PHYSICS

1) The minimum intensity of light to be detected by human eye is 10^{-10} W/m^2. For vision the number of photons of wavelength 5.6×10^{-7} m entering (per second) the eye, with pupil area 10^{-6} m^2 will be nearly :-

(1) 100

(2) 280

(3) 350

(4) 400

2) A plate of mass 10g is in equilibrium in air due to the force exerted by the light beam on the plate. Calculate power of the beam assume that the plate is perfectly absorbing :-

(1) 3×10^4 W

(2) 3×10^7 W

(3) 1.5×10^6 W

(4) 4.5×10^7 W

3) When radiation of wavelength λ is incident on a metallic surface, the stopping potential is 4.8 volts. If the same surface is illuminated with radiation of double the wavelength, then the stopping potential becomes 1.6 volts. Then the threshold wavelength for the surface is :-

(1) 2λ

(2) 4λ

(3) 6λ

(4) 8λ

4) The wavelength of a photon is 4 times of an electron. The speed of the electron is $V_e = \dfrac{C}{100}$ then ratio of energy of electron to that of photon is :-

(1) 10^{-2}

(2) 2×10^{-2}

(3) 4×10^{-2}

(4) 6×10^{-2}

5) Consider three statements :
A. In photo electric effect, even for monochromatic incident radiation, the photoelectrons are emitted with a spread of velocities.
B. Photoelectrons are emitted without delay once the incident light reaches the surface of the emitter.
C. Frequency of monochromatic light (well above the cutoff frequency), that is incident on a emitter

in a photoelectric effect, is increased while keeping the intensity constant. It results in decrease in magnitude of stopping potential.

Correct order of the true/false for the above statements is

(1) T T F

(2) F T T

(3) T F T

(4) F F T

6)

The positions of $_1^2D$, $_2^4He$ and $_3^7Li$ are shown on the binding energy curve as shown in figure. The energy released in the fusion reaction, $_1^2D + _3^7Li \rightarrow 2 _2^4He + _0^1n$
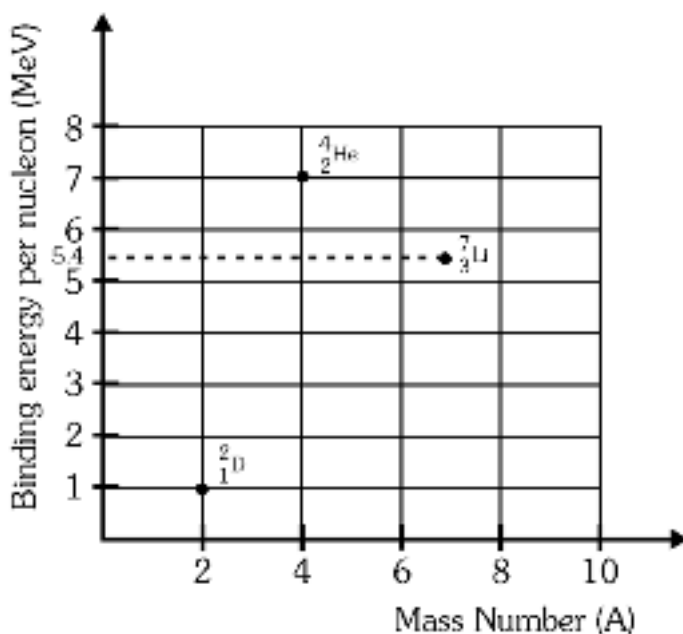
(1) 2.8 MeV

(2) 4 MeV

(3) 8 MeV

(4) 16.2 MeV

7) Photo electric effect experiment is repeated three times on the same photo cell with light of same frequency but different intensity of ratio 1 : 3 : 5. Ratio of stopping voltage and saturation current will be :-

(1) 1 : 3 : 5, 1 : 1 : 1

(2) 5 : 3 : 1, 1 : 3 : 5

(3) 1 : 1 : 1, 1 : 3 : 5

(4) 1 : 3 : 5, 1 : 3 : 5

8) In an experiment of photoelectric effect the stopping potential was measured to be V_1 and V_2 volts with incident light of wavelength λ and $\lambda/2$ respectively. The relation between V_1 and V_2 may be :-

(1) $V_2 < V_1$

(2) $V_1 < V_2 < 2V_1$

(3) $V_2 = 2V_1$

(4) $V_2 > 2V_1$

9)

If the work function for a certain metal is 3.2×10^{-19} joule and it is illuminated with light of frequency 8×10^{14} Hz, the maximum kinetic energy of the photoelectrons would be :-
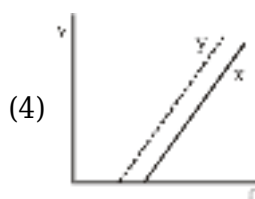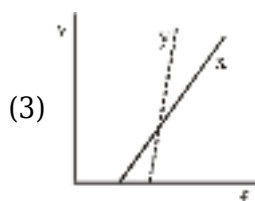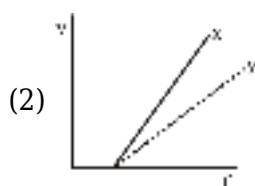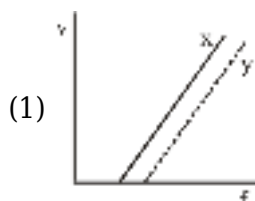
(1) 2.1×10^{-19} J

(2) 8.5×10^{-19} J

(3) 5.3×10^{-19} J

(4) 3.2×10^{-19} J

10) In a photoelectric emission, electrons are ejected from metals x and y by light of frequency f. The potential difference v required to stop the electrons is measured for various frequencies. If y has a greater work function than x which graph illustrates the expected results :–

(1)

(2)

(3)

(4)

11) Five elements A, B, C, D and E have work functions 1.2 eV, 2.4 eV, 3.6 eV, 4.8 eV and 6 eV respectively. If light of wavelength 4000 Å is allowed to fall on these elements, then photoelectrons are emitted from

(1) A, B and C

(2) A, B, C, D and E

(3) A and B

(4) Only E

12) On a photosensitive surface of threshold wavelength 5λ, two different monochromatic beams of wavelengths 3λ and λ are incident, one after another, then match the ratio of physical quantities specified in column-I to the ratio values given in column-II.

	Column-I		Column-II
(a)	Maximum KE of photo electrons	(i)	$1 : 3$
(b)	Speed of incident photons	(ii)	$1 : 6$
(c)	Momentum of incident photons	(iii)	$1 : \sqrt{6}$
(d)	Fastest speeds of photo electrons	(iv)	$1 : 1$

(1) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

(2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

(3) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

(4) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

13) An electron is moving through a field. It is moving (i) opposite an electric field (ii) perpendicular to a magnetic field as shown. For each situation the de-Broglie wave length of electron.
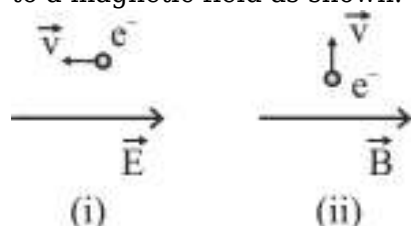
(1) Increasing, increasing

(2) Increasing, decreasing

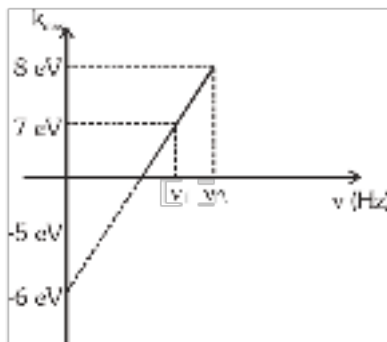(3) Decreasing, same

(4) Same, same

14)

The de Broglie wavelength of an electron and the wavelength of a photon are the same. The ratio between the energy of that photon and the momentum of that electron is :-

(c is velocity of light; h is Planck's constant)

(1) h

(2) c

(3) 1/h

(4) 1/c

15) The ratio of frequencies $\dfrac{\nu_1}{\nu_2}$ of incident photons in the graph shown will be :-

(1) $\dfrac{12}{13}$

(2) $\dfrac{13}{14}$

(3) $\dfrac{14}{13}$

(4) $\dfrac{13}{12}$

16) Energy of an electron and photon are equal. If wavelength of electron is 1Å then wavelength of the photon is approx :-

(1) 82.67 Å

(2) 1 Å

(3) 124 Å

(4) 1.67 Å

17) The ratio of de-Broglie wavelengths of molecules of hydrogen and helium atom which are at temperature 27ºC and 127ºC respectively is

(1) $\dfrac{1}{2}$

(2) $\sqrt{\dfrac{3}{8}}$

(3) $\sqrt{\dfrac{8}{3}}$

(4) 1

18) The ratio of de-Broglie wavelength of an α-particle to that of a proton being subjected to the same magnetic field so that the radii of their path are equal to each other assuming the field induction vector $\vec{B}$ is pependicular to the velocity vectors of α-particle and the proton is

(1) 1

(2) $\dfrac{1}{4}$

(3) $\dfrac{1}{2}$

(4) 2

19) The potential energy of a particle of mass m is given by $U(x) = \begin{cases} E_0 & 0 \leqslant x \leqslant 1 \\ 0 & x > 1 \end{cases}$ λ_1 and λ_2 are the de-Broglie wavelengths of the particle, when $0 \leq x \leq 1$ and $x > 1$ respectively. If the total energy of particle is $2E_0$, find $(\lambda_1/\lambda_2)^2$.

(1) 1

(2) 2

(3) 3

(4) 1/2

20) Which of the following statements are true :

(a) Dual nature of matter is evident in de-Broglie equation $\lambda = \dfrac{h}{P}$.

(b) Wave nature of macroscopic particles are not visible in daily life

(c) $\lambda = \dfrac{h}{P}$ is not satisfied by a photon

(1) (a, c)

(2) (a, b)

(3) (b, c)

(4) (a, b, c)

21) The nuclear radius of a nucleus with nucleon number 16 is 3×10^{-15} metre. Then the nuclear radius of a nucleus with nucleon number 128 is :-

(1) 3×10^{-15} m

(2) 1.5×10^{-15} m

(3) 6×10^{-15} m

(4) 4.5×10^{-15} m

22) One milligram of matter converted into energy will give

(1) 9 J

(2) 9×10^{13} J

(3) 9×10^{5} J

(4) 9×10^{10} J

23) The total energy of an electron is 5.555 MeV, then its Kinetic energy is :-

(1) 5.545 MeV

(2) 5.045 MeV

(3) 5.5 MeV

(4) 0.50 MeV

24) When $_{92}U^{235}$ undergoes fission 0.1% of its original mass is changed into energy. How much energy is released if 1 kg of $_{92}U^{235}$ undergoes fission -

(1) 9×10^{10} J

(2) 9×10^{11} J

(3) 9×10^{12} J

(4) 9×10^{13} J

25) If the energy released in the fission of one nucleus is 200 MeV then the number of nuclei required per second in a power plant of 16 kW will be

(1) 0.5×10^{14}

(2) 0.5×10^{12}

(3) 5×10^{12}

(4) 5×10^{14}

26) Fusion reaction takes place at high temperature because:

(1) Molecules break up at high temperature.

(2) Nuclei break up at high temperature.

(3) Atoms get ionised at high temperature.

(4) Kinetic energy is high enough to overcome the coulomb repulsion between nuclei.

27) Which of the following is incorrect about nuclear fusion :-

(1) mass of product > mass of reactant

(2) $(B.E.)_{product} > (B.E.)_{reactant}$

(3) possible only b/w light nuclei

(4) principle of energy generation in stars

28)

γ-rays radiation can be used to create electron-positron pair. In this process of pair production,γ-rays energy cannot be less than
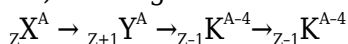
(1) 5.0 MeV

(2) 4.02 MeV

(3) 15.0 MeV

(4) 1.02 MeV

29) Radioactive substances do not emit

(1) Electron

(2) Helium nucleus

(3) Positron

(4) Proton

30) A nucleus with Z = 92 emits the following in a sequence α, β⁻, β⁻,α, α, α, α, α,β⁻, β⁻, α,β⁺, β⁺,α. The Z of the resulting nucleus is :

(1) 74

(2) 76

(3) 78

(4) 82

31) In the given reaction –
$$_{Z}X^{A} \rightarrow \, _{Z+1}Y^{A} \rightarrow \, _{Z-1}K^{A-4} \rightarrow \, _{Z-1}K^{A-4}$$
radioactive radiations are emitted in the sequence –

(1) α, β, γ

(2) β, α, γ

(3) γ, α, β

(4) β, γ, α

32) A potential difference of 20 kV is applied across an X-ray tube. The minimum wavelength of X-rays generated (in Å) is -

(1) 0.62

(2) 1.24

(3) 0.31

(4) 6.2

33) Given below are two statements: one is labeled as Assertion (A) and other is labeled as Reason (R).
Assertion (A) : Two photons having same energy may have different linear momentum.
Reason (R) : Two photon having same wavelength must have same linear momentum.

(1) Both A and R are true and R is not the correct explanation of A.

(2) A is true but R is false.

(3) A is false but R is true.

(4) Both A and R are true and R is the correct explanation of A.

34) *Assertion :* A particle can behave both as a particle and wave but in a given situation, it behaves either as a particle or as a wave.
Reason : A photon and a electron have same wavelength, then the velocity of photon is less than that of the electron.

(1) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A).

(2) Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A).

(3) Assertion (A) is true and Reason (R) is false.

(4) Both Assertion (A) and Reason (R) are false.

35) The binding energies of the nuclei of $_{2}^{4}He$, $_{3}^{7}Li$, $_{6}^{12}C$ & $_{7}^{14}N$ are 28, 52, 90, 98 MeV respectively. Which of these is most stable.

(1) $_2^4\text{He}$

(2) $_3^7\text{Li}$

(3) $_6^{12}\text{C}$

(4) $_7^{14}\text{N}$

36) Consider the following two reactions, then atomic number and mass number of nucleus X and Y :-

(i) $_{92}\text{U}^{235} + {}_0\text{n}^1 \rightarrow \text{X} + {}_{35}\text{Br}^{85} + 3\,{}_0\text{n}^1$

(ii) $_3\text{Li}^6 + {}_1\text{H}^2 \rightarrow \text{Y} + {}_2\text{He}^4$

(1) (i) 57,148 (ii) 2 , 4

(2) (i) 57 , 151 (ii) 4 ,4

(3) (i) 60 , 148 (ii) 4 , 2

(4) (i) 60 , 15 (ii) 3 , 4

37) The average binding energy per nucleon of a nucleus is of the order of :

(1) 8 eV

(2) 8 J

(3) 8 keV

(4) 8 MeV

38) Which one of the following statements is not true about de-Broglie waves ?

(1) All atomic particles in motion have waves character associated with them

(2) The higher the momentum, the longer is the wave-length

(3) The faster the particle, the shorter is the wavelength

(4) For the same velocity, a heavier particle has a shorter wavelength

39) **Assertion :** Work function of a metal is 8 eV. Two photons each having energy 5 eV can't eject the electron from the metal.
Reason : More than one photon can't collide simultaneously with an electron.
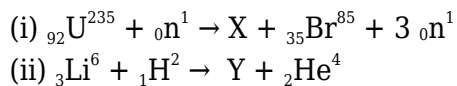
(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(2) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(3) Assertion is true but Reason is false.

(4) Both Assertion and Reason are false.

40) A photo-cell is illuminated by a source of light, which is placed at a distance d from the cell, If the distance become d/2, then number of electrons emitted per second will be :-

(1) Remain same

(2) Four times

(3) Two times

(4) One-fourth

41) Surface of sodium is illuminated by a light of 6000 Å wavelength. Work function of sodium is 1.6 eV. Then minimum K.E. of emitted electrons is :

(1) 0 eV

(2) 1.53 eV

(3) 2.46 eV

(4) 4.14 eV

42) When photon of energy 4.25 eV strike the surface of a metal A, the ejected photoelectrons have maximum kinetic energy T_A eV and de-Brolie wavelength λ_A. The maximum kinetic energy of photoelectrons liberated from another metal B by photon of energy 4.70 eV is $T_B = (T_A - 1.50)$ eV. If the de-broglie wavelength of these photoelectrons is $\lambda_B = 2 \lambda_A$, then

(1) The work function of A is 2.5 eV

(2) The work function of B is 4.20 eV

(3) $T_A = 4.00$ eV

(4) $T_B = 2.75$ eV

43) The collector plate in an experiment on photoelectric effect in kept vertically above the emitter plate. Light source is put on and a saturation photo current is recorded. An electric field is switched on which has a vertically downward direction.

(1) The photo current will increase

(2) The kinetic energy of the electrons will increase

(3) The stopping potential will decrease

(4) The threshold wavelength will increase

44) The energy that should be added to an electron to reduce its De broglie wavelength from 10^{-10} m to 0.5×10^{-10} m will be :

(1) Four times the initial energy

(2) Equal to initial energy

(3) Twice the initial energy

(4) Thrice the initial energy

45) Electron has energy of 100 ev what will be its wavelength :

(1) 1.2 Å

(2) 10 Å

(3) 100 Å

(4) 1 Å

CHEMISTRY

1) The rate of reaction A + 2B → 3C becomes
72 times when concentration of A is tripled and concentration of B is doubled then the order of

reaction with respect to A and B respectively is:-

(1) 1, 2

(2) 2, 3

(3) 3, 2

(4) 2, 2

2)

Consider the reaction ;
$N_2 + 3H_2 \rightarrow 2NH_3$
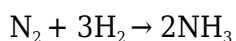
If the rate of disappearance of hydrogen is x mol $L^{-1}s^{-1}$, then the rate of appearance of ammonia would be :-

(1) x mol $L^{-1}s^{-1}$

(2) 2x mol $L^{-1}s^{-1}$

(3) $\dfrac{2}{3}$ x mol $L^{-1}s^{-1}$

(4) $\dfrac{3}{2}$ x mol $L^{-1}s^{-1}$

3)

Find the ratio of time $t_{1/2}$ to $t_{3/4}$ for zero order reaction.

(1) 4 : 15

(2) 2 : 3

(3) 1 : 15

(4) None of these

4)

For the reaction 2A + B → 3C + D.
Which of the following does not express the reaction rate ?

(1) $-\dfrac{1}{3}\dfrac{d\,[C]}{dt}$

(2) $-\dfrac{d\,[B]}{dt}$

(3) $\dfrac{d\,[D]}{dt}$

(4) $-\dfrac{1}{2}\dfrac{d\,[A]}{dt}$

5) At room temperature the reaction between NO and O_2 to give NO_2 is fast while that between CO and O_2 is slow it is due to -

(1) CO is smaller in size than that of NO

(2) CO is posionous

(3) The activation energy for the reactions

(4) None

6) In the following reaction : $xA \rightarrow yB$

$$\log \left| \frac{d|A|}{dt} \right| \qquad \log \left| \frac{d|B|}{dt} \right| \qquad \log 2$$

where –ve sign indicates rate of disappearance of the reactant. Thus, x : y is :

(1) 1 : 2

(2) 2 : 1

(3) 3 : 1

(4) 3 : 10

7) A gaseous reaction,

$$A_2(g) \rightarrow B(g) + \frac{1}{2}C(g)$$
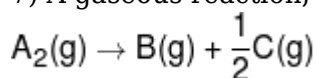
shows increase in pressure from 100 mm to 120 mm is 5 minutes. The rate of disappearance of A_2 is:

(1) 4 mm min^{-1}

(2) 8 mm min^{-1}

(3) 16 mm min^{-1}

(4) 2 mm min^{-1}
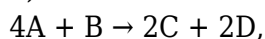
8) For the reaction:
$4A + B \rightarrow 2C + 2D$,
which of the following statement is not correct :

(1) Rate of disappearance of B is 1/4th of rate of disappearance of A

(2) Rate of formation of C is 1/2th of rate of disappearance of A

(3) Rate of appearance of D is 1/2th of rate of disappearance of B

(4) Rate of formation of C and D are equal.

9) Collision theory of chemical reactions is satisfactory for:-

(1) First order reactions

(2) Zero order reactions

(3) Bimolecular reactions

(4) Any order reactions

10) The initial rate of reaction $A + 5B + 6C \rightarrow 3L + 3M$ has been determined by measuring the rate of disppearance of A under the following conditions:

Experiment No.	$[A]_0$ (M)	$[B]_0$ (M)	$[C]_0$ (M)	Initial rate (M min^{-1})
1.	0.02	0.02	0.02	2.08×10^{-3}
2.	0.01	0.02	0.02	1.04×10^{-3}
3.	0.02	0.04	0.02	4.16×10^{-3}
4.	0.02	0.02	0.04	8.32×10^{-3}

Determine the rate law :-

(1) Rate = k [A] [B] [C]^2

(2) Rate = k [A] [C]^2

(3) Rate = k [A] [B] [C]

(4) Rate = k [A] [B] [C]$^{1/2}$

11) Differential form of the rate equation is :-

$$\frac{dx}{dt} = k[P][Q]^{0.5}[R]^{0.5}$$

Which statement about the above equation is wrong ?

(1) Order with respect to P is one

(2) Overall order of the reaction is two

(3) Order with respect to each of Q and R is 0.5

(4) Unit of specific reaction rate is mol.$\square$.s^{-1}
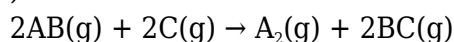
12) The reaction
    $2AB(g) + 2C(g) \rightarrow A_2(g) + 2BC(g)$
Proceeds according to the mechanism
    $2AB \rightleftharpoons A_2B_2$ (fast)
    $A_2B_2 + C \rightarrow A_2B + BC$ (slow)
    $A_2B + C \rightarrow A_2 + BC$ (fast)
Rate law of the reaction is :-
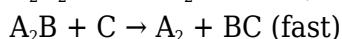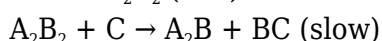
(1) $r = k[AB]^2[C]$

(2) $r = k[AB][C]^2$

(3) $r = k[AB]^2[C][A_2]$

(4) $r = k[A_2B_2][C]$

13) Unit of k for the rate law, $R = k[A][B]^{0.5}$ are :-

(1) mol$^{1/2}$ L$^{-1/2}$ S^{-1}

(2) mol$^{1/2}$ L$^{1/2}$ S^{-1}

(3) mol$^{-1/2}$ L$^{+1/2}$ S^{-1}

(4) mol$^{1/2}$ L$^{1/2}$ S^{+1}

14) The rate constant of which of the following reactions is independent of concentration of the reactants?

(1) First order reactions

(2) Zero order reactions

(3) Second order reactions

(4) All of these

15) Which one is not correct ?

(1) Rate of zero order reaction depends upon initial concentration of reactant

(2) Rate of zero order reaction does not depend upon initial concentration of reactant

(3) $t_{1/2}$ of first order reaction is independent of initial concentration of reactant

(4) $t_{1/2}$ of zero order reaction is dependent of initial concentration of reactant.

16) Order of reaction can be:

(1) 0

(2) fraction

(3) whole number

(4) integer, fraction, zero

17) The molecularity of a complex reaction given below is :
$2N_2O_5 (g) \rightarrow 4NO_2(g) + O_2(g)$
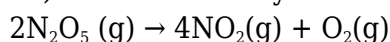
(1) 1

(2) 2

(3) 3

(4) has no meaning

18) A reaction involving two different reactant can never be :

(1) 1st order reaction

(2) Unimolecular reaction

(3) Bimolecular reaction

(4) Second order reaction

19) Under what conditions a bimolecular reaction may be kinetically first order ?

(1) When both reactants have same concentration

(2) When one of the reacting species is in large excess

(3) When the reaction is in equilibrium

(4) When the activation energy of reaction is less

20) Match the statements given in column I and column II

	Column-I		Column-II
(i)	Molecularity of reaction	(a)	the rate at a particular moment of time
(ii)	Instantaneous Rate	(b)	rate law
(iii)	Half - life of zero order reaction	(c)	cannot be fractional or zero.
(iv)	Mathematical expression for rate of reaction	(d)	is directly proportional to the initial concentration of reactant

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

(1) 1

(2) 2

(3) 3

(4) 4

21) In a zero order reaction concentration of reactant decreases from 0.08 M to 0.06 M in 10 sec then full life time is

(1) 20 sec.

(2) 40 sec.

(3) 60 sec.

(4) 80 sec.

22) For zero order reaction relation between $t_{1/2}$ and $t_{1/4}$ is :-

(1) $t_{1/2} = 2t_{1/4}$

(2) $t_{1/2} = 3t_{1/4}$

(3) $t_{1/2} = \dfrac{1}{2} t_{1/4}$

(4) $t_{1/2} = \dfrac{1}{3} t_{1/4}$

23) The decomposition of gaseous ammonia on a hot platinum surface is a zero order reaction at high pressure because

(1) Rate is proportional to surface coverage.

(2) Concentration of ammonia is constant.

(3) Metal surface gets saturated with gas molecules.

(4) Rate is directly proportional to pressure.

24) A zero order reaction completes 75 % in 6 hr. Then time taken for the completion of 87.5 % will be

(1) 8 hr
(2) 7 hr
(3) 10 hr
(4) 12 hr

25) 99% of a first order reaction was completed in 32 minutes when 99.9% of the reaction will complete :-

(1) 50 min
(2) 46 min
(3) 48 min
(4) 49 min

26) The rate of a first order reaction is 0.4 M sec^{-1} at 10 minutes and 0.04 M sec^{-1} at 20 minutes after initiation. The half life of the reaction is about :

(1) 2 minutes
(2) 3 minutes
(3) 6.9 minutes
(4) 3.3 minutes

27) **Assertion :** In a first order reaction, the rate constant becomes double on doubling the initial concentration of the reactant.
Reason : The rate constant varies directly with the concentration of the reactants in a first order reaction.

(1) Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
(2) Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
(3) Assertion is True but the Reason is False.
(4) Both Assertion & Reason are False.

28) The rate constant for a first order reaction which has half life 480 s is :-

(1) 1.44×10^{-3} s^{-1}
(2) 1.44 s^{-1}
(3) 0.72×10^{-3} s^{-1}
(4) 2.88×10^{-3} s^{-1}

29) For a first order reaction, (A) → products, the concentration of A changes from 0.1 M to 0.025M in 40 min. The rate of reaction when the concentration of A is 0.01 M is :-

(1) 1.73×10^{-4} M/min

(2) 1.73×10^{-5} M/min

(3) 3.47×10^{-4} M/min

(4) 3.47×10^{-5} M/min

30) Azo isopropane decomposes according to the equation
$(CH_3)_2CHN=NCH(CH_3)_2(g) \rightarrow$
$$N_2(g) + C_6H_{14}(g)$$
It is found to be a first order reaction. If initial pressure is P_0 and pressure of the reaction mixture at time t is P_t then rate constant K would be:
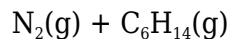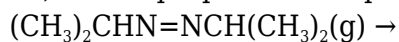
(1) $K = \dfrac{2.303}{t} \log \dfrac{P_0}{2P_0 - P_t}$

(2) $K = \dfrac{2.303}{t} \log \dfrac{P_0 - P_t}{P_0}$

(3) $K = \dfrac{2.303}{t} \log \dfrac{P_0}{P_0 - P_t}$

(4) $K = \dfrac{2.303}{t} \log \dfrac{2P_0}{2P_0 - P_t}$

31) The rate constant for a first order reaction is 4.606×10^{-3} s^{-1}. The time required to reduce 2.0 g of the reactant to 0.2 g is :

(1) 1000 s

(2) 100 s

(3) 200 s

(4) 500 s

32) The half-life period and initial concentration for a reaction are as follows. What is order of reaction ?

Initial Concentration (M)	350	700	175
$t_{1/2}$(hr)	425	212.5	850

(1) 0

(2) 1

(3) 2

(4) 3

33)

The correct difference between first- and second-order reaction is that

(1) the rate of a first-order reaction does not depend on reactant concentration; the rate of a second-order reaction does depend on reactant concentrations.

(2) the half-life of a first-order reaction does not depend on $[A]_0$; the half-life of a second-order reaction does depend on $[A]_0$

(3) a first-order reaction can be catalyzed; a second-order reaction cannot be catalyzed.

(4) the rate of a first-order reaction does depend on reactant concentrations; the rate of a second-order reaction does not depend on reactant concentrations

34)

For reaction $2X \rightarrow Y$
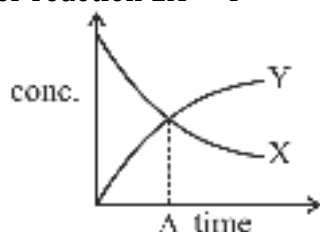
point of intersection (A) represents :-

(1) $t_{1/2}$

(2) $t_{1/4}$

(3) $t_{3/4}$

(4) $t_{2/3}$

35) Half-lives of first order and a zero order reaction are same. Then the ratio of the initial rates of first order reaction to that of the zero order reaction is

(1) $\dfrac{1}{0.693}$

(2) 2×0.693

(3) 0.693

(4) $\dfrac{2}{0.693}$

36)

Column - I (Order of reaction)		Column - II (Characteristics)	
(P)	0	(1)	Half life period does not depends on initial concentration
(Q)	2	(2)	Second half life is double of Ist half life
(R)	1	(3)	Reaction gets completed in a finite time interval
(S)	3	(4)	Graph of log (rate of reaction) Vs log (concentration of reactant) will have a slope equal to 3.

Which of the following code is correct. (Assume single reactant is involved in rate law)

(1) P - 2, Q - 4, R - 1, S - 3

(2) P - 3, Q - 2, R - 1, S - 4

(3) P - 3, Q - 1, R - 2, S - 4

(4) P - 1, Q - 2, R - 4, S - 3

37) In a reaction the half life becomes one fourth on doubling the initial concentration of reactant then order of reaction is :-

(1) 0

(2) 1

(3) 2

(4) 3

38) Select the correct diagram for an endothermic reaction that proceeds through two steps, where second step is rate determining step :-

(1)

Reaction coordinate

(2)

Reaction coordinate

(3)

Reaction coordinate

(4)

Reaction coordinate
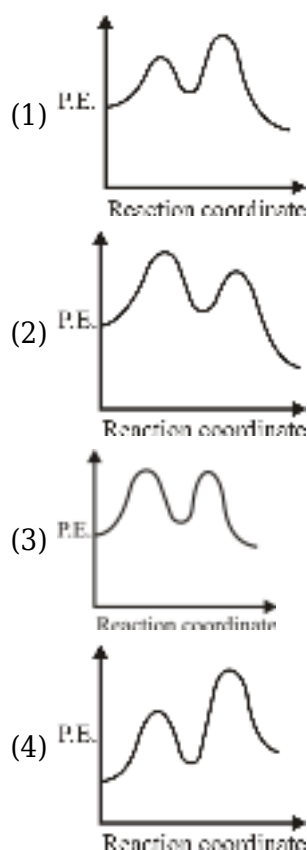
39) The given diagram represents the energy change during the conversion of reactants P and Q to

products R and S :   Reaction coordinate
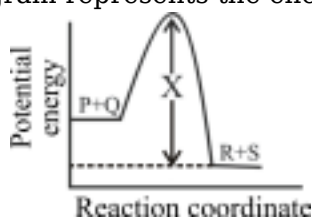
The quantity labelled 'X' is the

(1) Internal energy change, ΔU for the reaction
$P + Q \rightarrow R + S$

(2) Activation energy for the reaction   R + S → P + Q

(3) Enthalpy change for the reaction   R + S → P + Q

(4) Activation energy for the reaction   P + Q → R + S

40) An endothermic reaction A → B have an activation energy 15 kcal/mol and the ΔH is 5 kcal/mol. The activation energy of the reaction B → A is :-

(1) 20 kcal/mol

(2) 15 kcal/mol

(3) 10 kcal/mol

(4) Zero

41) Activation energy (E_a) and enthalpy of reaction (ΔH) for reaction A → B are 80 kJ mol^{-1} and –20 kJ mol^{-1} respectively. On adding catalyst activation energy decreases to 70 kJ mol^{-1} then enthalpy of reaction in presence of catalyst is :

(1) –10 kJ/mol

(2) –20 kJ/mol

(3) 10 kJ/mol

(4) 20 kJ/mol

42) In Maxwell's energy distribution curve, on increase in temperature, fraction of molecules having energy equal to most probable kinetic energy

(1) Increases

(2) Decreases

(3) Unchanged

(4) May be increase or decrease

43) The rate of reaction doubles for every 10°C rise in temperature. If the temperature is increased from 10°C to 50°C, the rate of reaction become :

(1) 4 times

(2) 8 times

(3) 16 times

(4) 32 times

44) For a first order reaction rate constant is
1×10^{-5} s^{-1} having E_a = 1800 kJ/mol. Then value of ℓnA at T = 600K is :-

(1) 151.7

(2) 349.5

(3) 24.7

(4) 11.34

45) The rate constant for the first order reaction is given by : $\log K = 14.34 - \dfrac{1.25 \times 10^4}{T}$
Calculate the activation energy :

(1) 2.393×10^5 J

(2) 8.69×10^4 J

(3) 1.18×10^5 J

(4) 8.69×10^5 J

BIOLOGY

1) The figure below shows ovarian changes during a mestruation cycle (A, B, C, D). Select the correct structure which secretes progesterone for maintenance of pregnancy.
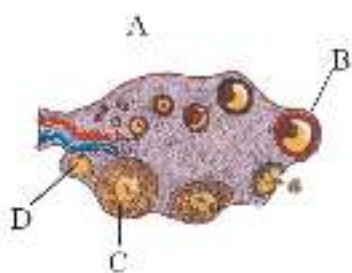
(1) B

(2) D

(3) A

(4) C

2) Find out correct match

(1) Spermatid – Haploid – 46

(2) Spermatozoa – Haploid – 23

(3) Sertoli cell – Diploid – 23

(4) Spermatogonia – Diploid – 23
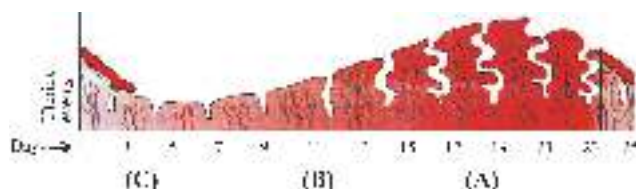
3)
Choose **correct** option :-

	A	B	C
(1)	Menstruation	Luteal phase	Secretory phase
(2)	Luteal phase	Secretory phase	Menstruation
(3)	Luteal phase	Follicular phase	Menstruation

(4)	Mestruation	Luteal phase	Secretory phase

(1) 1

(2) 2

(3) 3

(4) 4

4) Identify the correct match from the column-I, II, and III :-

	I		II		III
A	Progesterone	a	Corpus luteum	i	Maintain the endometrium
B	Oestrogen	b	Placenta	ii	Help in parturition
C	Relaxin	c	Theca interna	iii	Milk ejection reflex
D	Oxytocin	d	Post. pituitary	iv	Proliferation of endometrium

(1) A-a-i   B-d-ii   C-b-iii   D-c-iv

(2) A-a-i   B-c-iv   C-b-ii   D-d-iii

(3) B-a-iv   A-b-iii   C-c-ii   D-d-i

(4) B-c-iii   C-b-ii   A-d-iv   D-a-i

5) Which of the following will secrete inhibin hormone ?

(1) Granulosa cells

(2) Sertoli cells

(3) Leydig cells

(4) Both (1) and (2)

6) In oogenesis process meiosis-II complete.

(1) Before ovulation

(2) Before puberty

(3) After completion of fertilization

(4) After entery of sperm in ovum but before completion of fertilization

7) What is true for the polar bodies formed during the gametogenesis in human?

(1) They are formed during the foetal life of female

(2) They contain same number of chromosomes as in the secondary oocyte

(3) They contain same number of chromosomes as in the primary oocyte

(4) They are formed during spermatogenesis and oogenesis

8) Identify correctly the labeling A, B, C, D and E in the figure of male reproductive system given
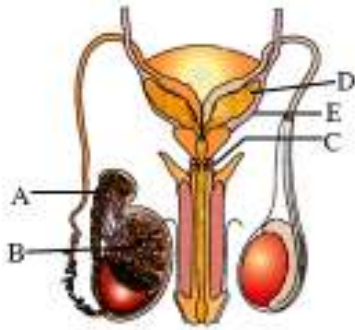
below.

(1) A = Bulbourethral gland, C = Prostate

(2) B = Rete testis, D = Seminal Vesicle

(3) C = Prostate, B = Rete testis

(4) C = Prostate, D = Seminal vesicle
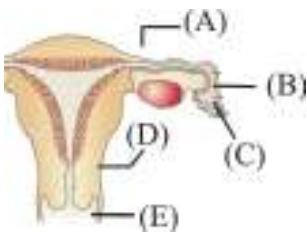
9)
See the diagram and Identify A,B,C,D,E :-

	A	B	C	D	E
(1)	Infund-ibulum	Ovary	Fimbriae	Cervix	Vagina
(2)	Fallopian tube	Infund-ibulum	Cervix	Vagina	Isthmus
(3)	Isthmus	Infund-ibulum	Fimbriae	Cervix	Vagina
(4)	Cervix	Ovary	Vagina	Fimbriae	Isthmus

(1) 1

(2) 2

(3) 3

(4) 4

10)

Which statement is **not true** ?

(1) The ovarian and uterine cycles run parallel to each other

(2) Both are of 28 days duration

(3) The uterine cycle is not dependent on the ovarian cycle.

(4) Both (1) & (3)

11) During Oogenesis in mammals Oocytes are arrested in which phase of cell division?

(1) Interphase

(2) Prophase-I

(3) Metaphase-I

(4) Anaphase-I

12) During spermatogenesis first haploid structure is called as:

(1) Spermatid

(2) Spermatozoa

(3) Primary spermatocyte

(4) Secondary spermatocyte

13)

The given below diagram represents "ovum" surrounded by few sperms. Identify A,B,C :
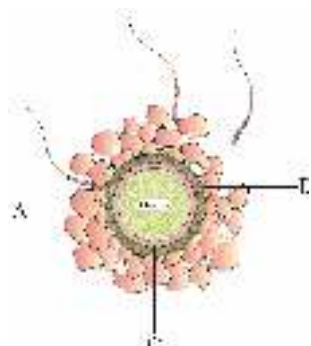
	A	**B**	**C**
(1)	Zona pellucida	Perivitelline	Corona radiata
(2)	Zona pellucida	Corona radiata	Perivitelline
(3)	Corona radiata	Perivitelline space	Zona pellucida
(4)	Corona radiata	Zona pellucida	Perivitelline space

(1) 1

(2) 2

(3) 3

(4) 4

14) Which of the following is incorrect?

(1) Ist polar body always divides to form two polar bodies in human beings

(2) One primary oocyte forms one ootid

(3) Ist polar body contains complete haploid genome but negligible cytoplasm

(4) Ovum and second polar body are formed in fallopian tube only when sperm enters the secondary oocyte

15) Several hormones like hCG, hPL, estrogen, progesterone are produced by :-

(1) Fallopian tube

(2) Pituitary

(3) Ovary

(4) Placenta

16) During early period pregnancy, which structure secrete H.C.G. for maintenance corpus luteum ?

(1) Hypothalamus and pituitary

(2) Trophoblast layer

(3) Vagina

(4) Placenta

17) How many structures in the list given below have (22 + x) chromosome ?
Polar Body, Oogonia, Primary Oocyte, Ovum, Secondary oocyte

(1) Four

(2) Three

(3) Two

(4) One

18) Seminal plasma is constituted by the secretions of which gland ?

(1) Cowper's gland, prostate gland, Bartholin's gland

(2) Seminal vesicle, Prostate gland, Bartholin's gland

(3) Prostate gland, Seminal vesicle, Bulbourethral gland

(4) Seminal vesicle & thyroid gland

19) Read the following statements carefully :-
(A) Menstrual cycle occur in human beings only
(B) Menstruation only occurs if the released ovum is fertilized
(C) Both LH and FSH attain a peak level in the middle of menstrual cycle
(D) Corpus luteum is degenerated in the absence of fertilization
(E) The first menstruation occurs just before puberty is called menarche.
Choose the True and False statements :

	A	B	C	D	E
(1)	FALSE	FALSE	FALSE	TRUE	TRUE
(2)	FALSE	TRUE	TRUE	FALSE	FALSE
(3)	TRUE	TRUE	FALSE	FALSE	TRUE
(4)	FALSE	FALSE	TRUE	TRUE	FALSE

(1) 1

(2) 2

(3) 3

(4) 4

20) Zona-Pellucida is a :-

(1) Unicellular layer

(2) Multicellular layer

(3) Acellular layer

(4) Acrosomal layer

21) Identify the contraceptive device shown below as well as the related right place of its

implantation into a woman and select the correct option together :

	Contraceptive device	Site of implant
(1)	LNG – 20	Fallopian tube
(2)	Lippes loop	Uterine wall
(3)	Copper–T	Uterine cavity
(4)	Multiload 375	Oviduct

(1) 1

(2) 2

(3) 3

(4) 4

22) Which of the following are natural contraceptive methods?
(A) Periodic abstinence
(B) Coitus interruptus
(C) Lactational amenorrhoea
(D) M.T.P.

(1) A, B and D

(2) A, C, D

(3) A, B, C

(4) B, D

23) Which of the following method of birth control can cause excessive menstrual bleedings pain and inflammation of uterine wall ?

(1) Condom

(2) Cervical cap

(3) Oral contraceptive

(4) Intra uterine device (IUDs)

24) Cu ions released from copper–releasing intra uterine devices (IUDs) helps in :-

(1) Prevent ovulation
(2) Block the uterus
(3) Increase phagocytosis of ovum
(4) Suppress sperm motility

25) Weekly oral pills for females are :-

(1) Mala-D
(2) Mala-N
(3) Saheli
(4) Gossypol

26) In ZIFT (Zygote Intra Fallopian Transfer), the fertilisation occurs

(1) inside fallopian tube
(2) outside female body
(3) inside uterus
(4) None of the above

27) Nearly __a__ million MTPs are performed in a year all over the world which accounts to __b__ of the total number of conceived pregnancies in a year :-

(1) a–40 to 50, b=$1/4^{th}$
(2) a–4 to 5, b=$1/5^{th}$
(3) a–45 to 50, b=$1/4^{th}$
(4) a-45 to 50, b=$1/5^{th}$

28) Which of the following statement is **not correct** :-

(1) Progestogens alone or in combination with estrogen can also be used by females.
(2) Saheli is "once a week" pill.
(3) Pills have to be taken daily for a period of 21 days.
(4) Saheli has high side effect and low contraceptive value.

29) Given below are four statements (a-d) regarding assisted reproductive technologies:-
(a) **ZIFT** - The zygote or early embryo (with upto 8 blastomere) transferred into the fallopian tube
(b) **ICSI** - A sperm is directly injected into the fallopian tube to form an embryo in the laboratory
(c) **IUI** - The semen collected either from the husband or healthy donor is artificially introduced into the uterus
(d) **GIFT** - Transfer of zygote collected from a donor into the fallopian tube of another female who cannot produce one but can provide suitable environment for fertilisation and development
Which two of the above statements are correct?

(1) a & d

(2) b & c

(3) a & c

(4) b & d

30) Select the correct statement :-

(1) MTPs are safe during the first trimester

(2) SAHELI oral contraceptive pills are non-steroidal

(3) Natural methods of contraception work on the principle of avoiding chances of ovum and sperms meeting

(4) All of above are correct

31) Family planning programme in India launched in :-

(1) 1951

(2) 1961

(3) 1971

(4) 1981

32) Given below are four methods (A–D) and their modes of action (a–d) in achieving contraception. Select their correct matching from the four options that follow

Method		Mode of Action	
A.	The pill	(a)	Prevents sperms reaching cervix
B.	Condom	(b)	Decrease sperm motility
C.	Vasectomy	(c)	Prevents ovulation
D.	Copper T	(d)	Semen contains no sperms

Matching :-

(1) A – (c), B – (d), C – (a), D – (b)

(2) A – (b), B – (c), C – (a), D – (d)

(3) A – (c), B – (a), C – (d), D – (b)

(4) A – (d), B – (a), C – (b), D – (c)

33) Which of the following method generally involves early embryos (with 8 blastomeres) ?

(1) IUT

(2) ZIFT

(3) GIFT

(4) AI

34) Incidences of STDs(sexually transmitted diseases) are reported to be very high among persons in the age group of :-

(1) 10-15 years

(2) 15-24 years

(3) 35-40 years

(4) 24-34 years

35) Surgical sterlization techniques are highly effective but the disadvantage is :-

(1) Ectopic pregnancy risk

(2) Increased risk of cancer

(3) Reversibility is very poor

(4) Irregular menstrual bleeding

36) The growth rate of India according to 2011 census

(1) Was around 1.7 percent i.e., 17/1000/year

(2) Could double population of India in 33 years

(3) Could lead to an absolute scarcity of food, shelter, clothing etc

(4) All of these

37) Read the following statements (A-D):-
(A) The first movement of the foetus and appearance of hair on the head are usually observed during fourth month.
(B) Saheli a new oral contraceptive for the females
(C) MTPs are considered relatively safe during the second trimester
(D) The corpus luteum secretes large amount of estrogen which is essential for maintenance of the endometrium
How many statement are **incorrect** in following ?

(1) Four

(2) Three

(3) Two

(4) One

38) Which of the following method of contraception is effective only upto a maximum period of six months following parturition :-

(1) Cu T

(2) LNG-20

(3) Coitus interrupts

(4) Lactational amenorrhoea

39) MTP or induced abortion is :-
A. Legalised method with some strict conditions to avoid its misuse.
B. Safe if carried out within 12 weeks of pregnancy
C. Done with the help of anti-progesterone drugs.
Correct option is -

(1) A only

(2) A & B only

(3) C only

(4) A, B & C

40)

How many of following are associated with natural method of contraception ?

Periodic abstinence, Lactational amenorrhea, Implant, LNG-20, Diaphragm, saheli

(1) one

(2) two

(3) three

(4) four

41) Menstruation is initiated by

(1) A sudden release of FSH from the anterior pituitary

(2) A lack of estrogen and progesterone due to degeneration of the corpus luteum

(3) An increased release of estrogen and progesterone from the corpus luteum

(4) A sudden drop in FSH

42) The following refers to schematic representation of oogenesis.
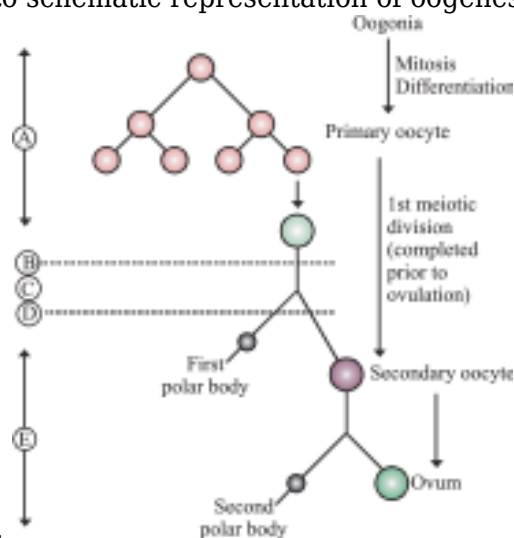
Identify A to E **correctly**.

(1) (A) Foetal life   (B) Birth   (C) Puberty
(D) Adult reproductive life (E) Childhood

(2) (A) Foetal life   (B) Birth   (C) Childhood
(D) Puberty   (E) Adult reproductive life

(3) (A) Adult reproductive life   (B) Birth
(C) Puberty   (D) Childhood   (E) Foetal life

(4) (A) Birth   (B) Childhood   (C) Foetal life
(D) Puberty   (E) Adult reproductive life

43) Read the following statements carefully.
The ....(A)...... present on the inside wall of ....(B)....... multiply by .....(C)...... division. A

......(D)....... completes the ....(E)....... division leading to formation of two equal, haploid cells called ....(F)....... . Which one of the following options gives the correct filling of A, B, C, D, E and F?

	(1)	(2)	(3)	(4)
(A)	Spermatogonia	Primary Spermatocyte	Spermatogonia	Primary Spermatocyte
(B)	Seminiferous tubule	Sertoli Cell	Sertoli Cell	Seminiferous tubule
(C)	Mitotic	Mitotic	First meiotic	First meiotic
(D)	Primary Spermatocyte	Secondary Spermatocyte	Secondary Spermatocyte	Spermatid
(E)	First meiotic	First meiotic	Second meiotic	Second meiotic
(F)	Secondary Spermatocyte	Spermatid	Spermatid	Sperm

(1) 1

(2) 2

(3) 3

(4) 4

44) Which phase of oogenesis runs during menstrual cycle in human ?

(1) Multiplication phase

(2) Yolk synthesis

(3) Maturation phase

(4) Growth phase

45) During implantation, the embryo becomes embedded in which layer of uterus ?

(1) Perimetrium

(2) Myometrium

(3) Endometrium

(4) Epimetrium

46) Which accessory sex gland in human being is unpaired ?

(1) Bartholin's gland

(2) Seminal vesicle

(3) Cowper gland

(4) Prostate gland

47)

What will be happened, if we remove zona pellucida of a embryo in morula stage ?

(1) Embryo may be destroyed in fallopian tube

(2) Embryo may be implanted at abnormal site

(3) Implantation will not be possible

(4) Both (1) and (2)

48) Identify the structure shown below and its location in the human, and select the right option.

	Structure	**Site of occurrence**
(1)	Testis	Abdominal cavity
(2)	Penis	Abdominal cavity
(3)	Seminiferous tubules	Testis
(4)	Prostate	Below the urinary bladder

(1) 1

(2) 2

(3) 3

(4) 4

49) Which of the following chemicals is responsible for diffusion and concentration of testosterone inside the seminiferous tubules ?

(1) ICSH

(2) ABP

(3) Inhibin

(4) Androgens

50) Which sequence is correct for male genital tract?

(1) Rete testis → Vas deferens → Vasa efferentia → Epididymis → Urethra

(2) Tubuli recti → Rete testis → Vas deferens→ Vasa efferentia → Seminal vesicle → Urethra

(3) Tubuli recti → Rete testis → Vasa efferentia → Vas deferens → Epididymis → Urethra

(4) Tubuli recti → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Urethra

51) It is a diagrammatic sectional view of male reproductive system, In which identify ejaculatory
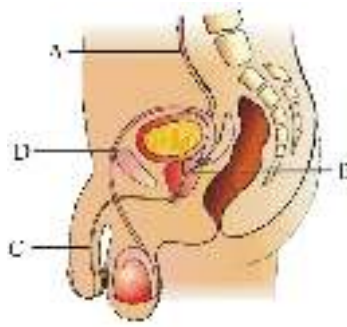
duct :-

(1) A

(2) B

(3) C

(4) D

52) Read the following statements :-
(a) It is paired structure
(b) It is present at dorsolateral side of urinary bladder
(c) It help in coagulation of semen
In above statements "It' refers to :-

(1) Seminal vesicle

(2) Bartholin gland

(3) Bulbourethral gland

(4) Prostate gland

53)

How many of the following are secondary sex organs in males ?

Uterus, Epididymis, Vas deferens, Prostate, Fallopian tube, Seminal vesicles, Penis, Vagina, Testes, Bulbourethral glands

(1) Five

(2) Six

(3) Seven

(4) Four

54) Differentiation occurs in which stage :-

(1) Primary spermatocyte → secondary spermatocyte

(2) Secondary spermatocyte → Spermatid

(3) Spermatid → Spermatozoa

(4) Spermatogonia → Primary spermatocyte

55) The edges of infundibulum posses finger like projections called fimbriae which helps in :-

(1) Collection of sperms

(2) To facilitate implantation

(3) To pass nutrition towards ovum

(4) Collection of ovum after ovulation

56) A temporary endocrine gland.........formed after ovulation in ovary and secretes.......hormone respectively:-

(1) Corpus albicans & estrogen

(2) Corpus luteum & LH

(3) Corpus albicans & progesterone

(4) Corpus luteum & progesterone

57) Refer the given schematic representation of menstrual cycle showing three phases I, II and III. Select the option that correctly matches these phases with the following events :-
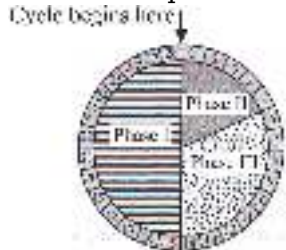
(i) FSH secreted by the anterior pituitary stimulates the ovarian follicle to secrete oestrogen which stimulates the proliferation of endometrium.

(ii) LH secreted by the anterior pituitary stimulates the development of corpus luteum which secretes progesterone

(iii) Reduced production of LH from anterior pituitary causes degeneration of corpus luteum, thereby menustral flow starts

	Phase - I	Phase - II	Phase - III
(1)	(i)	(ii)	(iii)
(2)	(iii)	(i)	(ii)
(3)	(ii)	(iii)	(i)
(4)	(iii)	(ii)	(i)

58) Generally fertilisation takes place in :-

(1) Isthumus

(2) Ampulla

(3) Infundibulum

(4) Uterus

59) The layer of developing embryo which attaches with endometrium of uterus during the process of implantation is :-

(1) Trophoblast

(2) Zona pellucida

(3) Corona Radiata

(4) Embryonal knob

60) Fusion of cytoplasm of male gametes & female gametes is called :-

(1) Syngamy

(2) Karyogamy

(3) Plasmogamy

(4) Amphimixis

61) The tertiary follicle is characterised by _____

(1) Presence of oocyte

(2) Presence of theca externa

(3) Presence of theca interna

(4) Presence of antrum

62) Find out the correct match from the following table :

	Column-I	Column-II	Column-III
(i)	Intestitial cells	Cells of seminiferous tubule	Secrete testosterone
(ii)	Nurse cells	Cells of testis	Provide nutrition to germ cells
(iii)	Spermatocyte	Cells of seminiferous tubule	Divided by meiosis and produce sperms
(iv)	Cremaster muscles	Scrotum	Help in elevation of testis

(1) Only (i) and (iii)

(2) Only (ii) and (iii)

(3) (ii), (iii) and (iv)

(4) (i), (ii), (iii) and (iv)

63) If for some reason, the vasa efferentia in the human reproductive system get blocked, the gametes will not be transported from :-

(1) Testis to epididymis

(2) Epididymis to Vasdeferens

(3) Ovary to uterus

(4) Vagina to uterus

64) Orchidectomy (testis removal) surgery is performed in a 40 years male due to suspicion of cancer. After one year of surgery that person was analysed for hormonal level. What would be the hormonal level of that person ?

(1) Androgens $\downarrow$, GnRH $\downarrow$

(2) Testosterone ↑, LH ↑ FSH ↓

(3) Testosterone ↑, LH ↓ FSH ↓

(4) Testosterone ↓, LH ↑, FSH ↑

65) Which statement is correct ?

(1) Glans penis is covered by a loose fold of skin called foreskin

(2) The male accessory glands include paired seminal vesicle, paired prostate and paired bulbourethral gland

(3) Both (1) and (2)

(4) Breast are secondary sex organ
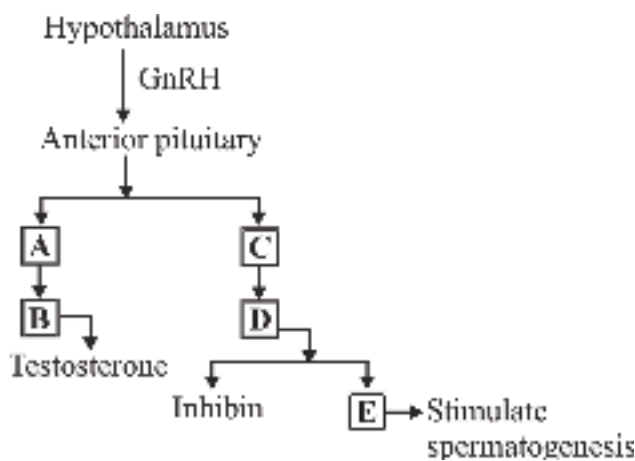
66)

Find out **A, B, C, D** and **E** respectively :-

	A	B	C	D	E
(1)	Testis	Leyding cells	Sertoli cells	AMH	ABP
(2)	ICSH	Testis	AMH	Sertoli cells	ABP
(3)	LH	Interstitial cells	FSH	Sertoli cells	AMH
(4)	ICSH	Leyding cells	FSH	Sertoli cells	ABP

(1) 1

(2) 2

(3) 3

(4) 4

67) Sperm are temporarily stored and matured in :-

(1) Prostate

(2) Epididymis

(3) Ampulla

(4) Rete testis

68) How many structures in the list given below are haploid?
Spermatid, secondary oocyte, primary spermatocyte, ovum, sperm, oogonia, spermatogonia, polar body

(1) Six

(2) Four

(3) Two

(4) Five

69) It is a diagrammatic presentation of developing follicle events, find out correct statement:
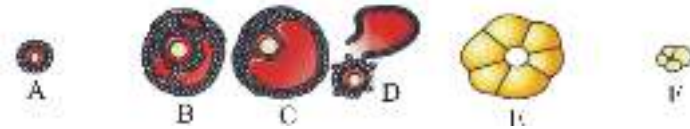
(1) A = Primary follicle, C = secondary follicle E = Corpus haemorragicum, F = Corpus luteum

(2) B = Secondary follicle, D = Mature follicle
E = Corpus haemorragicum, F=Corpus luteum

(3) A = Primary follicle, C = mature follicle E = Corpus luteum, F = Corpus albicans

(4) A = Primary follicle, D = Mature follicle E = Corpus luteum, F = Corpus albicans

70) There are three layers present in uterus, one of them is thick muscular, second is thin membranous and third is glandular layer. These layers are respectively:-

(1) Perimetrium, Myometrium, Endometrium

(2) Endometrium, Myometrium, Perimetrium

(3) Myometrium, perimetrium, Endometrium

(4) Myometrium, endometrium, Perimetrium

71) Which of the following structure is not found in female ?

(1) Uterus

(2) Prostate gland

(3) Bartholin's gland

(4) Fallopian tube
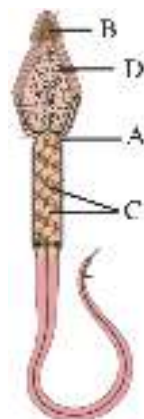
72) Identify A, B, C & D in given figure :

	A	B	C	D
(1)	Tail	Nucleus	Mitochondria	Acrosome
(2)	Neck	Acrosome	Mitochondria	Nucleus
(3)	Neck	Nucleus	Mitochondria	Acrosome
(4)	Head	Mitochondria	Nucleus	Acrosome

(1) 1

(2) 2

(3) 3

(4) 4

73) Secretary phase of menstrual cycle is also known as :-

(1) Follicular phase

(2) Estrogenic phase

(3) Luteal phase

(4) Menstrual phase

74) Which hormone level reaches peak during luteal phase of menstrual cycle ?

(1) Estrogen

(2) Progesterone

(3) Luteinizing hormone

(4) F.S.H.

75) Find out correct sequence of menstrual cycle phase:-

(1) Ovulation → Bleeding phase → Luteal phase

(2) Bleeding phase → Oestrogenic phase → Ovulation → Secretory phase

(3) Menstrual phase →Oestrogenic phase → Secretory phase → Ovulation

(4) Bleeding phase → Ovulation → Oestrogenic phase

76) How many mammary lobes present in human female ?

(1) 2–5

(2) 15–20

(3) 50–80

(4) 30–40

77) Which of the given below statement does not belong to sertoli cell ?

(1) Perform phagocytosis of dead sperms

(2) Formation of blood brain barrier

(3) Sertoli cell produce inhibin hormone

(4) They are columnar cells

78) Observe the schematic representation of menstrual cycle carefully and identify W,X,Y and Z
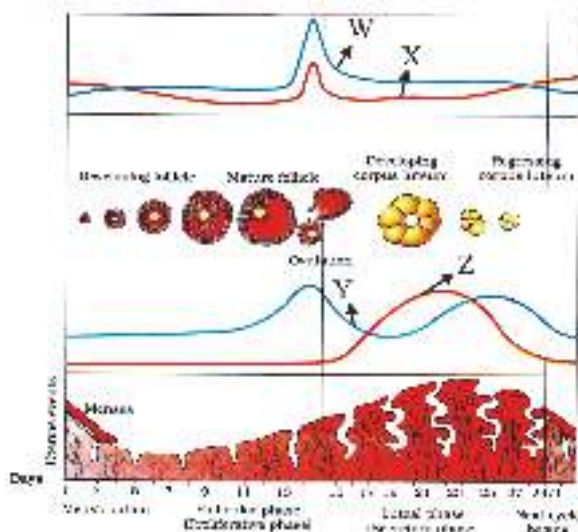
correctly from the given options :-

	W	X	Y	Z
(1)	Estrogen	Progesterone	L.H.	F.S.H.
(2)	F.S.H.	L.H.	Estrogen	Progesterone
(3)	L.H.	F.S.H.	Estrogen	Progesterone
(4)	Estrogen	Progesterone	F.S.H.	L.H.

(1) 1

(2) 2

(3) 3

(4) 4

79) In a menstrual cycle of 30 days the luteal phase will be completed in approximately :-

(1) 14 days

(2) 15 days

(3) 18 days

(4) It is not fixed

80) How many of the following is/are female reproductive organs ?
Epididymis, Fallopian tube, Uterus, Vagina, Testis, Prostate gland, Bulbourethral gland, Bartholin's gland, Ovary

(1) 4

(2) 5

(3) 6

(4) 7

81) How many of the following cells related to spermatogenesis are diploid in nature ?
Spermatogonia, Primary spermatocyte, Secondary spermatocyte, Spermatid, Sperm

(1) 4

(2) 3

(3) 2

(4) 1

82) Which of the following hormones is released by Sertoli cells in response to excess spermatogenesis?

(1) GnRH

(2) ICSH

(3) FSH

(4) Inhibin

83)

How many of the following structures are part of external genitalia of a female ?

Mons pubis, Labia majora, Clitoris, Vaginal canal, Uterus, Fallopian tube, Hymen.

(1) 5

(2) 4

(3) 3

(4) 2

84) One primary spermatocyte gives rise to four spermatozoa & one primary oocyte forms :-

(1) Four ova

(2) Two ova

(3) One ovum

(4) Many ova

85)

How many of the following statements is/are not **correct** ?
(a) Presence or absence of hymen is a reliable indicator of virginity/sexual experience.
(b) Vaginal orifice is completely closed by a septum of mucous membrane called hymen.
(c) The uterus opens into urethra.

(d) Vaginal canal along with cervical canal forms birth canal.

(1) 4

(2) 3

(3) 2

(4) 1

86) If tubectomy is done in 25 years old female, which statement is correct after this surgery ?

(1) M.C. Stop

(2) M.C. occurs irregulary

(3) No effect on normal M.C.

(4) Ovarian changes not occur

87) In human adult female oxytocin :

(1) Stimulates pituitary to secrete Vasopressin.
(2) Cause strong uterine contraction during parturition
(3) It secreted by adenohypophysis
(4) All of the above

88) Birth canal is formed by :-

(1) Uterus and cervical canal
(2) Cervical canal and vagina
(3) Vagina and uterus
(4) Uterus, cervical canal and vagina

89) Spermatogenesis starts at the time of

(1) Puberty
(2) Embryo stage
(3) After birth
(4) Life time

90) Second polar body is released during oogenesis

(1) At the time of fertilization
(2) After completion of meiosis–II
(3) At the time of formation of haploid ovum
(4) All of the above

ANSWER KEYS

PHYSICS

Q.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A.	2	2	2	2	1	4	3	4	1	1	3	3	3	2	2	1	3	3	2	2
Q.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A.	3	4	2	4	4	4	1	4	4	3	2	1	2	3	3	1	4	2	1	2
Q.	41	42	43	44	45															
A.	1	2	2	4	1															

CHEMISTRY

Q.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
A.	2	3	2	1	3	2	2	3	3	1	4	1	3	4	1	4	4	2	2	3
Q.	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
A.	2	1	3	2	3	2	4	1	3	1	4	3	2	4	2	2	4	4	2	3
Q.	86	87	88	89	90															
A.	2	2	3	2	1															

BIOLOGY

Q.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
A.	4	2	3	2	4	4	2	2	3	3	2	4	2	1	4	2	2	3	4	3
Q.	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
A.	3	3	4	4	3	2	4	4	3	4	1	3	2	2	3	4	2	4	4	2
Q.	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
A.	2	2	1	3	3	4	2	3	2	4	2	1	2	3	4	4	3	2	1	3
Q.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
A.	4	3	1	4	1	4	2	4	3	3	2	2	3	2	2	4	2	3	1	2
Q.	171	172	173	174	175	176	177	178	179	180										
A.	3	4	2	3	2	3	2	2	1	4										

PHYSICS

1) $I = 10^{-10}$ W/m^2

$\lambda = 5.6 \times 10^{-7}$ m

$A = 10^{-6}$ m^2

no. of photons per second = $n = 5 \times 10^{24}$ p λ

$n = 5 \times 10^{24}$ IA λ

$= 5 \times 10^{24} \times 10^{-10} \times 10^{-6} \times 5.6 \times 10^{-7}$

$= 280$

2)

$F_R = mg$

$P/C = mg$

$P = mgC$

$= 10 \times 10^{-3} \times 10 \times 3 \times 10^8$

$= 3 \times 10^7$W

3) By using $\dfrac{hc}{e}\left(\dfrac{1}{\lambda} - \dfrac{1}{\lambda_0}\right) = V_0$

$\Rightarrow \dfrac{hc}{e}\left(\dfrac{1}{\lambda} - \dfrac{1}{\lambda_0}\right) = 4.8$ .....(i)

and $\dfrac{hc}{e}\left(\dfrac{1}{2\lambda} - \dfrac{1}{\lambda_0}\right) = 1.6$ .....(ii)

From equation (i) by (ii),

$\dfrac{\left(\dfrac{1}{\lambda} - \dfrac{1}{\lambda_0}\right)}{\left(\dfrac{1}{2\lambda} - \dfrac{1}{\lambda_0}\right)} = \dfrac{4.8}{1.6} \Rightarrow \lambda_0 = 4\lambda$

4)

$\lambda_{ph} = 4\lambda_e \Rightarrow P_{ph} = \dfrac{P_e}{4}$

KE of electron $= \dfrac{1}{2}mv_e^2 = \dfrac{1}{2}P_e V_e$

$KE_e = \dfrac{1}{2}(4P_{ph})\left(\dfrac{C}{100}\right)$

$= \dfrac{4}{100} \times \left(\dfrac{1}{2}P_{ph} \times C\right)$

$KE_{ph} = P_{ph} \times C$

$$\Rightarrow \frac{KE_e}{KE_{ph}} = \frac{2}{100} = 2 \times 10^{-2}$$

5)

A → Range of kinetic energy of emitted
    photo electrons is 0 to $K_{max.}$
B → There is no. time lag.
C → On increasing frequency; stopping
    potential increases.

6)

Released energy = 2 × 4 × 7 – 2 × 1 – 7 × 5.4
            = 16.2 MeV

7) Stopping voltage depend on frequency
$eV_0 = h\upsilon - \phi$.
saturation current ∝ intensity of light.

8) **Concept :** Photoelectric effect

Formula:
Photon energy $E = \dfrac{hc}{\lambda}$
Stopping potential V ∝ Photon energy

Calculation:
$$ev_1 = \frac{hc}{\lambda} - \phi_0 \quad \text{...... (i)}$$
$$ev_2 = \frac{hc}{\left(\frac{\lambda}{2}\right)} - \phi_0 \quad \text{...... (ii)}$$
Using (i) and (ii), we get
$$V_1 = V_2 - \frac{hc}{\lambda e} \text{ so, } V_1 < V_2, \text{ yet}$$
$$\Rightarrow \frac{hc}{\lambda e} = V_2 - V_1 \text{.......(iii)}$$
Using (i) and (iii), we have
$V_1 = V_2 - V_1 - \phi_0$
$\Rightarrow V_2 = 2V_1 + \phi_0$
So, clearly, $V_2 > 2V_1$
Thus, over all conclusion is , $V_2 > 2V_1$

Correct Answer:
Option 4

9)

$K_{max} = h\nu - h\nu_0$

10)

Slope of graph is h/e, so it is constant for all metals greater the work function, greater the magnitude of y-intercept.

11) $E = \dfrac{12400}{4000} = 3.1 \text{ eV}$

Photoelectrons emits if energy of incident light $\geqslant$ work function.

12) $K_1 = \dfrac{hc}{3\lambda} - \dfrac{hc}{5\lambda} = \dfrac{hc}{\lambda}\left[\dfrac{1}{3} - \dfrac{1}{5}\right] = \dfrac{hc}{\lambda}\left[\dfrac{2}{15}\right]$

$K_2 = \dfrac{hc}{\lambda} - \dfrac{hc}{5\lambda} = \dfrac{hc}{\lambda}\left[1 - \dfrac{1}{5}\right] = \dfrac{hc}{\lambda}\left[\dfrac{4}{5}\right]$

(a) Ratio of KE

$\dfrac{K_1}{K_2} = \dfrac{\frac{hc}{\lambda}\left[\frac{2}{15}\right]}{\frac{hc}{\lambda}\left[\frac{4}{5}\right]} = \dfrac{1}{6} = 1 : 6$

(b) Ratio of speeds of incident photons

$\dfrac{c_1}{c_2} = \dfrac{1}{1} = 1 : 1$

(c) Ratio of momentum of incident photons

$\dfrac{p_1}{p_2} = \dfrac{\lambda_2}{\lambda_1} = \dfrac{\lambda}{3\lambda} = 1 : 3$

(d) Ratio of fastest speed of photo electrons

$\dfrac{v_1}{v_2} = \sqrt{\dfrac{K_1}{K_2}} = \sqrt{\dfrac{1}{6}} = 1 : \sqrt{6}$

13)

$\lambda = \dfrac{h}{m\nu}$

since v is increasing in case (i) but it is not changing in case (ii) hence in first case λ will change but in second case, it remains same

14) $\dfrac{E_{ph}}{p_e} = \dfrac{\frac{hc}{\lambda}}{\frac{h}{\lambda}} = c$

15) from graph :

$\phi = 6 \text{ eV}$

$E = K_{max} + \phi$

$\dfrac{h\nu_1}{h\nu_2} = \dfrac{7 + 6}{8 + 6} = \dfrac{13}{14}$

16) $\lambda_e = \sqrt{\dfrac{\sqrt{150}}{V_a}}$ Å = 1Å

so V_a = 150 V

and E = 150 eV

$\lambda_{ph} = \dfrac{hc}{E} = \dfrac{12400eV}{150eV}$ Å

λ_{ph} = 82.67Å

17) de-Broglie wavelength

$\lambda = \dfrac{h}{mv_{rms}} = \dfrac{h}{\sqrt{3mkT}}$

$\dfrac{\lambda_H}{\lambda_{He}} = \sqrt{\dfrac{m_{He}T_{He}}{m_H T_H}} = \sqrt{\dfrac{4(273+127)}{2(273+27)}} = \sqrt{\dfrac{8}{3}}$

18) When a charged particle (charge q, mass m) enters perpendicularly in a magnetic field (B)

then, radius of the path described by it $r = \dfrac{mv}{qB} \Rightarrow mv = qBr$

Also de-Broglie wavelength $\lambda = \dfrac{h}{mv}$

$\Rightarrow \lambda = \dfrac{h}{qBr} \Rightarrow \dfrac{\lambda_\alpha}{\lambda_p} = \dfrac{q_p r_p}{q_\alpha r_\alpha} = \dfrac{1}{2}$

19) K.E. = $2E_0 - E_0 = E_0$ (for $0 \leq x \leq 1$)

$\lambda_1 = \dfrac{h}{\sqrt{2mE_0}}$;

KE = $2E_0$ (for x > 1);

$\lambda_2 = \dfrac{h}{\sqrt{4mE_0}}$; $\dfrac{\lambda_1}{\lambda_2} - \sqrt{2} \Rightarrow \left(\dfrac{\lambda_1}{\lambda_2}\right)^2 = 2$

20) (a) In $\lambda = \dfrac{h}{P}$ equation →

λ is characterstic of wave & p (momentum) is characterstic of particle.

(b) Mass of macroscopic particles is high so de-Broglie wavelength is very small.

(c) $\lambda = \dfrac{h}{P}$ is applicable for material particle & photons as well.

21)

$R \propto A^{1/3}$

$\dfrac{R_2}{R_1} = \left(\dfrac{128}{16}\right)^{1/3} = 2$

$R_2 = 2R_1 = 6 \times 10^{-15}$ m

22) $m = 1mg = 10^{-6}$ kg

$E = mc^2 = 10^{-6} \times (3 \times 10^8)^2 = 9 \times 10^{10}$ J

23)

T.E. = Rest + K.E.

5.55 = 0.51 + K.E.

K.E. = 5.045 MeV

24) $E = \dfrac{0.1}{100} \times 1 \times (3 \times 10^8)^2$

25) $16 \times 10^3 = \dfrac{N \times 200 \times 10^6 \times 1.6 \times 10^{-19}}{1}$

26)

High temperature provides kinetic energy to nuclei to overcome repulsive electrostatic force between them.

27) In nuclear fusion :-

mass of product < mass of reactant

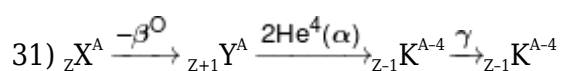as some mass is liberated in form of energy (Q-value)

28)

For pair production $E_{Ph} \geq 1.02$ MeV

29)

Radioactive substance can emit α, β, γ

30)

Z = 92 – 8 × 2 + 2 × 1

31) $_{Z}X^A \xrightarrow{-\beta^0} {}_{Z+1}Y^A \xrightarrow{2He^4(\alpha)} {}_{Z-1}K^{A-4} \xrightarrow{\gamma} {}_{Z-1}K^{A-4}$

32) V = 20 KV

$E = 20 \times 1.6 \times 10^{-19}$ eV

$\lambda_{min} = \dfrac{hC}{E} = 0.62 \times 10^{-10} = 0.62$Å

33) $P = \dfrac{E}{C}$ and $\dfrac{h}{\lambda}$

34)

Velocity of electron is always smaller than velocity of photon (i.e. speed of light).

35) **Problem Statement:** The question asks which of the given nuclei (helium-4, lithium-7, carbon-12, or nitrogen-14) is the most stable. Stability in this context is related to how strongly the nucleons (protons and neutrons) are bound together within the nucleus. We compare the nuclei based on their binding energy per nucleon to determine which one is most stable.
Underlying Concept: The core scientific concept is the binding energy per nucleon in nuclear physics. Binding energy is the energy required to disassemble a nucleus into its individual protons and neutrons. Higher binding energy per nucleon means the nucleus is more tightly bound and thus more stable.

Relevant Formulas: Binding energy per nucleon = $\dfrac{\text{Total binding energy (BE)}}{\text{Mass number(A)}}$

Where: - BE = total binding energy in MeV - A = total number of nucleons (protons + neutrons)
Step-by-Step Calculation: Step 1: Calculate the binding energy per nucleon for each nucleus by dividing the given binding energy by the mass number.

For $_2^4\text{He}$: $\dfrac{28 \text{ MeV}}{4} = 7.0$ MeV/nucleon

For $_3^7\text{Li}$: $\dfrac{52 \text{ MeV}}{7} \approx 7.43$ MeV/nucleon

For $_6^{12}\text{C}$: $\dfrac{90 \text{ MeV}}{12} = 7.5$ MeV/nucleon

For $_7^{14}\text{N}$: $\dfrac{98 \text{ MeV}}{14} = 7.0$ MeV/nucleon

Step 2: Compare these values to identify the highest binding energy per nucleon

36) Use Z and A conservation in nuclear reaction.

37)

BE per nucleon is of order MeV.

38) $\lambda = \dfrac{h}{P}$

39) **Explain Question :**
The metal has a work function of 8 eV, and two photons of 5 eV each are incident on it. The question asks if two photons can eject an electron from the metal.
Concept : Photoelectric effect
Formula:
Energy of photon $E_{photon} = h\nu$
Work function $\phi = 8$ eV

Calculation :

Since the work function is 8 eV, no single photon can eject an electron (as **5 eV < 8 eV**).

Hence, both assertion and reason are true.

Correct Answer: (1)

40) $n_e \propto \dfrac{1}{d^2}$

41) Minimum kinetic energy is always zero.

42) $K_{max} = E - W_0$

$\Rightarrow T_A = 4.25 - (W_0)_A$ ...(i)

$T_B = (T_A - 1.5) = 4.70 - (W_0)_B$ ...(ii)

Equation (i) and (ii) gives $(W_0)_B - (W_0)_A = 1.95$ eV

De-Broglie wavelength $\lambda = \dfrac{h}{\sqrt{2mK}} \Rightarrow \lambda \propto \dfrac{1}{\sqrt{K}}$

$\Rightarrow \dfrac{\lambda_B}{\lambda_A} = \sqrt{\dfrac{K_A}{K_B}} \Rightarrow 2 = \sqrt{\dfrac{T_A}{T_A - 1.5}} \Rightarrow T_A = 2$ ev

From equation (i) and (ii)

$W_A = 2.25$ eV and $W_B = 4.20$ eV

43)

By switching electric field vertically downwards, force on photo e^- acts vertically upwards. So kinetic energy increases.

44) Here $\lambda_2 = \lambda_1/2$

$\lambda = \dfrac{h}{\sqrt{2mE}} \Rightarrow \lambda \propto \dfrac{1}{\sqrt{E}}$

$E \propto \dfrac{1}{\lambda^2} \Rightarrow \dfrac{E_1}{E_2} = \left(\dfrac{\lambda_2}{\lambda_1}\right)^2$

$E_2 = E_1 \times \left(\dfrac{\lambda_1}{\lambda_2}\right)^2 = E_1 \left(\dfrac{\lambda_1}{\lambda_1/2}\right)^2 = 4E_1 = E_1 + 3E_1$

energy added should be thrice initial energy.

45) E = 100 eV

V = 100 volt

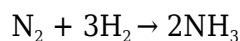$\lambda = \dfrac{12.27}{\sqrt{V}}$ Å $= \dfrac{12.27}{\sqrt{100}} = 1.227$ Å

CHEMISTRY

46)

$r = K[A]^{\alpha}[B]^{\beta}$

$r' = K[3A]^{\alpha}[2B]^{\beta}$

$\alpha = 2, \beta = 3$

$M = \dfrac{\% \frac{w}{v} \times 10}{Mw}$

47)

$N_2 + 3H_2 \rightarrow 2NH_3$

given $\quad -\dfrac{d[H_2]}{dt} = x$

We know $\quad -\dfrac{d[N_2]}{dt} = -\dfrac{1}{3}\dfrac{d[H_2]}{dt} = \dfrac{1}{2}\dfrac{d[NH_3]}{dt}$

⟹ $\dfrac{d[NH_3]}{dt} = \dfrac{-2}{3}\dfrac{d[H_2]}{dt} = \dfrac{2}{3}(x)$ rate of ↑se in concentration of $NH_3 = \dfrac{2}{3}x$

48)

For zero order:

$\dfrac{t_x}{t_y} = \dfrac{x}{y}$

$\dfrac{t_{1/2}}{t_{3/4}} = \dfrac{\frac{1}{2}}{\frac{3}{4}} - \dfrac{1}{2} \times \dfrac{4}{3}$

$\dfrac{t_{1/2}}{t_{3/4}} = \dfrac{2}{3}$

49) **Question Explanation**

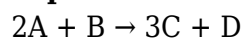Reaction rate must match stoichiometric coefficients; incorrect expression has wrong coefficient in denominator.

Concept

Rate = $\pm 1/$ coefficient $\times$ d [species]/dt for each reactant/product.

Incorrect Expression: Option 1: $\dfrac{1}{3}\dfrac{d[C]}{dt}$

Correct form should be: $\dfrac{1}{3}\dfrac{d|C|}{dt}$ with a positive sign (but it's marked wrongly here if sign is misused).

Explanation

$2A + B \rightarrow 3C + D$

ror = $\dfrac{\text{rod of A}}{2} = -\dfrac{\text{rod of B}}{1} = \dfrac{\text{roa of C}}{3} = \dfrac{\text{roa of D}}{1}$

ror = $\dfrac{1}{2}\left[\dfrac{-d(A)}{dt}\right] = \dfrac{-d[B]}{dt} = \dfrac{1}{3}\left[+\dfrac{d(C)}{dt}\right] = +\dfrac{d[D]}{dt}$

Final Answer (1)

50)

Higher the activation energy, slower in the reaction

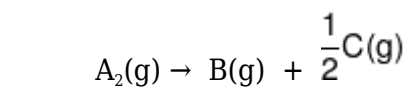**51)** $\log\left[\dfrac{-d[A]}{dt}\right] = \log\left[\dfrac{2d[B]}{dt}\right]$

taking antilog

$\dfrac{-d[A]}{dt} = \dfrac{2d[B]}{dt}$

$-\dfrac{1}{2}\dfrac{d[A]}{dt} = \dfrac{+d[B]}{dt}$

∴ reaction is 2A → B

$\qquad\qquad x : y = 2 : 1$

52)

$$A_2(g) \rightarrow B(g) \; + \; \frac{1}{2}C(g)$$

t = 0   100

t = 5   100−x   x $\dfrac{x}{2}$

Now $100 - x + x + \dfrac{x}{2} = 120$

⇒   x = 40

rod $A_2 = \dfrac{-\Delta P_{A_2}}{\Delta t} = -\dfrac{(-40)}{5} = 8$ mm min^{-1}

53) Generated by Allie

Problem Statement: The question asks which among four given statements about the rates of disappearance and formation of reactants and products in the chemical reaction 4A + B → 2C + 2D is incorrect. It requires understanding the relationship between the rates based on the reaction's stoichiometry.

Underlying Concept: The core concept is the relationship between reaction rates and stoichiometric coefficients in a balanced chemical equation. The rate of disappearance or appearance of each species is proportional to its stoichiometric coefficient, allowing comparison of rates by relating their changes over time.

Relevant Formulas: For a reaction aA + bB → cC + dD, the rate expression relates to species concentrations as:

$$\text{Rate} = -\frac{1}{a}\frac{d[A]}{dt} = -\frac{1}{b}\frac{d[B]}{dt} = \frac{1}{c}\frac{d[C]}{dt} = \frac{1}{d}\frac{d[D]}{dt}$$

Where: - $\dfrac{d[X]}{dt}$ is the rate of change of concentration of species X, - Negative sign indicates disappearance (reactants), positive sign indicates formation (products).

Step-by-Step Calculation: Given reaction: 4A + B → 2C + 2D

Define Rate = r.

- For A: $-\dfrac{d[A]}{dt} = 4r$ - For B: $-\dfrac{d[B]}{dt} = r$ - For C: $\dfrac{d[C]}{dt} = 2r$ - For D: $\dfrac{d[D]}{dt} = 2r$

Check each statement:

1. Rate of disappearance of B is 1/4 of that of A: $\dfrac{-d[B]/dt}{-d[A]/dt} = \dfrac{r}{4r} = \dfrac{1}{4}$ ✔ Correct

2. Rate of formation of C is 1/2 of disappearance of A: $\dfrac{d[C]/dt}{-d[A]/dt} = \dfrac{2r}{4r} = \dfrac{1}{2}$ ✔ Correct

3. Rate of appearance of D is 1/2 of disappearance of B: $\dfrac{d[D]/dt}{-d[B]/dt} = \dfrac{2r}{r} = 2 \neq \dfrac{1}{2}$ — Incorrect

4. Rate of formation of C and D are equal: $d[C]/dt = 2r, \quad d[D]/dt = 2r$ — Correct

Tips and Tricks: Relate each species' rate of change to a single 'Rate' variable scaled by their stoichiometric coefficients to compare easily.

Common Mistakes: Mistaking the ratio of rates, especially mixing up which species correspond to numerator and denominator, or forgetting the negative sign for reactants.

Why Other Options Are Incorrect?: Statement 3 claims the rate of D's appearance is half the rate of B's disappearance, but stoichiometry shows D forms twice as fast as B disappears in this reaction, so the correct ratio is 2, not 1/2.

54)

collision theory is applicable for gaseous bimolecular reactions

55)

On moving (1) to (2)

$A \times \dfrac{1}{2} \quad \Rightarrow r \times \dfrac{1}{2}$

⇨ Order w.r.t is 1

56) For second order reaction unit of $k = mol^{-1} L s^{-1}$

57) **Asking :**
Rate law exp.
Concept :
Mechanism of reaction based rate law.
Solution :
Step 1 (fast and rev.)

⇨ $K_c = \dfrac{[A_2B_2]}{[AB]^2}$

or $[A_2B_2] = K_c [AB]^2$ ....(1)
Step 2 (Slow and R.D.S.)
$R = K' [A_2B_2] [C]$ ....(2)
by 1st and 2nd equation
$R = b K'K_c' [AB]^2 [C]$
$R = K [AB]^2 [C]$
Correction option is : 1
$r = k[AB]^2[C]$

58) **A: Question Explanation:**
The question asks us to determine the unit of the rate constant (k) for the given rate law, $R = k[A][B]^{0.5}$.
B: Given Data Rate law: $R = k[A][B]^{0.5}$. **C: Concept:** Unit of (K)**Solution:**
The units of the rate constant (k) depend on the overall order of the reaction.

A. **Units of rate (R):**
   A. the unit of R is mol L^{-1} s^{-1}.
B. **Units of concentration:**
   A. Concentration is expressed in mol L^{-1}.
C. **Rearrange the rate law to solve for k:**
   A. $k = R / ([A][B]^{0.5})$
D. **Substitute the units:**
   A. $k = $ (mol L^{-1} s^{-1}) / ((mol L^{-1})(mol L^{-1})$^{0.5}$)
   B. $k = $ mol$^{(1-1.5)}$ L$^{(-1 \cdot (-1.5))}$) s^{-1}
   C. $k = $ mol$^{-0.5}$ L$^{0.5}$ s^{-1}

Final Answer : The unit of k is
(3) mol$^{-1/2}$ L$^{1/2}$ s^{-1}.
Hence, the correct answer is option (3)

59) **A. Question Explanation:**
Identify the type of reaction whose rate constant is independent of the concentration of reactants.
B. Given Data:
• Options:
1. First-order reactions
2. Zero-order reactions
3. Second-order reactions
4. All of these
C. Concept:
• **Reaction Order:** The order of a reaction with respect to a particular reactant is the power to which the concentration of that reactant is raised in the rate law.
• **Rate Constant (k):**

A. In first-order reactions, the rate is directly proportional to the concentration of the reactant.
B. In second-order reactions, the rate is proportional to the square of the concentration of the reactant (or the product of the concentrations of two reactants).
C. In zero-order reactions, the rate is independent of the concentration of the reactants.

D. Mathematical Calculation:

A. **Rate Laws:**
B. First-order: Rate = k[A]
C. Second-order: Rate = k[A]^2
D. Zero-order: Rate = k

E. Final Answer:
The rate constant of all order reactions(ZERO,First,second) is independent of the concentration of the reactants.

60) **Generated by Allie**
Problem Statement: The question asks which statement among the given options about reaction rates and half-lives in zero-order and first-order reactions is incorrect.
Underlying Concept: The core concept involves understanding reaction kinetics. Specifically, the rate law for zero-order and first-order reactions and how the rate and half-life depend on the initial concentration of reactants. Zero-order reactions have a rate independent of reactant concentration, while first-order reactions have a rate proportional to reactant concentration. Also, the half-life for first-order reactions is constant and does not depend on initial

concentration, whereas for zero-order reactions, half-life depends on it.
Relevant Formulas: For a zero-order reaction, rate = k[A]^0 = k (rate is constant).
Half-life for zero-order reaction: $t_{1/2} = [A]_0/(2k)$
Half-life for first-order reaction: $t_{1/2} = 0.693/k$
Tips and Tricks: Recall that zero order means exponent zero on concentration in the rate law, making rate independent of concentration. First order means a direct proportionality to concentration.
Common Mistakes: Confusing zero-order with first-order kinetics and assuming rate depends on concentration in all cases. Also, mixing up dependencies of half-life on initial concentration.
Why Other Options Are Incorrect?: The incorrect statement says the rate of zero order reaction depends on initial concentration, which contradicts the definition of zero order kinetics where the rate is constant and independent of concentration.

61)

order can be integer or fractional or zero

62) **Generated by Allie**
Problem Statement: The question asks for the molecularity of the given complex reaction involving decomposition of dinitrogen pentoxide (Nâ‚‚Oâ‚…) into nitrogen dioxide (NOâ‚‚) and oxygen (Oâ‚‚). It wants to know the molecularity value based on the given overall reaction.
Underlying Concept: Molecularity refers to the number of reactant molecules that come together to react in an elementary (single-step) reaction. It indicates whether the reaction is unimolecular, bimolecular, or termolecular. However, molecularity has meaning only for elementary reactions, not for complex (multi-step) overall reactions.
Tips and Tricks: Remember: Molecularity counts the number of molecules colliding simultaneously in a single reaction step. Complex reactions are made up of multiple elementary steps, so overall stoichiometry does not give molecularity.
Common Mistakes: Assuming molecularity can be determined from the coefficients of an overall reaction, which is often a complex reaction with multiple steps.
Why Other Options Are Incorrect?: Answers like '1', '2', or '3' assume the reaction is a single-step elementary reaction, which it is not. Hence, these values are incorrect as molecularity does not apply to overall reactions.

63)

at least two particles must collide

64) If one of the reacting species is in excess, a bimolecular reaction becomes first order reaction.

65)

1. Molecularity is integer only
2. Instantaneous rate is measured at an instant of time
3. $(t_{1/2})_{n=0} \propto [A]$
4. Rate law = Mathematical expression representing concentration of reactant.

66)

$A_0 = 0.08 \, M \quad A_t = 0.06 \, M \quad t = 10$

$A_t = A_0 = kt$

$k = \dfrac{0.08 - 0.06}{10} = 0.002$

$t_{100\%} = \dfrac{A_0}{k} = \dfrac{0.08}{0.002} = 40 \, sec$

67)

$$A_t = A_0 - kt$$

$t_{1/2} \Rightarrow A_t = \dfrac{A_0}{2} \qquad t_{1/2} = \dfrac{A_0}{2k}$

$t_{1/4} \Rightarrow A_t = \dfrac{3A_0}{4} \qquad t_{1/4} = \dfrac{\left(A_0 - \frac{3A_0}{4}\right)}{k} = \dfrac{A_0}{4k}$

$\boxed{t_{1/2} = 2t_{1/4}}$

68) Ncert, Class12th , Part-I , Article No:3.3.1, Pg.No:72 , Edition-2023-2024.

69)

$t_{75\%} = \dfrac{3}{2} t_{50\%} \qquad \dots\dots(1)$

$t_{87.5\%} = \dfrac{7}{4} t_{50\%} \qquad \dots\dots(2)$

so, $t_{87.5\%} = 7 \, hr \quad$ if $t_{75\%} = 6 \, hr$

70)

$\dfrac{t_{99.9\%}}{t_{99}} = \dfrac{\left[\frac{2.303}{k} \log\left(\frac{100}{0.1}\right)\right]}{\left[\frac{2.303}{k} \log\left(\frac{100}{1}\right)\right]} = \dfrac{3 \log 10}{2 \log 10}$

$t_{99.9\%} = \dfrac{3}{2} \times 32 = 48 \, min.$

71) Let us assume that the reaction starts at 10 minutes i.e. t = 20 – 10 = 10 minutes.

$k = \dfrac{2.303}{t} \log\left(\dfrac{[A]_0}{[A]_t} or \dfrac{r_0}{r_t}\right)$ (r→rate of reaction)

$k = \dfrac{2.303}{10}. \log \dfrac{0.4}{0.04} \Rightarrow k = \dfrac{2.303}{10}$

$t_{1/2} = \dfrac{0.693}{k} \Rightarrow t_{1/2} = 3 \, minutes$

72) The rate constant of any reaction does not depend on concentration of reactant.

73) Question Asking About:
We need to find rate constant (k) for first order reaction.

Given Data:

$t_{1/2}$ = 480 s.

Concept:

E

Formula:

$$t_{1/2} = \frac{0.693}{K}$$

so $K = \frac{0.693}{t_{1/2}}$

Solution/Explanation/Calculation:

$$K = \frac{0.693}{480}$$

$K = 1.44 \times 10^{-3}$ s^{-1}

Conclusion:

Hence, **option (1) is correct**

74) $K = \frac{2.303}{t} \log\left(\frac{a}{a-x}\right)$

$= \frac{2.303}{40} \log\left(\frac{0.1}{0.025}\right)$

$K = 0.0345$ min^{-1}

$r = K[A]$

$= 0.0345 \times 0.01$

$= 3.4 \times 10^{-4}$ M min^{-1}

75)

NCERT-XII, Pg. # 109

76) **Explanation:-** In Ist order reaction find t to reduce 2g of the reactant to 0.2g

Given data:- $k = 4.606 \times 10^{-3} s^{-1}$, $[A]_0 = 2g_1 [A]_t = 0.2g$

Concept:- $t = \frac{2.303}{k} \log \frac{[A]_0}{[AJ]_t}$

Calculation: $t = \frac{2.303}{4.606 \times 10^{-3}} \log\left(\frac{2}{0.2}\right)$

$= \frac{1000}{2}$

Final Answer:- 500 sec

77) $t_{1/2} \propto \frac{1}{a^{n-1}}$ ⟹ $\frac{(t_{1/2})_1}{(t_{1/2})_2} = \left(\frac{a_2}{a_1}\right)^{n-1}$

on doubling conc. $t_{1/2}$ become half So 2nd order reaction.

78) **Question Explanation**

The question asks to identify the correct difference between first-order and second-order reactions from the given options.

Concept

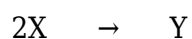The rate law and half-life expressions are key differences between reaction orders.

Explanation

$(t_{1/2})1^{st}$ order = Independent of Concentration

$(t_{1/2})2^{nd}$ order $\propto \dfrac{1}{[A]_0}$

Final Answer (2)

79)

$2X \quad \rightarrow \quad Y$

a $\qquad$ 0

a–x $\qquad$ x/2

$a - x = x/2 \quad x = 2/3\ a$

$a = 3x/2 \qquad t = t_{2/3}$

80) $\dfrac{0.693}{K_1} = \dfrac{[A]_0}{2K_0}$

$\dfrac{K_1}{K_0} = \dfrac{0.693 \times 2}{[A]_0}$

$= \dfrac{r_1}{r_0} = \dfrac{K_1[A]_0}{K_0}$

$= 0.693 \times 2$

81)

Theory based

82) $t_{1/2} \propto \dfrac{1}{a^{n-1}}$

83) ΔH is positive and second step is slow step which has high activation energy.

84)

X represents activation energy for reverse reaction.

85)

$\Delta H = (E_a)_b - (E_a)_b$

$5 = 15 - (E_a)_b$

$(E_a)_b = 15 - 5 = 10\ kJ\ mol^{-1}$

86) Catalyst doesn't affect, enthalpy of reaction.

87)

fraction $e^{-\frac{E_a}{RT}}$
$\therefore$ as $T \uparrow \Rightarrow$ fraction $\downarrow$

88) $\dfrac{r_2}{r_1} = r^{\frac{\Delta T}{10}}$ $r = 2$

          $\Delta T = 50 - 10 = 40$

$r_2 = 2^4 \times r_1$
   $= 16r_1$
 rate becomes 16 times

89)

$k = Ae^{-Ea/RT}$

$\ln k = \ln A - \dfrac{Ea}{RT}$

$\ln A = \ln k + \dfrac{Ea}{RT}$

$\ln A = (2.303 \times \log 10^{-5}) + \left(\dfrac{1800 \times 10^3}{8.314 \times 600}\right)$

$= -11.515 + 360.83$
$= 349.3 \approx 349.5$

90) $\dfrac{E_A}{2.303\,R} = 1.25 \times 10^4$

$E_A = 1.25 \times 10^4 \times 2.303 \times 8.314 = 2.393 \times 10^5$

BIOLOGY

91)

NCERT-XII, Pg. # 33

92)

NCERT-XII, Pg. # 31

93)

NCERT-XII, Pg. # 34

94)

95) The correct answer is Option 4: Both (1) and (2)
Inhibin is a hormone that plays a key role in regulating the production of reproductive hormones. Both granulosa cells and Sertoli cells secrete inhibin.
Granulosa cells : These cells are found in the ovaries and are involved in the development of the egg follicle. They secrete inhibin, which helps to regulate the production of follicle-stimulating hormone (FSH) from the pituitary gland.
Sertoli cells: These cells are found in the testes and are involved in the support and nourishment of developing sperm cells. They also secrete inhibin, which helps to regulate the production of FSH from the pituitary gland.

96)

NCERT-XII, Pg. # 36

97) **Generated by Allie**
Problem Statement: The question asks which statements are true regarding polar bodies formed during human gametogenesis. We need to understand when polar bodies form, during which type of gametogenesis they occur, and their chromosome number relative to oocytes.
Underlying Concept: Polar bodies are small cells produced during the meiosis of oocytes (female gametes) in humans. Meiosis in oogenesis produces one large ovum and smaller polar bodies which typically contain a haploid number of chromosomes, same as the secondary oocyte. These polar bodies are a way to discard the extra haploid sets of chromosomes.
Tips and Tricks: Remember that primary oocytes are diploid (2n) and after meiosis I, cells become haploid (n). Polar bodies formed alongside the secondary oocyte have the same haploid chromosome number as the secondary oocyte.
Common Mistakes: Confusing polar bodies formation with spermatogenesis where they do not form, or assuming polar bodies have the same chromosome number as primary oocytes (diploid) rather than secondary oocytes (haploid).
Why Other Options Are Incorrect?: 'They are formed during the foetal life of female' is partially incorrect because polar bodies form when meiosis occurs after puberty, not during foetal life. 'They contain same number of chromosomes as in the primary oocyte' is wrong because primary oocytes are diploid, but polar bodies are haploid. 'They are formed during spermatogenesis and oogenesis' is incorrect since polar bodies only form during oogenesis.

98)

NCERT-XII Fig.3.1(b) Pg. # 43

99)

NCERT-XII, Pg. # 29

100)

NCERT-XII, Pg. # 34

101) During oogenesis in mammals, primary oocytes are arrested in **2. Prophase-I** of meiosis I.
This arrested stage is specifically called **diplotene** within prophase I. The primary oocytes remain in this state from fetal development until puberty. With each menstrual cycle, a few primary oocytes will resume meiosis I and proceed to form the secondary oocyte.

102)

NCERT-XII, Pg. # 33

103)

NCERT-XII, Pg. # 35

104)

NCERT-XII, Pg. # 33

105) **Question Explanation:** Several hormones like hCG, hPL, estrogen, progesterone are produced by ?
Concept : Placense
Solution : Several hormones like hCG, hPL, Estropen, progesteron are produced by placents.
Final Answer : option (4). Placenta

106)

NCERT-XII, Pg. # 37

107)

NCERT-XII, Pg. # 31, 32

108) NCERT XII, Pg # 44, 2nd para

109) NCERT XII, Pg # 49,50,51

110)

NCERT-XII, Pg. # 35

111)

Question Asking About:

Identify the device:

Identify the implantation site:

Solution Explanation:

Correct Implantation Site: Copper-T IUDs are inserted into the **uterine cavity**.

Correct Answer: Option (3)

112)

Final Answer: (3) **A, B, C**
Periodic abstinence, coitus interruptus, and lactational amenorrhoea are all **natural contraceptive methods**, while MTP is not.

113)

NCERT Pg No # 60

114) **Question Asking About:**
The question asks you to identify the mechanism by which copper ions released from copper-releasing IUDs contribute to contraception.
Solution AND CORRECT ANSWER:
4. Suppress sperm motility:
This is the primary mechanism. Copper ions are toxic to sperm and suppress their motility, making it difficult for them to reach and fertilize the egg.
Therefore, the correct answer is
4. Suppress sperm motility.

115) **The correct answer is 3. Saheli.**
Saheli is a weekly oral contraceptive pill for females. It is a progestogen-only pill, meaning it contains only progestin and no estrogen.

116)

Question Asking About:
The question asks you to identify where fertilization occurs in the ZIFT (Zygote Intra Fallopian Transfer) procedure.

Solution AND CORRECT ANSWER:
2. Outside female body:
This is the correct answer. In ZIFT, fertilization occurs in vitro (outside the female
Therefore, the correct answer is **2. outside female body.**

117) NCERT (XII) Pg. # 46

118) **(1) Correct:** Progestogens, alone or in combination with estrogen, are used as oral contraceptives.
(2) Correct: Saheli is a **"once-a-week"** non-steroidal oral contraceptive pill.

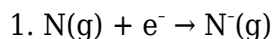**(3) Correct:** Most **oral contraceptive pills** are taken **daily for 21 days,** followed by a 7-day gap.
(4) Incorrect: Saheli has low side effects and high contraceptive value, making this statement wrong.
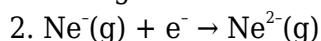Thus, the incorrect statement is **Option 4.**

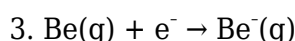119) **Question Explanation:** processes that are endothermic
Concept : EA
Solution : Endothermic process = Requires energy input.
1. $N(g) + e^- \rightarrow N^-(g)$
   Nitrogen has half-filled $2p^3$ shell → resists gaining electron → endothermic
2. $Ne^-(g) + e^- \rightarrow Ne^{2-}(g)$
   Neon is a noble gas, already stable. Ne^- is unstable → gaining another e^- → highly endothermic
3. $Be(g) + e^- \rightarrow Be^-(g)$
   Be has filled $2s^2$ → doesn't want extra e^- → endothermic
Final Answer : option (4)
A

120) NCERT XII, Page # 44,45,46

121) **Question Asking About :**
Asks to identify the year India's family planning program was launched.
Solution :
The correct answer is **1. 1951**.
India was the first country in the world to launch a national family planning program in 1951.
Final Answer :
Option (1)

122)

Question Asking About:

Match each method with its correct mode of action.

Solution and Correct Answer:

Let's analyze each method and its mode of action:

A. **A. The pill:** The pill contains hormones that primarily prevent ovulation (c).
B. **B. Condom:** Condoms act as a barrier, preventing sperm from reaching the cervix (a).
C. **C. Vasectomy:** Vasectomy involves cutting or blocking the vas deferens, so the semen contains no sperm (d).
D. **D. Copper T:** Copper T (IUD) decreases sperm motility and viability (b).

Final Answers:
A – (c), B – (a), C – (d), D – (b)

123) NCERT-XII, Pg. # 48

124) NCERT (XII) Pg. # 63, para 3

125)

The correct answer is **3. Reversibility is very poor**.
Here's why:
• **Surgical sterilization procedures** like tubal ligation (for women) or vasectomy (for men) are designed to be permanent.
• While there are reversal procedures available, they are not always successful, and success rates can vary depending on factors like the type of procedure, the individual, and the time elapsed since the initial sterilization.

126)

NCERT XII Pg. 59

127)

NCERT-XII, Pg. # 45, 46

128) The correct answer is **4) Lactational amenorrhoea.**
• **Lactational amenorrhea (LAM)** is a natural, temporary method of contraception that relies on the physiological suppression of ovulation during breastfeeding.

A. **How it works:** When a woman breastfeeds frequently and intensively (on demand, both day and night), the hormone prolactin is produced, which can inhibit the release of hormones needed for ovulation.

129) NCERT Page-62

130) NCERT Pg # 59

131)

NCERT Pg. 50

132)

NCERT-XIIth Pg. 33

133) NCERT XII Pg. # 47 (E) 51 (H)

134)

NCERT-XII, Pg. # 33

135)

NCERT Pg. 53

136)

NCERT Pg. # 44

137)

NCERT XII Pg. No. # 47

138)

NCERT XII Pg. No. # 28

139)

NCERT XII Pg. No. # 27

140)

The correct sequence for the male genital tract is:

4. Tubuli recti → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Urethra

A. **Tubuli recti:** These are the straight tubules that connect the seminiferous tubules (where sperm are produced) to the rete testis.
B. **Rete testis:** A network of tubules that carries sperm from the seminiferous tubules to the efferent ducts.
C. **Vasa efferentia:** These are the efferent ducts that carry sperm from the rete testis to the epididymis.
D. **Epididymis:** A coiled tube where sperm mature and are stored.
E. **Vas deferens:** A long, muscular tube that carries sperm from the epididymis to the ejaculatory ducts.
F. **Urethra:** The final passageway through which sperm and urine are expelled from the body.

141) The correct answer is **2. B**.
Solution/Explanation:
The ejaculatory duct is formed by the union of the vas deferens and the duct from the seminal vesicle.
In the image, the vas deferens is labeled as "A" and the duct from the seminal vesicle is not explicitly labeled. However, the urethra, which is the final passageway for semen, is labeled as "C".

142)

The correct answer is **1. Seminal Vesicle**

A. **Paired Structure:** Seminal vesicles are two pouch-like structures located behind the bladder.
B. **Dorsolateral side of urinary bladder:** This accurately describes their position.
C. **Help in coagulation of semen:** Seminal vesicles contribute a significant portion of the fluid volume in semen, which contains substances that help in coagulation (thickening) of the semen after ejaculation.

143)

NCERT XII Pg. No. # 27

144) NCERT Pg. # 47

145) NCERT Pg. # 45

146) NCERT-XII, Pg. # 35
Remaining parts of graafian follicle transforms as the corpus luteum and secretes large amount of progesterone.

147)

NCERT XII Pg. No. # 34

148) NCERT Pg # 46

149) NCERT Pg. # 53

150)

NCERT XII Pg. No. # 34

151) NCERT Pg. # 48(E), 53(H)

152)

NCERT XII Pg. No. # 34

153)

NCERT XII Pg. No. # 27

154)

NCERT XII Pg. No. # 34

155)

NCERT XII - Page no 43 + 44 + 47

156)

NCERT Pg. 47

157)

Application type - Allen module.

158)

NCERT XII Pg. No. # 31,32

159) A = Primary Follicle: This is the initial stage where a single layer of squamous cells surrounds the oocyte.
C = Mature Follicle: This is the final stage before ovulation, with a large antrum and a prominent layer of granulosa cells surrounding the oocyte.
E = Corpus Luteum: After ovulation, the ruptured follicle transforms into the corpus luteum, a temporary endocrine structure that produces progesterone. 1
F = Corpus Albicans: If pregnancy does not occur, the corpus luteum degenerates and forms the corpus albicans, a scar-like tissue.
Option 3 is the correct answer

160)

Ncert Page 46.

161)

NCERT XII Pg. No. # 29

162) NCERT Pg # 48, fig. 3.6

163)

NCERT Pg # 49

164)

NCERT XII, Pg. # 51

165)

NCERT XII Pg. No. # 34

166)

NCERT XII Pg. No. # 30

167)

Sertoli cells are specialized cells found in the seminiferous tubules of the testes. They play a vital role in supporting and nourishing developing sperm cells.

Functions of Sertoli cells:

A. Nutrition: Sertoli cells provide nutrients to the developing sperm cells.

B. Hormone production: They produce inhibin, a hormone that regulates sperm production.

C. Structural support: They form the blood-testis barrier, which isolates developing sperm cells from the immune system.

D. Columnar shape: Sertoli cells are tall, columnar-shaped cells.

Blood-brain barrier: This is a specialized barrier that separates the circulating blood from the brain and cerebrospinal fluid. It is formed by tight junctions between endothelial cells of blood vessels in the brain. Sertoli cells are not involved in its formation
The correct answer is 2. Formation of blood brain barrier.

168)

NCERT, Pg. # 35, Fig. 2.9

169)

NCERT XII Pg. No. # 34

170)

NCERT XII Pg. No. # 29

171)

NCERT (XII) (E) Pg. # 49 Fig. # 3.8

172)

In male sertoli cells in response to excess spermatogenesis, release inhibin hormone which gives negative feedback to FSH only not for LH.

173)

Answer: The correct answer is 2. 4
Mons pubis, labia majora, clitoris, and hymen are external.
Vagina, uterus, and fallopian tube are internal. So, 4 are part of the external genitalia.

174) NCERT Pg. No. 49

175)

NCERT XII Pg. No. # 30

176)

NCERT XII Pg. No. # 34

177)

NCERT XII Pg. No. # 38

178) NCERT XII Pg. # 46

179)

NCERT XII Pg. No. # 31

180)

NCERT XII Pg. No. # 180