's exclusion principle
(3) Both Hund's and Pauli's principles
(4) None of these

25. A cylinder is filled with a gaseous mixture containing equal masses of CO and N_2. The partial pressure ratio is:
(1) $P_{N_2} = P_{CO}$ (2) $P_{CO} = 0.875\,P_{N_2}$
(3) $P_{CO} = 2\,P_{N_2}$ (4) $P_{CO} = \frac{1}{2}P_{N_2}$

26. The enthalpy change (ΔH) for the process $N_2H_{4(g)} \rightarrow 2N_{(g)} + 4H_{(g)}$ in 1724 KJ mol^{-1}. If the bond energy of N–H bond in ammonia is 391 KJ mol^{-1}. What is the bond energy of N–N bond is N_2H_4?
(1) 160 KJ mol^{-1}
(2) 391 KJ mol^{-1}
(3) 1173 KJ mol^{-1}
(4) 320 KJ mol^{-1}

27 How many grams of CaC_2O_4 will dissolve in 1 L of saturated solution? K_{sp} of CaC_2O_4 is 2.5×10^{-9} mol^{-2} and its molecular weight is 128.
(1) 0.0064 g (2) 0.0128 g
(3) 0.0032 g (4) 0.0640 g

28. What will be the ratio of the masses of formalin (HCHO and glucose ($C_6H_{12}O_6$) contained in equal volumes of solutions having the same osmotic pressure at the given temperature?
(1) 1 : 1 (2) 1 : 2
(3) 1 : 3 (4) 1 : 6

29. Same quantity of current is passed through molten NaCl and molten cryolite containing Al_2O_3. If 4.6 g of sodium were liberated in one cell, the mass of aluminium liberated in other cell was
(1) 0.9 g (2) 2.7 g
(3) 1.8 g (4) 3.6 g

30. Read the following statements and predict the corresponding law. "At infinite dilution, when dissociation is complete, each ion makes a definite contribution towards total equivalent conductance of the electrolyte irrespective of the nature of the ion."
(1) Ostwald's dilution law
(2) Kohlrausch's law
(3) Nernst equation
(4) Ohm's law

BOTANY

31. Occasionally, a single gene may express more than one effect. This is
(1) Polygenic inheritance
(2) Pleiotropy
(3) Multiple allelism
(4) Co-dominance

32. For a given character, a gamete is always
(1) Homozygous (2) Pure
(3) Hybrid (4) Heterozygous

33. tt mates with Tt. What will be characteristics of offspring?
(1) 75% recessive (2) 50% recessive
(3) 25% recessive (4) All dominant

34. Who used frequency of recombination between gene pairs on the same chromosome as a measure of distance between genes and mapped their position on chromosome?
(1) Alfred Sturtevant (2) Gregor Mendel
(3) Correns (4) Tschermak

35. DNA replication is
(1) Conservative and discontinuous
(2) Semiconservative and semi-discontinuous
(3) Semiconservative and discontinuous
(4) Conservative

36. Codon with dual function is
(1) UGA (2) UUU
(3) AUG (4) AAA

37. Many non-humans model organisms have also been sequenced along with the human genome, these are
(1) Bacteria and yeast
(2) Plants (rice and Arabidopsis)
(3) Fruitfly and Coenohabditis (nematode)
(4) All of the above

38. What will be probability of homozygous offspring, dominant offspring, homozygous recessive and heterozygous offsprings. If cross is made between AaBbCcDd × AaBbCcDd
(1) $\frac{1}{16}, \frac{81}{256}, \frac{1}{256}, \frac{1}{16}$ (2) $\frac{8}{256}, \frac{1}{16}, \frac{1}{256}, \frac{1}{16}$
(3) $\frac{1}{16}, \frac{1}{16}, \frac{1}{256}, \frac{1}{16}$ (4) None

39. Match column-I with column-II and select the correct option from codes given below

Column-I	**Column-II**
A. Royal botanical garden, Kew	(i) Lucknow
B. Indian botanical garden	(ii) England
C. National botanical Research Institute	(iii) Howrah
D. Llyod botanical garden	(iv) Darjeeling

(1) A-(ii), B(iii), C-(i), D-(iv)
(2) A-(i), B(iii), C-(ii), D-(iv)
(3) A-(iv), B(ii), C-(i), D-(iii)
(4) A-(iv), B(iii), C-(ii), D-(i)

40. Read the given statements about lichens and select the incorrect ones
(i) They represent an example of commensalism
(ii) Algal partner obtains water and mineral salts from the fungus and the fungal partner obtains food prepared by the alga
(iii) These do not grow in polluted areas
(iv) The mycobiont is usually an Ascomycetes or a Basidiomycetes
(v) The phycobiont is mostly a green alga or a cyanobacterium
(vi) These constitute the pioneer community in case of hydrosere
(1) (i) and (ii)
(2) (v) and (vi)
(3) (i) and (vi)
(4) (i), (v) and (vi)

41. Match column-I with column-II and select the correct option from the codes given below

Column-I	Column-II
A. Monera	(i) *Chlamydomonas, Solanum*
B. Protista	(ii) *Bacillus, Oscillatoria*
C. Fungi	(iii) *Euglena, Trypanosoma*
D. Plantae	(iv) *Mucor, Penicillium*
E. Animalia	(v) *Felis, Panthera*

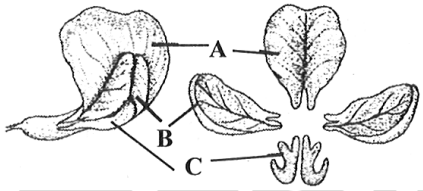
(1) A-(iii), B-(ii), C-(iv), D-(i), E-(v)
(2) A-(ii), B-(iii), C-(iv), D-(i), E-(v)
(3) A-(ii), B-(iii), C-(i), D-(iv), E-(v)
(4) A-(ii), B-(v), C-(i), D-(iv), E-(iii)

42. Match column-I with column-II and select the correct option from the codes given below

Column-I	Column-II
A. Thorns	(i) Vegetative propagation
B. Phylloclades	(ii) Defensive mechanism
C. Runners	(iii) Mechanical support
D. Stilt roots	(iv) Absorption of nutrition
E. Haustoria	(v) Photosynthesis

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

43. Select the correct option for A, B and C in the given diagram of papilionaceous corolla



(1) A-Keel, B-Wings, C-Vexillum
(2) A-Vexillum, B-Keel, C-Wings
(3) A-Vexillum, B-Wings, C-Keel
(4) A-Wings, B-Keel, C-Vexillum

44. Which of the following is a correct combination of family and its respective members?
(1) Fabaceae - *Colchicum, Trifolium*
(2) Solanaceae- *Petunia, Potato*
(3) Liliaceae - *Sesbania, Asparagus*
(4) Asteraceae - *Sonchus, Nicotiana*

45. Rearrange the following zones as seen in the root in vertical section and choose the correct option
A. Root hair zone B. Zone of meristems
C. Rootcap zone D. Zone of maturation
E. Zone of elongation
(1) C, B, E, A, D (2) A, B, C, D, E
(3) D, E, A, C, B (4) E, D, C, B, A

ZOOLOGY

46. Epithelial tissue is characterized by each of these traits, except that:
(1) It lacks blood vessels
(2) It functions in secretion, absorption and excretion
(3) Epithelial cells are loosely packed and have much intercellular material
(4) It is anchored to basement membrane

47. Match the following.

A.	Touch	1.	Nasal epithelium
B.	Smell	2.	Foramen magnum
C.	Cranial nerves	3.	Sensory papillae
D.	Medulla oblongata	4.	Peripheral nervous system

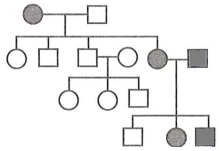
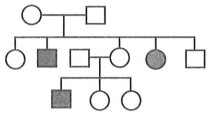
(1) A–3; B–1; C–2; D–4 (2) A–2; B–1; C–4; D–3
(3) A–3; B–4; C–2; D–1 (4) A–3; B–1; C–4; D–2

48. Immune system retains the memory of which response in vaccination process?
(1) Passive immunization response
(2) Primary immune response
(3) Secondary immune response
(4) All of the above

49. Which one of the following statements is correct with respect to AIDS?
(1) The HIV can be transmitted through eating food together with an infected person
(2) Drug addicts are least susceptible to HIV infection
(3) AIDS patients are being fully cured 100 per cent with proper care and nutrition
(4) The causative HIV retrovirus enters helper T lymphocytes thus reducing their numbers

50. Consider the following statements about biomeditechnologies.
(A) During open heart surgery, the blood is circulated in heart-lung machine
(B) Blockage in coronary arteries is removed angiography
(C) Computerized Axial Tomography (CAT) shows detailed internal structures as seen in a section of body
(D) X-ray provides clear and detailed images of organs prostate glands and lungs
Which two of the above statements are correct?
(1) A and C (2) A and B
(3) B and D (4) C and D

51. Identify the correct option w.r.t. given pedigree analysis

(A)  (B) 

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

52. Match the following.

	Column-I		Column-II
A.	Sickle cell anaemia	1.	7th chromosome
B.	Phenylketonuria	2.	4th chromosome
C.	Cystic fibrosis	3.	11th chromosome
D.	Huntington's disease	4.	X-chromosome
E.	Colour blindness	5.	12th chromosome

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

53. Which one of the following is correct matching of process occurring during menstrual cycle?
(1) Proliferative phase: Rapid regeneration of myometrium and maturation of Graafian follicle
(2) Secretory phase: Development of corpusluteum and increased secretion of progesterone.
(3) Menstruation: Breakdown of myometrium and ovum not fertilized
(4) Ovulation: LH and FSH attain peak level and sharp fall in the secreation of progesterone.

54. Seminal plasma in humans is rich in
(1) Fructose and calcium but has no enzymes
(2) Glucose and certain enzymes but has no calcium
(3) Fructose and certain enzymes but poor in calcium
(4) Fructose, calcium and certain enzymes

55. Which extra embryonic membrane in humans prevents desication of the embryo inside the uterus?
(1) yolk sac (2) amnion
(3) chorion (4) allantosis

56. The growth of corpus luteum is initiated by
(1) Human chorionic gonadotropin
(2) Follicle sitmulating hormone
(3) Luteinizing hormone
(4) Prolactin

57. Consider the statements given below regarding contraception and answer as directed thereafter:
A. Medical termination of pregnancy (MTP) during first trimester is generally safe
B. Generally, chances of conception are nil until mother breastfeeds the infant up to two years
C. Intrauterine devices like copper-T are effective contraceptives
D. Contraception pills may be taken up to one weak after coitus to prevent conception
Which two of the above statements are correct?
(1) A, C (2) A, B
(3) B, C (4) C, D

58. Copper-T is a device that prevents
(1) implantation of blastocyst
(2) ovulation
(3) fertilization
(4) egg maturation

59. Test-tube baby is one who
(1) is born out of artificial insemination
(2) has undergone development in a test tube
(3) is born out of in vitro fertilization
(4) has been developed without fertilization

60. Correctly match sexually transmitted disease with its pathogen
(1) Syphilis - Treponema pallidum
(2) AIDS - Bacillus anthracis
(3) Hepatitis B - HPV
(4) Gonarrhoea - Leishmania donovani