

CRASH COURSE

NEET 2021-22

PHYSICS

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- The period of oscillation (T) depends upon radius R , density ρ and gravitational constant G . Derive formula for T .
 - $k\rho G^{-1/2}$
 - $k\rho^{-1/2}G$
 - $k(\rho G)^{-1/2}$
 - $k(\rho G)^{1/2}$
- A particle has a velocity $4\hat{i}-3\hat{j}$ at any instant and has an acceleration $(-2\hat{i}+a\hat{j})\text{ ms}^{-2}$. Find the time when the velocity becomes zero and find the value of a :
 - 2 sec, 1.5 ms^{-2}
 - 4 sec, 3 ms^{-2}
 - 4 sec, 2.5 ms^{-2}
 - 2 sec, 3 ms^{-2}

3. A 175 m long train is travelling along a straight track with a velocity of 72 km h^{-1} . A bird is flying parallel to the train in the opposite direction with a speed of 18 km h^{-1} . The time taken by the bird to cross the train is :
- (a) 35 s (c) 27 s
(b) 7 s (d) 11.6 s
4. Find a vector parallel to $(3\hat{i} + 4\hat{j})$ and having magnitude equal to 10.
- (a) $8\hat{i} + 6\hat{j}$ (c) $15\hat{i} + 20\hat{j}$
(b) $6\hat{i} + 8\hat{j}$ (d) $5\hat{i} + 5\sqrt{3}\hat{j}$
5. $\vec{a} + \vec{b} + \vec{c} = 0$, then $\vec{b} \times \vec{c}$ is :
- (a) $\vec{c} \times \vec{a}$ (c) $\vec{b} \times \vec{c}$
(b) $\vec{a} \times \vec{c}$ (d) $\vec{c} \times \vec{b}$
6. A boat crosses from A to B , which are just on the opposite banks. The width of the river is D . the speed of water is v_w and that of boat is v_B relative to still water. Assume $v_B = 2v_w$. Time taken by the boat, if it has to cross directly.
- (a) $\frac{2D}{\sqrt{3} \cdot v_B}$ (c) $\frac{D}{v_B \sqrt{2}}$
(b) $\frac{\sqrt{3} D}{2v_B}$ (d) $\frac{D\sqrt{2}}{v_B}$
7. The equation of motion of a projectile is $y = 4x - \frac{x^2}{3}$. The horizontal component of velocity is 10 ms^{-1} . Then the range of the projectile is : ($g = 10 \text{ ms}^{-2}$)
- (a) 20 m (c) 80 m
(b) 40 m (d) 160 m
8. A projectile is projected with an initial velocity of $(5\hat{i} + 8\hat{j}) \text{ ms}^{-1}$. If $g = 10 \text{ ms}^{-2}$, then the range of the projectile is :
- (a) 8 m (c) 24 m
(b) 16 m (d) 4 m
9. Two stones are projected with the same speed but making different angles with the horizontal. Their ranges are equal. Angle of projection of one is $\pi/3$ and the maximum height reached by it is 102 metre. Then maximum height reached by the other :
- (a) 336 (c) 56
(b) 224 (d) 34

10. If retardation produced by air resistance to the projectile is one tenth of acceleration due to gravity, the time to reach maximum height :
- (a) decreases by 11%
 - (b) increases by 11%
 - (c) decreases by 9%
 - (d) increases by 9%



Answer & Solutions

1. (c)

$$\text{Solution : } T \propto R^a S^b G^c$$

$$T = k R^a S^b G^c$$

$$M^0 L^0 T^1 = [L]^a [ML^{-3}]^b [M^{-1} L^3 T^2]^c$$

$$b - c = 0 \quad \dots(\text{i})$$

$$a - 3b + 3c = 0 \quad \dots(\text{ii})$$

$$1 = -2c \quad \dots(\text{iii})$$

$$\Rightarrow T = k R^0 S^{-1/2} G^{-1/2}$$

2. (a)

$$v = u + at$$

$$0 = (4\hat{i} - 3\hat{j}) + (-2\hat{i} - a\hat{j})t$$

$$\Rightarrow 4 - 2t = 0 \text{ or } t = 2$$

$$-3 + at = 0 \text{ or } -3 + a \times 2 = 0$$

$$a = +1.5 \text{ m/s}^2$$

3. (b)

$$V_{\text{bird-train}} = 72 + 18 = 90 \text{ km/h}$$

$$\Rightarrow T = \frac{175}{1000} \times \frac{1}{90} \text{ hour or } T = 7 \text{ sec}$$

4. (b)

$$\text{Vector to } (3\hat{i} + 4\hat{j}) \text{ is } (3m\hat{i} + 4m\hat{j}) \text{ its mod is } \sqrt{9m^2 + 16m^2} = 10$$

$$\Rightarrow 25m^2 = 100 \Rightarrow m = 2$$

$$\text{So, required vector is } (6\hat{i} + 8\hat{j})$$

5. (a)

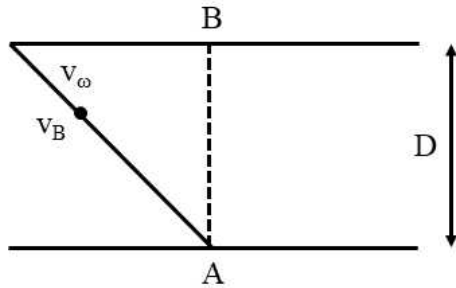
$$\vec{a} + \vec{b} + \vec{c} = 0$$

$$\Rightarrow \vec{b} = -(\vec{a} + \vec{c})$$

$$\vec{b} \times \vec{c} = -(\vec{a} + \vec{c}) \times \vec{c}$$

$$= -\vec{a} \times \vec{c} = \vec{c} \times \vec{a}$$

6. (a)

 $v_{\text{resultant}}$ in AB direction

$$t = \frac{D}{\sqrt{v_B^2 - v_\omega^2}}$$

$$\text{As } v_B = 2 v_\omega$$

$$t = \frac{2D}{\sqrt{3} \cdot v_B}$$

7. (c)

$$y = 4x - \frac{x^2}{3}$$

$$y' = \frac{4dx}{dt} - \frac{2x}{3}$$

$$4 \times 10 - \frac{2x}{3}$$

$$\text{At } t = 0, x = 0, y = 0$$

$$u_y = 40 \text{ m/s}$$

$$\text{Range } R = \frac{2u_x \cdot 4y}{g} = 80 \text{ m}$$

8. (a)

$$\vec{4} = 5\hat{i} + 8\hat{j}$$

$$4x = 5 \text{ m/s}, u_y = 8 \text{ m/s}$$

$$R = \frac{2u_x \cdot u_y}{g} = 8 \text{ m}$$

9. (d)

As range is same for 60° and 30°

$$H_1 = \frac{2u^2 \sin^2 \theta_1}{g}$$

$$H_2 = \frac{2u^2 \sin^2 \theta_2}{g}$$

$$\frac{H_2}{H_1} = \frac{1}{3} \Rightarrow H_2 = \frac{H_1}{3} = \frac{102}{3} = 34$$

10. (c)

$$g' = g + \frac{g}{10} = \frac{11}{10}g$$

$$T_1 = \frac{2u \sin \theta}{g} \quad T_2 = \frac{2u \sin \theta}{g'}$$

$$\frac{T_2}{T_1} = \frac{g}{g'} = \frac{10}{11}$$

$$\% \text{ change in } T \text{ is } \frac{1}{11} \times 100 \approx 9\%$$



CHEMISTRY

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- 34.2g of sucrose ($C_{12}H_{22}O_{11}$) are dissolved in 90g of water in a glass. The number of oxygen atoms in the solution are :
 - 3.66×10^{24}
 - 6.6×10^{23}
 - 6.02×10^{20}
 - 6.02×10^{22}
- What volume of oxygen gas (O_2) measured at $0^\circ C$ and 1 atm, is needed to burn completely 1 L of propane gas (C_3H_8) measured under the same conditions ?
 - 6 L
 - 5 L
 - 10 L
 - 7 L
- Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2 . When 0.1 mole of XY_2 weights 10g and 0.05 mole of X_3Y_2 weights 9g, the atomic weights of X and Y are
 - 40, 30
 - 60, 40
 - 20, 30
 - 30, 20
- How many spectral lines are produced in the spectrum of hydrogen atom from 5^{th} energy level?
 - 5
 - 10
 - 15
 - 4

5. The number of radial and angular nodes in $3p$ orbital are
(a) 1, 0
(b) 2, 1
(c) 1, 1
(d) 2, 0
6. The value of Planck's constant is $6.63 \times 10^{-34} \text{ J s}$. The speed of light is $3 \times 10^{17} \text{ nm s}^{-1}$. What is the uncertainty in its position (in nm)?
($h = 6.626 \times 10^{-34} \text{ J s}$)
(a) 50
(b) 75
(c) 10
(d) 25
7. Atom of which of the following elements has the greatest ability to attract electrons ?
(a) silicon
(b) sulphur
(c) sodium
(d) chlorine
8. The correct order of ionisation enthalpy of C, N, O, F is
(a) $C < O < N < F$
(b) $C < N < O < F$
(c) $F < N < C < O$
(d) $F < O < N < C$
9. Generally, the first ionization enthalpy increases along a period. But there are some exceptions. One which is NOT an exception is
(a) N and O
(b) Na and Mg
(c) Mg and Al
(d) Be and B
10. The paramagnetic behaviour of B_2 is due to the presence of
(a) 2 unpaired electrons in π_b MO
(b) 2 unpaired electrons in π^* MO
(c) 2 unpaired electrons in σ^* MO
(d) 2 unpaired electrons in σ_b MO

Answer & Solutions

1. (a)

$$W_{C_{12}H_{22}O_{11}} = 34.2 \text{ gm}$$

$$W_{H_2O} = 90 \text{ gm}$$

$$342 \text{ gm } C_{12}H_{22}O_{11} = 11 \times 6.022 \times 10^{23} \text{ 'O' atom}$$

$$34.2 \text{ gm } C_{12}H_{22}O_{11} = 11 \times 6.022 \times 10^{23} \times \frac{34.2}{342 \times 10}$$

$$= 11 \times 6.022 \times 10^{22} \text{ oxygen atom}$$

Now,

$$18 \text{ gm } H_2O = 1 \times 6.022 \times 10^{23} \text{ 'O' atom}$$

$$90 \text{ gm } H_2O = \left(\frac{90}{18}\right) \times 6.022 \times 10^{23} \text{ oxygen atom}$$

$$= 5 \times 6.022 \times 10^{23} \text{ oxygen atom}$$

$$\therefore \text{Total no. of oxygen atoms} = 11 \times 6.022 \times 10^{22} + 5 \times 6.022 \times 10^{23}$$

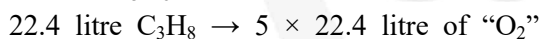
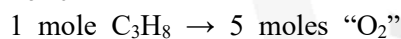
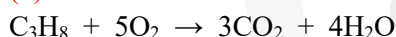
$$= 1.1 \times 6.022 \times 10^{22} + 5 \times 6.022 \times 10^{23}$$

$$= 6.022 \times 10^{23} (1.1 + 5)$$

$$= 6.5 \times 6.022 \times 10^{23}$$

$$= 3.6 \times 10^{24}$$

2. (b)



$$1 \text{ litre } C_3H_8 = \frac{5 \times 22.4}{22.4} \text{ litre of "O}_2\text{"} = 5 \text{ litre}$$

3. (a)

$$0.1 \text{ mole } XY_2 = 10 \text{ gm}$$

$$1 \text{ mole } XY_2 = \frac{1 \times 10}{0.1} = 100 \text{ gm}$$

$$\therefore \text{Molar mass of } XY_2 = 100 \text{ gm}$$

Now,

$$0.05 \text{ mole of } X_3Y_2 = 9 \text{ gm}$$

$$1 \text{ mole of } X_3Y_2 = \frac{9 \times 1}{0.05} \text{ gm} = \frac{9 \times 100}{5} = 180 \text{ gm}$$

$$\text{Molar mass of } X_3Y_2 = 180 \text{ gm}$$

$$\text{Let the atoms weight of } X = a$$

$$\text{Let the atoms weight of } Y = b$$

$$a + 2b = 100$$

$$3a + 2b = 180$$

$$-2a = -80$$

$$\Rightarrow a = \frac{80}{2} = 40\text{gm}$$

\therefore atomic weight of $x = 40\text{gm}$

\therefore atomic weight of $y = 30\text{gm}$

4. (b)

$$\begin{aligned} \text{No. of Spectral lines} &= \frac{(n_2 - n_1)(n_2 - n_1 + 1)}{2} \\ &= \frac{(5 - 1)(5 - 1 + 1)}{2} = \frac{4 \times 5}{2} = 10 \end{aligned}$$

5. (c)

$$\text{No. of angular nodes} = n - l - 1 = 3 - 1 - 1 = 1$$

$$\text{No. of angular nodes} = 1 = 1$$

6. Wrong Question

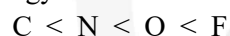
None

7. (d)

Chlorine has high value of electron gain enthalpy.

8. (b)

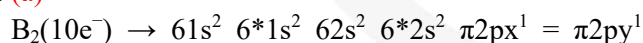
Along the period Ionization enthalpy increases but half filled and full filled subshells have more ionization energy.



9. (b)

This is general trend.

10. (a)



BIOLOGY

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1. Study the four statements (I-IV) given below and select the two correct ones out of them:
 - (i) Definition of biological species was given by Ernst Mayr.
 - (ii) Photoperiod does not affect reproduction in plants.
 - (iii) Binomial nomenclature system was given by RH whittaker.
 - (iv) In unicellular organisms, reproduction is synonymous with growth.The two correct statements are
 - (a) (i) and (iii)
 - (b) (iii) and (iv)
 - (c) (i) and (iv)
 - (d) (i) and (ii)
2. First life on earth was
 - (a) Cyanobacteria
 - (b) Chemoheterotrophs
 - (c) Autotrophs
 - (d) Photoautotrophs
3. Select wrong statement.
 - (a) The viroids were discovered by DJ Ivanowski
 - (b) WM Stanley showed that viruses could be crystallised
 - (c) The term Contagium vivum fluidum was coined by MW beijerinck
 - (d) Mosaic disease in tobacco and AIDS in human being are caused by viruses

4. Which statement is wrong for viruses?
 - (a) All are parasites
 - (b) All of them have helical symmetry
 - (c) They have ability to synthesise nucleic acids and proteins
 - (d) Antibiotics have no effect on them

5. In eubacteria, a cellular component that resembles eukaryotic cells is
 - (a) Nucleus
 - (b) Ribosomes
 - (c) Cell wall
 - (d) Plasma membrane

6. Pick up the wrong statement.
 - (a) Cell wall is absent in Animalia
 - (b) Protista have photosynthetic and heterotrophic modes of nutrition
 - (c) Some fungi are edible
 - (d) Nuclear membrane is present in Monera

7. Extranuclear inheritance occurs in
 - (a) Killer strain in paramecium
 - (b) Colour blindness
 - (c) phenylketouria
 - (d) Tay sachs disease

8. Protists obtain food as
 - (a) Photosynthesisers, symbionts and holotrophs
 - (b) Photosynthesisers
 - (c) Chemosynthesisers
 - (d) Holotrophs

9. The part of life cycles of malarial parasite plasmodium vivax, that is passed in female Anopheles is
 - (a) Sexual cycle
 - (b) pre-erythrocytic schisogony
 - (c) exo-erythrocytic schisogony
 - (d) post-erythrocytic schisogony

10. Cellulose is the major component of cell walls of
 - (a) Pythium
 - (b) Xanthomonas
 - (c) Pseudomonas
 - (d) Saccharomyces

Answer & Solutions

- (c)
Statements I and IV are correct, The correct form of II and III are as follows :
(II) Photoperiod does affect the reproduction in plants.
(III) Binomial nomenclature was given by carolus Linnaeus.
- (b)
First living beings were formed in the environment of sea having abundant organic molecules. They absorbed the organic materials for the sake of nutrition and hence, were chemoheterotrophs.
- (a)
All statements are correct except the statement
(a) Which can be corrected as Viroids were discovered by To Diener in 1971 as a new infectious agent that was smaller than virus.
- (b)
The nucleocapsids of viruses are constructed in highly symmetric ways. Two types of symmetry are recognised in viruses. which correspond to the two primary shapes. rod and spherical
Road-shaped viruses have helical symmetry and spherical viruses have icosahedral symmetry.
- (d)
The plasma membrane of eubacteria resembles to that of eukaryotic cell. It is made of phospholipid, protein and some amount of polysaccharides. However. it lacks sterol, the characteristic of eukaryotic cell membrane. Instead, there is sterol like compounds called hopanoid.
- (d)
In protista kingdom members exhibit both autotrophic as well heterotrophic nutrition. Animal cells lack cell wall and there are a few fungi that are edible. Monera is the kingdom that contains unicellular organisms with a prokaryotic cell organisation, i.e., which lacks nuclear membrane and other membrane bound organelles
- (a)
Paramecium exhibits cytoplasmic inheritance due to the presence of kappa particles (self replicating bodies that produce toxin called paramecin). Besides binary fission and conjugation other reproductive processes that occurs in Paramecium are autogamy, endomixis and cytogamy.
- (a)
Protists have variable modes of nutrition. They are photosynthetic heterotrophic, i.e., saprophytic, parasitic and ingestive.

9. (a)
Sexual phase in the life cycle of plasmodium occurs in the gut of mosquito. Sexual phase involves the gametocytes, megametocytes (female) and microgametocytes (male) which reach the stomach of female anopheles mosquito by sucking human blood
10. (a)
Cellulose does occur in cell walls of Oomycetes (e.g, Pythium) and Hyphochytridiomycetes. Fungal cell wall contains 80-90% carbohydrates, the remainder being proteins and lipids. The typical feature of fungal cell wall is presence of chitin.

