

The Brigade School@ G and W TA 1 (2020-21)

Total points **79/80** ?

Class 10

Physics

80 Marks

Time 2 ½ hours

Instructions:

0 of 0 points

1. Select your name correctly.
2. Select your school and section correctly.
3. Attempt all the questions.
4. This paper consists of Section A (40 marks) and Section B (40 marks)
4. Ensure that you have completed and revised your paper before submission.
5. You can attempt your paper only once.
6. Follow all the instructions given in the file upload question.

Name : *

Manan Y Mehta ▼

School: *

TBSG ▼

Class and Section: *

10 A ▼



Section I

39 of 40 points

Marks: 40

✓ Question 1 (a) Which of these does not change during uniform circular motion? * 1/1

☐ acceleration

☒ speed ✓

☐ velocity

Feedback

A body in circular motion changes its direction at every instant and hence changes its velocity. So it is accelerated motion.

✗ (b) The centre of gravity of a hollow cone is at a height _____ from its vertex. * 0/1

☐ $h/4$

☐ $h/3$

☒ $3h/4$ ✗

☐ $2h/3$

Correct answer

☒ $2h/3$

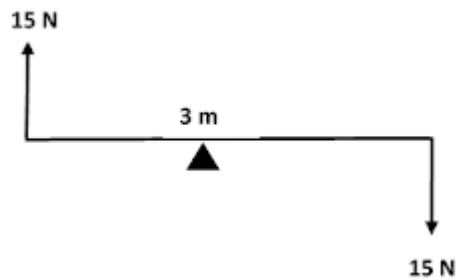


(c) Identify the correct symbol for SI unit of the following: *

	kWh	HP	W	calorie	Score	
Heat energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	1/1	✓
Power	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	1/1	✓
Electrical energy	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/1	✓
Mechanical unit of Power	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	1/1	✓



- ✓ (d) Two forces act on the two ends of a 3 m rule placed at its mid point as shown in the diagram below. The magnitude of the resultant moment of these forces about the mid point will be: *



- ☐ 45 Nm anticlockwise
- ☐ 675 Nm anticlockwise
- ☒ 45 Nm clockwise
- ☐ 22.5 Nm clockwise



Feedback

*Total moment of force = $F \times 1.5 + F \times 1.5$
or $F \times (1.5 + 1.5)$
or $15 \times 3 = 45 \text{ Nm}$. Body will move in anticlockwise direction*



✓ (e) Which of the following statement is true about the relation of frequency of a stretched string to its length and its tension? *

2/2

- ☐ Frequency of stretched string is directly proportional to both its length and its tension
- ☐ Frequency of stretched string is inversely proportional to its length and directly proportional to square of its tension
- ☒ Frequency of stretched string is inversely proportional to its length and directly proportional to the square root of its tension ✓
- ☐ Frequency of stretched string is inversely proportional to both its length and its tension

✓ Question 2. (a) The mechanical advantage of a class 3 lever is always *

1/1

- ☐ Greater than 1
- ☐ Equal to 1
- ☒ Less than 1 ✓

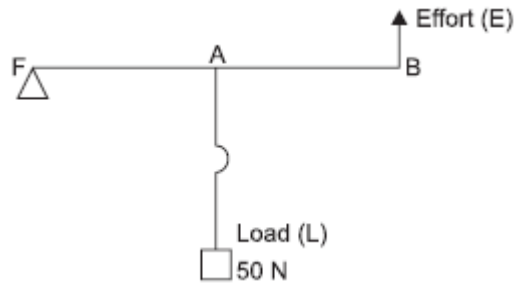
Feedback

The mechanical advantage of a lever of the third order is always less than one because effort arm is lesser than load arm.



✓ (b) The diagram below is a representation of class ____ lever. *

1/1



- ☐ Claas 1
- ☒ Class 2
- ☐ Class 3
- ☐ It is not a lever



Feedback

class 2 lever because load lies between fulcrum and effort



✓ (c) Which of the following is an example of the class of lever that you have mentioned in 2 (b). *

1/1

- ☐ seesaw
- ☐ see saw
- ☐ fishing rod
- ☒ bottle opener



Feedback

In a bottle opener the load is in between effort and fulcrum

✓ (d) In the figure in Q 2 (a) if FA = 40 cm and AB = 60 cm then the mechanical advantage of the lever is: *

1/1

- ☐ 1.5
- ☒ 2.5
- ☐ 0.4
- ☐ 0.67



Feedback

*FA = 40 cm = load arm
FA + AB = 40 + 60 = 100 cm = Effort arm
MA = EA/LA = 100/40 = 2.5*



✓ (e) How is an ammeter and a voltmeter connected in a circuit ? *

2/2

- ☐ ammeter in parallel and voltmeter in series
- ☐ Both in parallel
- ☐ Both in series
- ☒ Ammeter in series and voltmeter in parallel



✓ (f) _____ is the rate of flow of charges and its SI unit is _____. *

2/2

- ☐ Potential difference, Ampere
- ☐ Resistance, Ohms
- ☐ Potential difference, Volts
- ☒ Current, Ampere



✓ (g) If 8 A of electric current flows through a conductor having potential difference between two points equal to 16 V the resistance is: * 2/2

☐ 108 ohms

☐ 0.5 ohms

☒ 2 ohms ✓

☐ 24 ohms

Feedback

$$V = IR$$

$$R = V/I = 16/8 = 2 \text{ ohms}$$

✓ Question 3. (a) Calculate the amount of electric charge flowing through the circuit if an electric current of 7 A is drawn by an electric iron for 3 minutes. * 2/2

☐ 3/7 C

☐ 21 C

☐ 7/3 C

☒ 1260 C ✓



✓ (b) A movable pulley is used as *

1/1

☒ a force multiplier ✓

☐ an energy multiplier

☐ a speed multiplier

☐ a direction changer

✓ (c) Which is the correct option for refractive indices of red and violet? * 1/1

☐ $\mu_{\text{red}} > \mu_{\text{violet}}$

☐ $\mu_{\text{red}} = \mu_{\text{violet}}$

☒ $\mu_{\text{red}} < \mu_{\text{violet}}$ ✓

✓ (d) Which of the following relationship is correct? *

1/1

☒ Refractive index = Real depth/Apparent depth ✓

☐ Refractive index = Apparent depth/Real depth

☐ Refractive index = real depth x apparent depth



✓ (e) The speed of light in air is 3×10^8 m/s. If the refractive index of glass is $\frac{2}{1.5}$, then the speed of light in glass is *

☐ 4.5×10^8 m/s

☒ 2×10^8 m/s ✓

☐ 0.5×10^8 m/s

☐ 5×10^{-9} m/s

Feedback

Ref index = c/v or $v = c/\text{ref index} = 3 \times 10^8 / 1.5 = 2 \times 10^8$

✓ (f) The position, nature and size of image formed by a convex lens if the object is kept between F and 2F. * 3/3

☐ At 2 F on the other side, magnified, real and inverted

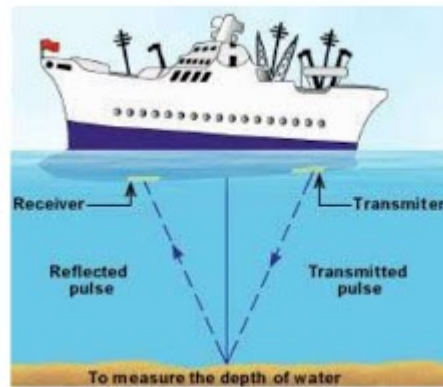
☐ Beyond 2 F on the other side, diminished, real and erect

☐ Between F and 2 F on the other side, diminished, real and inverted

☒ Beyond 2 F on the other side magnified, real and inverted ✓



- ✓ Question 4. (a) Observe the picture and answer the questions based on it: (i) Identify the device. *



- ☐ RADAR
- ☒ SONAR
- ☐ REFLECTOR



- ✓ ii) What is the type of wave transmitted by this device? *

1/1

- ☒ ultrasonic
- ☐ infrasonic
- ☐ audible



Feedback

Correct



✓ iii) Why is the waves named by you in Q (ii) used in this device? *

1/1

- ☐ Because they travel very fast
- ☐ They have a suitable wavelength
- ☒ They travel long distances without deviating



✓ (b) If ref. index of air with respect to glass is $\sin i / \sin r$ and if angle $r = 90$ degrees. then the corresponding angle i is called *

1/1

- ☐ angle of incidence
- ☒ critical angle
- ☐ Angle of total internal reflection



✓ (c) Which of these affect the angle of deviation produced by a prism? * 1/1

- ☐ angle i and angle A
- ☐ Refractive index of the prism
- ☐ wavelength of light used
- ☒ All of the above
- ☐ None of the factors listed



✓ (d) Choose the correct option to fill in the blanks in the correct sequence: (i) The _____ transformer is used in the main substation before it is transmitted to the heavy industries. (ii) The frequency of alternating current supplied to residential houses is _____. (iii) In a household electrical circuit the switch is connected to the _____ wire. *

3/3

- ☐ step-up, 50 Hz, neutral
- ☐ step- up, 100 Hz, live
- ☐ step-down, 220 Hz, earth
- ☒ Step-down, 50 Hz, live



✓ (e) A pond appears to be 2.7 m deep. If the refractive index is $\frac{4}{3}$, the actual depth of the pond is ____ m. *

2/2

- ☐ 20.25 m
- ☒ 3.6 m
- ☐ 36 m
- ☐ 2.25 m



Section II (40 marks)

40 of 40 points

The written parts and calculations have to be typed as long answers. The diagrams of these questions should be uploaded in the specified part.



- ✓ Question 5 (a) A uniform half meter rule balances horizontally on a knife edge at the 29 cm mark when a weight of 20 gf is suspended from one end. (i) Draw a neat labelled diagram of the arrangement. (ii) Calculate the weight of the half meter rule. *

(a)

(ii) Let the weight be 'x'

Since the scale is in equilibrium,

According to principle of moments,

Sum of Anticlockwise Moments = Sum of Clockwise Moments

$$(29 - 25)x = 20 \times 21$$

$$x = (20 \times 21) / 4$$

$$x = 105 \text{ gf}$$

The weight of the half meter rule is 105 gf.

Feedback

() Diagram [1]

(ii) Anti clockwise moment = $X \times 4 \text{ gf cm}$

Clockwise moment = $20 \times 21 \text{ gf cm}$

In equilibrium $ACM = CM$ [1/2]

$$X \times 4 = 20 \times 21 \text{ [1/2]}$$

$$x = 420 / 4 = 105 \text{ gf [1]}$$

- ✓ (b) A lens produces a virtual image between the object and the lens. (i) 3/3
Name the lens. (ii) State one use of the lens. (iii) Draw a ray diagram to show the formation of the image with object placed anywhere except infinity.

(b)

(i) Concave Lens

(ii) In Galilean telescope

Feedback

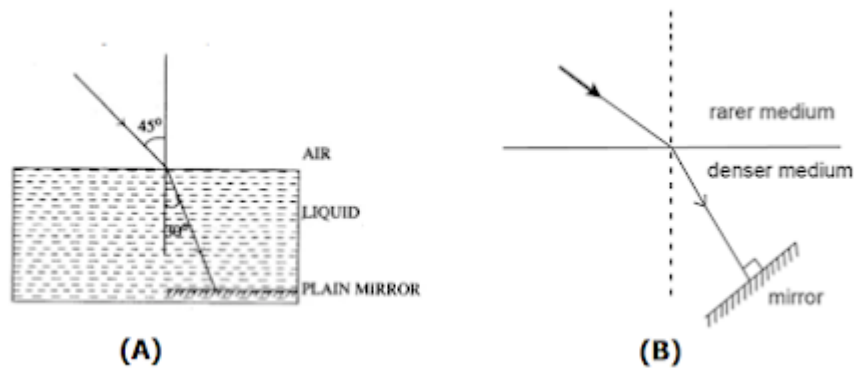
Concave lens [1]

Use - varied answers [½]

Diagram [1½]



- ✓ (c) (i) A ray of monochromatic light enters air to liquid as shown in Fig (A). 4/4
Copy the diagram and show the path of the ray of light after it strikes the mirror and enters air. Mark and state the value of the two angles on the surface of separation. (ii) What would have happened if the mirror was placed as shown in Fig (B). What is this principle called? *



- (c)
(ii) The light should have retraced the same path.
The principle is called reversibility of light.

Feedback

- (i) Diagram - path of ray [1] Labelling of value of angle [1]
(ii) The ray will go back along the same path or diagram [1]
This is called principle of reversibility [1]

Upload your diagram for Q 5 a (i) 5 b (iii) and 5 c (i) here. Write your Name, Class and School Name on the sheet that you are uploading. Name your file as Name_Q No {Example: Rahul_ Q 5b}

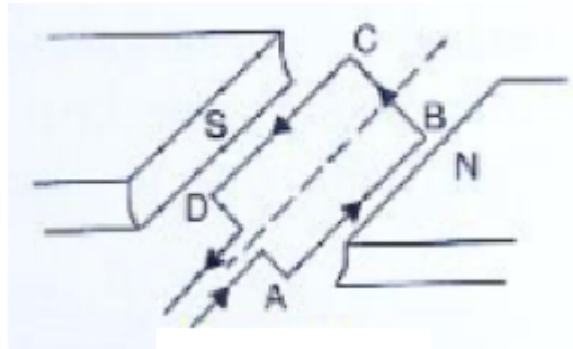
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PDF Manan_Q5b - Ma...

PDF Manan_Q5c - Ma...



- ✓ Q 6. (a) A coil is mounted on an axle and placed between the poles N and S of a permanent magnet as shown in the figure. (i) in which direction will the coil begin to rotate when current is passed through the coil in the direction ABCD by connecting a battery between A and D of the coil. (ii) Name and state the Law you used to arrive at the direction of movement of the coil. *



(a)

(i) Anticlockwise direction

(ii) Fleming's Left Hand Rule - When the forefinger, central finger, thumb are mutually perpendicular to each other, and if forefinger indicates direction of magnetic field, central finger indicates direction of current, then the thumb indicates direction of motion of conductor.

Feedback

(i) anticlock-wise

(ii) Fleming's Left hand Rule

When the first three fingers of the left hand are stretched mutually perpendicular to each other and if the forefinger points in the direction of magnetic field and the central finger in the direction of current then the thumb points in the direction of motion of the conductor.



- ✓ (b) A man X weighing 50 kgf climbs a staircase of 30 steps of 20 cm each ^{3/3} in 5 minutes and a person Y weighing 30 kgf does the same in 2 minutes.
(i) Calculate the work done by X and Y (ii) Find the ratio the power developed by each of them. *

(b)

$$g = 10 \text{ m s}^{-2}$$

For X :

$$t_1 = 5 \times 60 = 300 \text{ s}$$

$$F_1 = m_1 \times g = 50 \times 10 = 500 \text{ N}$$

$$S_1 = 30 \times 20 = 600 \text{ cm} = 6 \text{ m}$$

$$W_1 = F_1 \times S_1 = 500 \times 6 = 3000 \text{ J}$$

$$P_1 = W_1/t_1 = 3000/300 = 10 \text{ W}$$

For Y :

$$t_2 = 2 \times 60 = 120 \text{ s}$$

$$F_2 = m_2 \times g = 30 \times 10 = 300 \text{ N}$$

$$S_2 = 30 \times 20 = 600 \text{ cm} = 6 \text{ m}$$

$$W_2 = F_2 \times S_2 = 300 \times 6 = 1800 \text{ J}$$

$$P_2 = W_2/t_2 = 1800/120 = 15 \text{ W}$$

$$P_1/P_2 = 10/15 = 2/3$$

$$P_1: P_2 = 2:3$$

- (i) Work by X and Y is 3000J and 1800J respectively.
(ii) Ratio of Power of X:Y is 2:3.

Feedback

X = 50 kgf; Height = 30 x 20 = 600 cm = 6 m

Work done by X = 50 x 10 x 6 = 3000 J

Work done by Y = 30 x 10 x 6 = 1800 J

Power developed by X = 3000/5 x 60 = 10 W

Power developed by Y = 1800/2 x 60 = 15 W

Ratio of power of X: Y = 10: 15 = 2:3



- ✓ (c) A pulley system with a velocity ratio 4 is used to lift a load of 150 kgf through a vertical height of 20 m. The effort required is 50 kgf in the downward direction. Calculate (i) distance moved by the effort (ii) Work done by the effort (iii) Mechanical advantage (iv) efficiency of the pulley system. {take 1 kgf = 10 N} *

Given :

$VR = 4$; $dL = 20\text{m}$; $dE = ?$; $L = 150\text{kgf}$; $E = 50\text{kgf} = 50 \times 10\text{N} = 500\text{N}$

(i) $VR = dE / dL$

$$4 = dE/20$$

$$\text{Distance moved by effort} = 20 \times 4 = 80\text{m}$$

(ii) Work done by effort = $E \times dE = 500\text{N} \times 80 = 40,000\text{J}$

(iii) $MA = L/E = 150/50 = 3$

(iv) Efficiency = $MA/VR = 3/4 = 75\%$

Feedback

$VR = 4$, $L = 150\text{ kgf}$, $dL = 20\text{ m}$

(i) $VR = dE/dL$; $dE = 4 \times 20 = 80\text{ m}$

(ii) Work done by effort = $E \times dE = 50 \times 10 \times 80 = 40000\text{J}$

(iii) $MA = L/E = 150/50 = 3$

Efficiency = $MA/VR \times 100 = 3/4 \times 100 = 75\%$



- ✓ Question 7 (a) Sometimes when a vehicle is driven at a particular speed, 3/3 a rattling sound is heard. Explain briefly why this happens and give the name of the phenomenon taking place, Suggest one way by which the rattling can be reduced. *

When the car is moving with a particular speed, the natural frequency of few parts of the vehicle becomes equal to frequency of to and fro movement of piston of its engine and thus resonance occurs. Hence, those few parts of vehicle vibrate violently and rattling sound is heard.

Phenomenon - Resonance

Suggestion - Speed of vehicle should be changed

Feedback

This occurs because the external frequency applied becomes equal to the natural frequency of the vehicle parts and it resonates and rattles.

The phenomena is Resonance,

Rattling can be stopped by altering/changing the speed of the vehicle.



- ✓ (b) A lens forms the image of an object placed at a distance of 15 cm from it, at a distance of 60 cm in front of it. Find (i) focal length of the lens (ii) magnification (iii) power of the lens along with the sign. *

3/3

(b)

Given : $v = -60\text{cm}$; $u = 15\text{cm}$

(i) $1/f = 1/v - 1/u = 1/-60 + 1/15 = -1+4/60 = 3/60 = 1/20 \implies f = 20\text{cm}$ i.e focal length is 20cm.

(ii) $m = v/u = -60/15 = 4$

(iii) Power of lens = $1/f = 1/20 = 1/0.2\text{m} = 5\text{D}$

Feedback

(i) $u = -15, v = -60$

$1/f = 1/v - 1/u$

$1/f = 1/-60 - 1/-15$

$1/f = 3/60$

$f = 20\text{ cm}$

(ii) $m = v/u = -60/-15 = +4$

(iii) $P = 1/f \text{ in m} = 1/0.2 = +5\text{ D } [1 \times 3]$



- ✓ (c) A person standing between two vertical cliffs and 480 m from the nearest cliff shouts. He hears the first echo after 3 s and the second echo 5 s after the first. Calculate (i) the speed of sound (ii) The distance of the other cliff from the person. *
- 2/2

(c)

(i) $V = 2d/t = 2 \times 480/3 = 320 \text{ m/s}$

(ii) Total $t = 3 + 5 = 8 \text{ s}$

$$V = 2d/t$$

$$d = Vt/2 = 320 \times 8/2 = 1280 \text{ m}$$

Feedback

(i) First echo was heard after 3 s. Total distance travelled is $480 \times 2 = 960 \text{ m}$

Speed of sound in air = $960/3 = 320 \text{ m/s}$ [1]

(ii) Time taken for 2nd echo = $3+5=8 \text{ s}$

Speed of sound = 320 m/s

$$2d = v \times t$$

$$d = (320 \times 8)/2 = 2560/2 = 1280 \text{ m} [1]$$

- ✓ (d) (i) In what way does an 'Ideal machine' differ from a 'Practical machine'? (ii) Can a simple machine act as a force multiplier and a speed multiplier at the same time. *
- 2/2

(d)

(i) Ideal Machine : ~ No loss of energy.

~ Work output is equal to work input.

~ Efficiency is 100 %.

Practical Machine : ~ Always a loss of energy.

~ Output energy always less than input energy

~ Efficiency is not 100 %

Feedback

(i) An ideal machine has 100 % efficiency whereas a practical machine is not 100 % efficient as energy is lost due to friction.

(ii) No it cannot be used.



- ✓ Question 8. (a) A cell sends current in an external circuit, How does the terminal voltage compare with the emf of the cell? (b) What is the purpose of using a fuse in an electric circuit? (iii) What are the characteristic properties of a fuse wire? (iv) What is a fuse wire made of? 4/4

*

- (a) Terminal Voltage < e.m.f
(b) It protects the circuit from blowing off if the current in circuit exceeds current carrying capacity of the fuse due to overloading .
(iii) ~Uniform area of cross section
~Low melting point
~High resistance
(iv) Its made of a material of low melting point and high resistance.
Eg - Lead and tin alloy
-

Feedback

- (i) *e m f is greater than terminal voltage.*
(ii) *Fuse is a safety device which melts and and breaks when excess current flows through the circuit.*
(iii) *It has low melting point and high resistivity.*
(iv) *Alloy of lead and tin.*

- ✓ (b) (i) Write an expression for the electrical energy spent in the flow of current through an electric appliance in terms of I, R and t. (ii) At what voltage is the alternating current supplied to our houses. (iii) How should the electric lamps in a building be connected? * 3/3

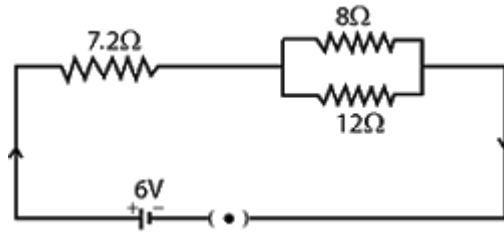
- (b)
(i) $H = I^2 R t$
(ii) 220V
(iii) It should be connected in parallel connection.
-

Feedback

- (i) *Electric energy = $I^2 R t$*
(ii) *220 V*
(iii) *Electric lamps are connected in parallel*



- ✓ (c) Calculate: (i) the equivalent resistance of the circuit. (ii) total current in the circuit. (iii) potential difference across the 7.2 ohm resistor. 3/3



(c)

(i) $\frac{1}{R_p} = \frac{1}{8} + \frac{1}{12} = \frac{(3 + 2)}{24} = \frac{5}{24}$
 $R_p = \frac{24}{5} = 4.8 \text{ ohms}$

$R_s = 4.8 + 7.2 = 12 \text{ ohms}$

Thus equivalent resistance is 12 ohms

(ii) $V = IR$

$I = V/R = 6/12 = 0.5 \text{ A}$

(iii) $V = IR = 0.5 \times 7.2 = 3.6 \text{ V}$

Feedback

(i) 8 ohm and 12 ohm are in parallel

$\frac{1}{R_p} = \frac{1}{8} + \frac{1}{12}$

$\frac{1}{R_p} = \frac{5}{24} \quad R_p = 4.8$

$R_s = 7.2 + 4.8 = 12 \text{ ohm}$

(ii) $V = IR$

$6 = I \times 12$

$I = 6/12 = 0.5 \text{ A}$

(iii) $V = IR = 0.5 \times 7.2 = 3.6 \text{ V}$

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