# physics

Q.1 Which one of the following represent the correct dimensions of the coefficient of viscosity?
(a) $ML^{-1}T^{-2}$
(b) MLT^{-1}
(c) $ML^{-1}T^{-1}$
(d) $ML^{-2}T^{-2}$

Q.2 A student uses a simple pendulum of exactly 1 m length to determine g, the acceleration due to gravity. He uses a stop watch with the least count of 1 sec for this and records 40seconds for 20 oscillations. For this observation, which of the following statements is true?
(a) Error ΔT in measuring T, the time period, is 0.15 seconds.
(b) Error ΔT in measuring T, the time period, is 1 second.
(c) Percentage error in the determination of g is 5%.
(d) Percentage error in the determination of g is 2.5%

Q.3 Two bodies are projected with the same velocity. If one is projected at an angle of 30° and the other at an angle of 60° to the horizontal, the ratio of the maximum heights reached is
(a) 3 : 1
(b) 1 : 3
(c) 1 : 2
(d) 2 : 1

Q.4 From a tower of height H, a particle is thrown vertically upwards with a speed u. The time taken by the particle, to hit the ground, is n times that taken by it to reach the highest point of its path. The relation between H, u and n is :-
(a) $gH = (n-2)u^2$
(b) $2gH = n^2u^2$
(c) $gH = (n-2)^2u^2$
(d) $2gH = nu^2(n-2)$

Q.5 A point P moves in counter-clockwise direction on a circular path as shown in the figure. The movement of P is such that it sweeps out a length $s = t^3 + 5$, where s is in metres and t is in seconds. The radius of path is 20 m. The acceleration of P when $t = 2$ s is nearly

(a) $14\ m\ s^{-2}$
(b) $13\ m\ s^{-2}$
(c) $12\ m\ s^{-2}$
(d) $7.2\ m\ s^{-2}$
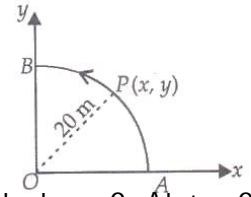
Q.6 A body is at rest at $x = 0$. At $t = 0$, it starts moving in the positive x-direction with a constant acceleration. At the same instant another body passes through $x = 0$ moving in the positive x-direction with a constant speed. The position of the first body is given by $x_1(t)$ after time t and that of the second body by $x_2(t)$ after the same time interval. which of the following graphs correctly describes $(x_1 - x_2)$ as a function of time t ?
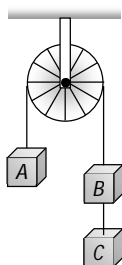
(a)

(b)

(c)

(d)
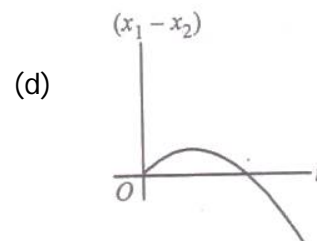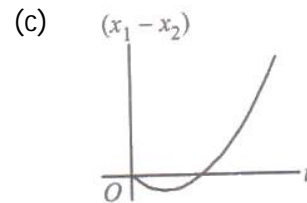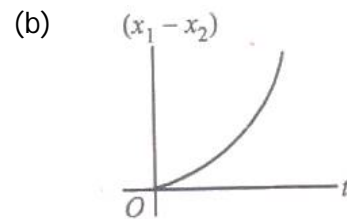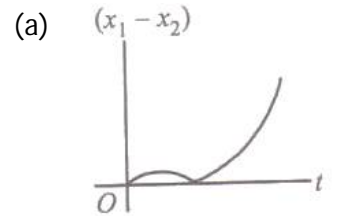
Q.7 A particle is moving eastwards with a velocity of $5m/s$. In 10s the velocity changes to $5m/s$ northwards. The average acceleration in this time is
(a) Zero
(b) $\frac{1}{\sqrt{2}}ms^{-2}$ towards north-west
(c) $\frac{1}{\sqrt{2}}ms^{-2}$ towards north-east

(d) $\frac{1}{2}ms^{-2}$ towards north

Q.8 A person start his journey at 9:00 am from Nahan to Chandigarh. Its position varies w.r.t. time as $s = \alpha t^2$. It crosses Kala-amb at 9:20 am. What will be its velocity and distance at 9:20 am ($\alpha = 0.02 \ m/s^2$).
(a) 28.8 m/s , 48 km
(b) 48 m/s, 28.8 km
(c) 28.8 m/s, 28.8 km
(d) 48 m/s, 48 km.

Q.9 Three equal weights A, B and C of mass 2 kg each are hanging on a string passing over a fixed frictionless pulley as shown in the figure The tension in the string connecting weights B and C is
(a) Zero
(b) 13 N
(c) 3.3 N
(d) 19.6 N

Q.10 A block P of mass m is placed on a horizontal frictionless plane. A second block of same mass m is placed on it and is connected to a spring of spring constant k. The two blocks are pulled by distance A. Block Q oscillates without slipping. What is the maximum value of frictional force between the two blocks?
(a) $kA/2$
(b) kA
(c) $\mu_s mg$
(d) zero
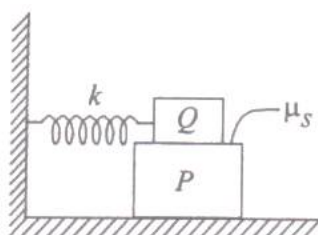
ANSWER KEY:-
1.(C)   2.(C)   3.(B)   4.(D)   5.(A)   6.(C)
7.(B)   8.(B)   9.(B)   10.(A)

Chemistry

Q.11 The equivalent weight of an element is 4. Its chloride has a vapour density 59.25. Then the valency of the element is
(a) 4
(b) 3
(c) 2
(d) 1

Q.12 6.022×10^{20} molecules of urea are present in 100 mL of its solution. The concentration of solution is
(a) 0.02
(b) 0.01
(c) 0.001
(d) 0.1.

Q.13 The energies E_1 and E_2 of two radiations are 25 eV, and 50eV, respectively. The relation between their wavelengths, i.e, λ_1 and λ_2 will be
(a) $\lambda_1 = \frac{1}{2}\lambda_2$
(b) $\lambda_1 = \lambda_2$
(c) $\lambda_1 = 2\lambda_2$
(d) $\lambda_1 = 4\lambda_2$.

Q.14 The total number of maximum different spectral lines obtained with an excited electron in a single H atom at 5th excited state de-excites.
(a) 5
(b) 15
(c) 1
(d) 10

Q.15 The first ionisation potential of Na is 5.1 eV. The value of electron gain enthalpy of Na^+ will be
(a) -2.55 eV
(b) – 5.1 eV
(c) -10.2 eV
(d) +2.55 eV.

Q.16 Match the Column I with Column II and select the correct answer using given codes.

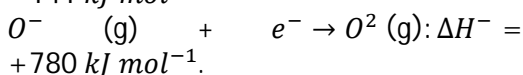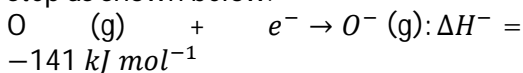| Column I (Elements)	Column II (Properties)
A. $Li^+ < Al^{3+} < Mg^{2+} < K^+$	1. EA (Electron affinity)
B. $Li^+ > Al^{3+} > Mg^{2+} > K^+$	2. Ionic radii
C. Cl > F > Br > I	3. EN (Electronegativity)
D. F > Cl > Br > I	4. ENC (Effective nuclear charge)

Codes

	A	B	C	D
(a)	2	4	3	1
(b)	2	4	1	3
(c)	4	2	3	1
(d)	4	2	1	3

Q.17 The electronic configuration of gadolinium (atomic number = 64) is

(a) $[Xe] \ 4f^3 \ 5d^5 \ 6s^2$
(b) $[Xe] \ 4f^7 \ 5d^2 \ 6s^1$
(c) $[Xe] \ 4f^7 \ 5d^1 \ 6s^2$
(d) $[Xe] \ 4f^8 \ 5d^6 \ 6s^2$.

Q.18   The formation of oxide ion O^{2-} (g), from oxygen atom requires first an exothermic and then an endothermic step as shown below.
O   (g)   + $e^- \to O^-$ (g): $\Delta H^- = -141 \ kJ \ mol^{-1}$
O^- (g)   + $e^- \to O^2$ (g): $\Delta H^- = +780 \ kJ \ mol^{-1}$.
Thus, process of formation of O^{2-} in gas phase is unfavorable even though O^{2-} is isoelectronic with neon. It is due to the fact that
(a) Oxygen is more electronegative
(b) Addition of electron in oxygen results in larger size of the ion
(c) Electron repulsion out weights the stability gained by achieving noble gas configuration
(d) O^-ion has comparatively smaller size than O-atom

Q.19   Isostructural species are those which have the same shape and hybridisation. Among the given species identify the isostructural pairs
(a) $[NF_3 \, and \, BF_3]$
(b) $[BF_4^- \, and \, NH_4^+]$
(c) $BCl_3 \, and \, BrCl_3$
(d) $[NH_3 \, and \, NO_3^-]$

Q.20   If Z is a compressibility factor, van der Waals' equation at low pressure can be written as
(a) $Z = 1 + \frac{RT}{pb}$
(b) $Z = 1 - \frac{a}{VRT}$
(c) $Z = 1 - \frac{pb}{RT}$
(d) $Z = 1 + \frac{pb}{RT}$

ANSWER KEY:-
11.(B)   12.(B)   13.(C)   14.(A)
15.(B)   16.(B)   17.(C)   18.(C)
19.(B)   20.(B)

Biology

Q.21   How many ATP and NADPH molecules are required for thr formation of 1 mol of glucose in C_4 cycle.
(a) 12 ATP + 18 NADPH
(b) 18 ATP + 12 NADPH
(c) 30 ATP + 12 NADPH
(d) 12 ATP + 30 NADPH

Q.22   Match the following –

Column I	Column II
1. Tidal Volume	A. 2500 – 3000 ml of air
2. Inspiratory reserve volume	B. 1000 ml of air
3. Expiratory reserve volume	C. 500 ml of air
4. Residual volume	D. 3400 – 4800 ml of air
5. Vital capacity	E. 1200 ml of air.

(a) 1 – C , 2 – D, 3 – B, 4 – A, 5 – E
(b) 1 – C, 2- A, 3- B, 4- E, 5 – D
(c) 1 – C, 2- A, 3- D, 4- E, 5- B
(d) 1 – E, 2 – A, 3- B, 4- C, 5- D.

Q.23   During ventricular systole-
(a) Oxygenated blood is pumped into the aorta and deoxygenated blood is pumped into the pulmonary artery
(b) Oxygenated blood is pumped into the pulmonary artery and deoxygenated blood is pumped into the artery
(c) Oxygenated blood is pumped into aorta and deoxygenated blood is pumped into the pulmonary vein
(d) Oxygenated blood is pumped into pulmonary vein and deoxygenated blood is pumped into pulmonary artery

Q.24   The outline of principle event of urination is given below in unordered manner –
I. Stretch receptors on the wall of urinary bladder send signal to the CNS
II. The bladder fills with of urine and becomes distended
III. Micturition
IV. CNS passes on motor messages to initiate the contraction of smooth muscles of bladder and simultaneous relaxation of urethral Sphincter.
The correct order of steps for urination is –
(a) I → II → III → IV →
(b) IV → III → II → I
(c) II → I → IV → III

(d) III → II → I → IV.

Q. 25   Match Column I with Column II

Column I	Column II
A. Pinna	I. Collects vibration in the air which produces sound
B. Ear canal	II. Passage for sound wave from pinna to ear drum
C. Tympanic membrane	III. Transfers sound wave to ear ossicles
D. Ear Ossicles	IV. Increases the efficiency of transmission of sound waves to the inner ear
E. Cochlea	V. Has hearing receptors
F. Eustachian tube	VI. Equalizes the pressure on both sides of ear drum
G. Auditory nerves	VII. Impulse transfer from organ of Corti to auditory cortex in temporal lobe of cerebrum

(a) A- I, B- II, C- III, D- IV, E- V, F- VI, G- VII

(b) A- VII, B- VI, C- V, D- IV, E- III, F- II, G- I

(c) A- I, B- II, C- IV, D- III, E- V, F- VI, G- VII

(d) A- I, B- II, C- III, D- IV, E- V, F- VII, G- VI.

Q. 26   Hormones produces their effect on target tissue by binding to specific __A__ called hormone receptors located in the target tissues only. __B__ soluble hormones usually need __C__ receptor that generate __D__ messengers for regulating cellular metabolism. __E__ soluble hormones can pass through cell membrane and bind to F receptors, mostly G receptors. The hormone receptor complex enter the __H__ and mostly regulate gene expression or chromosome function by interaction of hormone – receptor complex with the __I__.

(a) A – Protein, B- Water, C- Membrane bound, D- Second, E- Lipid, F- intracellular, G- Nuclear, H_ Nucleus, I- Genome

(b) A- Lipid B – Water, C- Membrane bound, D- Second, E- Water, F – intracellular, G- Nuclear, H_ Nucleus, I- Genome

(c) A – Protein, B- Water, C- Intracellular, D- Second, E- Lipid, F- Extracellular, G- Nuclear, H_ Nucleus, I- Genome

(d) A – Protein, B- Water, C- Membrane bound, D- Primary, E- Lipid, F- intracellular, G- Nuclear, H_ Nucleus, I- Genome

Q.27   Match diseases with hormone deficiency.

Diseases	Hormone deficiency
I. Dwarfism	A. Thyroxine
II. Acromegaly	B. GH
III. Simple goitre	C. Aldosterone and cortisol
IV. Exophthalmic goiter	D. Corticosteroid
V. Addison's diseases	E. Mineralocorticoids (Aldosterone)
VI. Conn's disease	
VII. Cushing disease	

(a) I- B; II – B; III- A ; IV- C; VI- E ; VI- D

(b) I- B; II- A; IV- B; V- E; VI- D; VII-C

(c) I- A; II- B; III- IV- A; V- C; VI- E; VII- D

(d) I- A; II- A; III- B; IV- B; V- C; VI- D; VII- E.

Q. 28

Column I (classes)	Column II Examples
A. Psilotopsida	I. Dryopteris, Pteris, Adiantum
B. Lycopsida	II. Equisetum
C. Sphenopsida	III. Selaginella
D. Pteropsida	IV. Lycopodium
	V. Psilotum

The correct combination is –

(a) A- V, B- III, IV, C- II, D-I

(b) A- I, B- II, C- III, D- IV

(c) A- IV, B- III, C- II, D- I

(d) A- III, IV, B- V, C- I, D- II.

Q. 29   This is the figure showing life cycle of a plant if this belongs to life cycle of bryophytes, pteridophytes and gymnosperms. What will be respective A and B in their life cycle-
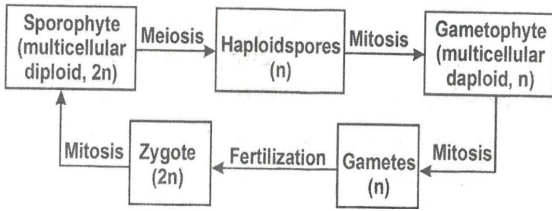
A	B
(a) Bryophytes : Peridophytes: Gymnosperms: Bryophtyes:	Sporangium, capsule strobili, sporangia flowers, cones
(b) Bryophytes: Pteridophytes: Gymnosperms:	Capsule, protonema (gametophores) sporangia, cones, sporophyll
(c)Bryophytes : Pteridophytes: Gymnosperms:	Protonema, gametophores strobili, sporangia flowers, cones
(d)) Bryophytes : Pteridophytes: Gymnosperms: Bryophtyes:	Strobili, capsule cones, sporangia flowers, cones.

Q.30 In which one of the following the genus name, its two characters and its class/phylum are correctly matched?

|	Genus name	Two characters	Class/Phylum
(a)	Ascaris	(i)Body segmented (ii) males and females distinct	Annelid
(b)	Salamandra	(i) A tympanum represents ear (ii) fertilization is external	Amphibia
(c)	Pteropus	(i) Skin possesses hair. (ii) oviparous	Mammalia
(d)	Aurelia	(i) Cnidoblasts. (ii) organ level of organization	Coelenterate

ANSWER KEY:-
21.(C) 22.(B) 23.(A) 24.(C) 25.(A)
26.(A) 27.(A) 28.(A) 29.(B) 30.(B)

Mental ability

Q.31 If the world "TRADE' is coded as 'XVEHI', how the word 'PUBLIC' should be coded?
(a) TYFMPG
(b) SXEOLF
(c) TYFPMG
(d) SXLLOP.

Q.32 Raju from A moved North- West side 2 km to B from there he turned 90° clockwise and moved 2 km to
C. From there, he turned 90° clockwise and travelled 2 km to D. Which of the answer figures shows he exact path he traced?

(a)

(b)

(c)

(d)
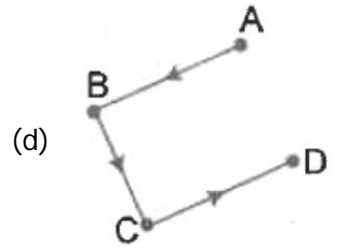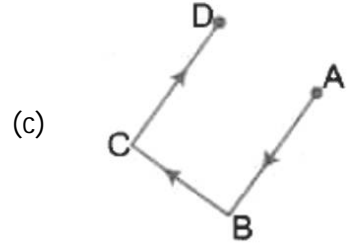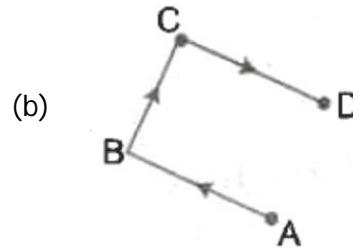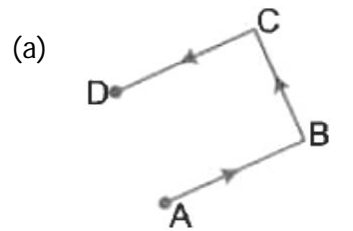
Q.33 Anuj started walking positioning his back towards the Sun. After sometime, he turned left, then turned right and then towards the left again. In which direction is he going now?
(a) North or South
(b) East or West
(c) North or West
(d) South or West.

Q.34 Complete the series 17, 25, 41, 65, 97,...
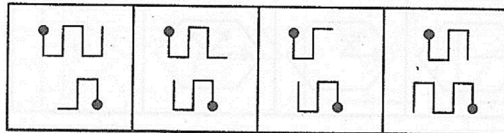(a) 147   (b) 100
(c) 137   (d) 98

Q.35 Complete the given series.
OTE, PUF, QVG, RWH, ...
(a) SY J
(b) TXI
(c) SX J
(d) SXI

Q.36 Ram is the brother of Shyam and Mahesh is the father of Ram Jagat is the brother of Priya and Priya is daughter of Shyam. Who is the uncle of Jagat?
(a) Shyam
(b) Mahesh
(c) Ram
(d) None of these

Q.37
Problem Figures
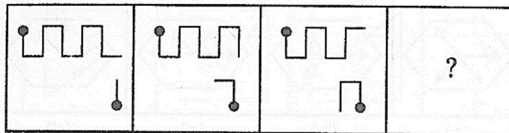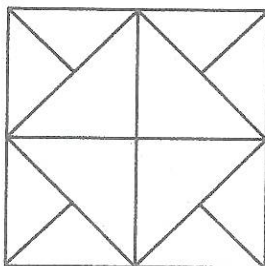

Answer Figures

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

Q.38 How many triangles are contained in the given figure?

(a) 9
(b) 12
(c) 13
(d) 20

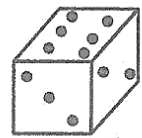Q.39 Rakesh obtained more marks than Suresh but less than Santosh. Ramesh obtained more than Rajesh but less than Harish. Santosh obtained less than Rajesh. Who obtained the highest marks?
(a) Harish
(b) Santosh
(c) Ramesh
(d) Rakesh

Q.40 If the bottom face is marked as number 1, which number will be on the top among the following two figures?
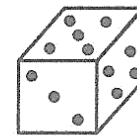
(I)   (II)

(a) 2
(b) 3
(c) 4
(d) 5

ANSWER KEY:-
31.(C)   32.(B)   33.(A)   34.(C)   35.(D)
36.(C)   37.(A)   38.(D)   39.(A)   40.(B)