

PRABAL TEST PAPER

Time : 1 : 00 Hr.

Question : 50

PHYSICS

01. In a nuclear reactor, the function of the moderator is to decrease

- (1) Number of neutrons
- (2) Speed of neutrons
- (3) Escape of neutrons
- (4) Temperature of the reactor

02. A Carnot's engine working between 300 K and 900 K has a work output of 1200 J per cycle. The amount of heat energy supplied to the engine from the source in each cycle is :

- (1) 3200 J
- (2) 1800 J
- (3) 1600 J
- (4) 2400 J

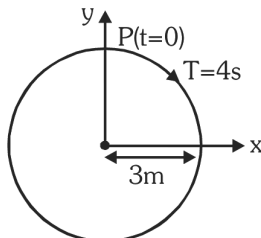
03. The force of kinetic friction does not depend on

- (1) The relative velocity of the two surfaces in contact
- (2) Nature of the surfaces in contact
- (3) Normal reaction on the moving body
- (4) All of the above

04. Two satellites, A and B, have masses m and $2m$ respectively. A is in a circular orbit of radius R , and B is in a circular orbit of radius $2R$ around the earth. The ratio of their kinetic energies, T_A/T_B , is:

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

05. The radius of circle, the period of revolution, initial position and sense of revolution are indicated in the fig.



y-projection of the radius vector of rotating particle P is:

- (1) $y(t) = -3\cos 2\pi t$, where y is in m
- (2) $y(t) = 4\sin\left(\frac{\pi t}{2}\right)$, where y is in m

(3) $y(t) = 3\cos\left(\frac{3\pi t}{2}\right)$, where y is in m

(4) $y(t) = 3\cos\left(\frac{\pi t}{2}\right)$, where y is in m

06. A charge $Q \mu\text{C}$ is placed at the centre of a cube. The flux coming out from it will be (in SI unit)

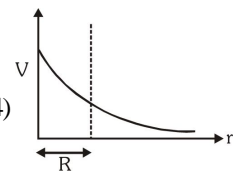
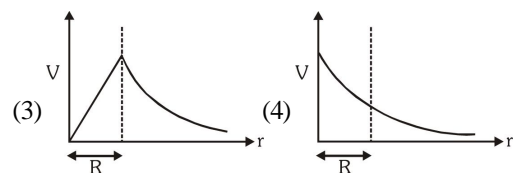
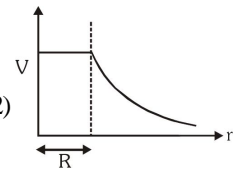
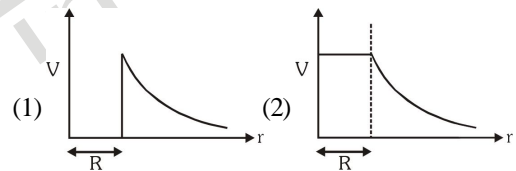
(1) $\frac{Q}{6\epsilon_0} \times 10^{-3}$

(2) $\frac{Q}{6\epsilon_0} \times 10^{-6}$

(3) $\frac{Q}{\epsilon_0} \times 10^{-6}$

(4) $\frac{2Q}{3\epsilon_0} \times 10^{-3}$

07. The variation of electrostatic potential with radial distance r from the centre of a positively charged metallic thin shell of radius R is given by the graph



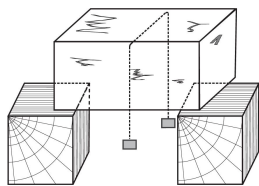
08. A circuit contains an ammeter, a battery of 30 V and a resistance 40.8 ohm all connected in series. If the ammeter has a coil of resistance 480 ohm and a shunt of 20 ohm, the reading in the ammeter will be:

- (1) 1 A
- (2) 0.5 A
- (3) 0.25
- (4) 2 A

09. A wire of length L metre carrying a current of I ampere is bent in the form of a circle. Its magnetic moment is,

- (1) $IL^2 / 4 \text{ A m}^2$
- (2) $I\pi L^2 / 4 \text{ A m}^2$
- (3) $2IL^2 / \pi \text{ A m}^2$
- (4) $IL^2 / 4\pi \text{ A m}^2$

10. In shown figure hanging thread will :



- (1) Slid on one side
- (2) pass through the slab
- (3) remain hanging as it is
- (4) freeze in ice.

CHEMISTRY

11. An organic compound has an empirical formula (CH_2O). Its vapour density is 45. The molecular formula of the compound is

(1) CH_2O (2) $\text{C}_2\text{H}_5\text{O}$ (3) $\text{C}_2\text{H}_2\text{O}$ (4) $\text{C}_3\text{H}_6\text{O}_3$

12. Out of the following pairs of electrons, identify the pairs of electrons present in degenerate orbitals.

(1) (i) $n = 3, l = 1, m_l = -1, m_s = -\frac{1}{2}$

(ii) $n = 3, l = 2, m_l = -1, m_s = -\frac{1}{2}$

(2) (i) $n = 3, l = 1, m_l = 1, m_s = +\frac{1}{2}$

(ii) $n = 3, l = 2, m_l = 1, m_s = +\frac{1}{2}$

(3) (i) $n = 4, l = 1, m_l = 1, m_s = +\frac{1}{2}$

(ii) $n = 3, l = 2, m_l = 1, m_s = -\frac{1}{2}$

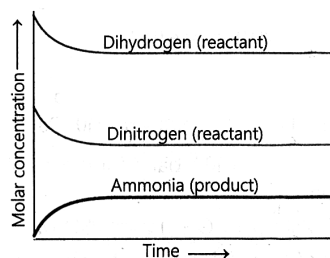
(4) (i) $n = 3, l = 2, m_l = +2, m_s = -\frac{1}{2}$

(ii) $n = 3, l = 2, m_l = +2, m_s = +\frac{1}{2}$

13. Identify the correct order of increase in the energy of the orbitals for hydrogen atom.

- (1) $1s < 2s < 2p < 3s = 3p = 3d < 4s = 4p = 4d = 4f$
- (2) $1s > 2s > 2p > 3s = 3p = 3d > 4s = 4p = 4d = 4f$
- (3) $1s = 2s = 3s = 4s > 2p = 3p = 4p > 3d = 4d > 4f$
- (4) $1s = 2s = 3s = 4s < 2p = 3p = 4p < 3d = 4d < 4f$

14. Consider the following statements about the graph given below,



I. After a certain time, the composition of the mixture remains same.

II. The reaction mixture starting with either H_2 or D_2 reach equilibrium with same composition.

III. The constancy in composition indicates that the reaction has reached equilibrium.

Choose the correct answer from the options given below.

- (1) Only I
- (2) Only II
- (3) I and III
- (4) I, II and III

15. When 3 moles of ethyl alcohol are mixed with 3 moles of acetic acid, 2 moles of ester are formed at equilibrium.

According to the equation,
 $\text{CH}_3\text{COOH}(l) + \text{C}_2\text{H}_5\text{OH}(l) \rightleftharpoons \text{CH}_3\text{COOC}_2\text{H}_5(l) + \text{H}_2\text{O}(l)$

The value of the equilibrium constant for the reaction is

- (1) 4
- (2) $\frac{2}{9}$
- (3) 2
- (4) $\frac{4}{9}$

16. **Statement I:** The pH of water increases with increase in temperature.

Statement II: The dissociation of water in H^+ and OH^- is an exothermic reaction.

- (1) Both Statement I and Statement II are false.
- (2) Statement I is true but Statement II is false.
- (3) Statement I is false but Statement II is true.
- (4) Both Statement I and Statement II are true.

17. The unit of ebullioscopic constant is

- (1) K kg mol^{-1} or K (molality)^{-1}
- (2) mol kg K^{-1} or K^{-1} (molality)
- (3) $\text{Kg mol}^{-1} \text{K}^{-1}$ or K^{-1} (molality) $^{-1}$
- (4) K mol kg^{-1} or K (molality)

18. Consider the data given below for a hypothetical reactions, $\text{M} \rightarrow \text{N}$

Time(s) **Rate of reaction ($\text{mol L}^{-1}\text{s}^{-1}$)**

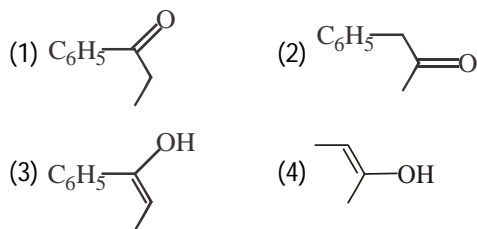
0	4.20×10^{-4}
10	4.20×10^{-4}
20	4.20×10^{-4}
30	4.20×10^{-4}
40	4.18×10^{-4}

For the above data, the order of reaction is

- (1) first
- (2) second
- (3) third
- (4) zero

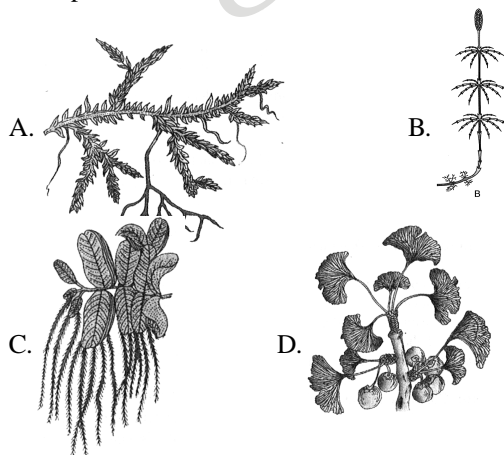
19. **Assertion :** The boiling point of alkanes increases steadily with increase in size of chain.
Reason: Greater the length of the chain in n-alkanes, greater the surface area and thus van der Waals attractive forces are large.
 (1) If Assertion and Reason both are correct and Reason is the correct explanation of Assertion
 (2) If Assertion and Reason both are correct but Reason is not the correct explanation of Assertion
 (3) If Assertion is correct but Reason is incorrect
 (4) If Assertion is incorrect but Reason is correct

20. $C_6H_5C \equiv CCH_3 \xrightarrow{Hg^{2+}/H^+} A$. Here A is



BOTANY

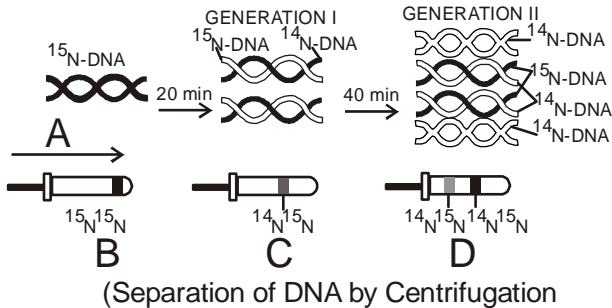
21. Predominate method for control of gene expression in prokaryote is
 (1) Transcriptional level
 (2) Translational level
 (3) Splicing level
 (4) Translocation of m-RNA
22. **Assertion:** In a monohybrid cross F_1 generation indicates recessive characters.
Reason: Dominance occurs only in homozygous state.
 (1) If both the assertion and the reason are true and the reason is a correct explanation of the assertion.
 (2) If both the assertion and reason are true but the reason is not a correct explanation of the assertion.
 (3) If the assertion is true but the reason is false.
 (4) If both the assertion and reason are false.
23. Examine the figures A, B, C and D. In which one of the four options all the items A, B, C and D are correct?



- (1) A–Chara, B–Marchantia, C–Fucus, D–Pinus
 (2) A–Equisetum, B–Ginkgo, C–Selaginella, D–Lycopodium
 (3) A–Selaginella, B–Equisetum, C–Salvinia, D–Ginkgo
 (4) A–Funaria, B–Adiantum, C–Salvinia, D–Riccia

24. In Mendelian dihybrid cross the yellow and green colour of seed is segregated in the ratio of
 (1) 3 : 1
 (2) 10 : 6
 (3) 9 : 4
 (4) 9 : 7
25. How many Calvin cycle forms one hexose molecule?
 (1) 2
 (2) 6
 (3) 4
 (4) 8
26. Heterosporous pteridophytes are
 (1) Dryopteris and Pteris.
 (2) Selaginella and Lycopodium.
 (3) Selaginella and Salvinia.
 (4) Equisetum and Adiantum.
27. Viruses infecting bacteria usually have..... as their genetic material.
 (1) ssRNA & dsRNA
 (2) ssRNA
 (3) dsDNA
 (4) ssRNA, dsRNA or dsDNA
28. Chromatin contains -
 (1) DNA and some basic proteins called histones.
 (2) DNA, histones and non-histone proteins
 (3) DNA, RNA, histone and non-histone proteins
 (4) DNA, RNA and histone proteins
29. **Assertion:** Human beings sweat or shiver during summers or winters respectively.
Reason: Humans beings are Regulators.
 (1) Both assertion and reason are true and the reason is the correct explanation of the assertion
 (2) Both assertion and reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true but reason is false
 (4) Both assertion and reason are false
30. **Statement I-** Amazon forest is estimated to produce 20% of total oxygen in earth's atmosphere.
Statement II- Biodiversity hotspots are also regions of accelerated habitat loss.
 (1) Both Statement-I and Statement-II are correct
 (2) Statement-I is correct and Statement-II is incorrect
 (3) Statement-I is incorrect and Statement-II is correct
 (4) Both statement-I and statement-II are incorrect.

31. What is indicated by A, B, C and D in the figure?



(Separation of DNA by Centrifugation)

- (1) Centrifugal force, Heavy, Hybrid and light hybrid
 (2) Centripetal force, Heavy, Hybrid and light hybrid
 (3) Gravitational force, Heavy, Hybrid and light hybrid
 (4) Radioactive force, Heavy, Hybrid and light hybrid
32. Which of the following statements are incorrect
 (a) Reproduction is an all inclusive defining characteristic of living organism.
 (b) Scientific term for categories like Cats, Mammals, Wheat, Rice, Plants and animals is "taxa"
 (c) Animals, mammals and dogs represent taxa at different levels.
 (d) Primata and insecta are on same level according to hierarchial arrangement of taxonomic categories.
 (1) a, b & c (2) c & d
 (3) a and c (4) only a
33. For the given magnitude of "r" values, which organism has slowest population increase if given a limited frame of time for all.
 (1) Norway rat = 0.015
 (2) Flour beetle = 0.12
 (3) Human population (1981) = 0.0205
 (4) Human population (2021) = 0.0195
34. Which of the following is correct order of decreasing biodiversity of major taxa.
 (1) Insects, Crustacean, Molluscs, Other insect groups
 (2) Fishes, Birds, Reptiles, Amphibian, Mammals
 (3) Crustacean, Mammals, Other insect groups, Insects
 (4) Lichen, Mosses, Fern and allies, Algae, Fungi, Angiosperm
35. David Tilman's long term ecosystem experiments using outdoor plots showed which of the following observation.
 (1) Higher the productivity, higher the biodiversity loss.
 (2) Higher the biodiversity, higher the variation in year to year production of biomass.
 (3) Lesser the diversity among organism, more is the variation in production of biomass.
 (4) Less the production of biomass, less biodiversity loss occurs.

ZOOLOGY

36. Match the disease in Column I with the appropriate items (pathogen/prevention/treatment) in Column II
- | Column-I | Column-II |
|---------------|---------------------------------------|
| A. Amoebiasis | 1. <i>Treponema pallidum</i> |
| B. Diphtheria | 2. Use only sterilized food and water |
| C. Cholera | 3. DPT vaccine |
| D. Syphilis | 4. Use oral rehydration therapy |
- (1) A-2, B-3, C-4, D-1 (2) A-1, B-2, C-3, D-4
 (3) A-2, B-4, C-1, D-3 (4) A-2, B-1, C-3, D-4
37. In bird exceptionally (A) gland is present at the (B).
 (1) A = Oil B = Base of fore limb
 (2) A = Oil B = Base of tail
 (3) A = preen B = Base of beak
 (4) A = Uropygeal B = Base of beak
38. **Assertion (A):** Animal belonging to phylum chordata are fundamentally characterized by the presence of notochord, a dorsal hollow nerve cord and paired pharyngeal gill slits.
Reason (R): These are triploblastic and pseudocoelomate animals.
 (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
 (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
 (3) (A) is true but (R) is false
 (4) Both (A) and (R) are false
39. Which of the following statements are correct about Klinefelter's Syndrome?
 A. This disorder was first described by Langdon Down (1866).
 B. Such an individual has overall masculine development. However, the feminine development is also expressed.
 C. The affected individual is short statured.
 D. Physical, psychomotor and mental development is retarded.
 E. Such individuals are sterile.
 Choose the correct answer from the options given below:
 (1) C and D only (2) B and E only
 (3) A and E only (4) A and B only
40. Choose the correct statement for frog:
 (1) Body of a mature frog is divisible into head, thorax and abdomen
 (2) Skin is moist and without scales
 (3) The forelimb has no role in swimming
 (4) The hind limbs end in four digits

41. An organ X has a large blood supply. It produces a hormone lack of which cause a disease called as cretinism. The cause is:
 (1) Excess growth hormone
 (2) Absence of insulin
 (3) Excess adrenalin
 (4) Hyposecretion of thyroid in childhood
42. Given below are two statements :
Statement I : Ligaments are dense irregular tissue.
Statement II : Cartilage is dense regular tissue.
 In the light of the above statements, choose the correct answer from the options given below :
 (1) Both Statement I and Statement II are false.
 (2) Statement I is true but Statement II is false.
 (3) Statement I is false but Statement II is true.
 (4) Both Statement I and Statement II are true.
43. Match the following columns.
- | | Column-I | | Column-II |
|----|--------------------------------------|----|-----------------|
| A. | Government of India legalised MTP in | 1. | 1951 |
| B. | Family planning introduced in India | 2. | 1971 |
| C. | Nirodh | 3. | Barrier method |
| D. | Mala-D and Mala-N | 4. | Hormonal method |
- (1) A-1; B-2; C-3; D-4 (2) A-2; B-1; C-3; D-4
 (3) A-4; B-3; C-2; D-1 (4) A-1; B-4; C-3; D-2
44. Who used hides to protect their body and buried their dead?
 (1) Neanderthal man (2) Homo habilis
 (3) Australopithecus (4) Dryopithecus
45. The techniques or processes that are included under biotechnology are
 A. in vitro fertilisation
 B. synthesising a gene
 C. chemical synthesis
 D. correcting a defective gene
 E. developing a DNA vaccine.
 (1) A, C, E (2) A, B, C
 (3) B, D, E (4) A, B, D, E
46. Which of the following statement is true regarding DNA polymerase used in PCR?
 (1) It is isolated from plant cells
 (2) It remains active at high temperature
 (3) It is used to ligate foreign DNA in recipient cells
 (4) It serves as a selectable marker
47. Enzymes that catalyse the removal of groups from substrates by mechanism other than hydrolysis and addition of groups to double bonds are called
 (1) Lyases (2) Ligases
 (3) Hydrolases (4) Dehydrogenases
48. The essential chemical components of many coenzymes are
 (1) Proteins (2) Nucleic acids
 (3) Carbohydrates (4) Vitamins
49. Identify the synovial joints among the given options.
 I. Ball and socket II. Hingejoint
 III. Pivot joints IV. Sutures of skull
 V. Vertebral joints
 Select the correct option.
 (1) I, II, III and IV (2) I, III, IV and V
 (3) II, III, IV and V (4) I, II and III
50. Consider the following statements.
 I. Transgenic animals are more sensitive to the toxic substance than non-transgenic animals.
 II. Useful biological products can be produced by introducing the portion of DNA which codes for a particular product into transgenic animals.
 III. Transgenics are designed to allow the study of gene regulation.
 IV. Transgenic animals are used to study the normal physiology and development.
 Which of the above statements are correct?
 (1) I, II, III and IV (2) I and II
 (3) I and III (4) II, III and IV