Ultimate KCET Crash Course 2026

PHYSICS

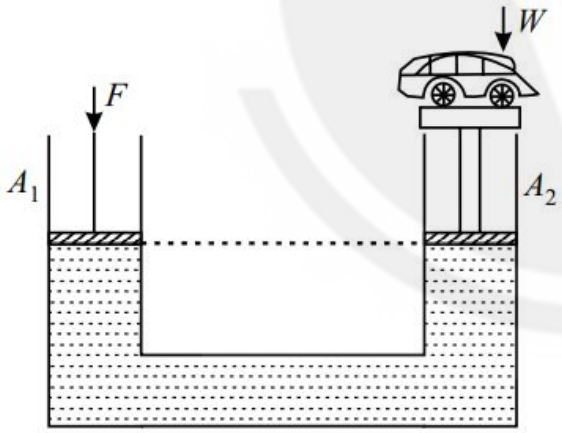
Mechanical properties of fluids & Thermal properties of Matter

DPP :- 01

Q1 It is easy to wash clothes in hot water because its:
(A) surface tension is more.
(B) surface tension is less.
(C) consumes less soap.
(D) None of these

Q2 Bernoulli's principle is based on the law of conservation of:
(A) mass.
(B) energy.
(C) angular momentum.
(D) linear momentum.

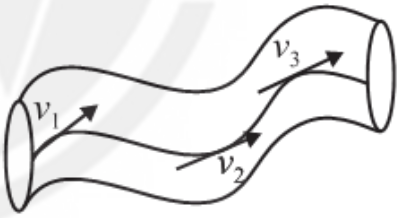
Q3 In a hydraulic jack as shown, mass of the car W=800kg, A_1=10cm^2,A_2=10m^2. The minimum force F required to lift the car is



(A) 1N (B) 0.8N
(C) 8N (D) 16N

Q4 The weight of an aeroplane flying in air is balanced by
(A) Upthrust of the air which will be equal to the weight of the air having the same volume as the plane
(B) Force due to the pressure difference between the upper and lower surfaces of the wings, created by different air speeds on the surface
(C) Vertical component of the thrust created by air currents striking the lower surface of the wings
(D) Force due to the reaction of gases ejected by the revolving propeller

Q5 Consider streamline flow of a liquid flowing through a tube as shown in the figure. Which of the following is correct regarding velocities of liquid at different points?



(A) v_1 = constant, v_2 = constant, v_3 = constant
(B) $v_1 \neq v_2 \neq v_3$
(C) $v_1 = v_2 = v_3$
(D) both (1) and (2) are correct.

Q6 Hydraulic brakes are based on:-
(A) Pascal's law
(B) Torricelli's law
(C) Newton's law
(D) Boyle's law

Q7 The density of glycerine is 1260 kgm^{-3} . What is the relative density? (Density of water is 1000 kgm^{-3}).

(A) 0.63 (B) 1.26
(C) 12.6 (D) 6.3

Q8 Two capillary tubes *P* and *Q* are dipped in water. The height of water level in capillary *P* is 2/3 times the height in *Q* capillary. The ratio of their diameters is

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

Q9 Water rises upto a height h in a capillary on the surface of the earth in stationary condition. Value of h increases if this tube is taken

(A) On sun
(B) On poles
(C) In a lift going upward with acceleration
(D) In a lift going downward with acceleration

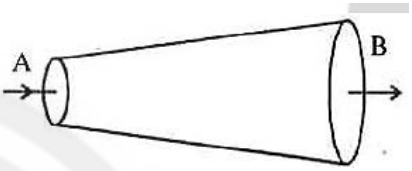
Q10 Assertion (A): When height of a tube is less than liquid rise in the capillary tube, the liquid does not
overflow.
Reason (R): Product of radius of meniscus and height of liquid in capillary tube always remains
constant.

(A) Both Assertion (A) and Reason (R) are thetrue and Reason (R) is a correct explanationof Assertion (A).
(B) Both Assertion (A) and Reason (R) are thetrue but Reason (R) is not a correctexplanation of Assertion (A).
(C) Assertion (A) is true and Reason (R) isfalse.
(D) Assertion (A) is false and Reason (R) istrue.

Q11 If a given mass of gas occupies a volume 60 m^3 at one atmospheric pressure and temperature of 100°C, what will be its volume at 4 atmospheric pressure when temperature remains same?

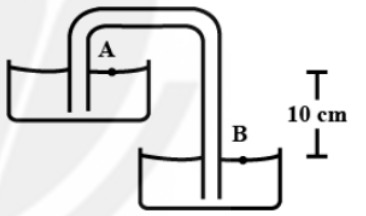
(A) 5 cm^3 (B) 50 cm^3
(C) 0 (D) 15 cm^3

Q12 An ideal fluid flow through a pipe of circular cross section with diameters 5 cm and 10 cm as shown. The ratio of velocities of fluid at A and B is



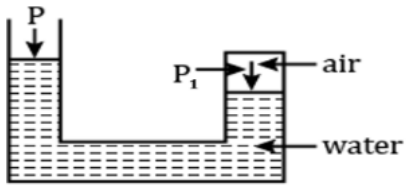
(A) 4 : 1 (B) 1 : 4
(C) 2 : 1 (D) 1 : 2

Q13 Figure shows a siphon and the liquid shown is water. The pressure difference $P_B - P_A$ between the points *A* and *B* is



(A) 400 N m^{-2}
(B) 3000 N m^{-2}
(C) 1000 N m^{-2}
(D) Zero

Q14 The pressure of confined air is P_1. If the atmospheric pressure is P, then



(A) P is equal to P_1

(B) P is less than P_1

(C) P is greater than P_1

(D) P may be less or greater than P_1 depending on the mass of the confined air

Q15 Pressure is applied to an enclosed fluid. It is

(A) increased and applied to every part of the fluid

(B) diminished and transmitted to the walls of the container

(C) increased in proportion to the mass of the fluid and then transmitted

(D) transmitted unchanged to every portion of the fluid and the walls of container

Q16 A fluid is in streamline flow across a horizontal pipe of variable area of cross-section. For this which of the following statements is correct?

(A) Velocity of fluid is maximum at narrowest part.

(B) Pressure of the fluid is maximum at widest part.

(C) Both (A) and (B)

(D) Neither (A) nor (B)

Q17 In which one of the following cases, will the liquid flow in a pipe be most streamlined?

(A) Liquid of high viscosity and high density flowing through a pipe of small radius

(B) Liquid of high viscosity and low density flowing through a pipe of small radius

(C) Liquid of low viscosity and low density flowing through a pipe of large radius

(D) Liquid of low viscosity and high density flowing through a pipe of large radius

Q18 In a soap bubble, pressure differecnce is

(A) $\frac{2S_{la}}{r}$ (B) $\frac{4S_{la}}{r}$

(C) $\frac{S_{la}}{r}$ (D) $\frac{8S_{la}}{r}$

Q19 A rain drop of radius 0.3 mm falls through air with a terminal velocity of $1\ \mathrm{m\ s^{-1}}$. The viscosity of air is 18×10^{-5} poise. The viscous force on the rain drop is

(A) 1.018×10^{-2} dyne

(B) 2.018×10^{-2} dyne

(C) 3.018×10^{-2} dyne

(D) 4.018×10^{-2} dyne

Q20 A raindrop is released from a cloud 1000 m above ground. When the drop is about to hit the ground, its speedwill be

(A) Cannot be predicted

(B) Constant terminal speed

(C) Decreasing due to retardation from air drag

(D) Increasing due to acceleration due to gravity

Q21 The surface energy of a liquid drop is U. It is splitted into 1000 equal droplets. Then its surface energy becomes

(A) U

(B) 10 U

(C) 100 U

(D) 1000 U

Q22 The surface energy of a film of liquid on a ring of area 0.04 m^2 is (surface Tension = 6 Nm^{-1})

(A) 0.12 J (B) 0.24 J

(C) 0.36 J (D) 0.48 J

Q23 Dynamic lift of an aeroplane is based on:

(A) Torricelli Theorem

(B) Bernoulli's Theorem

(C) Conservation of angular momentum

(D) Principle of continuity

Q24 The device which measures the flow speed of incompressible fluid is:
(A) Sphygmomanometer
(B) Open-tube manometer
(C) Venturimeter
(D) Mercury barometer

Q25 A water film is formed between two parallel wires of 10 cm length. The distance of 0.5 cm between the wires is increased by 1 mm. What will be the work done?
(Given, surface tension of water is 72 Nm^{-1})
(A) 2.88×10^{-3} J
(B) 1.44×10^{-2} J
(C) 7.2×10^{-2} J
(D) 3.6×10^{-3} J

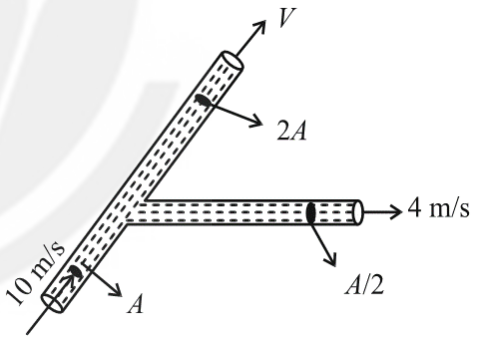
Q26 Which law states that the magnitude of pressure within fluid is equal in all parts?
(A) Pascals law
(B) Gay-Lusacs law
(C) Daltons law
(D) None of these

Q27 How much lead of specific gravity 11 should be added to a piece of cork of specific gravity 0.2 weighing 10 g so that it may just float on water?
(A) 4.4 g
(B) 44 g
(C) 440 g
(D) 2.2 g

Q28 64 identical drops of mercury are charged simultaneously to the same potential of 10 volt. Assuming the drops to be spherical, if all the charged drops are made to combine to form one large drop, then its potential will be
(A) 100 V (B) 320 V
(C) 640 V (D) 160 V

Q29 A cylindrical vessel open at the top is 20 cm high and 10 cm in diameter. A circular hole of cross sectional area 1 cm^2 is cut at the centre of the bottom of the vessel. Water flows from a tube above it into the vessel at the rate of 102 cm^3 /s The height of water in the vessel under steady state is (Take g = 10m /s^2)
(A) 20 cm (B) 15 cm
(C) 10 cm (D) 5 cm

Q30 An incompressible liquid is flowing through a horizontal pipe as shown in the figure. Speed of fluid and cross-section area of each section are indicated. The value of *V* is:



(A) 1 m/s (B) 2 m/s
(C) 3 m/s (D) 4 m/s

Answer Key

Q1	B
Q2	B
Q3	B
Q4	B
Q5	D
Q6	A
Q7	B
Q8	B
Q9	D
Q10	A
Q11	D
Q12	A
Q13	D
Q14	B
Q15	D
Q16	C
Q17	B
Q18	B
Q19	A
Q20	B
Q21	B
Q22	D
Q23	B
Q24	C
Q25	D
Q26	A
Q27	B
Q28	D
Q29	D
Q30	D

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

Surface tension of water decrease with rise in temperature.

Video Solution:

Q2 Text Solution:

Bernoulli's principle is based on the law of conservation of energy.

Video Solution:

Q3 Text Solution:

$F = \frac{mg}{A_2} \times A_1 = \frac{800 \times 10}{10} \times 10 \times 10^{-4} = 0.8N$

Video Solution:

Q4 Text Solution:

The upper surface of the wings of the plane is curved more and lower surface of the wings is less curved. Due to this speed of the air above the wings is greater than the speed of the air below the wings.

Here bernouli's theorem comes in role

The pressure of the air is higher with less speed and pressure of air is low with higher speed. Therefore the pressure below the wings is higher than that of above the wings. The difference in pressure observed on both sides of the wings of the airplane creates vertical lift on aeroplane.

Video Solution:

Q5 Text Solution:

In streamline flow,

v_1 = constant, v_2 = constant, v_3 = constant

But, $v_1 \neq v_2 \neq v_3$

So, both (1) and (2) are correct.

Video Solution:

Q6 Text Solution:

So hydraulic brakes are based on the principle of Pascal's law.

According to this law, whenever some pressure is applied on a fluid, it moves uniformly along all directions.

So a hydraulic brake is an arrangement of braking mechanism which uses internally brake fluid, containing typically glycol ethers. (In hydraulic brakes liquids are used instead of gas as liquid is incompressible, even under high pressure.)

Video Solution:

Q7 Text Solution:

The Relative density of any substance is the ratio of the density of the substance with the density of the water.

$$Relative\ density = \frac{\text{density of glycerine}}{\text{density of water}}$$

$$= \frac{1260}{1000} = 1.26$$

Video Solution:

Q8 Text Solution:

$$r \propto \frac{1}{h} \Rightarrow \frac{r_p}{r_Q} = \frac{h_Q}{h_P} \Rightarrow \frac{r_P}{r_Q} = \frac{h}{\frac{2}{3}h} = \frac{3}{2}$$

Video Solution:

Q9 Text Solution:

If lift moves downward with some acceleration, then effective g decreases. So, h increases.

$\because\ h \propto \frac{1}{g_{eff}}$

Video Solution:

Q10 Text Solution:

hR = constant

Hence when the tube is of insufficient length, radius of curvature of the liquid meniscus increases, so as to maintain the product *hR* a finite constant.

i.e. as *h* decreases, *R* increases and the liquid meniscus becomes more and more flat, but the

liquid does not overflow

Video Solution:

Q11 Text Solution:

Pressure is inversely proportional to volume at constant temperature

$$\frac{P_1}{P_2} = \frac{V_2}{V_1}$$

$$\frac{1}{4} = \frac{V_2}{60}$$

$$V_2 = 15m^3$$

Video Solution:

Q12 Text Solution:

$$a_1 v_1 = a_2 v_2$$

$$\frac{\pi D_1^2}{4} v_1 = \frac{\pi D_2^2}{4} v_2$$

$$\frac{v_1}{v_2} = \left(\frac{D_2}{D_1}\right)^2 = \left(\frac{10}{5}\right)^2 = \left(\frac{2}{1}\right)^2 = \frac{4}{1}$$

Video Solution:

Q13 Text Solution:

The pressure at these two points are equal to atmospheric pressure hence their difference is zero

Video Solution:

Q14 Text Solution:

$$Pressure\ of\ confined\ air\ can\ be\ given\ by,$$

$$P_{air} = P_1 = P + \rho gh$$

$$P_1 > P$$

Video Solution:

Q15 Text Solution:

Pascals Law says that - "Pressure exerted anywhere on a enclosed liquid is transmitted unchanged in every direction, to every portion of the liquid, and to all the walls of the containing vessel".

Video Solution:

Q16 Text Solution:

According to the equation of continuity,

A*v* = constant

Therefore, velocity of the fluid is minimum at the

widest part and maximum at the narrowest part of the horizontal pipe.

Again, according to Bernoulli's principle for horizontal pipe,

Hence, *p* is more, *v* is less and vice-versa. Therefore, when a fluid is flowing through the horizontal pipe of variable area of cross-section, then velocity is maximum at the narrowest part of the pipe and pressure is maximum at the widest part of the pipe

Video Solution:

Q17 Text Solution:

For streamline flow, Reynold's number $R_e \propto \frac{r\rho}{\eta}$ should be less. For less value of R_e, radius, density should be small and viscosity should be high.

Video Solution:

Q18 Text Solution:

» In a soap bubble, pressure difference is

» By laplace's law for bubbles

$P_{in} - P_{out} = \frac{4S}{R}$ S= surface tension

R = radius

» $(P_{in} - P_{out}) = P_{ex} = \frac{4S}{R}$

» The surface tension, drops and bubbles have a tendency to contract and compress the fluid inside. Bubble will compress the air inside.

» So inside pressure is greater than the outside one. $p_{in} > p_{out}$

Video Solution:

Q19 Video Solution:

Q20 Text Solution:

The rain drops acquire terminal velocity after falling long distance due to balance of buoyant force and weight of the drop dueto gravity.

Video Solution:

Q21 Text Solution:

$\text{Surface tension} = \frac{\text{surface energy}}{\text{area}}$

$U = TA = T4\pi R^2$

but, volume of big drop = 1000 volume of small drop

$\frac{4}{3}\pi R^3 = 1000\frac{4}{3}\pi r^3 = 10^3 r^3$

Radius of small drop $r = \frac{R}{10}$

Surface energy of each small drop, $U' = T.4\pi\left(\frac{R}{10}\right)^2 = \frac{1}{100}U$

Surface energy of 1000 small drops $= \frac{1000}{100}U = 10U$

Video Solution:

Q22 Text Solution:

Surface energy = $T \times$ Area = $6 \times 0.04 \times 2 = 0.48\ J$

(Here as film has two layers, area = $0.04 \times 2m^2$)

Video Solution:

Q23 Text Solution:

Bernoulli's theorem is behind the lift of an aeroplane if the energy of wind flow is constant ,then where air in low pressure region wind will move with high speed and in low pressure the speed of wind will decrease the wings of plane create a pressure difference between upper wing and lower wing which create a pressure difference and this pressure difference gives lift to the plane to overcome its gravitational weight take the lift

According to bernoulli theorem

$P + \frac{\rho v^2}{2} + pgh = \text{Constant}$

P=pressure at that point

v = speed at that particular point

ρ=density of the fluid

h=height

g = acceleration due to gravity

Video Solution:

Q24 Text Solution:

The device which measures the flow speed of incompressible fluid is Venturimeter.

Video Solution:

Q25 Text Solution:

Length of water film,

$l = 10\ \text{cm} = 0.1\ m$

Distance between the two parallel wires.

$b = 0.5\ \text{cm} = 0.5 \times 10^{-2}\ \text{m}$

Initial area of water film,

$A_1 = l \times b$

$= 0.1 \times 0.5 \times 10^{-2}\ \text{m}^2$

$= 5 \times 10^{-4}\ \text{m}^2$

When distance between the parallel wires is increased by 1 mm, then new distance,

$b' = 0.5\ \text{cm} + 1\ \text{mm}$

$= 0.5\ \text{cm} + 0.1\ \text{cm}$

$= 0.6\ \text{cm}$

$= 0.6 \times 10^{-2}\ \text{m}$

Hence, final area of water film,

$A_2 = l \times b'$

$= 0.1 \times 0.6 \times 10^{-2}\text{m}^2$

$= 6 \times 10^{-4}\ \text{m}^2$

Since, water film has two free surfaces, hence net change in area,

$A = 2(A_2 - A_1)$

$= 2\left(6 \times 10^{-4} - 5 \times 10^{-4}\right)$

$= 2 \times 10^{-4}\ \text{m}^2$

$\therefore$ Work done,

$W = T \times A = 72 \times 2 \times 10^{-4} = 1.44 \times 10^{-2}\ \text{J}$

Video Solution:

Q26 **Text Solution:**

Pascal's law states that the pressure applied to an enclosed fluid will be transmitted without a change in it's magnitude to every point of the fluid and to the walls of the container. Thus, the pressure at any point in the fluid is equal in all directions.

Video Solution:

Q27 **Text Solution:**

For Flotation

$m_1 g + m_2 g = (V_1 + V_2)\sigma_w g$

$m_1 + 10 = \left(\frac{m_1}{11\sigma_w} + \frac{m_2}{0{\cdot}2\sigma_w}\right)\sigma_\omega$

$\Rightarrow m_1 = 44g$

Video Solution:

Q28 **Text Solution:**

$V = \frac{(64q)}{4\pi\varepsilon_0 R} = \frac{64q}{4\pi\varepsilon_0(4r)}$

$= 16\left(\frac{q}{4\pi\varepsilon_0 r}\right) = 16 \times 10 = 160\ \text{V}$

Video Solution:

Q29 **Text Solution:**

$\left(\frac{dv}{dt}\right)_{in} = \left(\frac{dv}{dt}\right)_{out}$

$102 = Av = A\sqrt{2gh}$

$102 \times 102 = 1 \times 2 \times 10 \times 10^2 \times h$

$h = 5\ cm$

Video Solution:

Q30 **Text Solution:**

$A_1 v_1 = A_2 v_2 + A_3 v_3$

$10A = v \cdot 2A + 4 \times \frac{A}{2}$

$10A - 2A = 2vA$

$8A = 2vA$

$v = 4$ m/s

[New NCERT Class 11th Page No. 188]

Video Solution: