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SAMPLE PAPER - 66

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

PHYSICS

01. If the gravitational force between two objects were proportional to 1/R (and not as $1/R^2$), where R is the distance between them, then a particle in a circular path (under such a force) would have its orbital speed v, proportional to

(1) R (2) R^0 (independnt of R)

(3) $\frac{1}{R^2}$ (4) $\frac{1}{R}$

02. Consider a planet moving around a star in an elliptical orbit with period T. The area of the elliptical orbit is proportional to

(1) $T^{\frac{4}{3}}$ (2) T

(3) $T^{\frac{2}{3}}$ (4) $T^{\frac{1}{2}}$

03. The depth at which the effective value of acceleration due to gravity is $\frac{g}{4}$ is (R = radius of the earth)

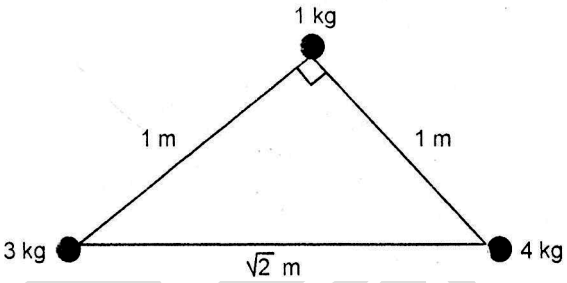
(1) R (2) $\frac{3R}{4}$ (3) $\frac{R}{2}$ (4) $\frac{R}{4}$

04. A point mass m is placed inside a spherical shell of radius R and mass M at a distance $\frac{R}{2}$ from the centre of the shell. The gravitational force exerted by the shell on the point mass is

(1) $\frac{GMm}{R^2}$ (2) $\frac{2GMm}{R^2}$

(3) Zero (4) None of these

05. Three spherical ball of mass 1 kg, 3kg, and 4 kg are placed at the corners of a right angle triangle as shown in figure. The magnitude of gravitational force exerted by 3 kg and 4 kg masses on 1 kg mass is



(1) 4 g (2) $3\sqrt{3}$ G (3) 5 G (4) $4\sqrt{2}$ G

06. A car 'A' moves due north at a speed of 40 km/hr, while another car 'B' moves due east at a speed of 30 km/hr. Find the velocity of car B relative to car A (both in magnitude and direction).

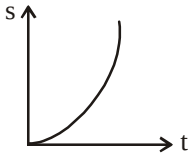
(1) 40 km/hr, at an angle $\tan^{-1}\left(\frac{3}{5}\right)$ east of south

(2) 50 km/hr, at an angle $\tan^{-1}\left(\frac{3}{5}\right)$ east of south

(3) 40 km/hr, at an angle $\tan^{-1}\left(\frac{3}{4}\right)$ east of south

(4) 50 km/hr, at an angle $\tan^{-1}\left(\frac{3}{4}\right)$ east of south

07. s-t graph shown in figure is a parabola. From this graph we find that



(1) the body is moving with uniform velocity
(2) the body is moving with uniform speed
(3) the body is starting from rest and moving with uniform acceleration
(4) the body is not moving at all

08. A car starts from rest and accelerates at 5 m/s^2. At t = 4 s, a ball is dropped out of a window by a person sitting in the car. What is the velocity and acceleration of the ball at t = 6 s? (Take g = 10 m/s^2)

(1) 20 $\sqrt{2}$ m/s, 10 m/s^2
(2) 20 m/s, 5 m/s^2
(3) 20 m/s, 0 (4) 20 $\sqrt{2}$ m/s, 0

09. From a circular ring of mass 'M' and radius 'R' an arc corresponding to a 90° sector is removed. The moment of inertia of the remaining part of the ring about an axis passing through the centre of the ring and perpendicular to the plane of the ring is 'K' times 'MR^2'. Then the value of 'K' is

(1) $\frac{1}{8}$ (2) $\frac{3}{4}$ (3) $\frac{7}{8}$ (4) $\frac{1}{4}$

10. A particle of mass 'm' is projected with a velocity $v = kV_e$ ($k < 1$) from the surface of the earth.
(V_e = escape velocity)
The maximum height above the surface reached by the particle is

(1) $\frac{Rk^2}{1-k^2}$ (2) $R\left(\frac{k}{1-k}\right)^2$

(3) $R\left(\frac{k}{1+k}\right)^2$ (4) $\frac{R^2k}{1+k}$

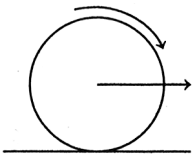
11. The instantaneous angular position of a point on a rotating wheel is given by the equation $\theta(t) = t^3 - 6t^2$. The torque on the wheel becomes zero at
(1) t = 0.5 s (2) t = 0.25 s (3) t = 2 s (4) t = 1 s

12. Let F be the force acting on a particle having position vector r and τ be the torque of this force about the origin. Then,
(1) $r \cdot \tau = 0$ and $F \cdot \tau \neq 0$ (2) $r \cdot \tau \neq 0$ and $F \cdot \tau = 0$
(3) $r \cdot \tau \neq 0$ and $F \cdot \tau \neq 0$ (4) $r \cdot \tau = 0$ and $F \cdot \tau = 0$

13. A thin rod of length L and mass M is bent at its mid-point into two halves, so that the angle between them is 90°. The moment of inertia of the bent rod about an axis passing through the bending point and perpendicular to the plane defined by the two halves of the rod is

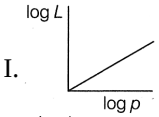
(1) $\frac{ML^2}{24}$ (2) $\frac{ML^2}{12}$ (3) $\frac{ML^2}{6}$ (4) $\frac{\sqrt{2}ML^2}{24}$

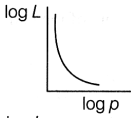
14 A bicycle wheel rolls without slipping on a horizontal floor. Which one of the following is true about the motion of points on the rim of the wheel, relative to the axis at the wheel's centre?

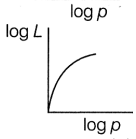


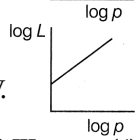
(1) Points near the top move faster than points near the bottom
(2) Points near the bottom move faster than points near the top
(3) All points on the rim move with the same speed
(4) All points have the velocity vectors that are pointing in the radial direction towards the centre of the wheel

15. Angular momentum L is given by $L = p \cdot r$. The variation of log L and log p is shown by

I. 

II. 

III. 

IV. 

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

CHEMISTRY

16.

Element	Group No.	Period
A	14	III
B	2	II
C	2	III
D	1	III
E	15	III

The decreasing order of metallic character of elements
(1) D > C > B > A > E (2) B > C > D > E > A
(3) B > C > D > A > E (4) D > C > B > E > A

17. Match the column -I and column-II

	Column-I		Column-II
A.	Element with five 'e' in outermost shell	p.	Fe, Co, Ni
B.	Element tends to loose two electron	q.	O, S, Se
C.	Element tends to gain two electron	r.	As, Sb, Bi
D.	Element that have two shells incomplete	s.	Ca, Sr, Ba

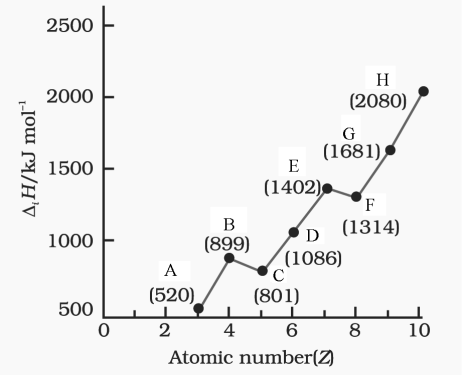
(1) A–r, B–s, C–p, D–q (2) A–r, B–s, C–q, D–p
(3) A–p, B–q, C–s, D–r (4) A–q, B–r, C–s, D–p

18. Elements given in column–I and their electron gain enthalpy in column–II. Match the elements with electron gain enthalpy.

	Column-I		Column-II
(i)	Noble gas	(p)	– 53 KJ/mole
(ii)	Alkali metal	(q)	– 328 KJ/mole
(iii)	Halogen	(r)	– 141 KJ/mole
(iv)	Chalcogen	(s)	+ 48 KJ/mole

(1) (i)–(s); (ii)–(q); (iii)–(p); (iv)–(r)
(2) (i)–(s); (ii)–(p); (iii)–(r); (iv)–(q)
(3) (i)–(s); (ii)–(p); (iii)–(q); (iv)–(r)
(4) (i)–(s); (ii)–(r); (iii)–(q); (iv)–(p)

19. Graph given below.



Match Column–I and Column–II. On the basis of graph.

	Column-I		Column-II
(i)	Most reactive N.M.	(p)	C
(ii)	Least reactive N.M.	(q)	G
(iii)	More reactive metal	(r)	H
(iv)	non metal with least I.P.	(s)	A

(1) (i)–(s); (ii)–(r); (iii)–(q); (iv)–(p)
(2) (i)–(q); (ii)–(s); (iii)–(p); (iv)–(r)
(3) (i)–(q); (ii)–(r); (iii)–(s); (iv)–(p)
(4) (i)–(r); (ii)–(q); (iii)–(p); (iv)–(s)

20. The correct order among the following is
(1) $HIO_4 > HBrO_4 > HClO_4 >$. dec. acidic strength
(2) $H_2O > H_2S > H_2Te >$. dec. acidic strength
(3) HI > HBr > HCl > HF dec. acidic strength
(4) $Na_2O > K_2O > Rb_2O > Cs_2O$ dec. basic strength

21. The first ionisation potential of Na, Mg, Al and Si are such that
(1) Na < Mg < Al > Si
(2) Na < Al < Mg < Si
(3) Na > Mg > Al > Si
(4) Na < Al < Si < Mg

22. The properties of zirconium and Hafnium atoms and ions are almost the same because both
(1) are metal and belong to same period
(2) have high melting point and belongs to d block elements
(3) have almost identical ionic and covalent radius
(4) are electropositive in nature

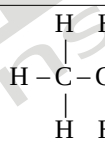
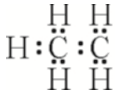
23. The first ionization energy (in kJ/mol) of Na, Mg, Al and Si respectively, are:
(1) 496, 737, 577, 786
(2) 786, 737, 577, 496
(3) 496, 577, 737, 786
(4) 496, 577, 786, 737

24. Match the facts of Column-I with those of Column-II and select the correct option.

	Column-I		Column-II
(p)	$CH_3-CH(CH_3)-CH_2-$	(i)	Neopentyl
(q)	$CH_3-C(CH_3)_2-$	(ii)	tert-butyl
(r)	$CH_3-CH_2-CH(CH_3)-$	(iii)	Isobutyl
(s)	$CH_3-C(CH_3)_2-CH_2-$	(iv)	sec-Butyl

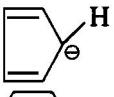
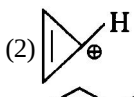
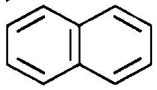
(1) (p)–(iv); (q)–(i); (r)–(ii); (s)–(iii)
(2) (p)–(iii); (q)–(i); (r)–(iv); (s)–(ii)
(3) (p)–(iv); (q)–(i); (r)–(iii); (s)–(ii)
(4) (p)–(iii); (q)–(ii); (r)–(iv); (s)–(i)

25. Match the facts for n–butane shown in Column-I with those of Column-II and select the correct option.

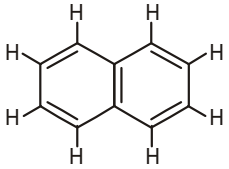
	Column-I		Column-II
(p)		(i)	Complete structure
(q)	$CH_3(CH_2)_2CH_3$	(ii)	Condensed structure
(r)		(iii)	Lewis or dot structure
(s)		(iv)	Bond line structure

(1) (p)–(iv); (q)–(iii); (r)–(ii); (s)–(i)
(2) (p)–(i); (q)–(ii); (r)–(iii); (s)–(iv)
(3) (p)–(iv); (q)–(ii); (r)–(i); (s)–(iii)
(4) (p)–(ii); (q)–(i); (r)–(iv); (s)–(iii)

26. Which of the following molecules represents the order of hybridisation sp^2, sp^2, sp, sp from right to left atoms?
(1) $CH_3-CH=CH-CH_3$
(2) $CH\equiv C-CH=CH_2$
(3) $CH_2=CH-C\equiv CH$
(4) $HC\equiv C-C\equiv CH$

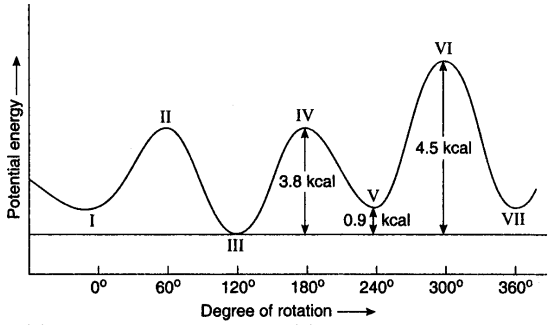
27. Which one of the following compounds is not aromatic?
(1) 
(2) 
(3) 
(4) 

28. Number of π bonded electron and σ bonded electron in the following structure is



(1) 5, 19 (2) 4, 20 (3) 10, 38 (4) 5, 20

29. What will be the correct stability order of the different conformations of n-butane?



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

30. Which of the following compounds contain most acidic H?

(1) $CH_2 = CH_2$ (2) $HC \equiv CH$

(3) 

(4) $CH_2 = CH - CH_2 - CH = CH_2$

BOTANY

31. Which of the following is not a part of bacterial flagellum?
(1) Filament (2) Hook
(3) Basal body (4) None of these

32. What is the component of middle lamella that puts the different binding neighbouring cells together?
(1) Calcium phosphate (2) Sodium pectate
(3) Calcium pectate (4) Sodium phosphate

33. Excretion in amoeba (fresh water protozoan) is performed by
(1) Golgi body (2) Food vacuoles
(3) Contractile vacuoles (4) Gas vacuoles

34. Golgi apparatus is absent in
(1) BGA
(2) Bacteria
(3) Mature mammalian RBC
(4) All of these

35. The similarity between prokaryote, mitochondria and chloroplast is
(1) Circular DNA (2) 70S ribosomes
(3) Absence of histone (4) All of these

36. Astral rays arise from
(1) Centriole (2) Cytoplasm
(3) Chromatid (4) Centromere

37. Cell in G_0 - phase of cell cycle
(1) Exit cell cycle (2) Enter cell cycle
(3) Suspended cell cycle (4) Terminate cell cycle

38. In which stage of cell cycle, chromosomes are most condensed ?
(1) Prophase (2) Metaphase
(3) Anaphase (4) Telophase

39. Which of the protein is found in spindle fibre ?
(1) Tubulin (2) Albumin
(3) Mucin (4) Haemoglobulin

40. Number of mitotic divisions required to produce 128 cells from a single cell:
(1) 32 (2) 14 (3) 16 (4) 7

41. Cyanobacteria are:
(1) Autotrophic prokaryotes with characteristic blue green pigments
(2) Bacteria infecting the cyanophycean algae
(3) Viruses infecting blue green algae
(4) Cyanophycean members infecting bacteria

42. Protista contains:
(1) Euglena, Dinoflagellates and Yeast
(2) Amoeba, Paramoecium, Hydra
(3) Euglena, Paramoecium, Mushroom
(4) Amoeba, Paramoecium and Dinoflagellates /Diatoms

43. Meiosis involves:
(1) Two nuclear divisions and one chromosome division
(2) One nuclear division and one chromosome division
(3) One nuclear division and two chromosome divisions
(4) Two nuclear divisions and two chromosome divisions

44. Meiosis II performs:
(1) Separation of sex chromosomes
(2) Synthesis of DNA and centromere
(3) Separation of homologous chromosomes
(4) Separation of chromatids

45. Select the correct option:

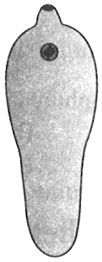
	Column–I		Column–II
(a)	Synapsis aligns homologous chromosomes	(i)	Anaphasell
(b)	Synthesis of RNA and protein	(ii)	Zygotene
(c)	Action of enzyme recombinase	(iii)	G_2-phase
(d)	Centromeres do not separate but chromatids move towards opposite poles	(iv)	Anaphase I
		(v)	Pachytene

(1) a→(ii); b→(iii); c→(iv); d→(v)
(2) a→(ii); b→(i); c→(iii); d→(iv)
(3) a→(ii); b→(iii); c→(v); d→(iv)
(4) a→(i); b→(ii); c→(v); d→(iv)

ZOOLOGY

46. The following features belong to which phylum?
(A) Exclusively marine
(B) Radial symmetry
(C) Diploblastic
(D) Tissue level organization
(1) Coelenterata (2) Porifera
(3) Ctenophora (4) Platyhelminthes

47. (1) Fertilization _____
(2) Development _____
(3) Excretion and osmoregulation by _____



Fill in the blanks for the organism given in figure.
(1) (1) Internal, (2) Direct, (3) Rennet cells
(2) (1) Internal, (2) Indirect, (3) Flame cells
(3) (1) External, (2) Direct, (3) Nephridia
(4) (1) External, (2) Indirect, (3) Protonephridia

48. Match the following.

	Column–I		Column–II
A.	Ascaris	1.	Intestinal roundworm
B.	Wuchereria	2.	Filarial worm
C.	Ancylostoma	3.	Hookworm
D.	Pheretima	4.	Earthworm

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

49. Metamerism is found in
(1) Ascaris (2) Leech
(3) Loligo (4) Octopus

50. The first true coelomates are
(1) Nereis (2) Centipede
(3) Crab (4) Wuchereria

51. Which is the correct sequence of the air passage in man?
(1) Nasal cavity → Pharynx → Trachea → Larynx → Bronchi → Bronchioles → Alveoli
(2) Nasal cavity → Pharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli
(3) Nasal cavity → Larynx → Pharynx → Trachea → Bronchi → Bronchioles → Alveoli
(4) Nasal cavity → Larynx → Bronchi → Pharynx → Trachea → Bronchioles → Alveoli

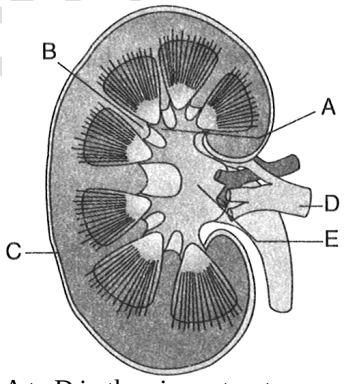
52. Cartilaginous rings in respiratory passage is present in
(1) Trachea only
(2) Trachea and initial bronchioles only.
(3) Trachea, bronchi and initial bronchioles.
(4) None of these

53. Arrange the following steps of the respiration process in correct sequence.
1. Breathing or pulmonary ventilation by which atmospheric air is drawn in and CO_2 rich alveolar air is released out.
2. Diffusion of gases (O_2 and CO_2) across alveolar membrane.
3. Transport of gases by the blood.
4. Diffusion of O_2 and CO_2 between blood and tissues.
5. Utilization of O_2 by the cells for catabolic reactions and resultant release of CO_2.
(1) 1, 2, 3, 4, 5 (2) 1, 3, 2, 5, 4
(3) 5, 4, 3, 1, 2 (4) 3, 4, 5, 2, 1

54. The largest quantity of air that can be expired after a maximum inspiratory effort is
(1) Residual volume (2) Tidal volume
(3) Vital capacity (4) Total lung volume

55. The total thickness of respiratory diffusion membrane is
(1) Less than fm (2) Less than micrometre
(3) Much less than mm (4) Less than nm

56. Observe the following figure.



Identify A to D in the given structure.
(1) A–Renal column, B–Renal capsule, C–Calyx, D–Renal pelvis.
(2) A–Renal capsule, B–Renal pelvis, C–Renal vein, D–Calyx.
(3) A–Calyx, B–Renal column C–Renal capsule, D–Renal vein.
(4) A–Renal vein, B–Calyx, C–Renal column, D–Renal capsule.

57. How much amount of blood is filtered by kidneys per minute?
(1) 500 ml (2) 1100-1200 ml
(3) 1500 ml (4) 125 ml

58. How much per cent of the filtrate is nearly reabsorbed by the renal tubules?
(1) 70 – 90% (2) 85%
(3) 99% (4) 90%

59. What is the ratio of concentration of outer medulla to the outer portion of inner medulla?
(1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{4}{3}$ (4) $\frac{1}{4}$

60. In an average, _____ of urea is excreted out per day.
(1) 20 – 25 gm (2) 25 – 30 gm
(3) 25 – 30 mg (4) 40 – 45 gm