

TALLENTEX Physics

Sample Paper – 2

Duration: 23 Minutes

Maximum Marks: 60

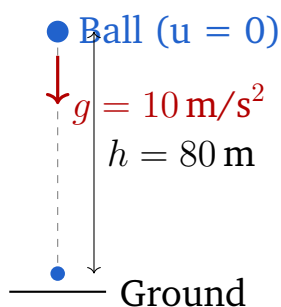
Instructions

- This paper contains **15** Multiple Choice Questions (Single Correct Answer), modelled on the Physics portion of **TALLENTEX** entrance.
- Each correct answer carries **+4 marks**. There is a **penalty of –1 mark** for incorrect answers. Unattempted questions carry no penalty.
- Only **one** option is correct. Choose carefully.
- Syllabus: **NCERT Class 8 and Class 9 Physics**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Section A — Multiple Choice Questions (MCQ)

- Q1.** In uniform circular motion, which of the following quantities remains constant throughout the motion?
- (A) Velocity
(B) Speed
(C) Acceleration
(D) Displacement
- Q2.** A ball is dropped from a height of 80 m (see figure). Taking $g = 10 \text{ m/s}^2$, its velocity just before hitting the ground is:





- (A) 40 m/s
- (B) 20 m/s
- (C) 80 m/s
- (D) 8 m/s

Q3. Which of the following is a scalar quantity?

- (A) Force
- (B) Displacement
- (C) Velocity
- (D) Speed

Q4. A net force of 30 N acts on an object of mass 10 kg. The acceleration of the object is:

- (A) 300 m/s^2
- (B) 0.3 m/s^2
- (C) 3 m/s^2
- (D) 30 m/s^2

Q5. A rifle of mass 5 kg fires a bullet of mass 50 g at a velocity of 400 m/s. The recoil velocity of the rifle is:

- (A) 0.4 m/s
- (B) 4 m/s
- (C) 40 m/s



(D) 8 m/s

Q6. The value of acceleration due to gravity on the surface of the Moon compared to the Earth's surface value ($g \approx 10 \text{ m/s}^2$) is approximately:

(A) $\frac{1}{6}$ of Earth's g

(B) Equal to Earth's g

(C) $\frac{1}{4}$ of Earth's g

(D) 6 times Earth's g

Q7. The buoyant force experienced by an object submerged in a liquid is equal to the weight of the liquid displaced by the object. This statement is known as:

(A) Newton's Third Law

(B) Pascal's Law

(C) Bernoulli's Principle

(D) Archimedes' Principle

Q8. A 2 kg object moves with a velocity of 10 m/s. Its kinetic energy is:

(A) 20 J

(B) 200 J

(C) 100 J

(D) 50 J

Q9. An electric motor does 6000 J of work in 60 seconds. The power developed by the motor is:

(A) 360 000 W

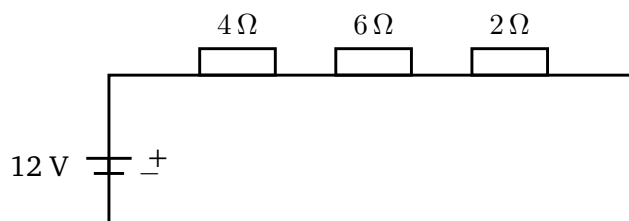
(B) 100 W

(C) 1000 W

(D) 6000 W



- Q10.** Which of the following devices uses ultrasonic sound waves to detect objects underwater?
- (A) SONAR
 - (B) Radio
 - (C) TV remote
 - (D) X-ray machine
- Q11.** The image formed by a plane mirror is:
- (A) Real, inverted, and of the same size
 - (B) Virtual, erect, and magnified
 - (C) Real, erect, and of the same size
 - (D) Virtual, erect, and of the same size as the object (laterally inverted)
- Q12.** When a ray of light travels from air into a glass slab (optically denser medium), which of the following correctly describes what happens?
- (A) It speeds up and bends away from the normal
 - (B) It slows down and bends away from the normal
 - (C) It slows down and bends towards the normal
 - (D) Its frequency increases
- Q13.** Three resistors of $4\ \Omega$, $6\ \Omega$ and $2\ \Omega$ are connected in series (as in the figure). The total resistance of the combination is:



- (A) $1\ \Omega$
- (B) $12\ \Omega$



(C) $24\ \Omega$

(D) $6\ \Omega$

Q14. A 12 V battery is connected in series with resistors of $4\ \Omega$ and $8\ \Omega$. The current through the circuit is:

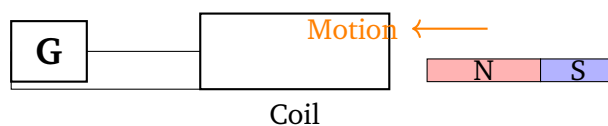
(A) 1 A

(B) 2 A

(C) 3 A

(D) 0.5 A

Q15. When a bar magnet is moved towards a stationary coil of wire (as shown in the figure), the galvanometer connected to the coil shows a deflection. This phenomenon is called:



(A) Magnetic saturation

(B) Hysteresis

(C) Electrostatic induction

(D) Electromagnetic induction



Detailed Solutions

Q1.

Solution

Speed is the magnitude of velocity. In uniform circular motion, the speed is constant because the object covers equal arc lengths in equal time intervals. However, the **velocity** (a vector) continuously changes direction, and the centripetal **acceleration** also changes direction. **Displacement** varies as the object moves along the circle.

Therefore, speed (option B) is the quantity that remains constant.

Answer: (B)

Q2.

Solution

Using the kinematic equation for free fall:

$$v^2 = u^2 + 2gh$$

Here $u = 0$ (dropped from rest), $g = 10 \text{ m/s}^2$, $h = 80 \text{ m}$.

$$v^2 = 0 + 2 \times 10 \times 80 = 1600$$

$$v = \sqrt{1600} = 40 \text{ m/s}$$

Option B gives $\sqrt{800} \approx 28 \text{ m/s}$; option C would require $v = h/\text{something}$; option D gives $\sqrt{160} \approx 12.6 \text{ m/s}$.

Answer: (A)

Solution

A **scalar** quantity has only magnitude, no direction. A **vector** quantity has both magnitude and direction.

- Q3.
- Force (A) — vector (has direction)
 - Displacement (B) — vector (has direction)
 - Velocity (C) — vector (has direction)
 - **Speed (D)** — scalar (only magnitude: distance per unit time)

Therefore, **Speed** is the scalar quantity.

Answer: (D)



Q4.

Solution

Using Newton's second law:

$$F = ma \implies a = \frac{F}{m} = \frac{30 \text{ N}}{10 \text{ kg}} = 3 \text{ m/s}^2$$

Option A (300 m/s^2) multiplies $F \times m$; option B (0.3 m/s^2) inverts; option D (30 m/s^2) omits the denominator.

Answer: (C)

Q5.

Solution

By conservation of momentum, the total momentum before and after firing is zero (rifle and bullet initially at rest):

$$0 = m_r v_r + m_b v_b$$

$$v_r = -\frac{m_b v_b}{m_r} = -\frac{0.05 \text{ kg} \times 400 \text{ m/s}}{5 \text{ kg}} = -\frac{20}{5} = -4 \text{ m/s}$$

The magnitude of recoil velocity is 4 m/s .

Option A misses a factor of 10 (uses 500 g instead of 50 g); option C forgets the mass ratio; option D uses double the correct value.

Answer: (B)

Q6.

Solution

The surface gravity of the Moon is $g_{\text{Moon}} \approx 1.63 \text{ m/s}^2$. Comparing with Earth's $g \approx 10 \text{ m/s}^2$:

$$\frac{g_{\text{Moon}}}{g_{\text{Earth}}} \approx \frac{1.63}{10} \approx \frac{1}{6}$$

This arises from the Moon's smaller mass and radius. Options B (equal), C ($1/4$), and D (6 times) are all incorrect.

Answer: (A)

Solution

The statement given — “the buoyant force on a submerged object equals the weight of the liquid displaced” — is the definition of **Archimedes' Principle**.



- Q7.
- Newton's Third Law (A): every action has an equal and opposite reaction.
 - Pascal's Law (B): pressure applied to an enclosed fluid is transmitted equally in all directions.
 - Bernoulli's Principle (C): faster-flowing fluid has lower pressure.

Answer: (D)

Q8.

Solution

Kinetic energy is given by:

$$KE = \frac{1}{2}mv^2 = \frac{1}{2} \times 2 \text{ kg} \times (10 \text{ m/s})^2 = \frac{1}{2} \times 2 \times 100 = 100 \text{ J}$$

Option A (20 J) uses mv instead of $\frac{1}{2}mv^2$; option B (200 J) omits the $\frac{1}{2}$; option D (50 J) halves v before squaring.

Answer: (C)

Q9.

Solution

Power is defined as work done per unit time:

$$P = \frac{W}{t} = \frac{6000 \text{ J}}{60 \text{ s}} = 100 \text{ W}$$

Option A (360 000 W) multiplies $W \times t$; options C and D are arithmetic errors.

Answer: (B)

Solution

SONAR (Sound Navigation and Ranging) uses ultrasonic pulses (frequency $> 20\,000 \text{ Hz}$) to detect objects underwater by measuring the time taken for the echo to return.

- Q10.
- Radio (B): uses electromagnetic (radio) waves.
 - TV remote (C): uses infrared electromagnetic radiation.
 - X-ray machine (D): uses ionising electromagnetic radiation.

Answer: (A)



Solution

A plane mirror always forms an image that is:

- Q11.
- **Virtual** (formed behind the mirror; cannot be obtained on a screen)
 - **Erect** (upright, not inverted)
 - **Same size** as the object
 - **Laterally inverted** (left and right are exchanged)

Options A and C describe real images, which are formed only by concave mirrors/converging lenses. Option B says magnified, which is wrong for a plane mirror.

Answer: (D)

Solution

When light travels from a rarer medium (air) into a denser medium (glass):

- Q12.
- Its **speed decreases** (light travels more slowly in glass).
 - It **bends towards the normal** (angle of refraction < angle of incidence), as per Snell's Law.
 - Its **frequency remains unchanged**; only wavelength changes.

Option A (speeds up, bends away) describes light going from denser to rarer. Option B (slows, bends away) contradicts Snell's law. Option D (frequency increases) is incorrect — frequency never changes during refraction.

Answer: (C)

Q13.

Solution

For resistors in series, the total resistance is the sum of individual resistances:

$$R_{\text{total}} = R_1 + R_2 + R_3 = 4\,\Omega + 6\,\Omega + 2\,\Omega = 12\,\Omega$$

Option A ($1\,\Omega$) applies the parallel formula $\left(\frac{1}{R} = \frac{1}{4} + \frac{1}{6} + \frac{1}{2}\right)$; option C ($24\,\Omega$) multiplies the values; option D ($6\,\Omega$) takes the average.

Answer: (B)

Q14.



Solution

Total resistance in series:

$$R_{\text{total}} = 4\ \Omega + 8\ \Omega = 12\ \Omega$$

Current from Ohm's Law:

$$I = \frac{V}{R} = \frac{12\text{ V}}{12\ \Omega} = 1\text{ A}$$

Option B uses only $8\ \Omega$ ($I = 12/8 = 1.5\text{ A}$); option C uses only $4\ \Omega$ ($I = 3\text{ A}$); option D has an arithmetic error.

Answer: (A)

Solution

When a bar magnet is moved towards (or away from) a stationary coil, the changing magnetic flux through the coil induces an electromotive force (EMF) and hence a current, as shown by the galvanometer deflection. This is **Electromagnetic Induction** (Faraday's Law).

- Q15.
- Magnetic saturation (A): a material property — no more magnetisation possible beyond a limit.
 - Hysteresis (B): the lag between magnetisation and the applied magnetic field.
 - Electrostatic induction (C): charge redistribution due to a nearby charged body, not a moving magnet.

Answer: (D)



Answer Key

1	B	2	A	3	D	4	C	5	B
6	A	7	D	8	C	9	B	10	A
11	D	12	C	13	B	14	A	15	D

