Question no. 1

Match the Column I (symbol) with Column II (their respective logic gate) and select the correct answer from the codes given below.

	Column I		Column II
A.		1.	OR
B.		2.	AND
C.		3.	NAND
D.		4.	NOR
E.		5.	NOT

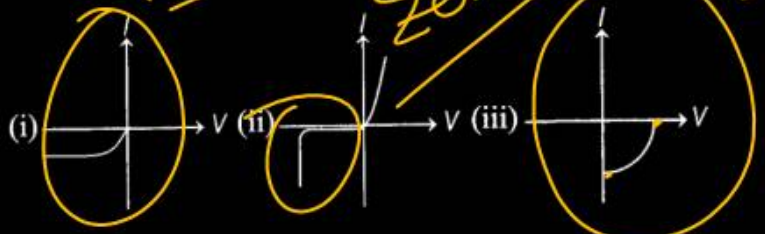
	A	B	C	D	E
(1)	1	2	3	4	5
(2)	3	1	2	4	5
(3)	5	1	2	5	4
(4)	5	1	2	3	4

A - 5
B - 1
C - 2
D - 3
E - 4

4

Question no. 2

Identify the semiconductor devices whose characteristics are as given below in the order (i), (ii) and (iii).



(1) Zener diode, Photo diode, solar cell

(2) Solar cell, Zener diode, Photo diode

(3) Zener diode, solar cell, Photo diode

(4) Photo diode, Zener diode, solar cell

Question no. 3

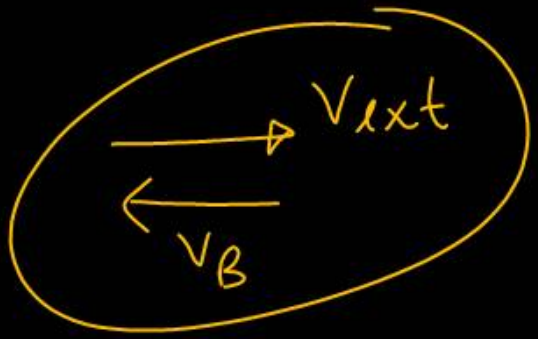
When p–n junction diode is forward biased then

(1) both the depletion region and barrier height are reduced

(2) the depletion region is widened and barrier height is reduced

(3) the depletion region is reduced and barrier height is increased

(4) Both the depletion region and barrier height are increased



DW ↓

Effective Barrier ↓

Question no. 4

Obtain the binding energy (in MeV) of a nitrogen nucleus $\left({}^{14}_{7}\mathrm{N}\right)$, given $\mathrm{m}\left({}^{14}_{7}\mathrm{N}\right) = 14.00307$ u.

(Use $m_p = 1.007834$ u and $m_n = 1.00867$ u)

(1) 210 MeV (2) 104.67 MeV

(3) 83.5 MeV (4) 72.25 MeV

2

$Z = 7$

$A = 14$

$$BE = \left(Z m_p + (A - Z) m_N - M_{Nu}\right) \times 931.5\ \text{MeV}$$

$$= \left(7(1.007834) + 7(1.00867) - 14.00307\right) \times 931.5$$

$$= 104.67\ \text{MeV (nearly)}$$

Question no. 5

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^{22}

(3) 5×10^{12} (4) 5×10^{14}

$P = 16\times10^{3}\ \frac{J}{s}$

$n = \frac{16\times10^{3}}{200\times10^{6}\times1.6\times10^{-19}}$

Question no. 6

The wavelength of the first line of Lyman series for hydrogen atom is equal to that of the second line of Balmer series for a hydrogen like ion. The atomic number Z of hydrogen like ion is

(1) 3 (2) 4

(3) 1 (4) 2

$\frac{1}{\lambda} = RZ^2\left(\frac{1}{1} - \frac{1}{4}\right)$

(H) → $\frac{1}{\lambda} = R(1)^2\left(\frac{3}{4}\right)$

$\frac{1}{\lambda} = \frac{Z^2}{16}$

$Z^2 = 4$

$Z = 2$

(2) → $\frac{1}{\lambda} = RZ^2\left(\frac{1}{4} - \frac{1}{16}\right)$

$\frac{1}{\lambda} = RZ^2\left(\frac{3}{16}\right)$

Question no. 7

If μ_r be the relative permeability and ε_r be the relative permittivity of a medium, the its refractive index is given by

(1) $\frac{1}{\sqrt{\mu_r \varepsilon_r}}$

(2) $\frac{1}{\mu_r \varepsilon_r}$

(3) $\sqrt{\mu_r \varepsilon_r}$

(4) $\mu_r \varepsilon_r$

$n = \frac{c}{v}$

$n = \frac{c}{\frac{c}{\sqrt{\mu_0 \varepsilon_0}}} = \sqrt{\mu_0 \varepsilon_0}$

Question no. 8

When 1 cm thick surface is illuminated with light of wavelength λ, the stopping potential is V. When the same surface is illuminated by light of wavelength 2λ, the stopping potential is V/3. Threshold wavelength for metallic surface is

(1) $4\lambda / 3$

(2) 4λ

(3) 6λ

(4) $8\lambda / 3$

$\phi = \frac{hc}{\lambda_0}$

$\frac{hc}{\lambda}\left(\frac{1}{2}-\frac{1}{3}\right) = \phi - \frac{\phi}{3}$

$\frac{hc}{3\lambda} = \frac{\phi}{3} + eV$

$\frac{hc}{2\lambda} = \frac{2\phi}{3}$

$\frac{hc}{2\lambda} = \phi + \frac{eV}{3}$

$\frac{hc}{2\lambda} = 2 \times \frac{hc}{\lambda_0}$

$\lambda_0 = 4\lambda$

Question no. 9

The linear momentum of a 3 MeV photon is

(1) 0.01 eV s m^{-1} (2) 0.02 eV s m^{-1}

(3) 0.03 eV s m^{-1} (4) 0.04 eV s m^{-1}

$$P = \frac{E}{C} = \frac{3 \times 10^6 \text{ eV}}{3 \times 10^8 \text{ m/s}} = 10^{-2} \text{ eV s m}^{-1}$$

$$= \frac{1}{100} = 0.01 \text{ eV s m}^{-1}$$

Question no. 10

Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 are the conductivities of the metals respectively, the effective conductivity of the combination is

(1) $\sigma_1 + \sigma_2$

(2) $\dfrac{\sigma_1 + \sigma_2}{2}$

(3) $\sqrt{\sigma_1 \sigma_2}$

(4) $\dfrac{2\sigma_1 \sigma_2}{\sigma_1 + \sigma_2}$

$$\sigma_{eq} = \frac{2\sigma_1\sigma_2}{\sigma_1 + \sigma_2}$$

$$R_{eq} = R_1 + R_2$$

$$\frac{2\ell_1}{\sigma_{eq} A} = \frac{\ell_1}{\sigma_1 A} + \frac{\ell_1}{\sigma_2 A}$$

$$\frac{2\ell_1}{\sigma_{eq}} = \ell\left(\frac{\sigma_2 + \sigma_1}{\sigma_1\sigma_2}\right)$$

Question no. 11

Two solenoids of equal number of turns have their lengths and the radii in the same ratio 1 : 2. The ratio of their self inductances will be

(1) 1 : 2 (2) 2 : 1

(3) 1 : 1 (4) 1 : 4

$$L = \frac{\mu_0 N^2 A}{\ell}$$

$$L \propto \frac{A}{\ell} \propto \frac{r^2}{\ell}$$

$$\frac{L_1}{L_2} = \left(\frac{r_1}{r_2}\right)^2 \times \left(\frac{\ell_2}{\ell_1}\right)$$

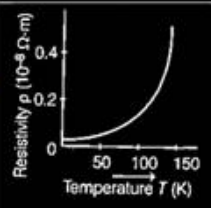
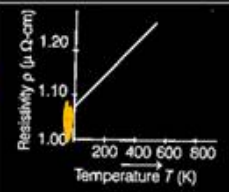
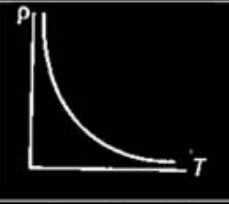
$$= \left(\frac{1}{2}\right)^2 \times \frac{1}{1}$$

$$= \frac{1}{4} \times \frac{1}{1}$$

$$\frac{L_1}{L_2} = \frac{1}{2}$$

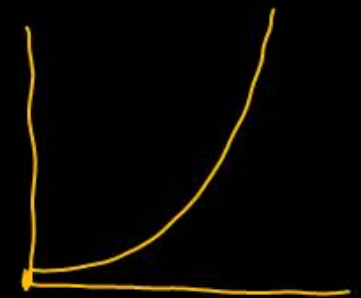
Question no. 12

Match the Column I (graph) with Column II (relation) and select the correct answer from the codes given below.

	Column I		Column II
A. 2		1.	Temperature dependence of resistivity for a typical semiconductor
B. 3		2.	Resistivity ρ of copper as a function of temperature T
C. 1		3.	Resistivity ρ of nichrome as a function of absolute temperature T.

	A	B	C
(1)	3	2	1
(3)	~~2~~	3	1

	A	B	C
(2)	2	1	3
(4)	3	1	2



$\rho = \rho_t(1 + \alpha\Delta T)$

$\rho \propto \alpha(\Delta T)$

Ni + Cr

80 20

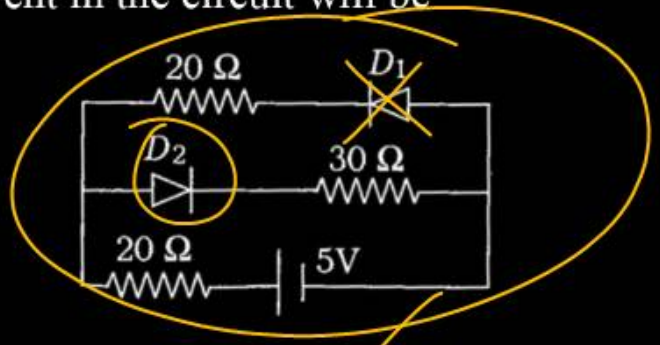
ok

$\rho \uparrow$

$\rho \propto \frac{1}{T}$

Question no. 13

The current in the circuit will be



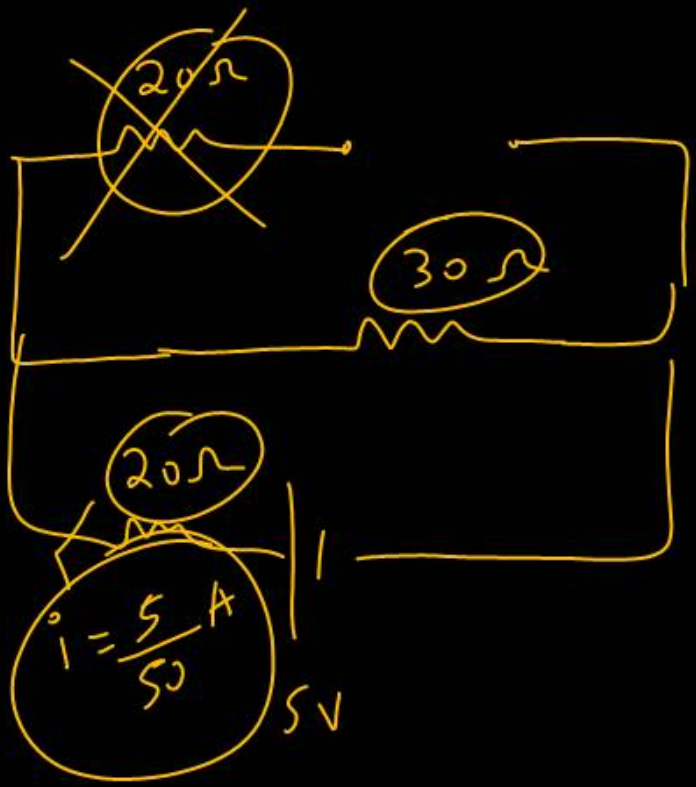
(1) (5/40) A (2) (5/50) A

(3) (5/10) A (4) (5/20) A

(2)

D_1 : RB

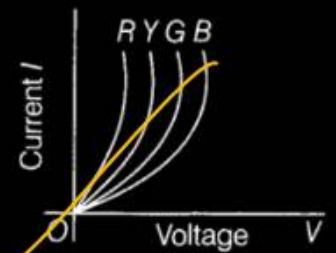
D_2 : FB



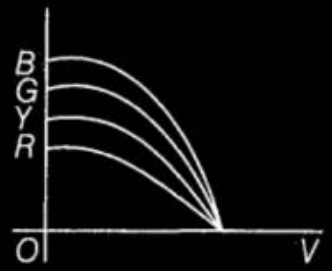
Question no. 14

The I-V characteristics of an LED is

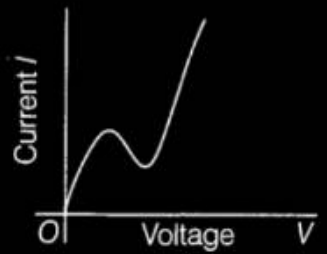
(1)



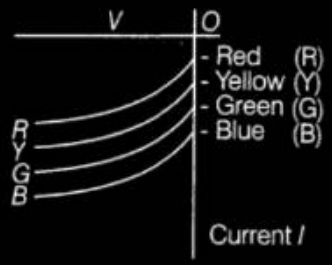
(2)



(3)



(4)



Question no. 15

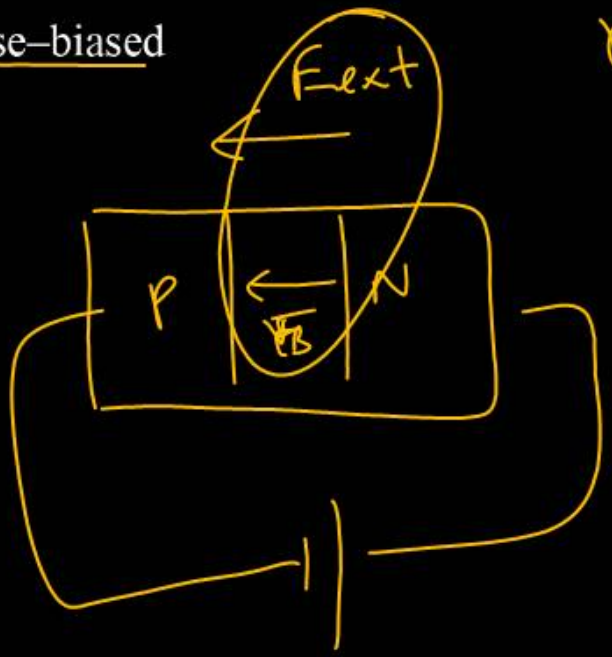
In the middle of the depletion layer of a reverse–biased p–n junction, the

(1) electric field is zero

(2) potential is maximum

(3) electric field is maximum

(4) potential is zero



net field ↑↑

3

Question no. 16

If M_0 is the mass of an oxygen isotope, ${}_{8}O^{17}$, M_p and M_n are the masses of a proton and a neutron respectively the nuclear binding energy of the isotope is

(1) $(8M_p - M_0)\,c^2$

(2) $(8M_p + 9M_n - M_0)\,c^2$

(3) $M_0\,c^2$

(4) $(17M_n - M_0)\,c^2$

2

$BE = \Delta m\, c^2$

$\Delta m = Z m_p + (A-Z) m_n - M_0$

$\Delta m = 8 m_p + (17-8) m_n - M_0$

$\Delta m = (8 m_p + 9 m_n - M_0)$

$BE = (8 m_p + 9 m_n - M_0)\, c^2$

Question no. 17

What is the Q-value of the reaction?

The atomic masses of ^{1}H, ^{4}He and ^{7}Li are 1.0078254u, 4.0026034u and 7.016004u, respectively.

(1) 17.35 MeV (2) 18.06 MeV

(3) 177.35 MeV (4) 170.35 MeV

$\Delta m = (1.007825 + 7.016004) - 2 \times (4.0026034$

Δm $\Delta E = 931\ MeV \times \Delta m$

Question no. 18

Choose the correct option relating wavelength of different parts of electromagnetic wave spectrum.

(1) $\lambda_{\text{radio waves}} > \lambda_{\text{micro waves}} > \lambda_{\text{visible}} > \lambda_{\text{X-rays}}$

(2) $\lambda_{\text{visible}} > \lambda_{\text{X-rays}} > \lambda_{\text{radio waves}} > \lambda_{\text{micro waves}}$

(3) $\lambda_{\text{X-rays}} < \lambda_{\text{micro waves}} < \lambda_{\text{radio waves}} < \lambda_{\text{visible}}$

(4) $\lambda_{\text{visible}} < \lambda_{\text{micro waves}} < \lambda_{\text{radio waves}} < \lambda_{\text{X-rays}}$

Question no. 19

A metallic surface is irradiated by a monochromatic light of frequency υ_1 and stopping potential is found to be V_1. If the light of frequency υ_2 irradiates the surface, the stopping potential will be → V_2

(1) $V_1 + \frac{h}{e}(\upsilon_1 + \upsilon_2)$

(2) $V_1 + \frac{h}{e}(\upsilon_2 - \upsilon_1)$

(3) $V_1 + \frac{e}{h}(\upsilon_2 - \upsilon_1)$

(4) $V_1 - \frac{h}{e}(\upsilon_1 + \upsilon_2)$

$hf_1 = \phi + eV_1$

$hf_2 = \phi + eV_2$

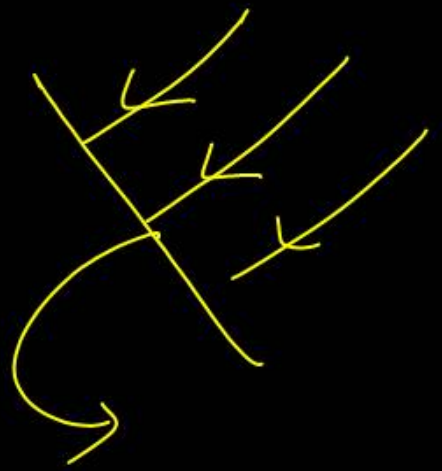
$h(f_2 - f_1) = e(V_2 - V_1)$

$\frac{h}{e}(f_2 - f_1) = V_2 - V_1$

$V_1 + \frac{h}{e}(f_2 - f_1) = V_2$

Question no. 20

The cathode of a photoelectric cell is changed such that the work function changes from W_1 to W_2 ($W_2 > W_1$) . If the current before and after are i_1 and i_2, respectively and all other conditions remaining unchanged, then



(1) $i_1 = i_2$

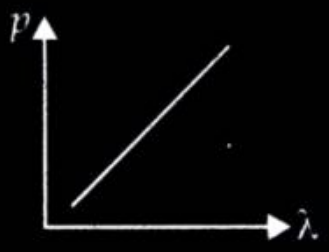
(2) $i_1 < i_2$

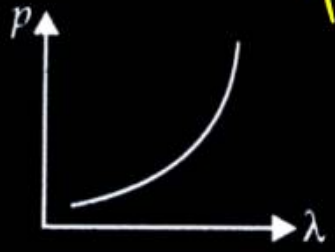
(3) $i_1 > i_2$

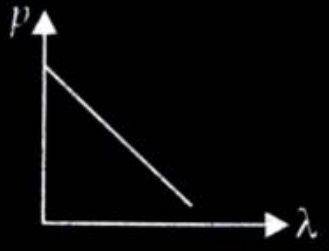
(4) $\frac{W_1}{W_2} = \frac{i_1}{i_2}$

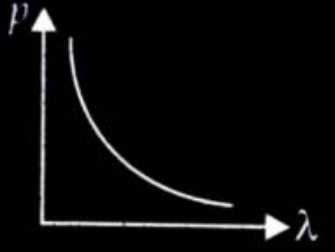
Question no. 21

Which of the following figure represents the variation of particle momentum (p) and associated de Broglie wavelength (λ)?

(1) 

(2) 

(3) 

(4) 

$p = \frac{h}{\lambda}$

$p \cdot \lambda = \text{Const}$

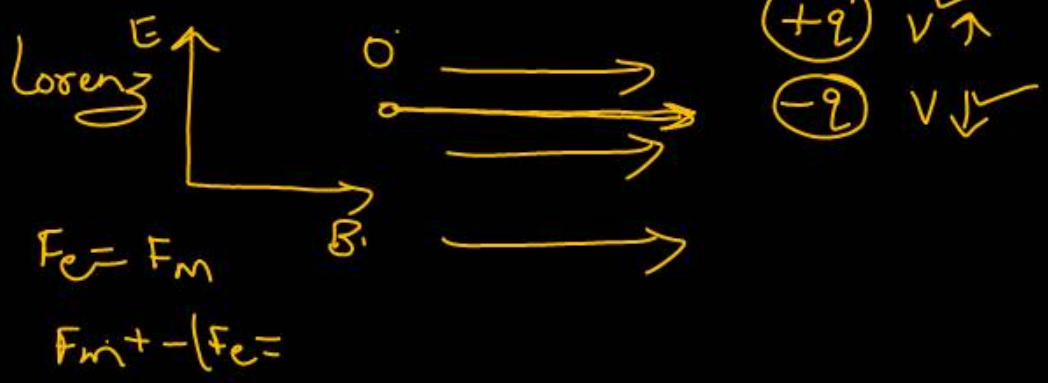
$p \propto \frac{1}{\lambda}$

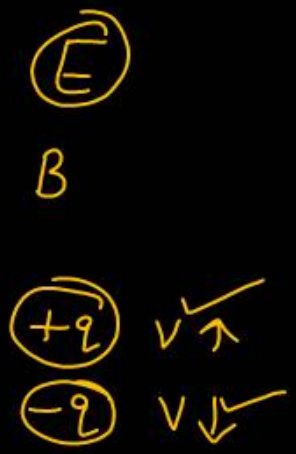
Question no. 22

A charged particle would continue to move with a constant velocity in a region wherein, which of the following conditions is not correct?

(1) $E = 0, B \neq 0$ (2) $E \neq 0, B \neq 0$

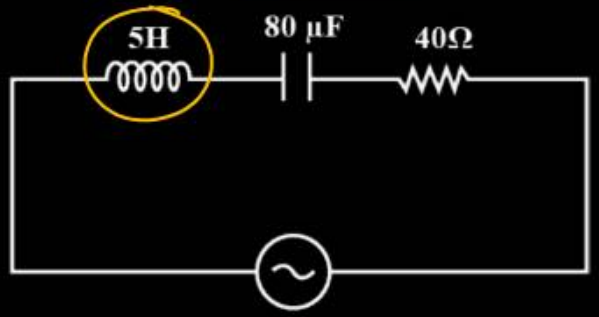
(3) $E \neq 0, B = 0$ (4) $E = 0, B = 0$





Question no. 23

Figure shows a series LCR circuit connected to a variable frequency 230 V source.



The source frequency which drives the circuit in the resonance is

(1) 4 H z (2) 5 Hz

(3) 6 Hz (4) 8 Hz

$$\nu = \frac{1}{2\pi\sqrt{LC}}$$

$$\nu = \frac{1}{2\pi\sqrt{5 \times 80 \times 10^{-6}}}$$

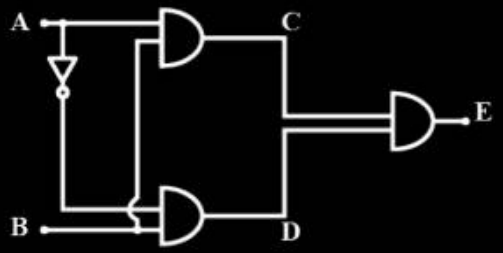
$$\nu = \frac{1}{2\pi \times 20 \times 10^{-3}}$$

$$\nu = \frac{25}{\pi} \text{ Hz}$$

$$\nu = \frac{25}{3.14} \approx 8 \text{ Hz}$$

Question no. 24

For given circuit, truth table is



(1)

A	B	Y
0	0	1
0	1	0
1	0	1
1	1	0

(2)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

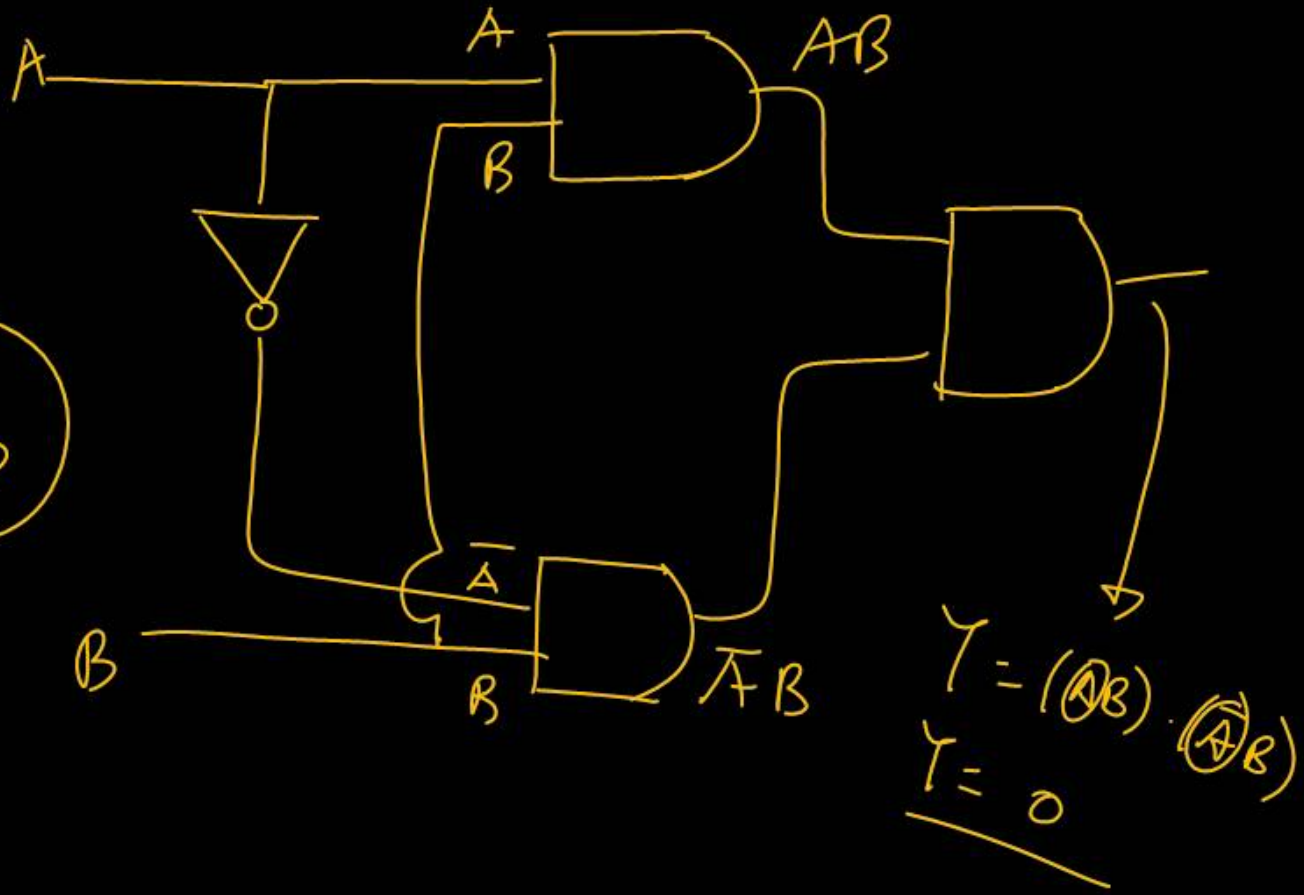
(3)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	0

(4)

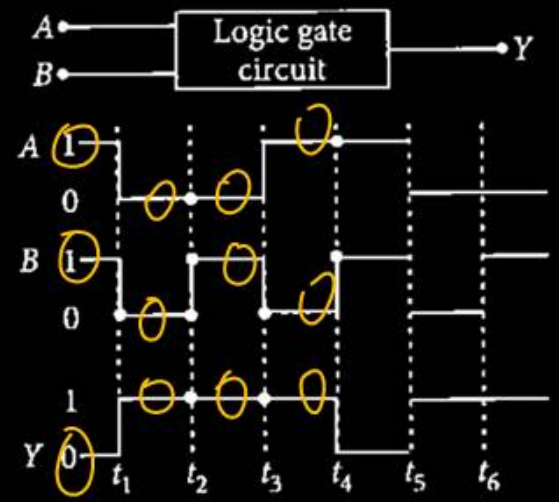
A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

3



Question no. 25

The following figure shows a logic gate circuit with two inputs A and B and the output Y. The voltage waveforms of A, B and Y are as given.



The logic gate is

(1) NOR gate (2) OR gate

(3) AND gate (4) NAND gate

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

NAND

Question no. 26

An intrinsic semiconductor at 0 K temperature behaves like a/an

(1) conductor

(2) p-type semiconductor

(3) n-type semiconductor

(4) insulator

Question no. 27

If radius of the $^{27}_{13}Al$ nucleus is estimated to be 3.6 fermi then the radius of $^{125}_{52}Te$ nucleus be nearly

(1) 8 fermi (2) 6 fermi

(3) 5 fermi (4) 4 fermi

2

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

$3.6 \text{ fermi} \propto (27)^{1/3}$

$R \propto (125)^{1/3}$

$\frac{3.6 f}{R} = \frac{3}{5}$

$R = \frac{3.6 \times 5}{3}$ fm

$R = 6$ fm

Question no. 28

For spectral series of hydrogen atom, match the Column I (spectral series) with Column II (region) and select the correct answer from the codes given below.

	Column I		**Column II**
A.	Lyman series	1.	Ultraviolet region
B.	Balmer series	2.	Infrared region
C.	Paschen series	3.	Visible region
D.	Brackett series		

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

Question no. 29

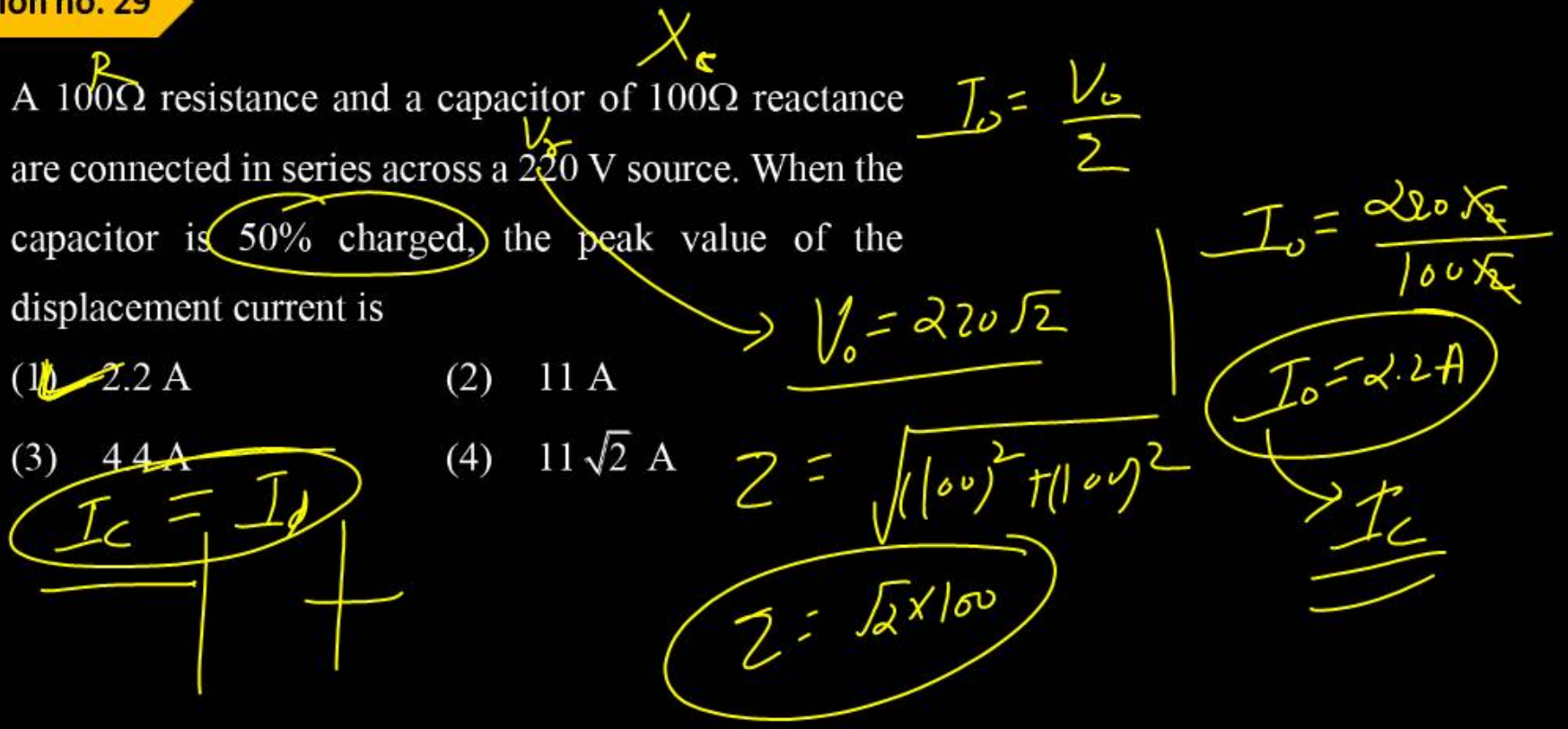
A 100Ω resistance and a capacitor of 100Ω reactance are connected in series across a 220 V source. When the capacitor is 50% charged, the peak value of the displacement current is

(1) 2.2 A

(2) 11 A

(3) 4.4 A

(4) $11\sqrt{2}$ A



Question no. 30

The surface of a metal is illuminated with the light of 400 nm. The kinetic energy of the ejected photoelectrons was found to be 1.68 eV. The work function of the metal is: (hc = 1240 eV. nm)

(1) 1.41 eV

(2) 1.91 eV

(3) 1.68 eV

(4) 3.09 eV

Question no. 31

A blue lamp mainly emits light of wavelength 4500 Å. The lamp is rated at 150 W and 8% of the energy is emitted as visible light. The number of photons emitted by the lamp per second is

(1) 3×10^{19}

(2) 3×10^{24}

(3) 3×10^{20}

(4) 3×10^{18}

1 Second → 150 J

$\frac{8}{100} \times 150 = 12\text{J}$

$n = \frac{E \cdot \lambda}{hc} = \frac{12 \times 4500 \times 10^{-10}}{6.6 \times 10^{-34} \times 3 \times 10^{8}}$

$E = n \cdot h\nu$

$E = \frac{n \cdot hc}{\lambda} \Rightarrow$

$= \frac{540\ 10^{-10} \times 10^{2}}{20\ 10^{-26}}$

$= 10^{-10+2+26}$

30×10^{18}

$= 3 \times 10^{19}$

Question no. 32

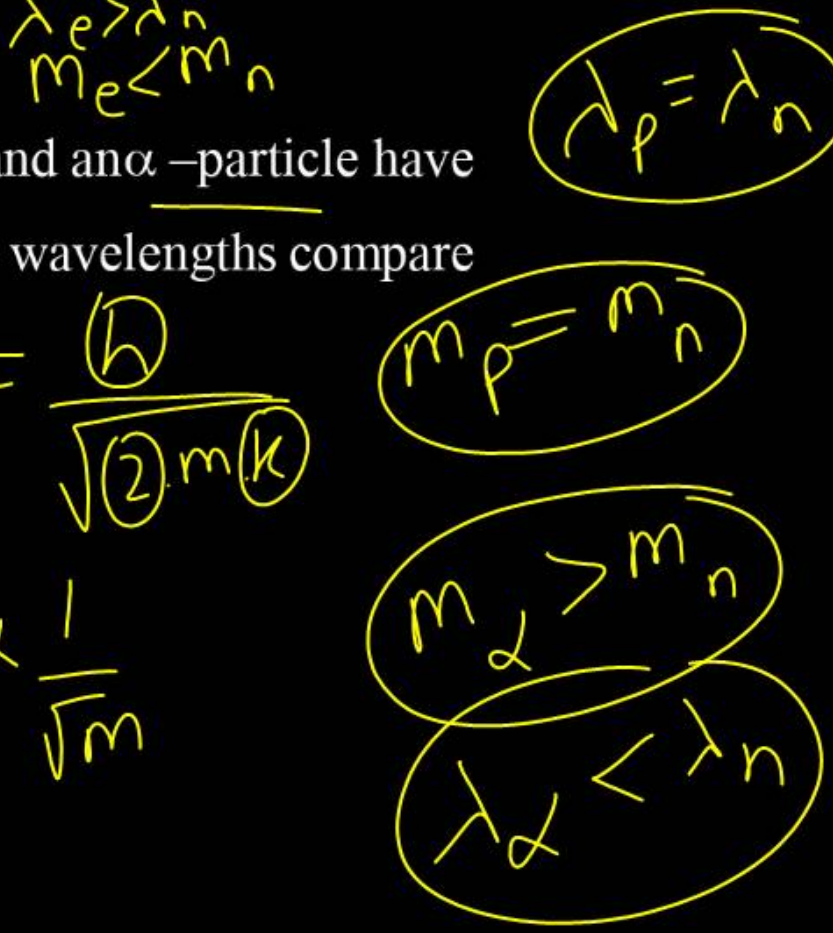
A proton, a neutron, an electron and an α –particle have same energy. The their de Broglie wavelengths compare as

(1) $\lambda_p = \lambda_n > \lambda_e > \lambda_\alpha$

(2) $\lambda_\alpha < \lambda_p = \lambda_n < \lambda_e$

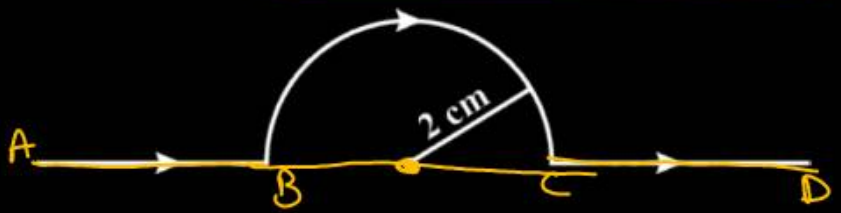
(3) $\lambda_e < \lambda_p = \lambda_n < \lambda_\alpha$

(4) $\lambda_e = \lambda_p = \lambda_n = \lambda_\alpha$



Question no. 33

A straight wire carrying a current of 13 A is bent into a semi–circular arc of radius 2 cm as shown in figure. The magnetic field is 1.5×10^{-4}T at the centre of arc, then the magnetic field due to straight segment is



(1) 1.5×10^{-4} T

(2) 2.5×10^{-4} T

(3) zero

(4) 3×10^{-4} T

Question no. 34

There is a solid sphere of radius R having uniformly distributed charge throughout it. What is the relation between electric field E and distance r from the centre $(r < R)$?

(1) $E \propto r^{-3}$

(2) $E \propto r^{-1}$

(3) $E \propto r$

(4) $E \propto r^2$

Surface.

$$E = \frac{kq}{R^2}.$$

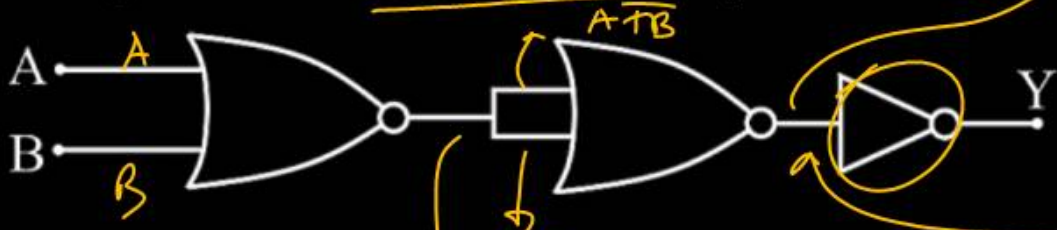
Inside

$$E = \frac{kq(r)}{R^3}$$

$E \propto r$

Question no. 35

The given electrical network is equivalent to



(1) AND gate

(2) OR gate

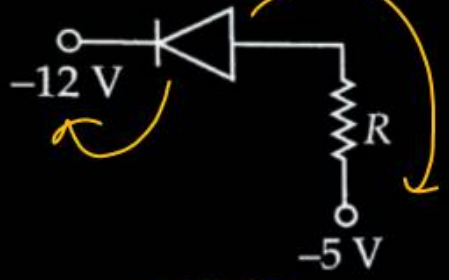
(3) NOR gate

(4) NOT gate

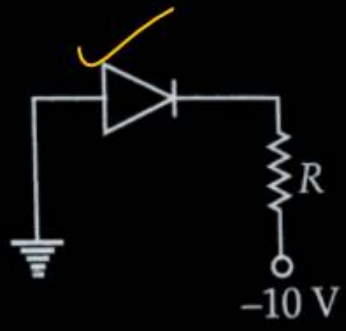
Question no. 36

Of the diodes shown in the following figures, which one is reverse biased?

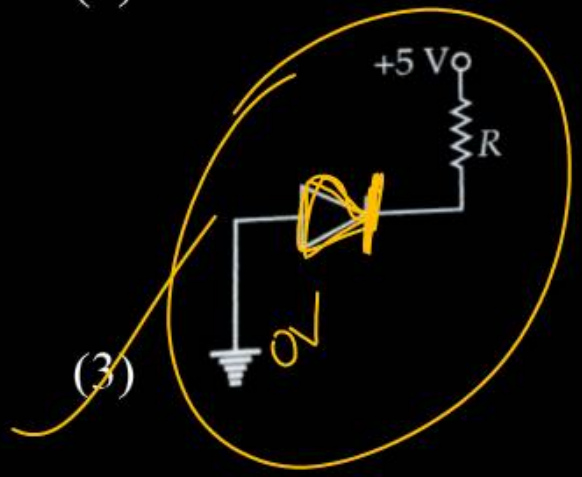
(1)



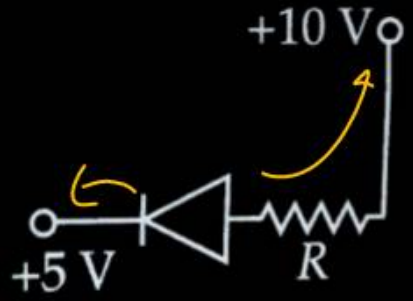
(2)



(3)



(4)



Question no. 37

Minority carriers in a p-type semiconductor are

(1) free electrons

(2) holes

(3) neither holes nor free electrons

(4) both holes and free electrons

Question no. 38

Match the following two columns and choose the correct option from the codes given below.

	Column I		Column II
A.	$\frac{Z^3}{n^5}$	p.	Angular speed
B.	$\frac{Z^2}{n^2}$	q.	Magnetic field at the centre due to revolution of electron
C.	$\frac{Z^2}{n^3}$	r.	Potential energy of an electron in nth orbit
D.	$\frac{Z}{n}$	s.	Speed of electron in nth orbit

Codes

	A	B	C	D
(1)	s	p	q	r
(3)	q	r	s	p

	A	B	C	D
(2)	q	r	p	s
(4)	q	p	r	s

$V \propto \frac{Z}{n}$

$\omega = \frac{V}{r}$

$\omega \propto \frac{Z/n}{n^2/Z} \propto \frac{Z^2}{n^3}$

$r \propto \frac{n^2}{Z}$

$E \propto \frac{Z^2}{n^2}$

$U = \frac{-kZe \times e}{r}$

$U \propto \frac{Z}{n^2/Z} = \frac{Z^2}{n^3}$

$B = \frac{\mu_0 I}{2r}$

$\omega \propto 2\pi f$

$qf \rightarrow \omega$

$B \propto \frac{Z^2/n^3}{n^2/Z} = \frac{Z^3}{n^5}$

Question no. 39

Match the Column I (spectral series) with Column II (maximum wavelength of the series) and select the correct answer from the codes given below. (R = Rydberg's constant)

select the correct answer from the codes given below.

	Column I		Column II
A.	Lyman series	1.	400/9R
B.	Balmer series	2.	144/7R
C.	Paschen series	3.	36/5R
D.	Brackett series	4.	4/3R

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

$\frac{RZ^2}{\lambda}$

$\frac{1}{\lambda} = k\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

$\frac{1}{\lambda_L} = R\left(\frac{1}{1} - \frac{1}{4}\right)$

$\lambda_L = \frac{4}{3R}$

$\frac{1}{\lambda_B} = R\left(\frac{1}{4} - \frac{1}{9}\right)$

$\lambda_B = \frac{36}{5R}$

$\frac{1}{\lambda_P} = R\left(\frac{1}{9} - \frac{1}{16}\right)$

$\lambda_P = \frac{144}{7R}$

Question no. 40

Which among the following does not represent Maxwell's equation?

(1) $\oint \vec{E}.\overrightarrow{dA} = \frac{q}{\varepsilon_0}$

(2) $\oint \vec{B}.\overrightarrow{dA} = 0$

(3) $\oint \vec{E}.\overrightarrow{d\ell} = \frac{-dB}{dt}$

(4) $\oint \vec{B}.\overrightarrow{d\ell} = \mu_0 I_C + \mu_0 \varepsilon_0 \frac{d\Phi_E}{dt}$

Question no. 41

An electron moving with speed v and a photon moving with speed c, have same D-Broglie wavelength. The ration of kinetic energy of electron to that of photon is :

(1) $\frac{3c}{v}$

(2) $\frac{v}{3c}$

(3) $\frac{2c}{v}$

(4) $\frac{v}{2c}$

$\frac{K_e}{K_p} = ?$

$\lambda_p = \lambda_p$

$\frac{h}{p_e} = \frac{h}{p_p}$

$K_e = \frac{p_e^2}{2m_e}$

$K_e = \frac{h^2}{2m_e \times \lambda_e^2}$

$K_p = \frac{hc}{\lambda_e}$

$\frac{K_e}{K_p} = \frac{h}{2m_e\lambda_e c}$

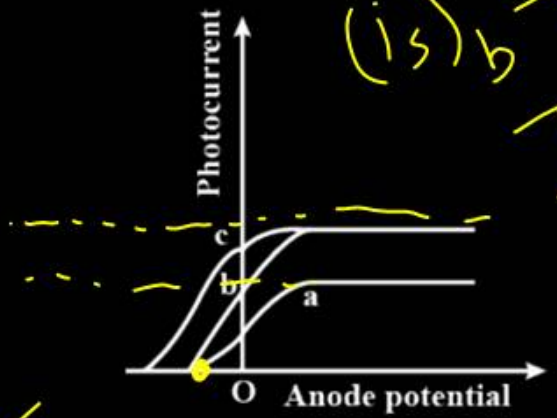
$\frac{K_e}{K_p} = \frac{p_e}{2m_e \times c}$

$\rightarrow m_e v$

$\frac{K_e}{K_p} = \frac{V}{2c}$

Question no. 42

The figure shows the variation of photocurrent with anode potential for a photo–sensitive surface for three different radiations. Let I_a, I_b and I_c, be the intensities and υ_a, υ_b and υ_c be the frequencies for the curves a, b and c respectively. Then



(1) $\upsilon_a = \upsilon_b$ and $I_a \neq I_b$ (2) $\upsilon_a = \upsilon_c$ and $I_a = I_c$

(3) $\upsilon_a = \upsilon_b$ and $I_a = I_b$ (4) $\upsilon_b = \upsilon_c$ and $I_b = I_c$

Current ∝ Intensity

$(is)_b = (is)_c$

$I_b = I_c > I_a$

Potential ∝ frequency

$V_a = V_b$

Question no. 43

If in a photoelectric cell, the wavelength of incident light is changed from 4000 Å to 3000 Å then change in stopping potential will be

(1) 0.66 V (2) 1.03 V

(3) 0.33 V (4) 1.03 V

$E_{max} = hU - \phi$

$E_{max} = e \cdot V_s$

$\frac{h \cdot c}{\lambda_1} - \phi_0 = eV_1$

$\frac{h \cdot c}{\lambda_2} - \phi_0 = eV_2$

$\frac{hc}{e}\left(\frac{1}{\lambda_2} - \frac{1}{\lambda_1}\right) = (V_2 - V_1)$

$\Delta V = \frac{hc}{e}\left(\frac{1}{\lambda_2} - \frac{1}{\lambda_1}\right)$

$= \frac{12400}{3000} - \frac{12400}{4000} = \frac{496 - 372}{120}$

$= \frac{124\ V}{120}$

$\frac{1.0}{\frac{124}{120}}$

Question no. 44

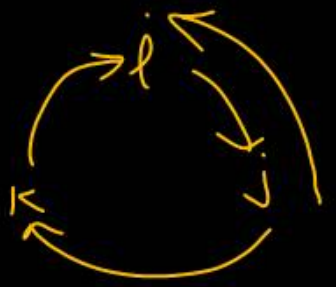
A dipole of magnetic moment $\vec{M} = 30\hat{j}$ A m^2 is placed along the y –axis in a uniform magnetic field $\vec{B} = (2\hat{i} + 5\hat{j})$ T. The torque acting on it is

(1) –40k N m (2) –50k N m

(3) –60k N m (4) –70k N m

$\vec{\tau} = \vec{M} \times \vec{B}$

$\vec{\tau} = 30\hat{j} \times (2\hat{i} + 5\hat{j})$



$30\hat{j} \times 2\hat{i}$

$-60\hat{k}$

Question no. 45

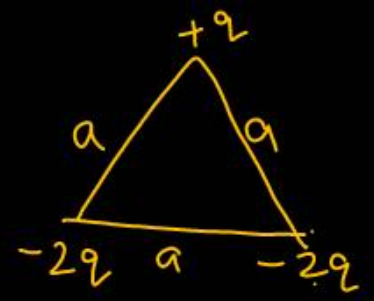
Three point charges $+q_1$, $-2q$ and $-2q$ are placed at the vertices of an equilateral triangle of side a. The work done by some external force to increase their separation to 2a will be

(1) $\frac{1}{4\pi\varepsilon_0}\frac{2q^2}{a}$

(2) $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{2a}$

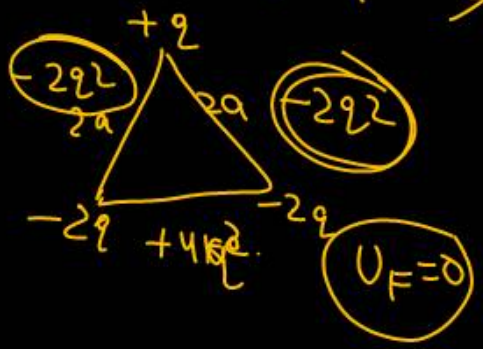
(3) $\frac{1}{4\pi\varepsilon_0}\frac{\delta q}{a^2}$

(4) zero



$$U_I = \frac{k\times(+q\times-2q)}{a} + \frac{k(-2q\times-2q)}{a} + \frac{k\times-2q\times q}{a}$$

$$U_I = -\frac{2kq^2}{a} + \frac{4kq^2}{a} - \frac{2kq^2}{a} = 0$$



$-4q^2 + 4q^2$

Question no. 46

Which of the following species, do not show disproportionation reaction?

(1) ClO^- +1

(2) ClO_2^- +3

(3) ClO_3^- +5

(4) ClO_4^- +7

Cl_{17} = 2, 8, 7

-1 +1 +3 +5 +7

Question no. 47

Consider the following reaction :

$$x\,MnO_4^- + yC_2O_4^{2-} + zH^+ \rightarrow x\,Mn^{2+} + 2y\,CO_2 + (z/2)\,H_2O$$

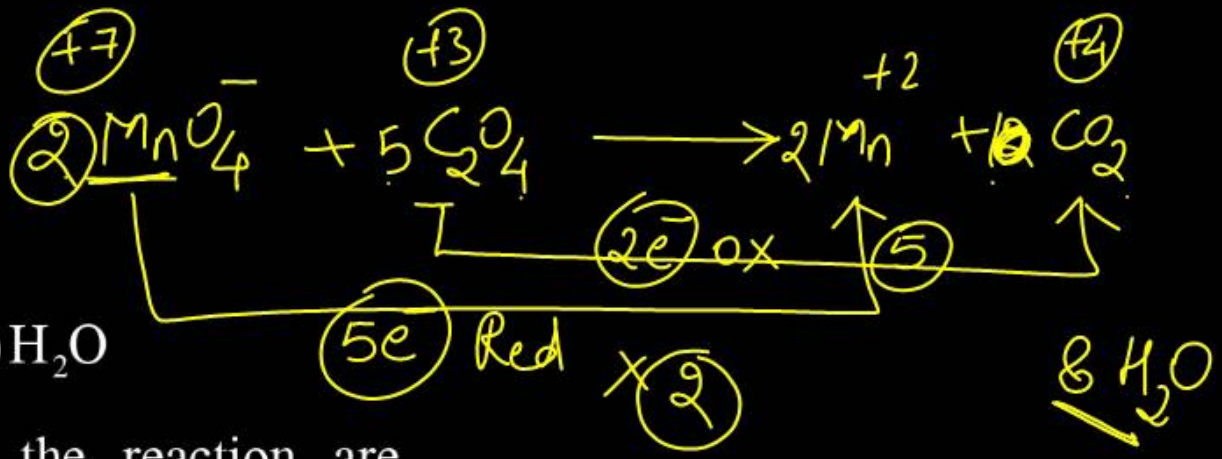
The values of x, y and z in the reaction are, respectively:

(1) 5, 2 and 16

(2) 2, 5 and 8

(3) 2, 5 and 16

(4) 5, 2 and 8



X = 2 y = 5

Z = 16

Question no. 48

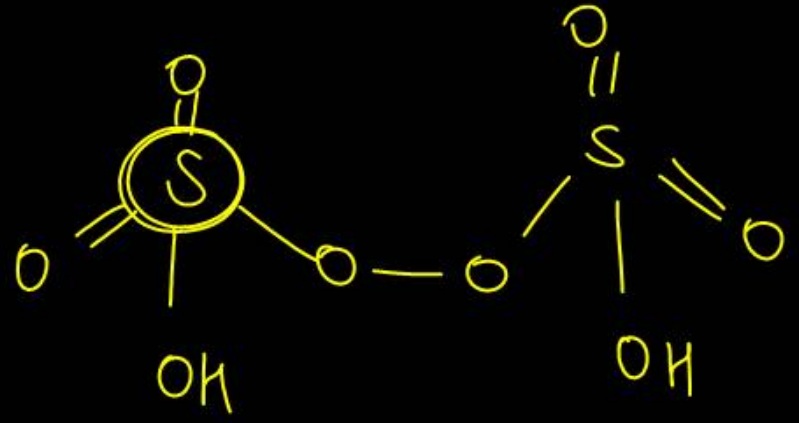
The oxidation number of sulphur in $H_2S_2O_8$, $H_2S_2O_4$, $H_2S_2O_6$ are respectively

(1) +3, +4, +5

(2) +5, +4, +3

(3) +6, +3, +5

(4) +3, +5, +4



Question no. 49

An element X has the following isotopic composition:

$^{200}X(80\%), {}^{199}X(7.0\%), {}^{202}X(13\%)$

The weighted average atomic mass of the naturally occuring elements X is closet to

(1) 202 amu (2) 200 amu

(3) 199 amu (4) 201 amu

$$\text{Average Atomic mass} = \frac{(200 \times 80) + (199 \times 7) + (202 \times 13)}{100}$$

200.19

Question no. 50

Match the List-I with List-II.

	List-I		List-II
A.	392 g of H_2SO_4	i.	2 mol
B.	44.8 L of CO_2 at STP	ii.	0.33 mol
C.	9 g of Al	iii.	5.458×10^{-6} mol
D.	65 μg of C	iv.	4 mol

Choose the correct answer from the options given below.

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

(A) $\text{mol} = \frac{392}{98} = 4$

(B) $\text{mol} = \frac{44.8}{22.4} = 2$

(C) $\text{mol} = \frac{9}{27} = \frac{1}{3} = 0.33$

(D) $\text{mol} = \frac{65\ \mu g}{12} = 5.458\ \mu\text{mol} = 5.458 \times 10^{-6}\ \text{mol}$

Question no. 51

The mass percent of different elements present in sodium sulphate, Na_2SO_4 respectively are

(1) 32.37 ; 45.06 and 22.57

(2) 22.57 ; 32.37 and 45.06

(3) 45.06 ; 32.37 and 40.06

(4) 32.37 ; 22.57 and 45.06

Na, S, O

M_w of $Na_2SO_4 = 23 \times 2 + 96$

$= 142$

% of $Na = \frac{46}{142} \times 100 = 32.$

% of $S = \frac{32}{142} \times 100 = 22$

% of $O_2 = \frac{64}{142} \times 100 = 45$

Question no. 52

What are the values of the orbital angular momentum of an electron in the orbitals 1s, 3s, 3d, and 2p?

(1) $0, 0, \sqrt{6}\hbar$, and $\sqrt{2}\hbar$

(2) $1, 1, \sqrt{4}\hbar$, and $\sqrt{2}\hbar$

(3) $0, 1, \sqrt{6}\hbar$, and $\sqrt{3}\hbar$

(4) $0, 0, \sqrt{20}\hbar$, and $\sqrt{6}\hbar$

$= \sqrt{l(l+1)}\left(\frac{h}{2\pi}\right)$

$l = 0$ $l = 1$ $l = 2$

$1s = 0$

$3s = 0$

$3d = l = 2 = \sqrt{2(2+1)}\,\hbar = \sqrt{6}\,\hbar$

$2p = l = 1 = \sqrt{1(1+1)}\,\hbar = \sqrt{2}\,\hbar$

Question no. 53

The energies of orbitals of hydrogen atom are in the order

(1) $3s < 3p < 4s < 3d < 4p$

(2) $3s < 3p < 3d < 4s < 4p$

(3) $3s = 3p < 3d < 4s < 4p$

(4) $3s = 3p = 3d < 4s = 4p$

for H atom if n is same then Energy is same

$n \uparrow E \uparrow$ $l \uparrow$ Energy = same

Question no. 54

In a hydrogen atom, if the energy of an electron in the ground state is 13.6 eV, then that in the 2nd excited state is

(1) 1.51 eV (2) 3.4 eV

(3) 6.04 eV (4) 13.6 eV

$E_n = -13.6 \times \frac{Z^2}{n^2}$ eV/atom

→ $n = 3$

$E_n \propto \frac{1}{n^2}$

$\frac{E_1}{E_2} = \left(\frac{n_2}{n_1}\right)^2$

$\frac{13.6}{E_2} = \left(\frac{3}{1}\right)^2$

$E_2 = \frac{13.6}{9} = 1.51$

Question no. 55

How many electrons in an atom have the following quantum numbers?

$n = 4, m_s = -\frac{1}{2}$

(1) 4

(2) 8

(3) 16

(4) 32

n = 4 32 e^-

16 16

$+\frac{1}{2}$ $-\frac{1}{2}$

Question no. 56

Consider the follwoign two complex ions : $[CoF_6]^{3-}$ and $[Co(C_2O_4)_3]^{3-}$. Which of the following statement(s) is / are false?

I. Both are octahedral.

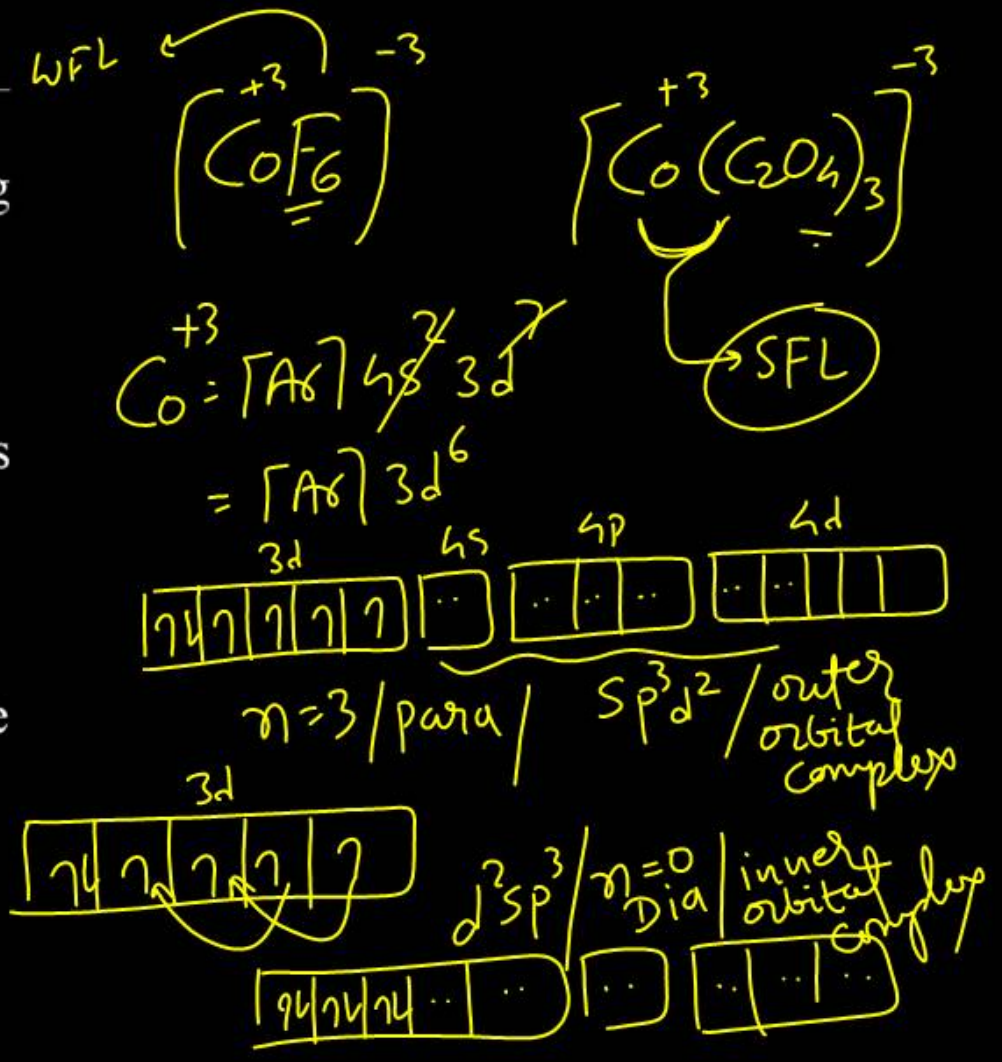
II. $[Co(C_2O_4)_3]^{3-}$ is diamagnetic while $[CoF_6]^{3-}$ is paramagnetic.

III. Both are outer orbital complexes.

IV. In both the complexes, the central metal is in the same oxidation state.

(1) II and III (2) II, III and IV

(3) III only (4) III and IV



Question no. 57

The largest oxidation number exhibited by an element depends on its outer electronic configuration. With which of the following outer electronic configuration the element will exhibit largest oxidation number?

(1) $3d^1, 4s^2$ → +2, +3

(2) $3d^3, 4s^2$ → +2, +5

(3) $3d^5, 4s^1$ → +1, +6

(4) $3d^5, 4s^2$ → +2, +7

min O.S. = ns^2

max O.S = $ns^2 + (n-1)d^e$

Question no. 58

Which of the following reactions are

Disproportionation reaction?

(i) $2Cu^{+} \longrightarrow Cu^{2+} + Cu^{0}$

(ii) $3MnO_4^{2-} + 4H^{+} \longrightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$

(iii) $2KMnO_4 \longrightarrow K_2MnO_4 + MnO_2 + O_2$

(iv) $2MnO_4^{-} + 3Mn^{2+} + 2H_2O \longrightarrow 5MnO_2 + 4H^{+}$

Select the the correct option from the following.

(1) (i), (ii) and (iii)

(2) (i), (ii) and (iv)

(3) (i) and (iv)

(4) (i) and (ii)

Question no. 59

Match the half reactions (in Column I) with change in oxidation number (in Column II).

	Column I		Column II
A.	$Cl^- \longrightarrow ClO_4^-$	1.	2
B.	$Cr^{3+} \longrightarrow CrO_5$	2.	8
C.	$H_2O_2 \longrightarrow O_2$	3.	0
D.	$CrO_2^{2+} \longrightarrow CrO_4^{2-}$	4.	3

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

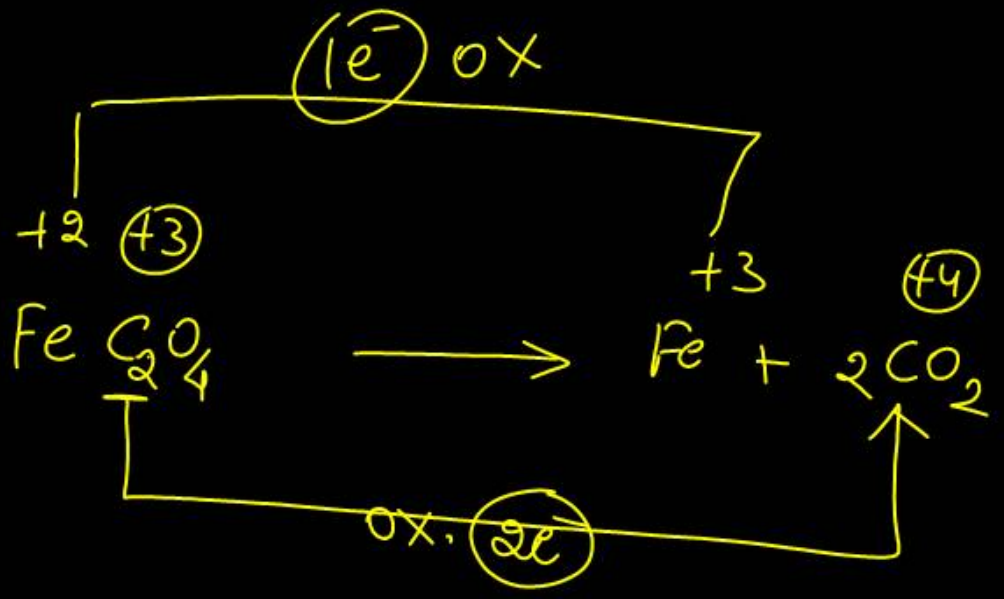
Question no. 60

Equivalent weight of FeC_2O_4 in the change,

$FeC_2O_4 \rightarrow Fe^{3+} + CO_2$ is

(1) M/3 (2) M/6

(3) M/2 (4) M/1



$$\frac{M}{n\text{-factor}}$$

$$\frac{M}{3}$$

Question no. 61

The ratio between kinetic energy and total energy of the electron of hydrogen atom according to Bohr's model is

(1) 2 : 1 (2) 1 : 1

(3) 1 : –1 (4) 1 : –2

$$-T.E. = K.E.$$

$$\frac{-KZe^2}{2\ell} = \frac{KZe^2}{2\ell}$$

$$\frac{+1}{-1}$$

Question no. 62

Haemoglobin contains 0.34% of iron by mass. The number of Fe atoms in 3.3 g of haemoglobin is

(Given : At. mass of Fe is 56 u, $N_A = 6.022 \times 10^{23}\ mol^{-1}$)

(1) 1.21×10^{5} (2) 12.0×10^{16}

(3) 1.21×10^{20} (4) 3.4×10^{22}

0.34 gm fe $\longrightarrow$ 100 gm Hb

100 gm Hb $\longrightarrow$ 0.34 gm fe

1 gm Hb $\longrightarrow \frac{0.34}{100}$ gm fe

3.3 gm Hb $\longrightarrow \frac{0.34}{100} \times 3.3$

wt. of fe $= 0.01122$

$\text{mol} = \frac{\text{wt}}{\text{Mw}} = \frac{0.01122}{56}$

$= \frac{112.2 \times 10^{-4}}{56}$

$= 2.1 \times 10^{-4}$

molecule/atom $=$ mol $\times N_A$

$= 2.1 \times 10^{-4} \times 6.023 \times 10^{23}$

$= 1.21 \times 10^{+20}$

Question no. 63

How much copper can be obtained from 100 g of copper sulphate ($CuSO_4$) ?

(1) 45.79 g cu (2) 30.50 Cu

(3) 39.81 g Cu (4) 50.10 g Cu

$M_w = CuSO_4 = 63.5 + 96$

$= 159.5$ gm

159.5 gm $CuSO_4 \longrightarrow 63.5$ gm

1 gm $CuSO_4 \longrightarrow \frac{63.5}{159.5}$ gm Cu

100 gm $CuSO_4 \longrightarrow \frac{63.5}{159.5} \times 100$

$= 39.81$

Question no. 64

Which of the following set of quantum numbers is permissible?

(1) $n = 3; l = 2; m = 2$ and $s = +\frac{1}{2}$

3d

(2) $n = 3; l = 4; m = 0$ and $s = -\frac{1}{2}$

(3) $n = 4; l = 0; m = 2$ and $s = +\frac{1}{2}$

(4) $n = 4; l = 4; m = 3$ and $s = +\frac{1}{2}$

Question no. 65

The number of radial nodes in 3s and 2p respectively are

(1) 2 and 0

(2) 1 and 2

(3) 0 and 2

(4) 2 and 1

Radial Node = $n-l-1$

3s $n=3,\ l=0$

R.N. $= 3-0-1=2$

2p $n=2\ \ l=1$

R.N. $= n-l-1$

$= 2-1-1=0$

3s = 2

2p = 0

Question no. 66

The radius of hydrogen atom is 0.53 Å . The radius of Li^{2+} is

(1) 1.27 Å

(2) 0.17 Å

(3) 0.57 Å

(4) 0.99 Å

$r \propto \frac{n^2}{Z} A^0$

$\frac{r_H}{r_{Li^{+2}}} = \frac{Z_{Li^{+2}}}{Z_H}$

0.529

$\frac{0.53}{r_{Li^{+2}}} = \frac{3}{1}$

$r_{Li^{+2}} = \frac{0.53}{3}$

$= 0.17 A^0$

Question no. 67

Consider the following statements :

(i) $La(OH)_3$ is the least basic among hydroxides of lanthanoid

(ii) Zr^{4+} and Hf^{4+} possess almost the same ionic radii

(iii) Ce^{4+} can act as an oxidising agent

Which of the above is/are true?

(1) (i) and (iii) (2) (ii) and (iii)

(3) (ii) only (4) (i) and (ii)

La —— Lu at size↓ ionic size↓ Basicity of hydroxide↓

$La(OH)_3 > \cdots\cdots > Lu(OH)_3$

$Zr = Hf^{+2}$

$Zr^{+2} = Hf^{+4}$

$Zr^{+4} = Hf^{+4}$

$Ce^{+4} \xrightarrow{\text{Reduction}} Ce^{+3}$

Question no. 68

The CFSE for $[(CoCl)_6]^{4-}$ complex is $18000cm^{-1}$. The Δ for $[CoCl_4]^{2-}$ will be :

(1) $18000\ cm^{-1}$ (2) $16000\ cm^{-1}$

(3) $8000\ cm^{-1}$ (4) $2000\ cm^{-1}$

$$\Delta_t = \frac{4}{9}\Delta_o$$

$$= \frac{4}{9} \times 18000$$

$$= 8000$$

Question no. 69

In which of the following reaction, oxidation number of Cr has been affected?

(1) $2CrO_4^{2-} + 2H^+ \longrightarrow Cr_2O_7^{2-} + H_2O$

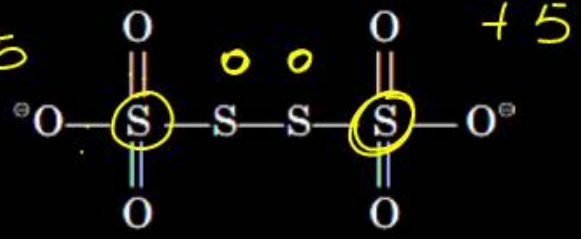
(2) $Cr_2O_7^{2-} + 2OH^- \longrightarrow 2CrO_4^{2-} + H_2O$

(3) $(NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + 4H_2O$

(4) $CrO_2Cl_2 + 2OH^- \longrightarrow CrO_4^{2-} + 2HCl$

Question no. 70

The oxidation state of S-atoms in $S_4O_6^{2-}$ from left to right are respectively



(1) +3, +1, +1, +3

(2) +4, +1, +1, +4

(3) +5, +0, +0, +5

(4) +6, +0, +0, +6

Question no. 71

Oxidation numbers of P in PO_4^{3-} of S in SO_4^{2-} and that of Cr in $Cr_2O_7^{2-}$ are respectively:

(1) –3, +6 and +6

(2) +5, +6 and +6

(3) +3, +6 and +5

(4) +5, +3 and +6

+5 +6 +6

Question no. 72

Equal masses of three gases oxygen, hydrogen, and methane are taken in identical conditions. What is the ratio of the volume of the gases under identical conditons?

(1) 16 : 1 : 8 (2) 1 : 16 : 2

(3) 1 : 16 : 8 (4) 2 : 16 : 1

$O_2 : H_2 : CH_4 = W = \text{Equal}$

$W = 32\ gm$

$\text{mol} = \frac{32}{32} : \frac{32}{2} : \frac{32}{16}$

$= 1 : 16 : 2\ \text{mol}$

mol Ratio = 1 : 16 : 2

Volume ratio = 1 : 16 : 2

1 mol = 22.4 lit

Question no. 73

Compound A (molar mass 162 g mol^{-1}) contains 8.7% hydrogen, 74% carbon and 17.3% nitrogen. The molecular formula of the compound is

(1) $C_4H_6N_2$ (2) C_2H_3N

(3) C_5H_7N (4) $C_{10}H_{14}N_2$

	%		% / A	
H	8.7	1	8.7	8.7/1.2 = 7 → 7
C	74	12	6.12	6.12/1.2 = 5 → 5
N	17.3%	14	17.3/14 = 1.2	1.2/1.2 = 1 → 1

H_7C_5N = C_5H_7N EF

Efmass = 60 + 7 + 14 = 81

Mf = n × EF

$n = \frac{Mf\,mass}{Efmass} = \frac{162}{81} = 2$

Mf = 2 × C_5H_7N

= $C_{10}H_{14}N_2$

Question no. 74

Which of the following pairs has/have the same number of atoms?

(1) 16 g of O_2 (g) and 4g of H_2(g)

(2) 16 g of O_2 and 44 g of CO_2

(3) 28 g of N_2 and 16 g of O_2

(4) 12 g of C (s) and 23 g of Na(s)

mol = $16/32 = 0.5$, mol = $4/2 = 2$

mol = $16/32 = 0.5 = 1N_A$, $= 44/44 = 1 \times 3N_A$

mol = $\frac{28}{28} = 1$ atom $= 2N_A$, mol = $\frac{16}{32} = 0.5$

atom $= 0.5 \times 2N_A = N_A$

mol = $\frac{12}{12} = 1$, mol = $\frac{23}{23} = 1$

atom $= 1 \times N_A = N_A$ atom

atom $= 1 \times N_A = N_A$ atom

Question no. 75

The electrons identified by quantum numbers, n and l

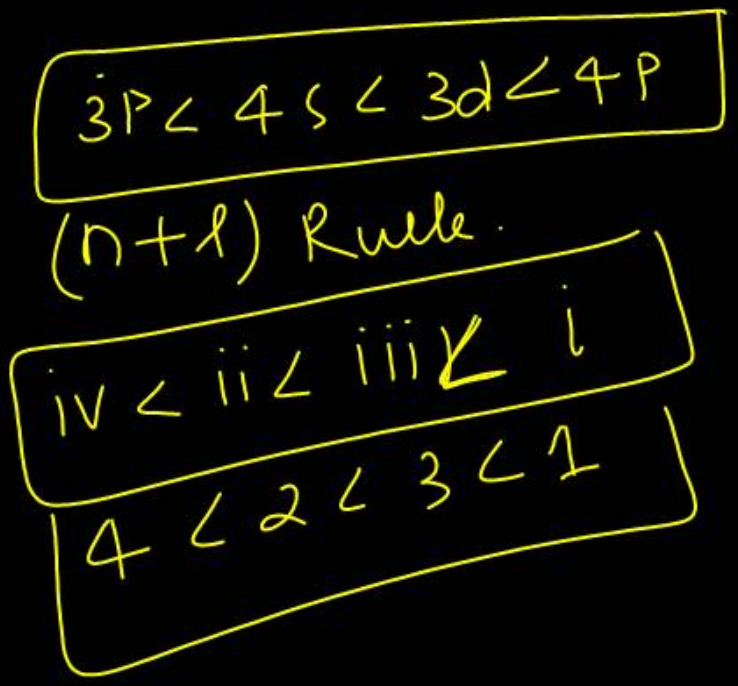
(i) n = 4, l = 1 (ii) n = 4, l = 0 (iii) n = 3, l = 2 (iv) n = 3, l = 1 can be placed in order of increasing energy from the lowest to highest, as

(1) (iv) < (ii) < (iii) < (i)

(2) (ii) < (iv) < (i) < (iii)

(3) (i) < (iii) < (ii) < (iv)

(4) (iii) < (i) < (iv) <(ii)



Question no. 76

What is the ratio of time periods (T_1/T_2) in second orbit of hydrogen atom to third orbit of He^+ on?

$$\frac{T_1}{T_2} = \frac{n_1^3/Z_1^2}{n_2^3/Z_2^2}$$

(1) $\frac{8}{27}$

(2) $\frac{32}{27}$

(3) $\frac{27}{32}$

(4) $\frac{27}{8}$

$$\frac{T_1}{T_2} = \frac{2^3/1^2}{3^3/2^2} = \frac{8 \times 4}{27} = \frac{32}{27}$$

Question no. 77

Uncertainty in the position of an electron moving with a velocity 300 ms^{-1}, accurate upto 0.001 % will be

(1) 1.92×10^{-2} m (2) 3.84×10^{-2} m

(3) 19.2×10^{-2} m (4) 5.76×10^{-2} m

$$\Delta x \cdot \Delta v \geq 5.8 \times 10^{-5}$$

$$\Delta x \geq \frac{5.8 \times 10^{-5}}{3 \times 10^{-3}}$$

$$v = 300 \text{ m/sec}$$

$$\Delta v = 300 \times \frac{0.001}{100} = 300 \times 10^{-5} = 3 \times 10^{-3}$$

Question no. 78

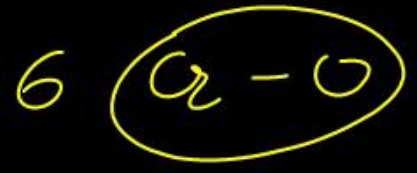
In the dichromate dianion,

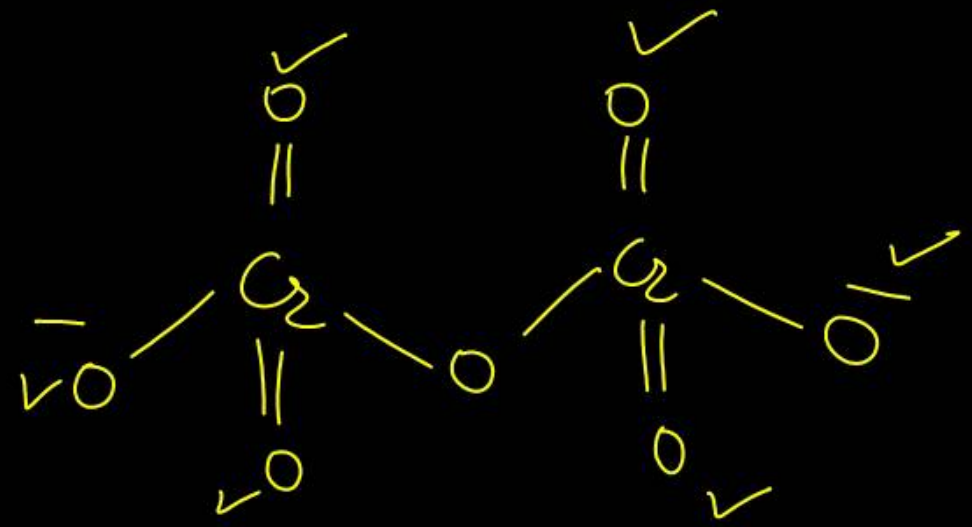
(1) 4 Cr – O bonds are equivalent

(2) 6 Cr – O bonds are equivalent

(3) All Cr – O bonds are equivalent

(4) All Cr – O bonds are non-equivalent





Question no. 79

Incorrect order of stability of cation is :

(1) $Ge^{2+} < Sn^{2+} < Pb^{2+}$

(2) $Ge^{4+} < Sn^{4+} < Pb^{4+}$

(3) $Sn^{2+} < Sn^{4+}$

(4) $Pb^{4+} < Pb^{2+}$

$Ge^{+4} > Sn^{+4} > Pb^{+4}$

+2
+4

C
Si
Ge
Sn
Pb

$Sn^{+4} > Sn^{+2}$

2

Pb^{+2} Pb^{+4}

Down the group
Stability of +2 ↑
Stability of +4 ↓

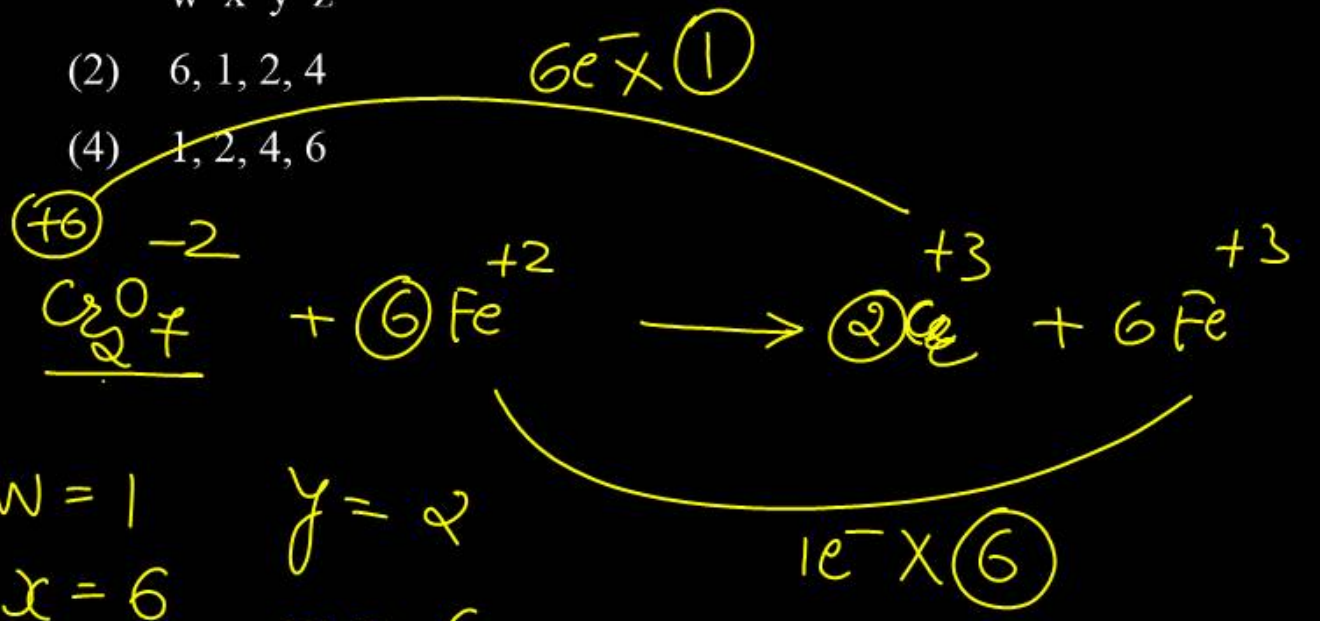
Question no. 80

The coefficients w, x, y, z in the reaction

$$wCr_2O_7^{2-} + xFe^{2+} \longrightarrow yCr^{3+} + zFe^{3+} + H_2O$$

	w	x	y	z
(1)	1,	2,	6,	6
(3)	1,	6,	2,	6

	w	x	y	z
(2)	6,	1,	2,	4
(4)	1,	2,	4,	6



Question no. 81

In which of the following the oxidation number of oxygen has been arranged in increasing order

(1) $OF_2 < KO_2 < BaO_2 < O_3$

(2) $BaO_2 < KO_2 < O_3 < OF_2$

(3) $KO_2 < OF_2 < O_3 < BaO_2$

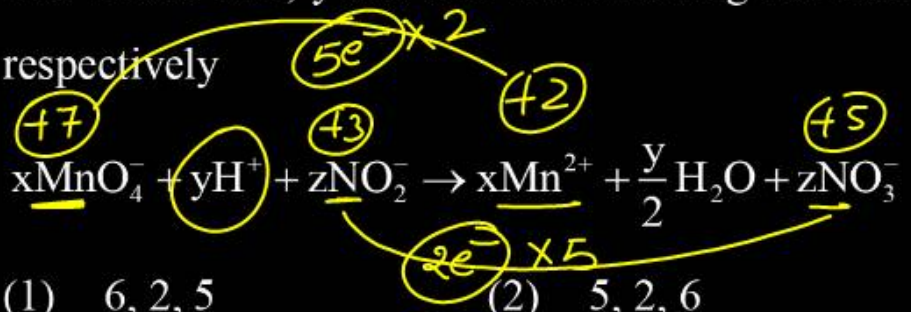
(4) $OF_2 < O_3 < KO_2 < BaO_2$

$+2 \quad -1/2 \quad -1 \quad 0$

$-1 < -\frac{1}{2} < 0 < +2$

Question no. 82

The values of x, y and z in the following reaction are respectively



$$x\,MnO_4^- + y\,H^+ + z\,NO_2^- \rightarrow x\,Mn^{2+} + \frac{y}{2}\,H_2O + z\,NO_3^-$$

(1) 6, 2, 5 (2) 5, 2, 6

(3) 2, 5, 6 (4) 2, 6, 5

$$6H^+ + 2MnO_4^- + 5NO_2^- \longrightarrow 2Mn^{+2} + 5NO_3^- + 3H_2O$$

$x = 2$ $z = 5$

$y = 6$

Question no. 83

X and Y are two elements which form X_2Y_3 and X_3Y_4. If 0.20 mol of X_2Y_3 weighs 32.0 g and 0.4 mol of X_3Y_4 weighs 92.8 g, the atomic weights of X and Y are, respectively

(1) 16.0 and 56.0 (2) 8.0 and 28.0

(3) 56.0 and 16.0 (4) 28.0 and 8.0

X_2Y_3

0.2 mol → 32 gm

1 mol → $\frac{32}{0.2} = 160$ gm

$X_2Y_3 \rightarrow 2X + 3Y = 160$ — (1)

X_3Y_4

0.4 mol → 92.8 gm

1 mol → $\frac{92.8}{0.4} = 232$ gm

$X_3Y_4 \rightarrow 3X + 4Y = 232$ — (2)

$\begin{matrix} 2X+3Y = 160 \times 3 \\ 3X+4Y = 232 \times 2 \end{matrix} \Rightarrow \begin{matrix} 6X+9Y = 480 \\ 6X+8Y = 464 \end{matrix}$

$Y = 16$

On putting value of Y in eq^n (1)

$2X + 3Y = 160$

$2X + 3 \times 16 = 160$

$2X = 160 - 48$

$2X = 112$

$X = 112/2 = 56$

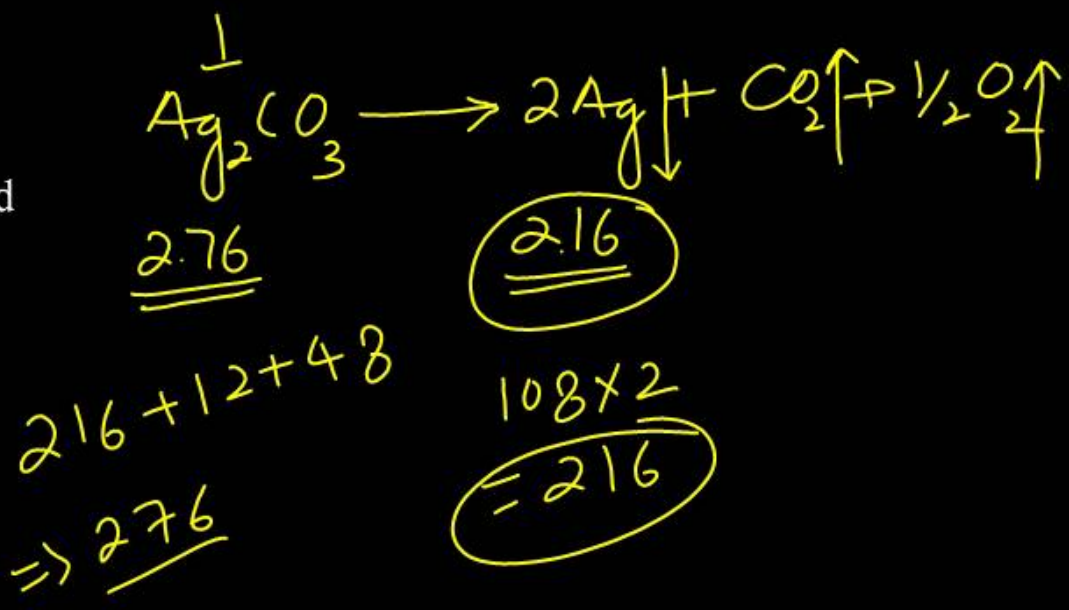
$X = 56, \; Y = 16$

Question no. 84

2.76 g of silver carbonate on being strongly heated yield a residue of weighing

(1) 2.16 g (2) 2.48 g

(3) 2.48 g (4) 2.32 g



Question no. 85

One mole of oxygen gas at STP is equal to

(1) 6.022×10^{23} atom of oxygen

(2) 6.022×10^{24} atoms of oxygen

(3) 16 g of oxygen

(4) 32 g of oxygen

1 mole O_2 gas

$6.023 \times 10^{23} \times 2$

$\frac{1}{2}$ ×

32 O_2

Question no. 86

Which of the following does not represent the mathematical expression for the Heisenberg's uncertainty principle

(1) $\Delta x . \Delta p \geq h / (4\pi)$ (2) $\Delta x . m\Delta v \geq h / (4\pi)$

(3) $\Delta E . \Delta t \geq h / (4\pi)$ (4) $\Delta E . \Delta x \geq h / (4\pi)$

Question no. 87

According to the Bohr Theory, which of the following transitions in the hydrogen atom will give rise to the least energetic photon?

(1) n = 6 to n = 1

(2) n = 2 to n = 1

(3) n = 5 to n = 2

(4) n = 6 to n = 2

$$\Delta E = -13.6\, Z^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

13.3

10.2

0.17

3.2

Question no. 88

The correct order of increasing bond angles in the following speceis is :

(1) $ClO_2^- < Cl_2O < ClO_2$ (2) $Cl_2O < ClO_2 < ClO_2^-$

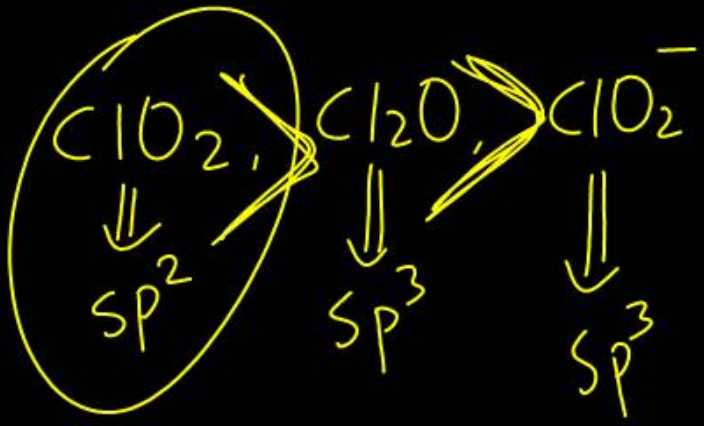
(3) $ClO_2 < Cl_2O < ClO_2^-$ (4) $Cl_2O < ClO_2^- < ClO_2$

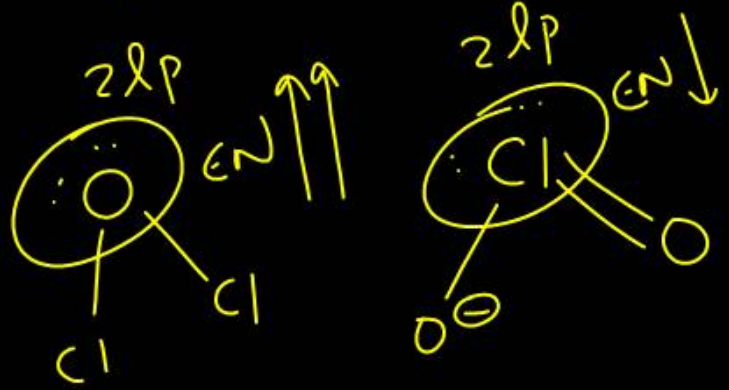
$BA \propto \frac{1}{\text{No. of Hybrid orbital}} \propto \frac{1}{\text{lp on C.A.}} \propto \text{EN of C.A.}$

$sp = 180^\circ$ (2HO)

$sp^2 = 120^\circ$ (3HO)

$sp^3 = 109.5^\circ$ (4HO)





Question no. 89

The IUPAC name of $[Ni(NH_3)_4][NiCl_4]$ is

(1) Tetrachlronickel(II) tetraamminenickel(II)

(2) Tetraamminenickel(II) tetrachloronoickel(II)

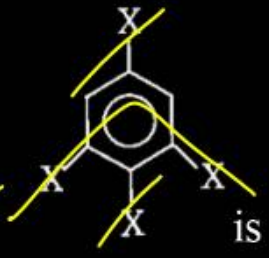
(3) Tetraamminenickel(II) tetrachloridonickelate(II)

(4) Tetrachloronickel(II) tetraamminenickelate(0)

Question no. 90

Dipole moment of

Is 1.5 D. Then dipole moment of the following



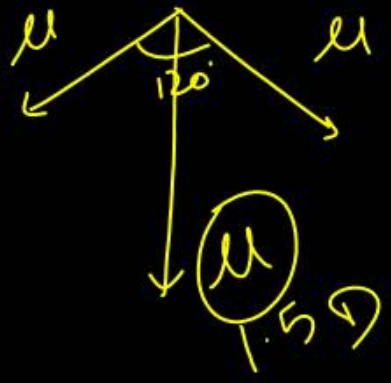
is

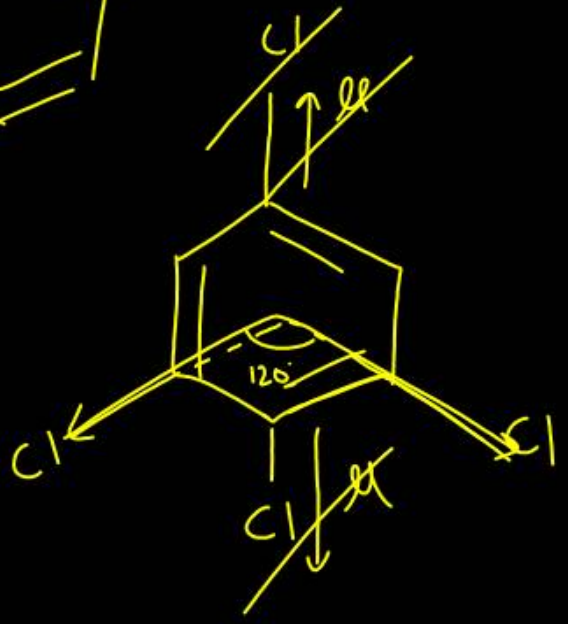
(1) 1.5 D

(2) 2.35 D

(3) 1 D

(4) 3 D





Question no. 91

Which of the following is considered as a recessive character of Mendel?

(1) Round seed

(2) Wrinkled seed

(3) Axial flower

(4) Green pod

Height of plant - Tall / Dwarf
Position of flower - Axial / Terminal
Colour of flower - Violet / white
Shape of pod - Inflated / constricted
Colour of pod - Green / yellow
Shape of seed - Round / wrinkled
Colour of seed - Yellow / green

Question no. 92

Mendelian ratio 9 : 3 : 3 : 1 is due to

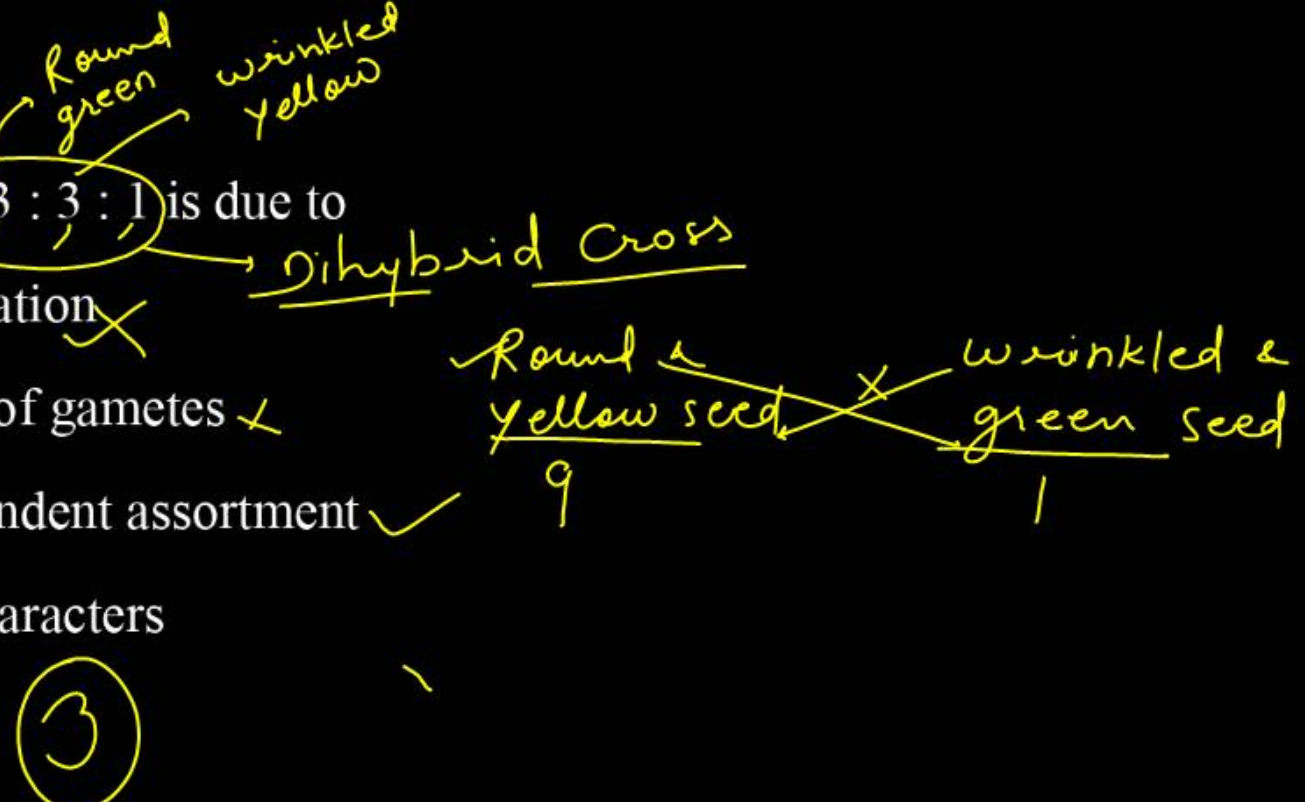
(1) Law of segregation

(2) Law of purity of gametes

(3) Law of independent assortment

(4) Law of unit characters

3



Question no. 93

Which of the following is an example of pleiotropic gene?

(1) Haemophilia

(2) Thalassemia

(3) Phenylketonuria

(4) Colour blindness

3

pleiotropism

pleiotropic gene

Sickle cell Anaemia

phenylketonuria

many character

Question no. 94

2

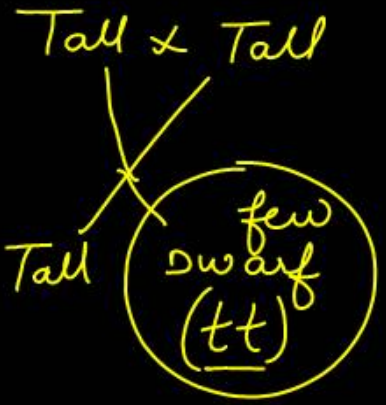
A cross between two tall plants resulted in offspring having few dwarf plants. What would be the genotypes of both the parents?

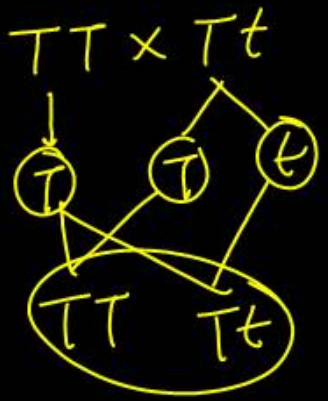
(1) TT and Tt

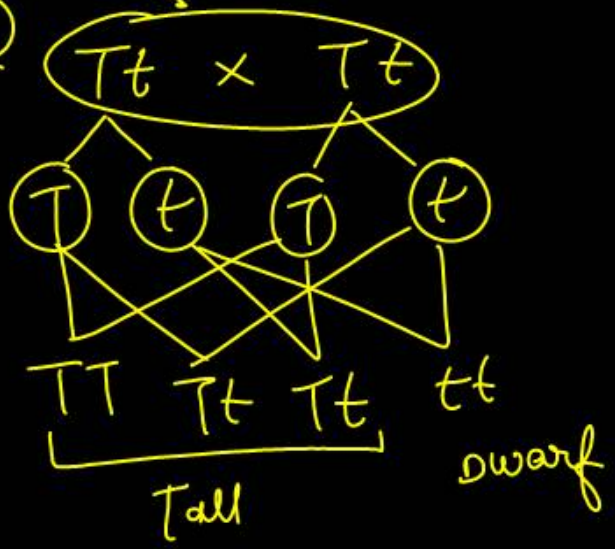
(2) Tt and Tt

(3) TT and TT

(4) Tt and tt







Question no. 95

Select the correct statement w.r.t. linkage.

(1) Linked genes are present on different chromosomes.

(2) Linked genes always assort independently during gametogenesis.

(3) Completely linked genes are present far away on same chromosome.

(4) No crossing over is observed between two completely linked genes.

Question no. 96

In human beings, which of the following disorders occurs due to the dominant allele?

(1) Haemophillia (2) Colourblindness

(3) Thalassemia (4) Myotonic dystrophy

Recessive

Recessive

Dominant Allele

4

Question no. 97

The unequivocal proof that DNA is the genetic material came from the experiments of

(1) Hershey and Chase (1952)

(2) Frederic Griffith (1928)

(3) Watson and Crick

(4) Meselson and Stahl (1958)

Griffith 1928

A. M a M_c : 1933-1944

Hershey a chase 1952

1

Question no. 98

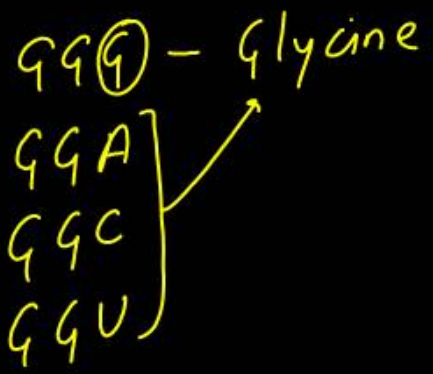
Out of 64 codons, 61 codons code for 20 types of amino acid. It is called

(1) Wobbling of codon

(2) Overlapping of gene

(3) Universality of codons

(4) Degeneracy of genetic code



Question no. 99

Which of the following statements are correct?

A. RNA polymerase I transcribes rRNAs

B. RNA polymerase II transcribes snRNAs

C. RNA polymerase III transcribes hnRNA

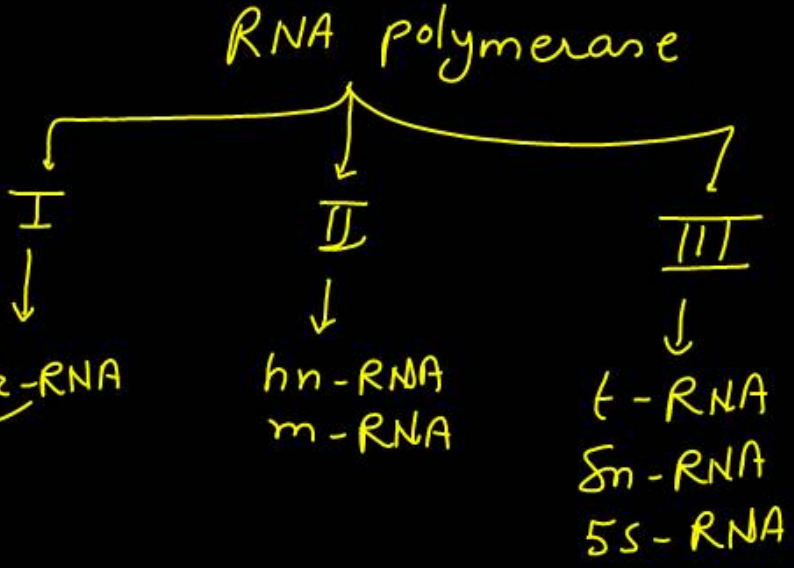
D. RNA polymerase II transcribes hnRNAs

(1) A and B are correct

(2) A and C are correct

(3) A, B and D are correct

(4) A and D are correct



Question no. 101

The process of recovery and purification of the expressed biological products is called

(1) Downstream processing

(2) Bioprocessing

(3) Post Production processing

(4) Upstream processing

Question no. 102

Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme?

(1) 5' ..... CGTTCG ..... 3'
    3' ..... ATGGTA ..... 5'

(2) 5' ..... GATATG ..... 3'
    3' ..... CTACTA ..... 5'

(3) 5' ..... GAATTC ..... 3'
    3' ..... CTTAAG ..... 5'

(4) 5' ..... CACGTA ..... 3'
    3' ..... CTCAGT ..... 5'

3

Question no. 103

cry II Ab and cry I Ab produce toxins that control :

(1) cotton bollworms and corn borer respectively

(2) cotton borer and cotton bollworms resepectively

(3) tobacco budworms and nematodes respectively

(4) nematodes and tobacco budworms resepectively

Cry I Ab → Corn borer

Cry II Ab, Cry I Ac → Cotton boll worm

Question no. 104

Which of the following enzyme is used in case of fungus to cause release of DNA along with other macromolecules?

(1) ~~Lysozyme~~
(2) ~~Cellulase~~
(3) Chitinase
(4) ~~Amylase~~

3

Bacteria - Lysozyme ✓
Plant cell → cellulase ✓
Fungus - chitinase ✓

Question no. 105

The term "competent" refers to

(1) Increasing the competition between cells

(2) Making cells impermeable for DNA

(3) Increasing the efficiency with which DNA enters the bacterium through pores in its cell wall

(4) Making cells permeable for divalent cations

3

Question no. 106

Use of bioresources by multinational companies and organisations without authorization from the concerned country and its people is called

(1) Bio–infringement

(2) Biopiracy

(3) Biodegradation

(4) Bioexploitation

Question no. 107

Read the following statement and choose the appropriate options w.r.t. features of genetic code.

A. One codon specifies only one amino acid.

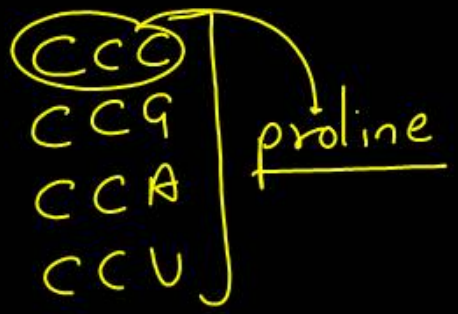
B. Some amino acids are coded by more than one codon.

C. From bacteria to human, UUU would code for phenylalanine.

	A	B	C
(1)	Non ambiguous	Degenerate	Specificity
(2)	Non ambiguous	Degenerate	Universal
(3)	Ambiguous	Specificity	Universal
(4)	Ambiguous	Co–linearity	Specificity

GGG - Glycine

AUG - methean



2

Question no. 108

Choose the odd one out with respect to the critical research area of biotechnology.

(1) Providing the best catalyst in the form of improved organism.

(2) Creating optimal condition through engineering for catalyst to act.

(3) Agro chemical based agriculture.

(4) Downstream processing to purify the organic compound.

3

Question no. 109

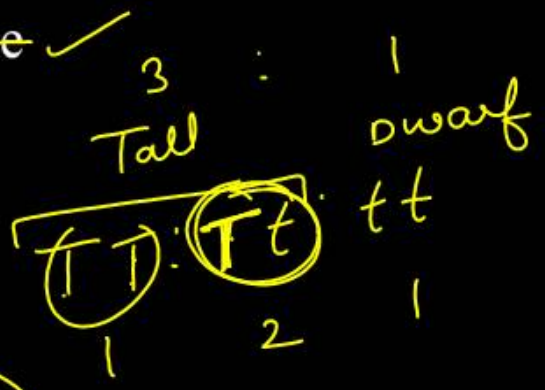
In case of inheritance of one gene, 3 : 1 phenotypic ratio can be explained on the basis of

(1) ~~Incomplete dominance~~

(2) ~~Codominance~~

(3) ~~Dominance~~

(4) ~~Linkage~~



3

Question no. 110

The amino acid substituted in sickle cell anaemia is

(1) Glutamic acid for valine in the alpha chain

(2) Glutamic acid for valine in the beta chain

(3) Valine for glutamic acid in the alpha chain

(4) Valine for glutamic acid in the beta chain

Haemoglobin
β-chain
6th Glutamic Acid
Valine

4 4

Question no. 111

Match Column I with Column II and select the correct option form the codes given below.

	Column I		Column II
A.	A single trait controlled by three or more than three alleles	i.	Pleiotropy
B.	A single trait controlled by three or more than three genes	ii.	Multiple alleles
C.	A single gene exhibits multiple phenotypic expression	iii.	Polygenic inheritance

	A	B	C		A	B	C
(1)	(ii)	(iii)	(i)	(2)	(ii)	(iii)	(i)
(3)	(iii)	(ii)	(i)	(4)	(i)	(iii)	(ii)

A - ii
B - iii
C - i

Question no. 113

The two genes of a chromosome lie at adjacent gene locus; they show/are

(1) ~~Maximum recombination~~

(2) ~~More crossing over~~

(3) ~~No linkage~~

(4) Tightly linked

4

Question no. 114

If the size of starch grain in pea is considered as phenotype. The Bb allele will show

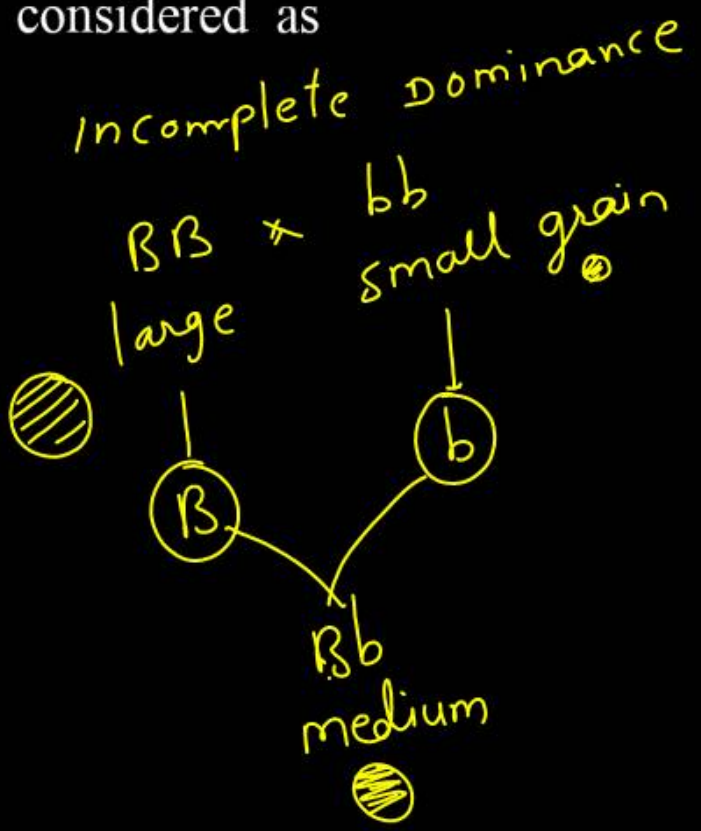
(1) ~~Complete dominance~~

(2) Incomplete dominance

(3) ~~Co-dominance~~

(4) ~~Pleiotropism~~

2



Question no. 115

Main enzyme of DNA replication is

(1) ~~DNA dependent RNA polymerase~~

(2) DNA dependent DNA polymerase

(3) ~~RNA dependent~~ RNA polymerase

(4) ~~RNA dependent~~ DNA polymerase

2

DNA $\xrightarrow{\text{DNA dependent DNA polymerase}}$ DNA

DNA $\xrightarrow{\text{DNA dependent RNA polymerase}}$ RNA

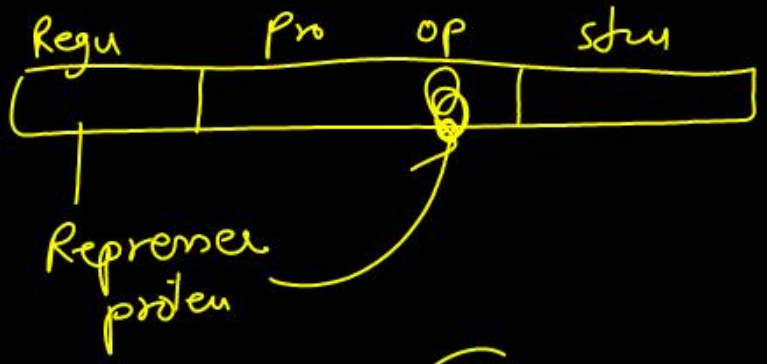
RNA $\xrightarrow{\text{RNA dependent DNA polymerase}}$ DNA

Question no. 116

Repressor protein is formed from

(1) Repressor gene (2) Structural gene

(3) Operator gene (4) Regulatory gene



4

Question no. 117

Select the correct option:

	Direction of RNA synthesis	Direction of reading of the template DNA strand
(1)	5' — 3'	3' – 5'
(2)	3' — 5'	5' – 3'
(3)	5' — 3'	5' – 3'
(4)	3' — 5'	3' – 5'

Question no. 118

A region of coding strand of DNA has the following nucleotide sequence:

5' – TACGCCG – 3'

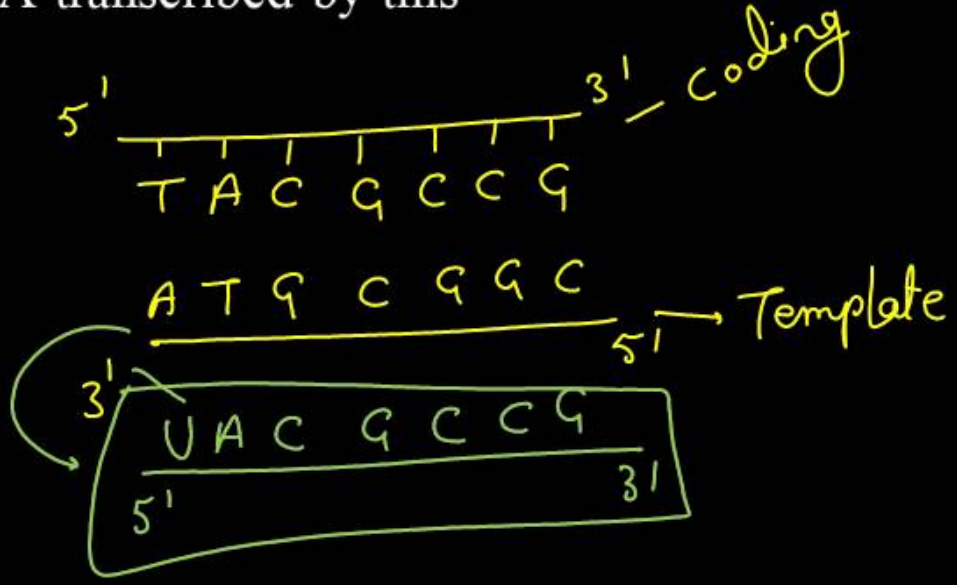
The sequence of bases on mRNA transcribed by this would be:

(1) 5' – UACGCCG – 3'

(2) 3 ' UACGCCG – 3'

(3) 5' – ATGCGGC – 3'

(4) 3' – ATGCGGC – 3'



Question no. 119

During the process of gene amplification using PCR, if very high temperature is not maintained in the beginning, then which of the following steps of PCR will be affected first?

(1) Ligation
(2) Annealing
(3) Extension
(4) Denaturation

94°C
Denaturation
Annealing
Extension

4

Question no. 120

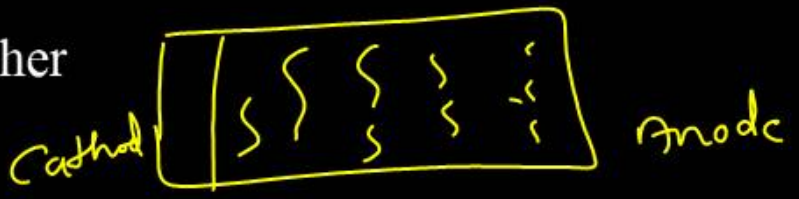
What is the criterion for DNA fragments movement on agarose gel during gel electrophoresis?

(1) The smaller the fragement size, the farther it moves.

(2) Positively charged fragments move to farther end.

(3) Negatively charged fragments do not move.

(4) The largest the framgent size, the farther it moves.



Question no. 121

Identify curative methods used to treat ADA deficiency disease in human.

A. Gene Therapy

B. Bone Marrow Transplantation

C. Complete Blood Replacement

D. Enzyme Replacement Therapy

Choose the correct answer from the options given below :

(1) A, B and D only (2) B, C and D only

(3) A, C and D only (4) A and C only

Question no. 122

Which of the following compound is used in visualization DNA fragments in gel electrophoresis?

(1) Hexachlorobenzene (2) Silver bromide

(3) Ethyl chloride (4) Ethidium bromide

4

Question no. 123

Which one of the following is used as vector for cloning into higher organisms

Animals → Retrovirus

(1) Salmonella typhimurium

(2) Rhizopus nigricans

(3) Retrovirus

(4) Baculovirus

3

Question no. 124

With regards to insulin choose correct options.

(a) C– peptide is not present in mature insulin.

(b) The insulin produced by rDNA technology has C–peptide.

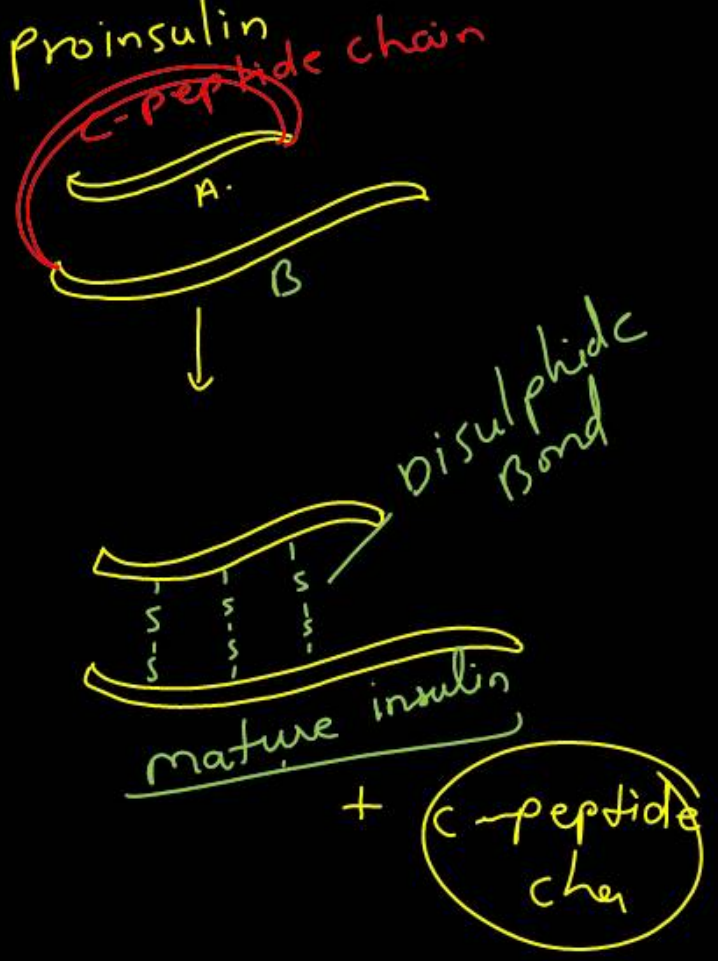
(c) The pro–insulin has C–peptide

(d) A–peptide and B–peptide of insulin are interconnected by disulphide bridges.

Choose the correct answer from the options given below.

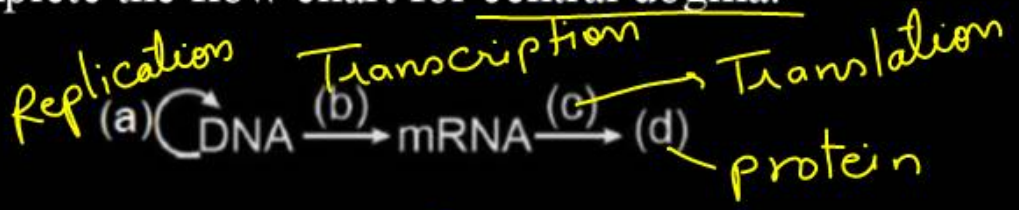
(1) (b) and (d) only (2) (b) and (c) only

(3) (a), (c) and (d) only (4) (a) and (d) only



Question no. 125

Complete the flow chart for central dogma.



(1) (a)–Replication; (b)–Transcription;
(c)–Transduction; (d)–Protein

(2) (a)–Translation; (b)–Replication;
(c)–Transcription; (d)–Transduction

(3) (a)–Replication; (b)–Transcription;
(c)–Translation; (d)–Protein

(4) (a)–Transduction; (b)–Translation;
(c)–Replication; (d)–Protein

3

Question no. 126

Meloidogyne incognita infects which part of the tocacco plant?

(1) Stem

(2) Root

(3) Leaf

(4) Flower

2

Question no. 127

In case of incomplete dominance in F_2 generation

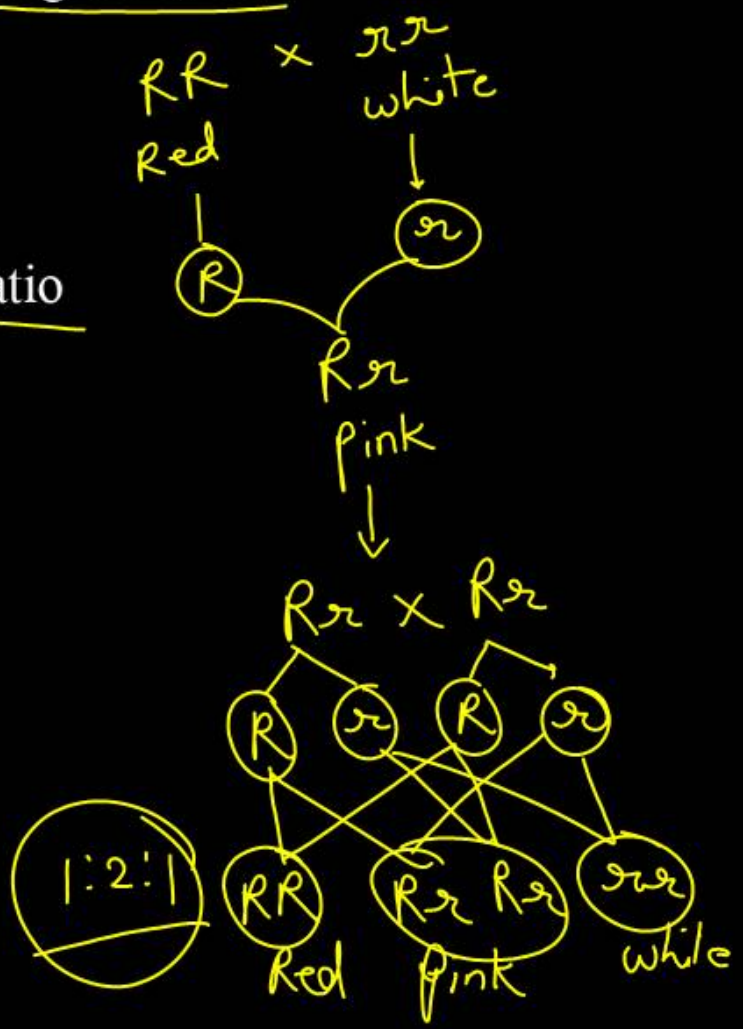
(1) Genotypic ratio is 3 : 1

(2) Phenotyhpic ratio is 3 : 1

(3) Genotypic ratio = phenotypic ratio

(4) Nothing can be concluded

3



Question no. 128

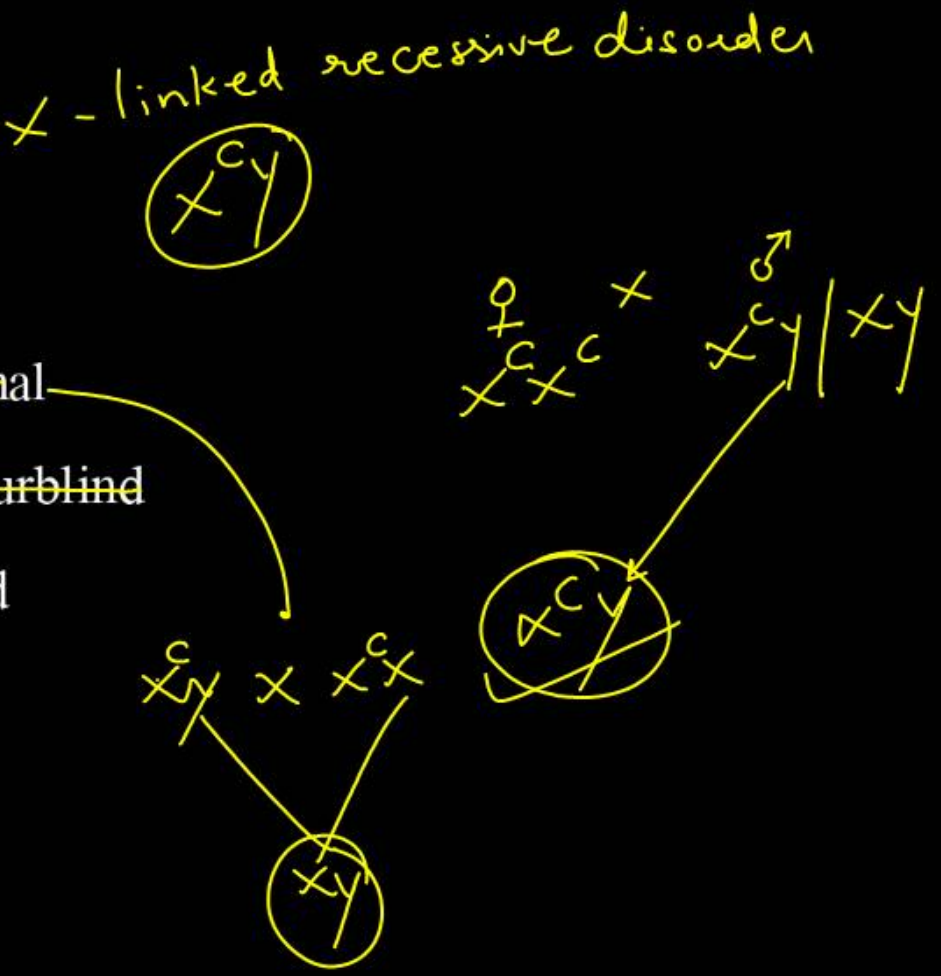
All sons of a couple are colourblind because

(1) Mother is homozygous colourblind

(2) Mother is heterozygous and father normal

(3) Mother is heterozygous and father colourblind

(4) Mother is normal and father colourblind



Question no. 129

What map unit (Centimorgan) is adopted in the construction of genetic maps?

(1) A unit of distance between two expressed genes, representing 100% cross over

(2) A unit of distance between genes on chromosomes representing 1% cross over

(3) A unit of distance between genes on chromosomes, representing 50% cross over

(4) A unit of distance between two expressed genes, representing 10% cross over

2

% Freq. of Crossing over ∝ Distance b/w genes

1 map unit

1%

10% = 10 mu

20% = 20 mu

Question no. 130

An exception to Mendelian principle where both alleles express themselves equally in heterozygous condition is

(1) Incomplete dominance

(2) Co-dominance

(3) Polygenic inheritance

(4) Pleiotropism

2

Bb
Tt
Rr Codominance
Aa
Ii

Question no. 131

Consider the following.

A. Karyotype 44 + XXY

B. Sterile male with gynaecomastia

C. Overall masculine development

D. Presence of one barr body

Above given traits show presence of :

(1) Klinefelter's syndrome

(2) Turner's syndrome

(3) Down syndrome

(4) Edward syndrome

Question no. 132

Consider the following characteristics.

A. Monosomy of X chromosome

B. Karyotype is 45 + XO

C. Presence of barr bodies

D. Sterile females with rudimentary ovaries

E. Lack of secondary sexual characters

Which of the given statements are related to Turner's syndorme?

(1) A, B, C and D

(2) Only A, D and E

(3) All expect C

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

Question no. 133

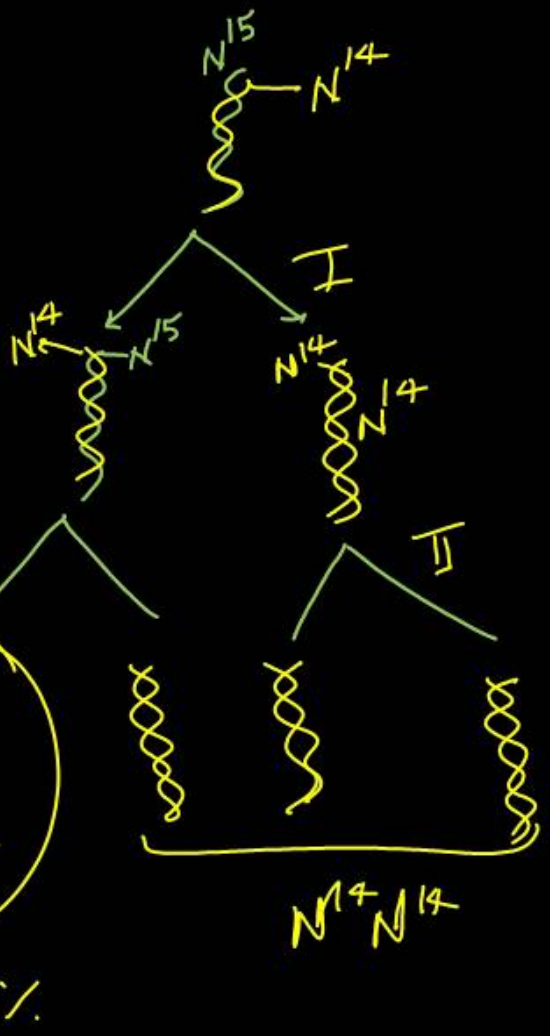
If a hybrid DNA molecule labelled with ^{15}N is allowed to replicate twice in normal culture medium, the percentage of hybrid DNA after second replication will be

(1) 50%

(2) 12.5%

(3) 25%

(4) 75%



Question no. 134

Identify the correct pairing regarding the structure of heterochromatin.

(1) Loosely packed; Stain light

(2) Loosely packed; Stain dark

(3) Densely packed; Stain light

(4) Densely packed; Stain dark

4

Euchromatin
↳ loosely
light stain

Heterochromatin
↳ Dense
Dark stain

Transcriptionally
Inactive

Question no. 135

Which of the following criteria must a molecule fulfil to act as a genetic material?

(i) It should not be able to generate its replica

(ii) It should chemically and structurally be stable

(iii) It should not allow slow mutation

(iv) It should be able to express itself in the form of Mendelian Characters

(1) (i) and (ii)
(2) (ii) and (iii)
(3) (iii) and (iv)
(4) (ii) and (iv)

4

Question no. 136

Thermus aquaticus

Enzyme 'Taq plymerase' used in PCR, has been isolated from bacterium.

(1) Agrobacterium tumefaciens

(2) Thermus aquaticus

(3) Streptomyces albus

(4) Escherichia coli

2

Question no. 137

Which of the following shows the correct sequence of processess with respect to the PCR

(1) Extension, denaturation, annealing

(2) Denaturation, annealing, extension

(3) Denaturation, extension, annealing

(4) Annealing, extension, denaturation

2

Question no. 138

Separation of DNA fragments is done by a technique known as

(1) Gel electrophoresis

(2) ~~Polymerase Chain Reaction~~

(3) ~~Recombinant technology~~

(4) ~~Southern blotting~~

1

Question no. 139

In the lactose operon of Escherichia, what is the function of promoter?

(1) Binding of Gyrase enzyme

(2) Binding of RNA polymerase

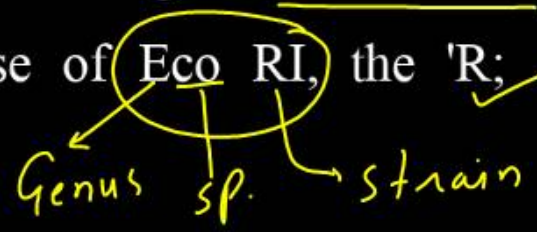
(3) Codes for RNA polymerase

(4) Processing of messenger RNA

2

Question no. 140

The conventional method for naming the restriction enzymes is followed. In case of Eco RI, the 'R; indicates



(1) Genus (2) Species

(3) Name of the scientist (4) Strain

4

Question no. 141

Which of the following restriction enzymes produces blunt ends?

(1) Xho I

(2) Hind III

(3) Sal I

(4) Eco RV

4

Question no. 142

Wich of the following steps in transcription is catalyzed by sigma factor?

(1) Initiation

(2) Elongation

(3) Termination

(4) More than one option is correct.

Question no. 143

In which of the following methods, the recombinant DNA is directly injected into the nucleus of animals cells?

(1) Gene gun

(2) Biolistic gun

(3) Microinjection

(4) Both (1) and (2)

3

Question no. 144

Which among the following statements are incorrect?

(i) ABO blood groups are controlled by the gene I

(ii) Gene I has four alleles

(iii) I^A and I^B produce same type of sugar

(iv) I^A and i produce different types of sugar

(v) I^A and I^B show incomplete dominance

(1) i, ii (2) v, ii

(3) ii, iii, iv (4) ii, iii, iv, v

I^A (i^A) — A
I^B (i^B) — B
I^o (i) — X

4

Question no. 145

Find out of the following human disorder exhibit 'Mendelian' pattern of inheritance.

I. Colour blindness
II. Night blindness
III. Haemophilia
IV. Down's syndrome
V. Cystic fibrosis

(1) I, II and IV
(2) I, III and V
(3) III, II and IV
(4) III, IV and V

2

Question no. 146

The recombination frequency between the genes a & c is 5%, b & c is 15%, b & d is 9%, a & b is 20%, c & d is 24% and a & d is 29%.

What will be the sequence of these genes on a linear chromosome?

(1) a, b, c, d

(2) a, c, b, d

(3) a, d, b, c

(4) d, b, a, c

a & c = 5 % = 5 mu

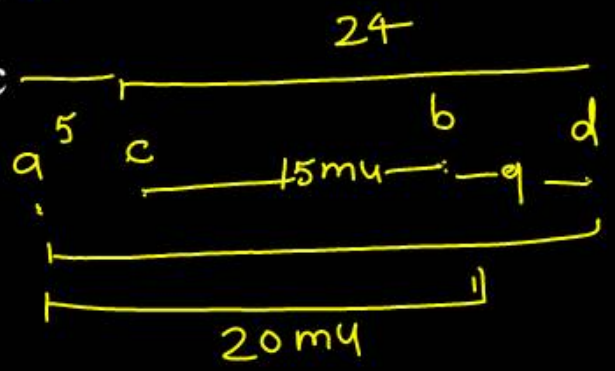
b a c = 15 % = 15 mu

b a d = 9 % = 9 mu

a a b = 20 % = 20 mu

e a d = 24 % = 24 mu

a a d = 29 % = 29 mu

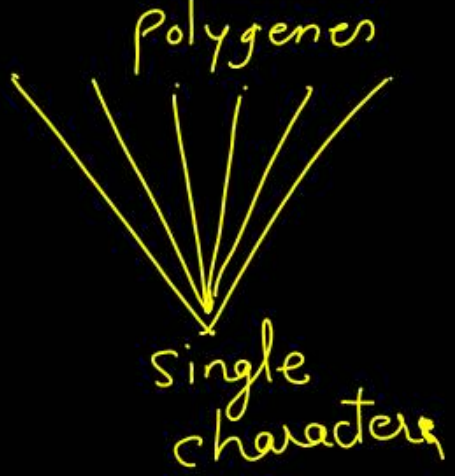


2

Question no. 147

Human skin colour is controlled by

(1) Polygenes
(2) Monogene
(3) Qualitative gene
(4) Holandric gene



Question no. 148

Which of the following Mendelian disorder is a quantitative problem of synthesizing few β-globin molecules?

A. Sickle cell anaemia

B. Haemophilia

C. Thalassemia

(1) A and C (2) Only C

(3) Only A (4) A, B and C

(Qualitative)
Sickle cell Anaem
Thalasse
(Quantitative)

2

Question no. 149

In DNA, if 10% guanine is present, then the amount of thymine present is

(1) 10%
(2) 40%
(3) 80%
(4) 20%

50% 50%
Purines = Pyrimidine
A + G = C + T
40% 10 10% 40%

2

G = 10%
C = 10%

Question no. 150

Portion of gene which is transcribed but not translated is

(1) Exon

(2) Intron

(3) Cistron

(4) Codon

2

Question no. 151

Which one of the following mRNA sequences can be translated completely?

(1) AUG UUC UCC UGG UAA UAU

(2) AUG UUC UCC UGA UGG UAU

(3) AUG ACG UAU UUC UGA CUC

(4) AUG UAU UUC UGC UCU UAG

UAA
UAG
UGA

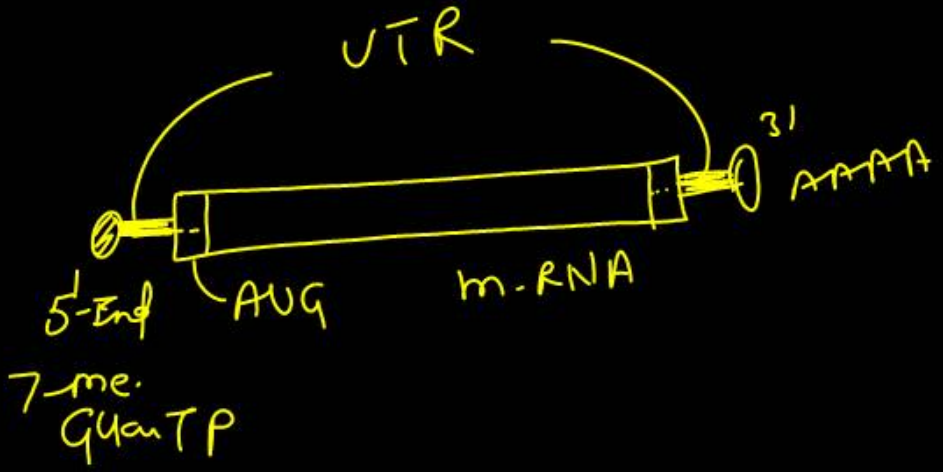
4

Question no. 152

UTRs are untranslated regions present on

(1) rRNA (2) tRNA

(3) mRNA (4) hnRNA



Question no. 153

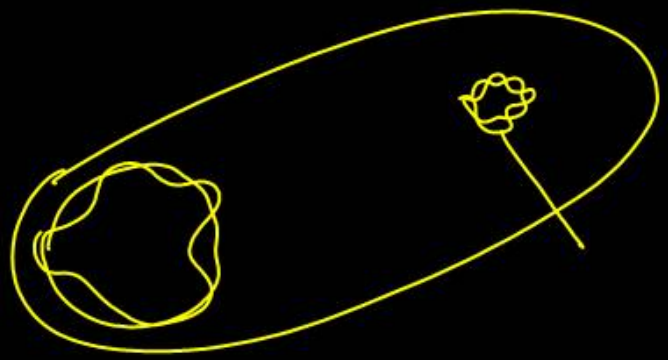
Which of the following is not a feature of the plasmids

(1) Independent replication

(2) Circular structure

(3) Transferable

(4) Single–stranded



4

Question no. 154

The colonies of recombinant bacteria appear white in contrast to blue colonies of non-recombinant bacteria because of

(1) Insertional inactivation of alpha-galactosidase in non-recombinant bacteria.

(2) Insertional inactivation of alpha-galactosidase in recombinant bacteria.

(3) Insertional inactivation of glycosidase enzyme in recombinant bacteria.

(4) Non-recombinant bacteria containing beta-galactosidase.

Question no. 155

Due to ampicillin resistance gene, one is able to select a transformed cell in the presence of ampicillin. The ampicillin resistance gene in this case is called

(1) recombinant gene

(2) selectable marker

(3) origin of replication

(4) recognition site

Question no. 156

The amino acids which are present in histones are

(1) Lysine and histidine

(2) Valine and Histidine

(3) Arginine and lysine

(4) Arginine and histidine

3

Question no. 157

The term ' chemical knife' refers to

(1) polymerases (2) Endonucleases

(3) Ribonucleases (4) Cellulases

2

Question no. 158

Which of the following is not a desirable feature of a cloning vector?

(1) Presence of single restriction enzyme site

(2) Presence of two or more recognition sites

(3) Presence of origin of replication (ORI)

(4) Presence of a marker gene.

2

Question no. 159

Human chromosome with greatest number of genes is

(1) Chromosome–1

(2) Chromosome 22

(3) X chromosome

(4) Y chromosome

1 - 2968 Gene

Y - 231

1

Question no. 160

A person in the initial stage of a bacterial infection; hence the concentration of the pathogen is very low in the body. Which of the following would be the preferable diagnostic method for this person from the beginning?

(1) Serum analysis (2) Urine analysis

(3) PCR (4) Blood test

3

r-DNA Tech
PCR
ELISA

Question no. 161

The genetically modified flavr savr variety of tomato has been developed for

(1) Enhancing shelf–life

(2) Enhancing mineral content

(3) Drought–resistance

(4) Insect–resistance

Question no. 162

How many among the following are product(s) of genetic engineering?

(A) Hepatitis B vaccine (B) Golden rice

(C) Bt cotton (D) Human insulin

(E) α1–antitrypsin

Choose the correct option.

(1) A, B, C, E (2) Only A

(3) A, C, D (4) A, B, C, D, E

4

Question no. 163

Some of the steps involed in production of humulin are given below. Choose the correct sequence.

(i) Synthesis of insulin gene artificially.

(ii) Culturing recombination E. coli in bioreactors

(iii) Purification of humulin

(iv) Insertion of human insulin gene into plasmid

(v) Introduction of recombinant plasmid into E.coli

(iv) Extraction of recombinant gene product from E. coli

(1) ii, i, iv, iii, v, vi

(2) i, iv, v, ii, vi, iii

(3) i, iii, v, vi, ii, iv

(4) iii, v, ii, I, vi, iv

Question no. 164

Gene for hirudin production has been introduced in an organism named

(1) Salmonella typhimurium

(2) Bacillus thuringiensis

(3) Brassica napus

(4) Agrobacterium tumifaciens

3

Question no. 165

Which of the following is incorrect w.r.t transgenic animals?

(1) 95% of all transgenic animals are mice.

(2) Transgenic animals are more sensitive to toxic substance.

(3) Tracey is the first transgenic sheep to produce α1–antitrypsin.

(4) Transgenic mice cannot be used to test the safety of polio vaccine.

Question no. 166

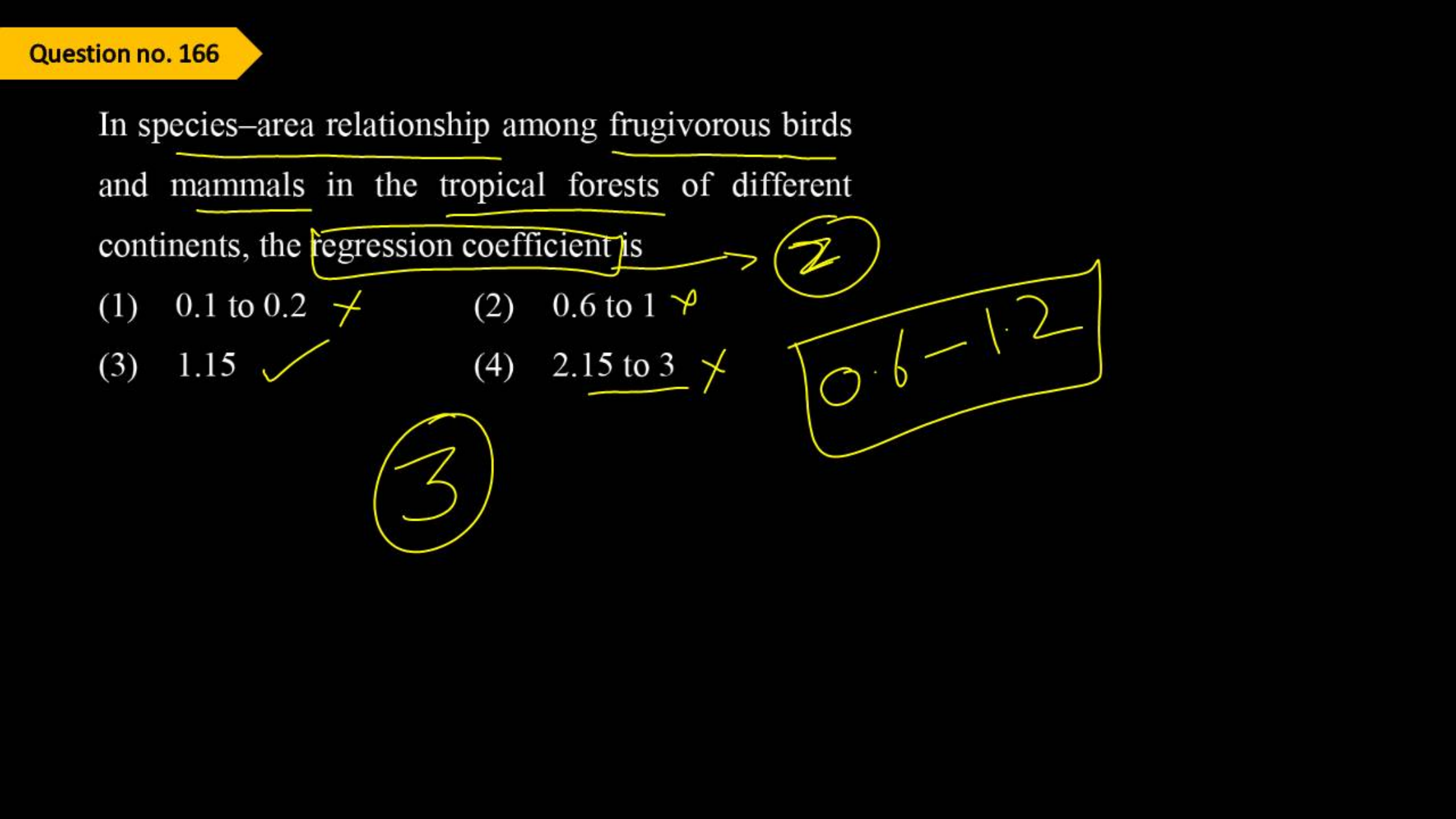
In species–area relationship among frugivorous birds and mammals in the tropical forests of different continents, the regression coefficient is

(1) 0.1 to 0.2

(2) 0.6 to 1

(3) 1.15

(4) 2.15 to 3



Question no. 167

Which is not an example of ex–situ conservation?

(1) Wildlife safari park

(2) National park

(3) Zoological park

(4) Botanical garden

2

Question no. 168

Which of the following is expected to have the highest value ($gm/m^2/yr$) in an ecosystem?

(1) Tertiary productivity

(2) Gross productivity

(3) Net productivity

(4) Secondary productivity

Question no. 169

Match the column and select correct option for animal and area where it found?

	Column I		Column II
A.	Dodo	i.	Africa
B.	Quagga	ii.	Russia
C.	Thylacine	iii.	Mauritius
D.	Steller's sea cow	iv.	Australia
E.	Passenger pigeon	v.	North America

(1) A – iii; B – ii; C – iv; D – i; E - v

(2) A – ii; B – i; C – iv; D – v; E - iii

(3) A – i; B – iv; C – iii; D – ii; E - v

(4) A – iii; B – i; C – iv; D – ii; E – v

Question no. 170

What is common between chloroplasts, chromoplasts and leucoplasts?

(1) Presence of pigments

(2) Possession of thylakoids and grana

(3) Storage of starch, proteins and lipids

(4) Ability to multiply by a fission-like process

Question no. 171

Which of the following statements are correct?

(i) in prokaryotic cells, a special membranous structure formed by the extension of the plasma membrane into the cell is known as polysome.

(ii) The smooth endoplasmic reticulum is the major site for synthesis of proteins.

(iii) RuBisCO is the most abundant protein in the whole biosphere

(iv) Mitochondria, chloroplasts and peroxisomes are not considered as part of endomembrane system

(v) Primary wall of cell is not capable of growth.

(1) (iii) and (iv) (2) (i) and (ii)

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

Question no. 172

Match the following columns and select the correct option

	Column I		Column II
A.	Colstridium butylicum	I.	Cyclosporin-A
B.	Trichoderma polysporum	II.	Butyric Acid
C.	Monascus purpureus	III.	Citric Acid
D.	Aspergillus niger	IV.	Blood cholesterol lowering agent

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

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

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

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

Question no. 173

Which of the following are not membrane-bound?

(1) Ribosomes

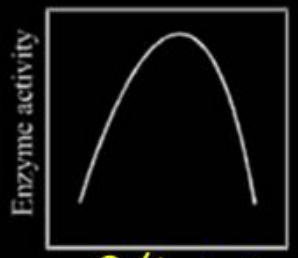
(2) Lysosomes

(3) mesosomes

(4) Vacuoles

Question no. 174

The given graph represents activity of enzyme:



(1) low activity below the optimum temperature and high activity above this temperature

(2) low activity below and above the optimum pH

(3) low activity below the optimum pH and high activity above this pH

(4) high activity below the optimum temperature and low activity above this temperature

Question no. 175

Assertion : mitosis maintains the genetic similarity of somatic cells.

Reason : Chromosomes do not undergo crossing over.

(1) Both assertion and reason are true but reason is not the correct explanation of assertion.

(2) Assertion is true but reason is fasle

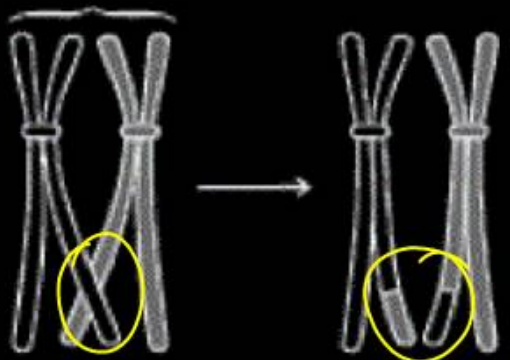
(3) Assertion is false but reason is true.

(4) Both assertion and reason are true and reason is the correct explantion of assertion.

4

Question no. 176

Given below is the representation of a certain event at a particular stage of a type of cell division. Which is this stage?



(1) Prophase I during meiosis

(2) Prophase II during meiosis

(3) Prophases of mitosis

(4) Both prophases and metaphases of mitosis

Question no. 177

Match the description given in column-I with their steps given in column-II and identify the correct answer.

	Column I		Column II
A.	Initiation of the assembly of mitotic spindle	I.	Anaphase
B.	Proteins are synthesized in preparation for mitosis while cell growth continues	II.	Prophase
C.	Spindle fibres attach to kinetochores of chromosomes.	III.	Interphase
D.	Movement of chromatids towards opposite poles	IV.	Metaphase

The correct match is

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

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

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

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

Question no. 178

Consider the food chain:

Grass → Grasshopper → Frog → Snake → Peacock

If 1000 J is the NPP at producer level, how much energy will be available to the peacock

(1) 0.01 J (2) 0.1 J

(3) 1 J (4) 10 J

Question no. 179

Select the correct matching in the following pairs:

(1) Smooth ER – Synthesis of lipids

(2) Rough ER – Synthesis of glycogen

(3) Rough ER – Oxidation of fatty acids

(4) Smooth ER – Oxidation of phospholipids

Question no. 180

Conversion of milk to curd improves its nutritional value by increasing the amount of :

(1) Vitamin D

(2) Vitamin A

(3) Vitamin B_{12}

(4) Vitamin E

3