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Must Cover Questions for AIPMT 2015 with Solutions

(These questions are trending in the past year papers and have been repeated across years with some slight variations.)

Biology>>

Q1 (AIPMT 2014): Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of:

Option A	Option B	Option C	Option D
Analogous organs	Adaptive radiation	Homologous organs	Convergent evolution

Correct Answer: Option C

Forelimbs of a cat and a lizard are used in walking; forelimbs of a whale are used in swimming and forelimbs of a bat are used in flying. These are examples of homologous organs as all of the mentioned organs are modified forelimbs that have become different through adaptation due to different types of habitats.

Q2 (AIPMT 2014): Which one of the following are analogous structures?

Option A	Option B	Option C	Option D
Wings of Bat and Wings of Pigeon	Gills of Prawn and Lungs of Man	Thorns of Bougainvillea and Tendrils of Cucurbita	Flippers of Dolphin and Legs of Horse

Correct Answer: Option A

The wings of bats and pigeons have same function but they are not anatomically similar. Similarly the gills of prawns and lungs of man have same function of respiration but they are also anatomically different.
Organs given in options (C) and (D) are homologous organs.
Hence, the correct options for this question could be (A) or (B).

Note: If we consider convergent evolution, only option (A) would be the correct answer as prawns and humans have different habitats, therefore their organs are bound to be anatomically different but bats and birds share a common habitat, adaptations and mode of life.

Q3 (AIPMT 2012): Which one of the following options gives one correct example each of convergent evolution and divergent evolution?

Option A:
Convergent evolution: Eyes of octopus and mammals
Divergent evolution: Bones of forelimbs of Vertebrates

Option B:
Convergent evolution: Thorns of Bougainvillea and tendrils of Cucurbita
Divergent evolution: Wings of butterflies and birds

Option C:
Convergent evolution: Bones of forelimbs of vertebrates
Divergent evolution: Wings of butterfly and birds

Option D:
Convergent evolution: Thorns of Bougainvillea and tendrils of Cucurbita
Divergent evolution: Eyes of Octopus and mammals

Correct Answer: Option A

Convergent evolution: Eyes of octopus and mammals
Divergent evolution: Bones of forelimbs of vertebrates

Q4 (AIPMT 2010): Darwin's finches are a good example of:

Option A	Option B	Option C	Option D
Industrial melanism	Connecting link	Adaptive radiation	Convergent evolution

Correct Answer: Option C
Adaptive radiation

Q5 (AIPMT 2009): Phylogenetic system of classification is based on:

Option A	Option B	Option C	Option D
Morphological features	Chemical constituents	Floral characters	Evolutionary relationships

Correct Answer: Option D
Evolutionary relationships

Q6 (AIPMT 2008): Thorn of Bougainvillea and tendril of cucurbita are example of:

Option A	Option B	Option C	Option D
Retrogressive evolution	Analogous organs	Homologous organs	Vestigial organs

Correct Answer: Option C
Homologous organs

Q7 (AIPMT 2008): Which one of the following pairs of items correctly belongs to the category of organs mentioned against it?

Option A	Option B	Option C	Option D
Wings of honey-bee and wings of crow – Homologous organs	Thorn of Bougainvillea and tendrils of Cucurbita – Analogous organs	Nictitating membrane and blind spot in human eye – Vestigial organs	Nephridia of earthworm and malpighian tubules of cockroach – Excretory organs

Correct Answer: Option D

Wings of honey bee and the wings of crow are analogous organs, thorn of Bougainvillea and tendrils of Cucurbita are homologous organs & blind spot in humans represent the point where the optic nerve will leave the eyeball so it is not vestigial.

Chemistry>>

Q1 (AIPMT 2013): A magnetic moment of 1.73 BM will be shown by one among the following:

Option A: $[Cu(NH_3)_4]^{2+}$

Option B: $[Ni(CN)_4]^{2-}$

Option C: $TiCl_4$

Option D: $[COCl_6]^{4-}$

Correct Answer: Option D

μ = 1.73 BM

We know that, μ = $\sqrt{n(n+2)}$ (n = number of unpaired electrons)

$(1.73)^2 = n^2 + 2n$

$n^2 + 2n - 3 = 0$

$n = 1, -3$

$n = 1$

Out of the given cations, $Cu^{2+}([Cu(NH_3)_4]^{2+})$, $Ni^{2+}([Ni(CN)_4]^{2-})$, Ti^{4+} $(TiCl_4)$ and $Co^{2+}([CoCl_6]^{4-})$, only Cu^{2+}has 1 unpaired electron (d^9 configuration).

Therefore, the correct answer is $[Cu(NH_3)_4]^{2+}$.

Q2 (AIPMT 2012): A metal crystallizes with a face-centered cubic lattice. The edge of the unit cell is 408 pm. The diameter of the metal atom is:

Option A: 288 pm

Option B: 408 pm

Option C: 144 pm

Option D: 204 pm

Correct Answer: Option A

For FCC, The relationship between edge length, a and radius of atom R is $a\sqrt{2}=4R$

$$\frac{\sqrt{2}\times 408}{2} = 2R \qquad (2R = \text{Diameter})$$

Diameter =288 pm approx.

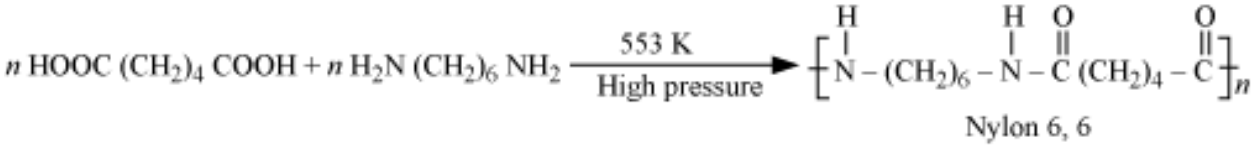
Q3 (AIPMT 2013): Nylon is an example of:

Option A: Polyeater
Option B: Polysaccharide
Option C: Polyamide
Option D: Polythene

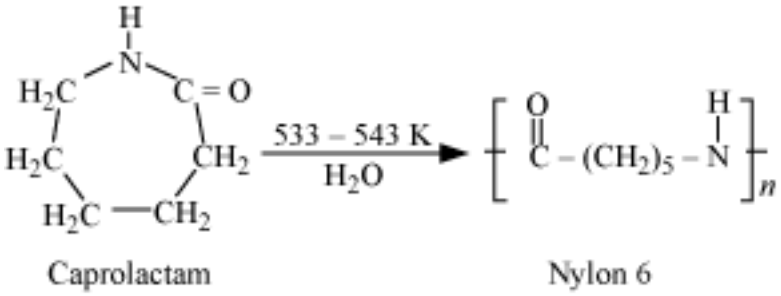
Correct Answer: Option C

Nylon is a condensation polymer containing amide linkage (-CO-NH-). So it is polyamide.

Nylon 6, 6



Nylon 6



Nylon 2-nylon 6

Polyamide co-polymer of glycine ($H_2N{-}CH_2{-}COOH$) and amino caproic acid [$H_2N(CH_2)_5COOH$]

$-[HN{-}CH_2{-}$ CO - HN $(CH_2)_5CO\text{-}HN{-}CH_2{-}CO]_n-$

Q4 (AIPMT 2011): The freezing point depression constant for water is −1.86° Kkg mol^{-1}. If 5.00 g Na_2SO_4 is dissolved in 45.0 g H_2O,the freezing point is changed by −3.82°C. Calculate the van't Hoff factor for Na_2SO_4

Option A: 0.381
Option B: 2.05
Option C: 2.63
Option D: 3.11

Correct Answer: Option C
Na_2SO_4

$$U\sin g, \Delta T_f = i \times K_f \times m$$

$$I = \frac{T_f \times W_A}{K_f \times n_B \times 1000} = \frac{3.82 \times 45}{1.86 \times \left(\frac{5}{142}\right) \times 1000} = 2.63$$

Q5 (AIPMT 2013): A button cell used in watches functions as following:

$$Zn(s) + Ag_2O(s) + H_2O(l) \text{ƒ } 2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$$

If half cell potentials are

$$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s); E^\circ = -0.76V$$

$$Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq), E^\circ = 0.34V$$

The cell potential will be:

Option A: 1.10 V
Option B: 0.42 V
Option C: 0.84 V
Option D: 1.34 V

Correct Answer: Option A

The reaction is:

$Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow 2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$

Oxidation reaction:

$Zn \rightarrow Zn^{2+} + 2e^-$ $E^o = -0.76$ V

Reduction reaction:

$Ag_2O + H_2O + 2e^- \rightarrow 2Ag + 2OH^-$ $E^o = 0.34$ V

$$E^o_{cell} = E^o_{cathode} - E^o_{anode}$$

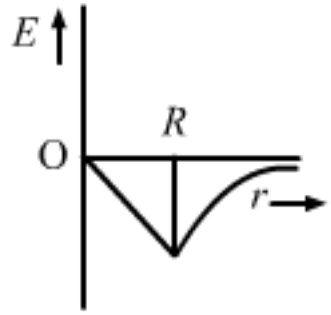
$$E^o_{cell} = 0.34 - (-0.76) = 1.1V$$

Therefore, the correct answer is 1.1 V.

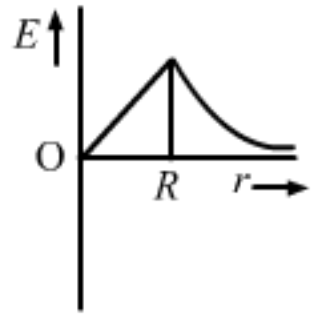
Physics>>

Q1 (AIPMT 2012): Dependence of intensity of gravitational field (*E*) of earth with distance (*r*) from centre of earth is correctly represented by:

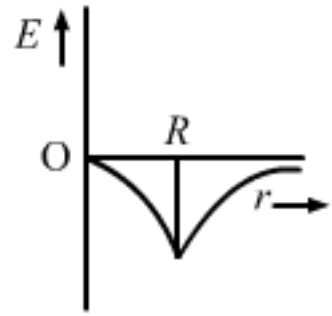
Option A:



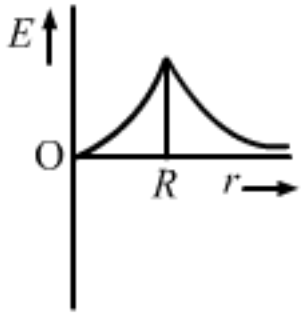
Option B:



Option C:



Option D:



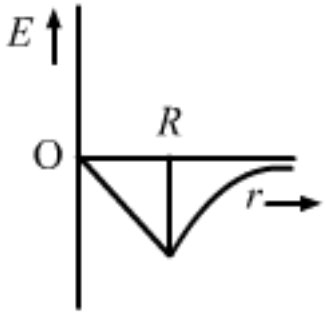
Correct Answer: Option A

The intensity of gravitational field of the earth at a distance *r* from the centre of the earth is given by:

$E = \frac{-GMr}{R^3} \quad (For\ r < R)$

and $E = \frac{-GM}{r^2} \quad (For\ r > R)$

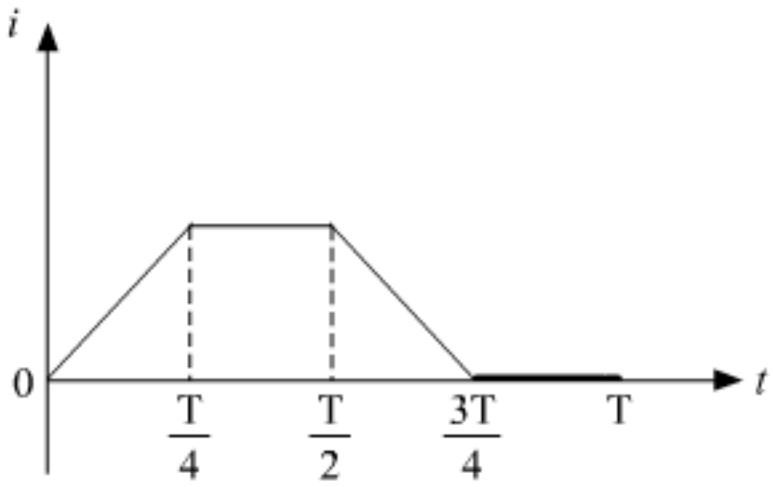
Here, *M* is the mass of the earth, *R* is the radius of the earth and *G* is the gravitational constant.



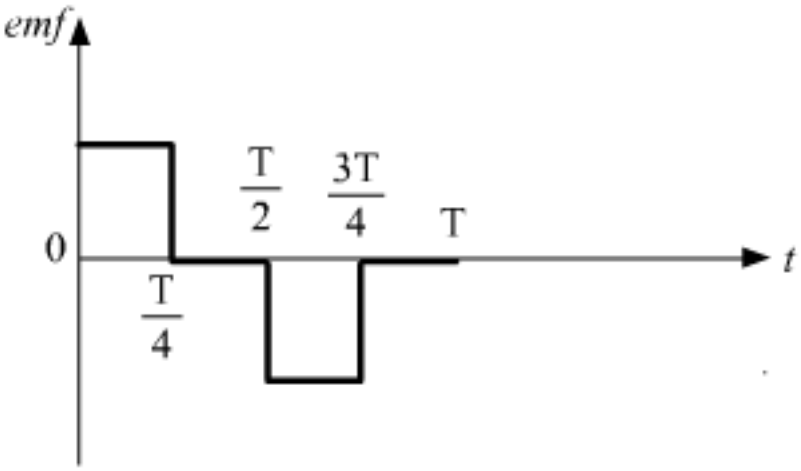
This graph correctly represents the dependence of the intensity of gravitational field (*E*) of the earth with distance *r* from its centre.

Hence, the correct option is (A).

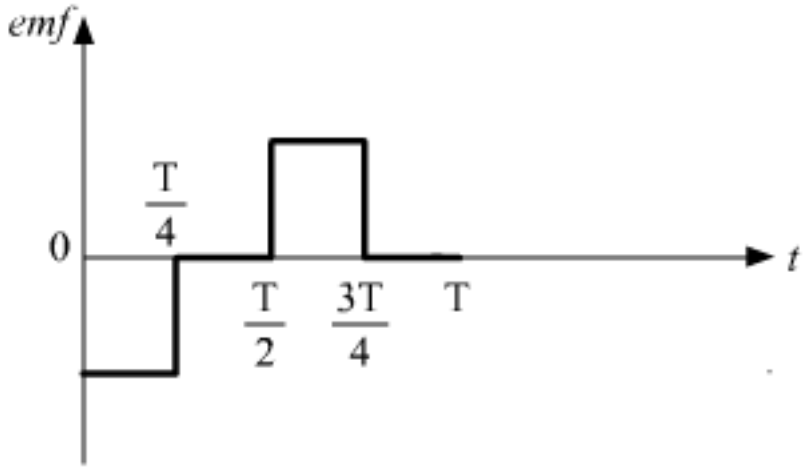
Q2 (AIPMT 2011): The current *i* in a coil varies with time as shown in the figure. The variation of induced emf with time would be:



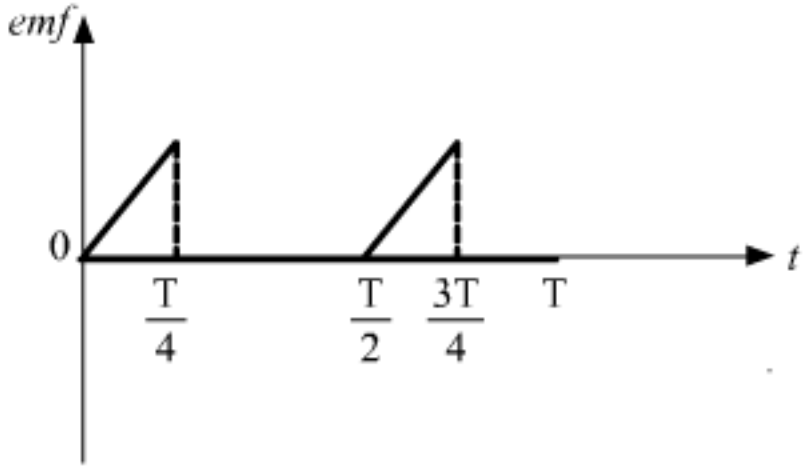
Option A:



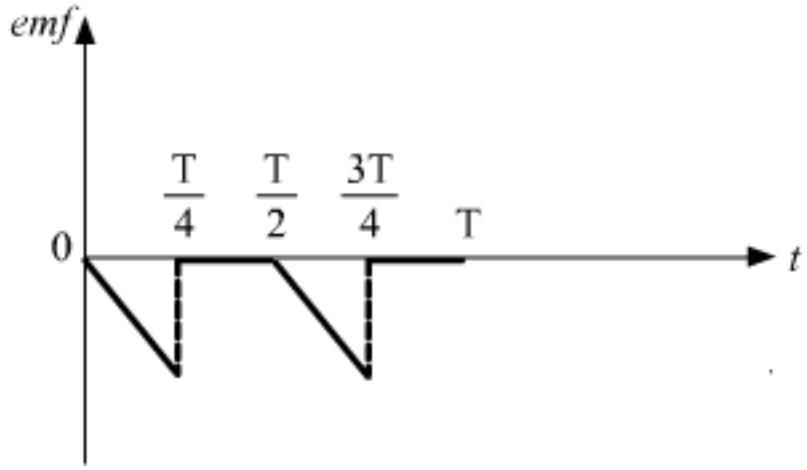
Option B:



Option C:



Option D:



Correct Answer: Option B

$$e = -L\frac{di}{dt}$$

During 0 to T/4

$\frac{di}{dt}$ = constant $\Rightarrow e$ is negative

$\frac{T}{4}$ to $\frac{T}{2}$, $\frac{di}{dt} = 0 \Rightarrow e$ is 0

$\frac{T}{2}$ to $\frac{3T}{4}$, $\frac{di}{dt} = 0 \Rightarrow e$ is positive

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Q3 (AIPMT 2010): A common emitter amplifier has a voltage gain of 50, an input impedance of 100Ω and an output impedance of 200 Ω . The power gain of the amplifier is:

Option A: 500
Option B: 100
Option C: 1250
Option D: 50

Correct Answer: Option C

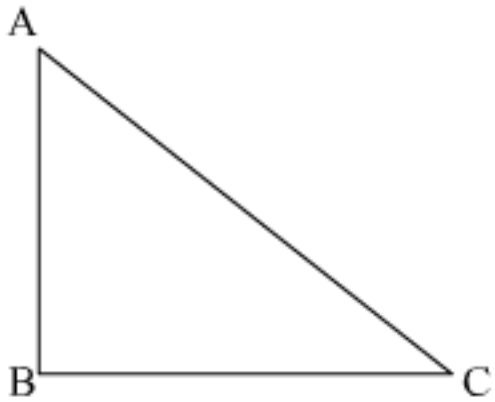
Power gain

$$V_G \cdot I_G = \frac{V_0}{V_i} * \frac{I_0}{I_i}$$

$$= \frac{V_0^2}{V_i^2} * \frac{R_i}{R_0} = 50 \times 50 \times \frac{100}{200}$$

$$= \frac{2500}{2} = 1250$$

Q4 (AIPMT 2011): A current carrying closed loop in the form of a right angle isosceles triangle ABC is placed in a uniform magnetic field acting along AB. If the magnetic force on the arm BC is $\vec{F}$, the force on the arm AC is



Option A: $\sqrt{2}\vec{F}$

Option B: $-2\sqrt{2}\vec{F}$

Option C: $-\vec{F}$

Option D: $\vec{F}$

Correct Answer: Option C

Component of AC perpendicular to magnetic field is just equal in magnitude and opposite in direction to BC so force on AC is $-\vec{F}$

Q5 (AIPMT 2013): In Young's double slit experiment, the slits are 2mm apart and are illuminated by photons of two wavelengths

$\lambda_1 = 12000\,\mathring{A}$ and $\lambda_2 = 10000\,\mathring{A}$ **. At what minimum distance from the common central bright fringe on the screen 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other?**

Option A: 8 mm
Option B: 6 mm
Option C: 4 mm
Option D: 3 mm

Correct Answer: Option B

$$\because \frac{\lambda_1}{\lambda_2} = \frac{n_2}{n_1} = \frac{12000}{10000} = \frac{6}{5}$$

Thus the 5th bright fringe of wavelength 1200 Å coincides with the 6th bright fringe of wavelength 1000 Å.

$$x = \frac{n_1 \lambda_1 D}{d} = \frac{5 \times 12000 \times 10^{-10} \times 2}{2 \times 10^{-3}} = 6 \times 10^{-3} \text{ m} = 6 \text{ mm}$$
